

**SERVICING & STORMWATER
MANAGEMENT IMPLEMENTATION REPORT**

WYLDEWOOD CREEK

TOWN OF COLLINGWOOD

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1.0 INTRODUCTION

C.F. Crozier & Associates Inc. ("Crozier") has been retained by Brandy Lane Corporation to prepare a Servicing & Stormwater Management Implementation Report and detailed design to support the Site Plan Application (SPA) for the proposed Wyldeewood Creek Development located in the Town of Collingwood.

The subject site is the south block of the Georgian Bay Hotel lands located at 10 Vacation Inn Drive and is bounded by the Cranberry Marsh located to the east and Cranberry Golf Course to the south and west. The site is legally described as part of Lots 47 and 48, Concession 11 in the Town of Collingwood, County of Simcoe.

According to the Town's Official Plan, the lands are currently designated as Resort Commercial and zoned C3-4. A zoning by-law amendment application has been submitted to rezone the southern block as Residential Fourth Density Exception (R4-3) on behalf of Georgian Bay Hotel (the current Owners). Crozier prepared a high-level Functional Servicing & Stormwater Management Report in July 2018 (FSSMR, 2018) and a Flood Study (September 2020) in support of the zoning By-Law and Official Plan Amendment Application.

Consultation with the Town and Nottawasaga Valley Conversation Authority (NVCA) has occurred as part of the OPA/ZBA submission. Additional pre-consultation has occurred with the Town on the Site Plan, a first SPA submission was made in February 2019, a second SPA submission was made in April 2021, a third SPA submission was made in January 2022, a fourth submission SPA was made in March 2024, and a fifth submission SPA was made in April 2024.

This report has been prepared to provide details associated with the implementation of the servicing and stormwater management design for the proposed development and to address comments provided by the Town and NVCA on the OPA/ZBA application and on the first, second, third, fourth, and fifth submission SPAs. This report has been prepared based on the design framework established in the following reports:

- Servicing Report – Georgian Manor Resort & Country Club, prepared by Henderson, Paddon & Associates Ltd, dated April 2003.
- Compilation of Site Servicing Drawings (Existing Works) – Georgian Manor Resort & Country Club, prepared by Henderson, Paddon & Associates Ltd, dated April 2004.
- Regional Stormwater Management Update & Master SWM Strategy – Tanglewood at Cranberry Trail / Cranberry Creek Watershed – Tanglewood (Sierra Homes) Inc., prepared by Crozier, final dated May 2007.
- Servicing & Stormwater Management Implementation Report – Blue Fairway: Block 7 – Macpherson Builders (Cranberry Ltd.), prepared by C.F. Crozier & Associates, final dated May 2007.
- Functional Servicing & Stormwater Management Report – 10 Vacation Inn Drive – Georgian Bay Hotel, prepared by Crozier, final dated July 2018.
- Flood Study – Wyldeewood Creek – Brandy Land Corporation/Georgian Bay Hotel, prepared by Crozier, dated September 2020.

2.0 BACKGROUND & SITE DESCRIPTION

The proposed development area is approximately 2.56 ha in size. The site is located south of Vacation Inn Drive and Trafalgar Road in the Town of Collingwood. To the west and south of the site is a golf course and to the east is Cranberry Marsh. Beyond the golf course south of the site is the unopened right-of-way (ROW) for Cranberry Trail which will connect Cranberry Trail East and West. Currently this portion of Cranberry Trail is a construction access for the Blue Fairway development and the watermain and hydro have been constructed.

The site is covered with grass, trees, bushes, and buildings. The existing maintenance buildings are proposed to be removed or relocated. At the south east corner of the Subject Site is an existing cell tower which will remain. Under existing conditions, the site drains to the east as sheet flow; there is also a 500 mm culvert which conveys external flows across the site and outlets at the east property line. This existing culvert and drainage works to the west of Cranberry Marsh have been referred to as the West Watercourse in the previous reports, this includes the conveyance features of the Subject Site and adjacent golf course lands. The site and surrounding area are characterized by relatively flat topography with good drainage conditions, which ultimately drains towards the Cranberry Marsh.

The proposed development consists of 6 mid-rise residential buildings (total of 165 units) with associated at grade parking spaces, a recreational facility, and a private road. It will also include storm sewers, water and sanitary sewer servicing, stormwater management infrastructure, an engineered drainage channel and typical utility servicing.

According to the Soil Survey of Simcoe County (1962), the soil on site is classified as Sargent soil of Hydrologic Soil Group 'A'. This was confirmed by a site specific geotechnical investigation completed by Soils Engineering Ltd. The geotechnical investigation determined that the site is underlain by shallow bedrock and high groundwater. With bedrock having been encountered at depths ranging from 0.7m to 2.4m and groundwater having been measured at depths between 0.8m to 1.5m at select borehole locations. Refer to the Geotechnical Report for further information regarding subsurface conditions.

3.0 ROADWAY & SERVICING CORRIDOR

Based on the proposed site plan, vehicular access to the site will be provided in one location from Georgian Bay Hotel. The access will be aligned with the existing intersection of Vacation Drive and Trafalgar Road. The proposed internal design consists of a 25 m servicing corridor with the following parameters:

- 3.35 m asphalt lanes at 2% cross fall;
- 600.070 OPSD concrete 2-stage barrier curb with standard gutter (dropped);
- Major Storm event to be conveyed within the ROW and discharged directly to designated overland flow routes;
- Parking on either side;
- Utility corridor with hydro and telecommunications parallel to the roadway;
- Sanitary alignment generally following the centerline;
- Storm sewer along the west side of the roadway; and
- Watermain along the east side of the roadway.

Road grades have been prepared to demonstrate that the site can be developed according to Town Standards for geometric design. The road design and site grading provide drainage for minor and major storm events as per Town Standards. The storm sewer is designed to capture and convey

the 5-year (minor) storm event and the major storm events are conveyed overland via the road surface to appropriate outlets which drain to Cranberry Marsh.

The necessity for guiderails at the culvert crossing was evaluated and determined to not be required because the 3-meter clearzone has been achieved.

4.0 UTILITIES

The subject site will be serviced with natural gas, telephone, cable TV and hydro. Water, gas and hydro will be connected to the Cranberry Trail ROW within a 10 m wide servicing easement through the golf course lands. Gas lines will be installed at the rear of the buildings, while hydro and telecommunication lines will be installed in the servicing corridor parallel to private roadway.

5.0 SANITARY SEWAGE SYSTEM

5.1 Existing Sanitary Sewer Infrastructure

There are existing sanitary sewers located along the west side of the private roadways that cross through the yards of the Georgian Bay Hotel lands. These sewers collect and convey sewage flow from all buildings to a 750 mm diameter trunk sewer in Highway 26 Right-of-Way. These sewers are part of a private system, and the sewers range in size from 200 mm diameter (servicing the administration buildings) to 375 mm diameter sewer. There are approximately 1,400 m of existing sanitary sewers internal to the Hotel Lands. There is a sewage holding tank for the maintenance building on the subject property which will be decommissioned.

The capacity of the private internal sanitary sewer system is approximately 68 L/s with a residual capacity of 61.3 L/s, based on the Sanitary Sewer Evaluation prepared by Henderson, Paddon & Associates.

The existing internal sanitary sewer network traverses the developed sectors of the Site from a connection at Highway 26 to the Vacation Inn Drive/Trafalgar Road intersection just north of the southern sector. The sanitary sewer invert at the termination of the existing Hotel sanitary network is 178.05 m, which will be used as a connection for the subject development. The internal sewer connects to the municipal sanitary sewer within the Highway 26 ROW, where there is a downstream 750 mm diameter gravity trunk sewer.

The sanitary sewer within Cranberry Trail was also investigated for connection. However, the elevation of this sewer was not suitable to service the site via a gravity connection.

5.2 Proposed Sanitary Servicing Strategy

It is the intent for the entire Wyldeewood Creek development is to be serviced by gravity sewers discharging to the existing 375 mm sanitary sewer located within the Georgian Bay Hotel property. The proposed routing of the internal sanitary sewers will follow the internal roadway. The design of this sewer is shown in DWG C103A and sanitary sewer calculations are included in Appendix A.

Sanitary flows for the site were computed using the following values, per the Town of Collingwood Standards and the Ontario Building Code (Table 8.2.1.3).

- | | |
|----------------------------------|-----------------|
| • Average Residential Flow Rate | 260 L/cap/day |
| • Average Recreational Flow Rate | 40 L/day/member |
| • Infiltration | 0.23 L/s/ha |

- | | |
|-------------------------------|------------------|
| • Residential Peaking Factor | 4.07 (Harmon) |
| • Recreational Peaking Factor | 4.47 (Harmon) |
| • Population Density | 1.9 Persons/Unit |

Based on these values it is estimated that peak sanitary flow from the site will be **4.46 L/s**. The sanitary sewer design sheet in Appendix A includes the downstream Georgian Bay Hotel network, confirming the available capacity.

6.0 POTABLE WATER SUPPLY

6.1 Existing Water Infrastructure

The existing developed sectors of Georgian Bay Hotel lands are serviced via a 200 mm diameter private watermain. The internal system connects to an existing 300 mm diameter watermain within the Highway 26 ROW. There is also an existing 300 mm diameter public watermain located within the unopened ROW of Cranberry Trail on the south side of the roadway.

6.2 Proposed Water Servicing Strategy

The preferred connection for the watermain from the subject site is to the municipal watermain within Cranberry Trail. This connection allows the watermain within the proposed development to be a part of the public system. Therefore, the proposed water distribution system within the Wyldewood Creek development is designed according to Town of Collingwood Standards and MOE Guidelines for Drinking Water (2008). The proposed watermain will also be connected to the private watermain system on the Georgian Bay Hotel lands with a backflow preventer to allow for a secondary connection for the Hotel Lands. Water modeling has been conducted by the Town's Consultant, CIMA+, to assess the available fire flows through the site. Refer to Appendix A for the water modeling report. Please note that although the Town of Collingwood Standards were updated in 2022, resulting in reduced calculated water demand flows due to revised per capita flow rates, the Water Modeling Report was prepared using the previous design standards.

Individual service connections will be extended to the apartment buildings and the recreational facility from the local watermain, and will have backflow prevention per OBC requirements. Fire protection for the apartment buildings will be provided by a series of fire hydrants connected to the proposed 300 mm watermain.

Water demands for the site was determined using the following design figures:

- | | |
|----------------------------------|-----------------|
| • Average Residential Flow Rate | 260 L/C-day |
| • Average Recreational Flow Rate | 40 L/member/day |
| • Max Day/Peak Hour Factor | 1.77/2.7 |

The water demand for the site was calculated using the values listed above, 165 proposed apartment units and one recreational facility. The water demands for the site are summarized below:

- | | |
|----------------------|----------|
| • Average Daily Flow | 0.95 L/s |
| • Max Day | 1.68 L/s |
| • Peak Hour | 2.57 L/s |

Refer to Appendix A for detailed calculations.

Preliminary fire flows required to service the subject site were determined to be **200 L/s** per the Fire Underwriter's Survey (FUS). The Ontario Building Code (OBC) fire protection water supply calculation was not considered due to the max flow possible from the OBC being 150 L/s, which is above the minimum flow calculated from the FUS. Adding the peak hour demand and the required fire flow, the total design flow for the internal water distribution system is **202.57 L/s**. Refer to Appendix A for potable water servicing demand and fire flow demand calculations.

Based on the current practices in the Town of Collingwood, it is acknowledged that the Municipality will assume ownership of the watermain distribution network located in the privately held portions of the development. This typically includes all watermains, hydrants, valves, and services up to and including curb stops. An easement in the name of the Municipality along the alignment of the watermain through the privately held portions of the development and golf course lands will be provided.

7.0 STORMWATER MANAGEMENT AND SITE DRAINAGE

7.1 Stormwater Management Criteria

The management of stormwater and site drainage for both the existing site and the future development must comply with the policies and standards of the various agencies including the Town, Nottawasaga Valley Conservation Authority (NVCA), and Ministry of Environment and Climate Change (MOECC).

The stormwater management criteria for the future development include:

- Water Quantity Control
 - Quantity Control is not required for future development within the Cranberry Creek Watershed per Regional Stormwater Management Update & Master SWM Strategy by C.F. Crozier & Associates (May 2007); and
- Water Quality Control
 - "Enhanced Protection" given Georgian Bay as the ultimate receivers.
- Erosion Control
 - First 5mm from any storm event retained on-site; and
 - Runoff from 25mm storm event detained for 48 hours or longer.
- Water Balance
 - Target of achieving pre-development annual infiltration volumes.
- Phosphorous Loading
 - "Best Efforts" to achieve pre-development phosphorous loading rates.
- Development Standard
 - Lot grading at 2% optimum grade; and,
 - Drainage system to convey runoff from frequent and infrequent rainfall events, respectively.

7.2 Existing Drainage Conditions

Currently the subject site is composed of a gravel access road, maintenance buildings and relatively flat ground covered in light vegetation. There are currently no stormwater controls in place. Stormwater runoff is conveyed overland to the West Watercourse and Cranberry Marsh.

The West Watercourse Drainage is conveyed via a 500 mm diameter culvert across Cranberry Golf Course Hole #10 which discharges to the west of the Subject Site where it is then conveyed across the southern sector via a 500 mm diameter culvert which discharges to Cranberry Marsh.

A hydrologic analysis for the Cranberry Creek Watershed was previously conducted by Crozier as part of the Regional Stormwater Management Update and SWM Strategy Report (Crozier, 2007). The analysis presented in the report included the assessment of the impacts of the South Georgian Bay Hotel South Block development. The Cranberry Marsh provides quantity control of stormwater runoff for the areas within its watershed, prior to discharging to the Cranberry Marsh and ultimately to the Georgian Bay (FSSWMR, 2018). Thus, the requirement for quantity control is determined by a development's proximity to the Marsh. Due to the location of the Wyldeewood Creek with respect to the Cranberry Marsh, it was determined that quantity control is not required for the site.

The Master SWM Strategy report indicated that water quality controls would be required in all future residential developments in the watershed. The drainage area north of the Georgian Trail is characterized by shallow bedrock and high groundwater. Consequently, infiltration for the quality control is not recommended. It is recommended for oil/grit separators to be utilized for roads, parking lots and buildings.

The stormwater management strategy has been designed and assessed using the recommendations and conclusions presented in the Master SWM Strategy Report. In addition to adhering to the conclusions and recommendations made in the Master SWM Strategy report, the management of stormwater and site drainage for the proposed development must also comply with the policies and standards of the various agencies including the Town of Collingwood, Ministry of the Environment (MECP), and the Nottawasaga Valley Conservation Authority (NVCA).

7.3 Proposed Drainage Conditions

The major drainage for proposed development will be conveyed via overland flow routes along the alignment of the roadways. It will also convey flows from the larger storm events to Cranberry Marsh, which is directly adjacent to the east site of the subject site. The minor (5-year storm) system drainage from these areas will be conveyed via gutters above ground and intercepted by catch basins and storm sewers.

Quality treatment will be achieved through the use of two filter units, one will be constructed north of the channel, and one will be constructed south of the channel. The water from the sidewalks, roofs and front yards of the apartments is considered clean water and will be discharged to the catch basins. These filter units also provide phosphorous removal from the stormwater runoff.

Overland flow will be conveyed along the internal roadway and parking areas to the catch basins at low points throughout the site. The downstream end of the storm sewer has been designed to capture and convey flows up to the five (5) year storm event. Stormwater that exceeds the capacity of the sewer in major events will by-pass the quality control units and be conveyed to the Cranberry Marsh. Refer to DWG C107 for the Storm Drainage Plan. The stormwater will be treated by filter units prior to discharging to Cranberry Marsh. Refer to Table 1 for filter sizing criteria.

Stormwater runoff from the roofs is to be intercepted and captured within landscape features for infiltration and evapotranspiration as a “best efforts” approach for the water balance and erosion control criteria.

External drainage will be conveyed through the site via an engineered channel. Refer to the Flood Study prepared by Crozier dated September 2020 for additional information regarding the hydraulic analysis of the engineered channel.

7.4 Stormwater Quality Controls

Runoff from the parking lots and roadways will be treated in end-of-pipe filter units prior to discharging to the engineered channel. Based on the 0.41 ha contributing area to the storm sewer north of the channel and an 83% impervious level, a filter unit was sized in order to provide sufficient water quality control to meet enhanced protection level. Similarly, for the 0.97 ha contributing area to the storm sewer south of the channel, with an impervious level of 83%; a filter unit was sized to provide sufficient water quality control to meet enhanced protection level.

A minimum 80% total suspended solids removal and 90% treatment of total annual runoff volume is provided in accordance with the Ministry of Environment Stormwater Management Planning & Design Manual (March 2003). Water will outlet from the filter units into the constructed watercourse. StormFilter units were selected for this development since there is shallow bedrock across the site and the StormFilter units can have shallow structures. Refer to Table 1 included below for a detailed breakdown of the required filter unit sizing. Refer to Appendix B for the detailed sizing calculations of the proposed filter units to provide water quality treatment.

Table 1: Recommended Filter Unit Sizing Criteria

Catchment	Contributing Drainage Area (ha)	% Impervious	Target Total Suspended Solids Removal (%)	Target Annual Runoff Volume Treated (%)	Filter Unit	Total Suspended Solids Removal (%)	Total Annual Runoff Volume Treated (%)
North of Channel	0.41	83	80	90	StormFilter SFPD0811	80	90
South of Channel	0.97	83	80	90	StormFilter SFPD0820	80	90

The filter systems will be privately owned and maintained. Once the filter systems are installed and operating accordingly to manufacturer's specifications, the Owner will be required to inspect and service the units on a regular basis to ensure long term efficiency. At a minimum, the unit should be inspected at least once every six months to measure the sediment depth and oil/floatable level. Once the sediment reaches a certain depth (as specified by the manufacturer) the unit shall be serviced by a vacuum truck company licensed to dispose of solid waste. If any large presence of oil / floatable materials is evident, the material should be removed and disposed.

7.5 Stormwater Erosion Control

Per the NVCA's comments, it is stated that the erosion control criteria for new developments within the NVCA's jurisdiction is that the first 5mm of precipitation from any storm event is required to be retained on-site and that the 25mm storm event is to be detained in a stormwater management facility for a minimum of 48 hours. It is generally accepted that these criteria are intended to mitigate the potential for increased erosion on downstream waterbodies caused by urbanization

within the watershed. This erosion is typically associated with moving bodies of water such as streams, creeks, rivers, etc.

The Subject Site drains to the West Watercourse which then discharges to Cranberry Marsh which outlets to Georgian Bay via Cranberry Creek. The hydrologic properties of wetlands such as Cranberry Marsh provide natural peak flow control and mitigate downstream erosion. As such, the focus for applying the erosion control criteria is to mitigate the erosion potential of the West Watercourse and its point of discharge to Cranberry Marsh.

A review of the NVCA's Stormwater Technical Guide (December 2013) states the following:

"To deal with potential impacts of increased erosion in the receiving watercourses, the NVCA recommends that a rapid geomorphic assessment is completed for all development applications where the outlet is directly into a watercourse.

NVCA staff may remove the requirement of geomorphic assessments for altered systems (e.g. ditches, municipal drains); however, this can only occur through preconsultation with appropriate technical staff to determine the level of impact to the receiving watercourse. If a watercourse is deemed sensitive based on the criteria below, then a minimum of 48-hour detention is required for the 25 mm storm event. There may also be a need to increase the amount of volume retained on-site based on the results of the detailed geomorphic assessment."

Since the West Watercourse is to be realigned as an engineered channel from the Subject Site to Cranberry Marsh, it would not be considered sensitive. GEO Morphix has been retained to provide design guidance for the West Watercourse design to ensure that the engineered channel is not subject to aggradation, degradation, channel widening or planimetric form adjustment. Based on the above, retention of the 25mm storm event for a minimum of 48 hours is not applicable to the Subject Site.

With respect to the criterion regarding retaining 5mm of precipitation, the NVCA's Stormwater Technical Guide (December 2013) states the following:

"To deal with the issues resulting from additional volume of runoff produced as a result of urbanization, a minimum of the first 5 mm of rainfall should be retained on site. This requires Low-Impact-Development measures of sufficient size to store the volume of 5 mm across the entire development site. The volume of storage required should be calculated by multiplying the 5 mm depth over the entire area to be treated by the stormwater management treatment train. This could be done through infiltration, rainwater harvesting or evapotranspiration. In some sites the conditions make retention of 5mm impractical. For these sites the NVCA encourages a "best efforts" approach to try to meet this goal."

Further, the NVCA's Stormwater Technical Guide (December 2013) provides standard initial abstraction/ depression storage (IA) depths for various land covers in Table 10.2. The minimum IA depth for pervious landcovers is 5mm. Therefore, the 5mm retention criterion is achieved for all pervious areas. The IA depth for the impervious areas is stated in Table 10.2 as 2mm and does not achieve this criterion.

The Subject Site is subject to shallow bedrock, high groundwater, non-native soils. Due to these constraints, a 'best efforts' approach to retain 5mm from the impervious areas through infiltration and evapotranspiration was implemented. Since groundwater separation could not be achieved for underground systems and site grading to match existing grades at the property lines did not allow for low-impact development methods that would retain 5mm through infiltration for the roadways and parking lots. Additionally, rainwater harvesting of stormwater runoff from these areas was deemed to be unsuitable since this runoff is likely to have a higher pollutant load from the paved surfaces which are subject to vehicular traffic.

The "best efforts" approach involves directing the stormwater runoff from the roofs of the residential buildings to river stone and planting landscape features. These features retain the stormwater runoff within the void spaces of the soil media and stones and allow for infiltration and evapotranspiration. These landscape features provide stormwater storage in excess of that required for 5mm across the impervious areas of the development, which is approximately equivalent to 10mm of stormwater runoff from the roofs. Based on a 24 hr drawdown time, imported fill below the associated landscaped areas will be specified to meet a minimum of 5.2mm/hr infiltration rate. Storage volumes are summarized in Table 2 below. Refer to Appendix B for detailed calculations.

Table 2: Erosion Control Volume

Site Area (ha)	Pervious Area (ha)	Impervious Area (ha)	Erosion Control Volume (m ³)	¹ Available Storage (m ³)
2.56	1.27	1.29	64.5	89.8

1) Refers to storage available in void spaces of the river stone and planting features surrounding the buildings.

7.6 Water Balance

Per the NVCA comments, every effort to maintain pre-development annual infiltration rates should be applied. A water balance analysis was performed to determine the post-development changes in the water balance. It was determined that under post-development conditions, there is an infiltration deficit of 615 m³/yr. As a "best effort" approach, the landscaping for the site has been developed in such a way that roof water is directed to river stone beds and planters surrounding the buildings. Additionally, it is recommended that increased topsoil soil depths be provided in all landscaped areas. Refer to the Landscape Plans prepared by Crozier. The volume of stormwater captured and retained by the landscape features for infiltration and evapotranspiration is 1180 m³/yr. The water balance analysis is summarized in Table 3 below. Refer to Appendix B for detailed calculations.

Table 3: Water Balance Summary

Characteristic	Pre-Development	Post-Development	Post-Development with Mitigation	Change (Pre to Post w/ Mitigation)
Volume (m³/yr)				
Precipitation Surplus	12255	15501	15501	26%
Net Surplus	12255	15501	15501	26%
Evapotranspiration	13140	9894	9894	-25%
Infiltration	3524	3158	3158	-10%
Mitigation	0	0	1180	-
Total Infiltration & Mitigation	3524	3158	4338	23%
Runoff Pervious Areas	5286	2105	2105	-60%
Runoff Impervious Areas	3445	10237	9058	-
Total Runoff	8731	12343	11163	28%
Total Outputs	25395	25395	25395	0%

7.7 Phosphorous Loading

A Phosphorus Budget was completed using values from the Nottawasaga Valley Conservation Authority Phosphorus Tool which is consistent with the Hutchinson Environmental Sciences Ltd. Phosphorus Report. Per the NVCA's comments "best efforts" are required to achieve pre-development loading rates. The mitigation for the site consists of a proprietary filter system which removes 77% of the phosphorus load from the stormwater leaving the site. Table 4 summarizes the pre-and post-development, and post-development with mitigation phosphorus outputs from the site. Refer to Appendix B for phosphorus budget calculations and supporting documentation regarding the phosphorous removal efficiency of the filter systems.

Table 4: Phosphorus Budget Summary

	Land Use	Area (ha)	Phosphorus Coefficient (kg/ha)	Phosphorus Load (kg/yr)
Pre-Development	Transition	2.56	0.07	0.18
Post-Development	Residential	2.56	1.33	3.41
Post-Development (with mitigation)	Residential	2.56	0.35	0.89

8.0 EROSION & SEDIMENT CONTROLS

Erosion & sediment controls will be implemented prior to any on-site construction works. The controls will consist of a combination of silt fencing, mud mat, sediment trap, and dust separation.

- Silt fencing

Silt fence will be constructed in accordance with NVCA's Typical Detail of Silt/Sediment Fence (BSD-23 Draft). It should be noted that additional silt fence may be added based on field decisions by the Engineer and Developer prior to, during and following the earth works. Double row silt fencing with straw bales is to be used along the western and southern property lines to provide additional protection for the natural heritage features.

- Mud Mat

A mud mat has been proposed at the entrance to the development from Vacation Drive and Trafalgar Drive. This mud mat will be maintained at the site until base asphalt is placed to limit mud tracking from the site onto the Georgian Bay Hotel property and the surrounding Municipal roadway network. The Contractor shall ensure mud mat maintenance (cleaning / additional stone) is completed on an as needed basis to ensure proper operation.

- Excavated Sediment Trap

Excavated sediment trap(s) or basins may be required to remove sediment from runoff before the runoff discharges to receiving conveyance routes.

- Dust Suppression

During earthwork activities, the Contractor will be responsible for ensuring dust suppression is maintained by the use of water or calcium chloride, or other methods approved by the Engineer.

9.0 CONCLUSIONS AND RECOMMENDATIONS

The analysis presented above provides a comprehensive servicing and stormwater management assessment in support of the proposed Wyldeewood Creek development.

- Sanitary Servicing of the Wyldeewood Creek development will be provided by extension of sewers from Georgian Bay Hotel with laterals provided to each building.
- Potable water for drinking water and fire protection will be provided via connection to the existing 300 mm diameter watermain within the Cranberry Trail ROW with services to each building and hydrants located throughout the site.
- Backflow prevention is provided at the connection to the Georgian Bay Hotel's private watermain.
- Utilities for site servicing are available and will be extended to the subject development.
- Stormwater management objectives for water quality control have been addressed in the design of the Wyldeewood Creek development.
- The proposed stormwater filter units specified in this report will provide water quality controls in accordance with the MOE Stormwater Management Manual (2003) to meet the Enhanced Level criterion.
- Phosphorous removal is provided via filter units as a "best effort" approach.
- A "best efforts" approach for water balance and erosion control have been implemented.
- Sediment and erosion controls as specified, will be effective in preventing and controlling sediment from migrating into nearby swales, ditches and watercourses.
- External drainage is conveyed through the site via an engineered channel and two concrete box culverts below the private roadway.

Therefore, we recommend approval of the Site Plan Application for the subject lands from the perspective of engineering servicing and stormwater management requirements.

Respectfully submitted,

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Project Manager

J:\1500\1535-Brandy Lane Corp\4897-Georgian Bay Hotel South Block\Reports\6. Sixth Submission\4897_FSR&SWM
(December 2024).docx

APPENDIX A

Sanitary & Potable Water Design Sheets

Sanitary Sewer Design Sheet

Sanitary Demand Sheet

Potable Water Demand Calculations

Fire Flow Calculations

Watermain Hydraulic Assessment Report prepared by CIMA+.

WYLDEWOOD CREEK 1535-4897 SANITARY SEWER DESIGN SHEET																																																							
C CROZIER CONSULTING ENGINEERS										<table><tr><th>Unit Type</th><th>PPU</th></tr><tr><td>Single & Semi Detached</td><td></td></tr><tr><td>Townhome & Apartment</td><td>1.90</td></tr></table>		Unit Type	PPU	Single & Semi Detached		Townhome & Apartment	1.90	<table><tr><td>Mannings "n":</td><td>0.013</td></tr><tr><td>Peak Factor (M):</td><td>1+(14/4+(P/1000)^0.5)</td></tr><tr><td>Residential Avg. Daily/Capita Flow (L/cap.d):</td><td>260</td></tr><tr><td>Commercial Avg. Daily/Capita Flow (m³/ha.d):</td><td>28</td></tr><tr><td>Institutional (Recreation Facility) Avg. Daily/Capita Flow (L/day.person):</td><td>40</td></tr><tr><td>Infiltration Q (L/ha.s):</td><td>0.23</td></tr></table>										Mannings "n":	0.013	Peak Factor (M):	1+(14/4+(P/1000)^0.5)	Residential Avg. Daily/Capita Flow (L/cap.d):	260	Commercial Avg. Daily/Capita Flow (m³/ha.d):	28	Institutional (Recreation Facility) Avg. Daily/Capita Flow (L/day.person):	40	Infiltration Q (L/ha.s):	0.23	<table><tr><td>DESIGNED BY:</td><td>ML</td></tr><tr><td>CHECKED BY:</td><td>RA</td></tr><tr><td>DATE:</td><td>2019.02.30</td></tr><tr><td>REVISION NO.:</td><td>Sub. #5</td></tr><tr><td>REVISED BY:</td><td>IB</td></tr><tr><td>DATE:</td><td>2024.04.11</td></tr></table>				DESIGNED BY:	ML	CHECKED BY:	RA	DATE:	2019.02.30	REVISION NO.:	Sub. #5	REVISED BY:	IB	DATE:	2024.04.11
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CATCHMENT I.D.	FROM MH NO	TO MH NO	AREA (Ha)	TOWNHOME/ APARTMENT UNITS	INSTITUTIONAL POP.	TOTAL INST. TRIB. POP.	RESIDENTIAL POP.	TOTAL RES. TRIB. POP.	RESIDENTIAL PEAK FACTOR	RESIDENTIAL AVG. FLOW (l/s)	RESIDENTIAL MAX. FLOW (l/s)	INSTUTIONAL PEAK FACTOR	INSTITUTIONAL AVG. FLOW (l/s)	INSTITUTIONAL MAX. FLOW (l/s)	MAX FLOW (l/s)	INFILT. (l/s)	TOTAL INFILT. (l/s)	TOTAL FLOW (l/s)	LENGTH (m)	PIPE DIAM. (mm)	UPPER INV. EL.	LOWER INV. EL.	UPPER OBV. EL.	LOWER OBV. EL.	SLOPE (%)	CAP. (l/s)	CAP. (%)	FULL FLOW VELOCITY (m/s)	GROUND UPPER	GROUND LOWER	COVER UPPER	COVER LOWER																							
13	SAMH6	SAMH5	0.23	18	0	0	34	34	4.35	0.10	0.45	0.00	0.00	0.00	0.45	0.05	0.05	0.50	12.3	200	181.12	180.87	181.32	181.07	2.00%	46.38	1.08%	1.48	183.81	183.87	2.49	2.80																							
9, 10, 12	SAMH5	SAMH4	0.55	33	0	0	63	97	4.25	0.29	1.24	0.00	0.00	0.00	1.24	0.13	0.18	1.42	50.8	200	180.37	179.43	180.57	179.63	1.86%	44.73	3.17%	1.42	183.87	183.16	3.30	3.53																							
8, 11	SAMH4	SAMH3	0.31	27	0	0	51	148	4.19	0.45	1.87	0.00	0.00	0.00	1.87	0.07	0.25	2.12	41.7	200	179.12	178.82	179.32	179.02	0.71%	27.64	7.67%	0.88	183.16	182.31	3.84	3.29																							
5, 6, 7	SAMH3	SAMH2	0.73	27	14	14	51	200	4.15	0.60	2.49	4.46	0.01	0.03	2.52	0.17	0.42	2.94	95.4	250	178.63	178.34	178.88	178.59	0.30%	32.57	9.02%	0.66	182.31	182.29	3.43	3.7																							
2, 3, 4	SAMH2	SAMH1	0.58	60	0	14	114	314	4.07	0.94	3.84	4.46	0.01	0.03	3.87	0.13	0.55	4.42	20.2	250	178.29	178.23	178.54	178.48	0.32%	33.64	13.14%	0.69	182.29	181.75	3.75	3.27																							
1	SAMH1	EX MH	0.19	0	0	14	0	314	4.07	0.94	3.84	4.46	0.01	0.03	3.87	0.04	0.60	4.46	19.1	250	178.18	178.12	178.43	178.37	0.30%	32.57	13.71%	0.66	181.75	180.95	3.32	2.58																							
*Low Rise Condo Units	EX MH	Ex. MH #6	0.6			14	32	346	4.05	1.04	4.21	4.46	0.01	0.03	4.24	0.14	0.73	4.98	75	375	-	-	-	-	0.32%	99.18	5.02%	0.90	-	-	-	-																							
*Administration Buildings	Ex. MH #10	Ex. MH #9	0.32			0	45	45	4.32	0.14	0.59	4.50	0.00	0.00	0.59	0.07	0.07	0.66	76	200	-	-	-	-	0.40%	20.74	3.18%	0.66	-	-	-	-																							
*Low Rise Condo Units	Ex. MH #9	Ex. MH #7	0.11			0	24	69	4.28	0.21	0.89	4.50	0.00	0.00	0.89	0.03	0.10	0.99	25	200	-	-	-	-	0.40%	20.74	4.77%	0.66	-	-	-	-																							
*Low Rise Condo Units	Ex. MH #7	Ex. MH #6	0.28			0	24	93	4.25	0.28	1.19	4.50	0.00	0.00	1.19	0.06	0.16	1.35	35	375	-	-	-	-	1.28%	198.36	0.68%	1.80	-	-	-	-																							
*Club House & Condo Units	Ex. MH #6	Ex. MH #5	0.44			14	16	455	4.00	1.37	5.46	4.46	0.01	0.03	5.49	0.10	1.00	6.49	55	375	-	-	-	-	0.24%	85.89	7.56%	0.78	-	-	-	-																							
*Low Rise Condo Units	Ex. MH #5	Ex. MH #4	0.47			14	114	569	3.94	1.71	6.75	4.46	0.01	0.03	6.78	0.11	1.11	7.88	59	375	-	-	-	-	0.14%	65.60	12.02%	0.59	-	-	-	-																							
*Low Rise Condo Units	Ex. MH #4	Ex. MH #3	0.69			14	48	617	3.93	1.86	7.28	4.46	0.01	0.03	7.31	0.16	1.27	8.58	86.5	375	-	-	-	-	0.20%	78.41	10.94%	0.71	-	-	-	-																							
*Hotel & Condo Units	Ex. MH #3	Ex. MH #2	0.75			14	389	1006	3.80	3.03	11.49	4.46	0.01	0.03	11.52	0.17	1.44	12.96	94.5	375	-	-	-	-	0.29%	94.42	13.73%	0.85	-	-	-	-																							
*To Hwy 26	Ex. MH #2	Ex. MH #1	0.72			14	24	1030	3.79	3.10	11.75	4.46	0.01	0.03	11.78	0.17	1.60	13.38	90	375	-	-	-	-	0.27%	91.10	14.69%	0.82	-	-	-	-																							
To Hwy 26	Ex. MH #1	Ex. MH #1A	0			14	0	1030	3.79	3.10	11.75	4.46	0.01	0.03	11.78	0.00	1.60	13.38	6.5	375	-	-	-	-	0.46%	118.91	11.25%	1.08	-	-	-	-																							

* Existing sanitary design values from Servicing Report: Georgian Manor Resort and Country Club (July 2003) prepared by Henderson, Paddon & associates Ltd.

Wyldewood Creek - Future Development Sanitary Demand

Southern Sector	2.58	ha
Total Area	2.58	ha
Number of Residential Units and Land Usage		
1) Apartment	165	Units
2) Recreational Facility	1	Facility
Person Per Residential Unit		
1) Apartments (Per Collingwood Engineering Standards, amended 2022)	1.90	persons/unit
2) Recreational	14	person/facility
Total Residential Population	314	Persons
Total Recreational Complex Population	14	Persons
Recreational Equivalent Population	2	Persons
Unit Sewage flows		
Residential (Per Collingwood Engineering Standards, 2007)	260	L/C-day
Recreational (Per OBC Table 8.2.1.3.B.)	40	L/person-day
Infiltration (Per Collingwood Engineering Standards, 2007)	0.23	L/s/ha
Total Design Sewage Flows		
Infiltration/Inflow Residential	0.59	L/sec
Average Daily Residential Flow	0.94	L/sec
Average Recreational Daily Flow	0.01	L/sec
Residential Peak Factor (Harmon Formula)	4.07	
Recreational Peak Factor (Harmon Formula)	4.46	
Total Peak Daily Flow	4.46	L/sec

Wyldeewood Creek - Future Development Water Demand

Southern Sector	2.58	ha
Total Area	2.58	ha
Number of Residential Units and Land Usage		
1) Apartment	165	Units
2) Recreational	1	Facility
Person Per Residential Unit		
1) Apartments (Per Collingwood Engineering Standards, amended 2022)	1.90	persons/unit
2) Recreational	14	person/facility
Total Residential Population	314	Persons
Total Recreational Complex Population	14	Persons
Recreational Equivalent Population	2	Persons
Domestic Water Design Flows		
Residential (Per Collingwood Engineering Standards, amended 2022)	260	L/C-day
Recreational (Per OBC Table 8.2.1.3.B.)	40	L/person-day
Total Domestic Water Design Flows		
Average Residential Daily Flow	0.94	L/sec
Average Recreational Daily Flow	0.01	L/sec
Total Daily Flow	0.95	L/sec
Max Day Peak Factor (Per Collingwood Engineering Standards, 2007)	1.77	
Max Day Demand Flow	1.68	L/sec
Peak Hour Factor (Per Collingwood Engineering Standards, 2007)	2.70	
Peak Hour Flow	2.57	L/sec

Fire Flow Summary

FIRE UNDERWRITER'S SURVEY

Unit Block #	Total Floor Area (m ²)	Effective Floor Area (m ²)	Flow (L/min)	Reduction (L/min)	Exposure Surcharge (L/min)	Required Flow (L/min)	Required Flow (L/s)
Building A, 3 Story Unit	1,864	1,398	12,000	-1,800	2,040	12,000	200
Building B, 3 Story Unit	1,556	1,167	11,000	-1,650	1,870	11,000	183
Building C, 3 Story Unit	1,548	1,161	11,000	-1,650	2,338	12,000	200
Building D, 3 Story Unit	1,504	1,128	11,000	-1,650	2,338	12,000	200
Building E, 3 Story Unit	1,576	1,182	11,000	-1,650	2,338	12,000	200
Building F, 3 Story Unit	2,224	1,668	13,000	-1,950	1,105	12,000	200

Fire Flow Determination Per Fire Underwriters Survey (2020) - Building A

Water Supply for Public Fire Protection - 2020

Fire Underwriters Survey

Part II - Guide for Determination of Fire Flows for Public Fire Protection in Canada

An estimate of fire flow required for a given area may be determined by the formula:

$$RFF = 220 * C * \sqrt{A}$$

where:

RFF = the required fire flow in litres per minute (L/min)

C = the construction coefficient is related to the type of construction of the building

= 1.5 for Type V Wood Frame Construction

= 0.8 for Type IV-A Mass Timber Construction

= 0.9 for Type IV-B Mass Timber Construction

= 1.0 for Type IV-C Mass Timber Construction

= 1.5 for Type IV-D Mass Timber Construction

= 1.0 for Type III Ordinary Construction

= 0.8 for Type II Non-combustible Construction

= 0.6 for Type I Fire Resistive Construction

A = the total effective floor area (effective building area) in square metres (excluding basements at least 50 percent below grade) in the building considered

STEP A: Construction Coefficient (C)

1.5

Wood Frame Construction

STEP B: Total Effective Floor Area

Proposed Building

Building A

Yes/No/Unknown

Is basement at least 50% below grade?

Yes

If yes, basement floor area excluded

Vertical openings protected?

Unknown

*For consideration for effective area calculations

Calculate Effective Floor Area based on the highlighted cell

-C value from 1.0 to 1.5: 100% of all floor areas are used

-C value below 1 and vertical openings are not protected: Consider two largest floors plus 50% of all floor above to a max of eight

-C value below 1 and vertical openings are protected: Consider single largest floor plus 25% of the two immediately adjoining floors

*A building may be subdivided if there is a vertical firewall with a fire-resistance rating greater than 2 hours, and meets the requirements of the National Building Code.

Floor/Building	*Total Floor Area* (m ²)	% of Area Considered	Effective Floor Area (m ²)
Basement	466	0%	0.0
1st floor	466	100%	466.0
2nd floor	466	100%	466.0
3rd floor	466	100%	466.0
Total	1864		1398.0

*Fire Wall Included,
floor area decreased*

Total Effective Floor Area 1398 m²

STEP C:

Therefore RFF =

12,000 L/min (rounded to nearest 1000 L/min)

STEP D: Occupancy Contents Adjustment Factor

The required fire flow may be reduced by as much as -25% for occupancies having contents with very low fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

Occupancy and Contents Adjustment Factor

Non-Combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Burning	25%

*Refer to Table 3 for recommended Occupancy and Contents Charges by major occupancy examples.

Type of Occupancy

Adjustment Factor

Residential Occupancy Limited Combustible -15%

Total Reduction % -1,800 L/min (reduction)

RFF = 10,200 L/min (not rounded)

Note: The RFF flow 10200 L/min is used in Step E and F.

Fire Flow Determination Per Fire Underwriters Survey (2020) - Building A

STEP E: Automatic Sprinkler Protection

Sprinklers - The required fire flow may be reduced by up to 50% for complete automatic sprinkler protection depending upon adequacy of system.

	Yes/No/Unknown	*Possible Reduction Available	Actual Reduction Provided
Automatic sprinkler protection designed and installed in accordance with NFPA 13?	No	-30%	0%
Water supply is standard for both the system and Fire Department hose lines?	No	-10%	0%
Fully supervised system?	No	-10%	0%

*Reduction available assumes complete building coverage

*30% reduction typical for building requiring sprinkler system

Total Reduction % 0% (reduction)

Total Reduced Flow 0 L/min (reduction, not rounded)

STEP F: Exposure Adjustment Charge

Exposure - A percentage of water for the exposures should be added to the required fire flow for the subject building to provide adequate flow rates for hose streams used to reduce the spreading of fire from the subject building to exposed risks. The required fire flow of a subject building may be increased depending on the severity of exposed risks to the subject building and the distance between the exposed risks and the subject building. This charge considers the usage of water supplies to prevent exposed risks from igniting or being damaged during a major fire incident in the subject building.

Separation Distance	Maximum Exposure Adjustment Charge
0 to 3m	25%
3.1 to 10m	20%
10.1 to 20m	15%
20.1 to 30m	10%
Greater than 30m	0%

*If a vertical fire wall is properly constructed and has a rating of no less than 2 hours, then the boundary can be treated as protected with no exposure charge

*The maximum exposure adjustment charge to be applied to a subject building is 75%

*The distance in metres from the subject building facing wall to the exposed building facing wall, measured to the nearest metre, between the nearest points of the buildings. Where either the subject building or the exposed building is at a diagonal to the other building, the shortest distance should be increased by 3 metres and this adjusted value used as exposure distance.

Exposed buildings	Distance	Surcharge Factor	Surcharge (L/min)
North	Adjacent Dwelling >30	0%	0
East	Adjacent Dwelling 29	10%	1020
South	Adjacent Dwelling 22	10%	1020
West	Adjacent Dwelling >30	0%	0

Total Reduced Flow 2,040 L/min Surcharge (not rounded)

STEP G: Final Required Fire Flow

Step D - Occupancy Adjusted Fire Flow Demand	10,200 L/min
Step E - Sprinkler (Reduction)	0 L/min
Step F - Exposure Charge	2,040 L/min
Final Fire Flow:	12,240 L/min
or	12,000 L/min (rounded to nearest 1000L/min)
or	200 L/s
or	3,170 USGPM
Required duration:	2.50 hours

*Refer to Table 1 for Duration

Table 1 - FUS 2020

Required Duration of Fire Flow	
Flow Required (L/min)	Duration (hours)
2,000 or less	1.00
3,000	1.25
4,000	1.50
5,000	1.75
6,000	2.00
8,000	2.00
10,000	2.00
12,000	2.50
14,000	3.00
16,000	3.50
18,000	4.00
20,000	4.50
22,000	5.00
24,000	5.50
26,000	6.00
28,000	6.50
30,000	7.00
32,000	7.50
34,000	8.00
36,000	8.50
38,000	9.00
40,000 and over	9.50

*Interpolate for intermediate figures

Fire Flow Determination Per Fire Underwriters Survey (2020) - Building B

Water Supply for Public Fire Protection - 2020

Fire Underwriters Survey

Part II - Guide for Determination of Fire Flows for Public Fire Protection in Canada

An estimate of fire flow required for a given area may be determined by the formula:

$$RFF = 220 * C * \sqrt{A}$$

where:

RFF = the required fire flow in litres per minute (L/min)

C = the construction coefficient is related to the type of construction of the building

= 1.5 for Type V Wood Frame Construction

= 0.8 for Type IV-A Mass Timber Construction

= 0.9 for Type IV-B Mass Timber Construction

= 1.0 for Type IV-C Mass Timber Construction

= 1.5 for Type IV-D Mass Timber Construction

= 1.0 for Type III Ordinary Construction

= 0.8 for Type II Non-combustible Construction

= 0.6 for Type I Fire Resistive Construction

A = the total effective floor area (effective building area) in square metres (excluding basements at least 50 percent below grade) in the building considered

STEP A: Construction Coefficient (C)

1.5

Wood Frame Construction

STEP B: Total Effective Floor Area

Proposed Building

Building B

Yes/No/Unknown

Is basement at least 50% below grade?

Yes

If yes, basement floor area excluded

Vertical openings protected?

Unknown

*For consideration for effective area calculations

Calculate Effective Floor Area based on the highlighted cell

-C value from 1.0 to 1.5: 100% of all floor areas are used

-C value below 1 and vertical openings are not protected: Consider two largest floors plus 50% of all floor above to a max of eight

-C value below 1 and vertical openings are protected: Consider single largest floor plus 25% of the two immediately adjoining floors

*A building may be subdivided if there is a vertical firewall with a fire-resistance rating greater than 2 hours, and meets the requirements of the National Building Code.

Floor/Building	*Total Floor Area* (m ²)	% of Area Considered	Effective Floor Area (m ²)
Basement	389	0%	0.0
1st floor	389	100%	389.0
2nd floor	389	100%	389.0
3rd floor	389	100%	389.0
Total	1556		1167.0

*Fire Wall Included,
floor area decreased*

Total Effective Floor Area **1167 m²**

STEP C:

Therefore RFF = 11,000 L/min (rounded to nearest 1000 L/min)

STEP D: Occupancy Contents Adjustment Factor

The required fire flow may be reduced by as much as -25% for occupancies having contents with very low fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

Occupancy and Contents Adjustment Factor

Non-Combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Burning	25%

*Refer to Table 3 for recommended Occupancy and Contents Charges by major occupancy examples.

Type of Occupancy	Adjustment Factor
Residential Occupancy	Limited Combustible -15%
Total Reduction %	-1,650 L/min (reduction)
RFF =	9,350 L/min (not rounded)

Note: The RFF flow 9350 L/min is used in Step E and F.

Fire Flow Determination Per Fire Underwriters Survey (2020) - Building B

STEP E: Automatic Sprinkler Protection

Sprinklers - The required fire flow may be reduced by up to 50% for complete automatic sprinkler protection depending upon adequacy of system.

	Yes/No/Unknown	*Possible Reduction Available	Actual Reduction Provided
Automatic sprinkler protection designed and installed in accordance with NFPA 13?	No	-30%	0%
Water supply is standard for both the system and Fire Department hose lines?	No	-10%	0%
Fully supervised system?	No	-10%	0%

*Reduction available assumes complete building coverage

*30% reduction typical for building requiring sprinkler system

Total Reduction % 0% (reduction)

Total Reduced Flow 0 L/min (reduction, not rounded)

STEP F: Exposure Adjustment Charge

Exposure - A percentage of water for the exposures should be added to the required fire flow for the subject building to provide adequate flow rates for hose streams used to reduce the spreading of fire from the subject building to exposed risks. The required fire flow of a subject building may be increased depending on the severity of exposed risks to the subject building and the distance between the exposed risks and the subject building. This charge considers the usage of water supplies to prevent exposed risks from igniting or being damaged during a major fire incident in the subject building.

Separation Distance	Maximum Exposure Adjustment Charge
0 to 3m	25%
3.1 to 10m	20%
10.1 to 20m	15%
20.1 to 30m	10%
Greater than 30m	0%

*If a vertical fire wall is properly constructed and has a rating of no less than 2 hours, then the boundary can be treated as protected with no exposure charge

*The maximum exposure adjustment charge to be applied to a subject building is 75%

*The distance in metres from the subject building facing wall to the exposed building facing wall, measured to the nearest metre, between the nearest points of the buildings. Where either the subject building or the exposed building is at a diagonal to the other building, the shortest distance should be increased by 3 metres and this adjusted value used as exposure distance.

Exposed buildings	Distance	Surcharge Factor	Surcharge (L/min)
North	Adjacent Dwelling >30	0%	0
East	Adjacent Dwelling >30	0%	0
South	Adjacent Dwelling 21	10%	935
West	Adjacent Dwelling 29	10%	935

Total Reduced Flow 1,870 L/min Surcharge (not rounded)

STEP G: Final Required Fire Flow

Step D - Occupancy Adjusted Fire Flow Demand	9,350 L/min
Step E - Sprinkler (Reduction)	0 L/min
Step F - Exposure Charge	1,870 L/min

Final Fire Flow: 11,220 L/min
or 11,000 L/min (rounded to nearest 1000L/min)

or 183 L/s

or 2,906 USGPM

Required duration: 2.25 hours

*Refer to Table 1 for Duration

Table 1 - FUS 2020

Required Duration of Fire Flow	
Flow Required (L/min)	Duration (hours)
2,000 or less	1.00
3,000	1.25
4,000	1.50
5,000	1.75
6,000	2.00
8,000	2.00
10,000	2.00
12,000	2.50
14,000	3.00
16,000	3.50
18,000	4.00
20,000	4.50
22,000	5.00
24,000	5.50
26,000	6.00
28,000	6.50
30,000	7.00
32,000	7.50
34,000	8.00
36,000	8.50
38,000	9.00
40,000 and over	9.50

*Interpolate for intermediate figures

Fire Flow Determination Per Fire Underwriters Survey (2020) - Building C

Water Supply for Public Fire Protection - 2020

Fire Underwriters Survey

Part II - Guide for Determination of Fire Flows for Public Fire Protection in Canada

An estimate of fire flow required for a given area may be determined by the formula:

$$RFF = 220 * C * \sqrt{A}$$

where:

RFF = the required fire flow in litres per minute (L/min)

C = the construction coefficient is related to the type of construction of the building

= 1.5 for Type V Wood Frame Construction

= 0.8 for Type IV-A Mass Timber Construction

= 0.9 for Type IV-B Mass Timber Construction

= 1.0 for Type IV-C Mass Timber Construction

= 1.5 for Type IV-D Mass Timber Construction

= 1.0 for Type III Ordinary Construction

= 0.8 for Type II Non-combustible Construction

= 0.6 for Type I Fire Resistive Construction

A = the total effective floor area (effective building area) in square metres (excluding basements at least 50 percent below grade) in the building considered

STEP A: Construction Coefficient (C)

1.5

Wood Frame Construction

STEP B: Total Effective Floor Area
Proposed Building

Building C

Yes/No/Unknown

Is basement at least 50% below grade?
Vertical openings protected?

Yes
Unknown

If yes, basement floor area excluded
*For consideration for effective area calculations

Calculate Effective Floor Area based on the highlighted cell

-C value from 1.0 to 1.5: 100% of all floor areas are used

-C value below 1 and vertical openings are not protected: Consider two largest floors plus 50% of all floor above to a max of eight

-C value below 1 and vertical openings are protected: Consider single largest floor plus 25% of the two immediately adjoining floors

*A building may be subdivided if there is a vertical firewall with a fire-resistance rating greater than 2 hours, and meets the requirements of the National Building Code.

Floor/Building	*Total Floor Area* (m ²)	% of Area Considered	Effective Floor Area (m ²)
Basement	387	0%	0.0
1st floor	387	100%	387.0
2nd floor	387	100%	387.0
3rd floor	387	100%	387.0
Total	1548		1161.0

*Fire Wall Included,
floor area decreased*

Total Effective Floor Area 1161 m²

STEP C:

Therefore RFF = 11,000 L/min (rounded to nearest 1000 L/min)

STEP D: Occupancy Contents Adjustment Factor

The required fire flow may be reduced by as much as -25% for occupancies having contents with very low fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

Occupancy and Contents Adjustment Factor

Non-Combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Burning	25%

*Refer to Table 3 for recommended Occupancy and Contents Charges by major occupancy examples.

Type of Occupancy	Adjustment Factor
Residential Occupancy	Limited Combustible -15%
Total Reduction %	-1,650 L/min (reduction)
RFF =	9,350 L/min (not rounded)

Note: The RFF flow 9350 L/min is used in Step E and F.

Fire Flow Determination Per Fire Underwriters Survey (2020) - Building C

STEP E: Automatic Sprinkler Protection

Sprinklers - The required fire flow may be reduced by up to 50% for complete automatic sprinkler protection depending upon adequacy of system.

	Yes/No/Unknown	*Possible Reduction Available	Actual Reduction Provided
Automatic sprinkler protection designed and installed in accordance with NFPA 13?	No	-30%	0%
Water supply is standard for both the system and Fire Department hose lines?	No	-10%	0%
Fully supervised system?	No	-10%	0%

*Reduction available assumes complete building coverage

*30% reduction typical for building requiring sprinkler system

Total Reduction % 0% (reduction)

Total Reduced Flow 0 L/min (reduction, not rounded)

STEP F: Exposure Adjustment Charge

Exposure - A percentage of water for the exposures should be added to the required fire flow for the subject building to provide adequate flow rates for hose streams used to reduce the spreading of fire from the subject building to exposed risks. The required fire flow of a subject building may be increased depending on the severity of exposed risks to the subject building and the distance between the exposed risks and the subject building. This charge considers the usage of water supplies to prevent exposed risks from igniting or being damaged during a major fire incident in the subject building.

Separation Distance	Maximum Exposure Adjustment Charge
0 to 3m	25%
3.1 to 10m	20%
10.1 to 20m	15%
20.1 to 30m	10%
Greater than 30m	0%

*If a vertical fire wall is properly constructed and has a rating of no less than 2 hours, then the boundary can be treated as protected with no exposure charge

*The maximum exposure adjustment charge to be applied to a subject building is 75%

*The distance in metres from the subject building facing wall to the exposed building facing wall, measured to the nearest metre, between the nearest points of the buildings. Where either the subject building or the exposed building is at a diagonal to the other building, the shortest distance should be increased by 3 metres and this adjusted value used as exposure distance.

Exposed buildings	Distance	Surcharge Factor	Surcharge (L/min)
North	Adjacent Dwelling >30	0%	0
East	Adjacent Dwelling 28	10%	935
South	Adjacent Dwelling 13	15%	1402.5
West	Adjacent Dwelling >30	0%	0

Total Reduced Flow 2,338 L/min Surcharge (not rounded)

STEP G: Final Required Fire Flow

Step D - Occupancy Adjusted Fire Flow Demand	9,350 L/min
Step E - Sprinkler (Reduction)	0 L/min
Step F - Exposure Charge	2,338 L/min

Final Fire Flow: 11,688 L/min
or 12,000 L/min (rounded to nearest 1000L/min)

or 200 L/s

or 3,170 USGPM

Required duration: 2.50 hours

*Refer to Table 1 for Duration

Table 1 - FUS 2020

Required Duration of Fire Flow	
Flow Required (L/min)	Duration (hours)
2,000 or less	1.00
3,000	1.25
4,000	1.50
5,000	1.75
6,000	2.00
8,000	2.00
10,000	2.00
12,000	2.50
14,000	3.00
16,000	3.50
18,000	4.00
20,000	4.50
22,000	5.00
24,000	5.50
26,000	6.00
28,000	6.50
30,000	7.00
32,000	7.50
34,000	8.00
36,000	8.50
38,000	9.00
40,000 and over	9.50

*Interpolate for intermediate figures

Fire Flow Determination Per Fire Underwriters Survey (2020) - Building D

Water Supply for Public Fire Protection - 2020

Fire Underwriters Survey

Part II - Guide for Determination of Fire Flows for Public Fire Protection in Canada

An estimate of fire flow required for a given area may be determined by the formula:

$$RFF = 220 * C * \sqrt{A}$$

where:

RFF = the required fire flow in litres per minute (L/min)

C = the construction coefficient is related to the type of construction of the building

= 1.5 for Type V Wood Frame Construction

= 0.8 for Type IV-A Mass Timber Construction

= 0.9 for Type IV-B Mass Timber Construction

= 1.0 for Type IV-C Mass Timber Construction

= 1.5 for Type IV-D Mass Timber Construction

= 1.0 for Type III Ordinary Construction

= 0.8 for Type II Non-combustible Construction

= 0.6 for Type I Fire Resistive Construction

A = the total effective floor area (effective building area) in square metres (excluding basements at least 50 percent below grade) in the building considered

STEP A: Construction Coefficient (C)

1.5

Wood Frame Construction

STEP B: Total Effective Floor Area
Proposed Building

Building D

Yes/No/Unknown

Is basement at least 50% below grade?

Yes

If yes, basement floor area excluded

Vertical openings protected?

Unknown

*For consideration for effective area calculations

Calculate Effective Floor Area based on the highlighted cell

-C value from 1.0 to 1.5: 100% of all floor areas are used

-C value below 1 and vertical openings are not protected: Consider two largest floors plus 50% of all floor above to a max of eight

-C value below 1 and vertical openings are protected: Consider single largest floor plus 25% of the two immediately adjoining floors

*A building may be subdivided if there is a vertical firewall with a fire-resistance rating greater than 2 hours, and meets the requirements of the National Building Code.

Floor/Building	*Total Floor Area* (m ²)	% of Area Considered	Effective Floor Area (m ²)
Basement	376	0%	0.0
1st floor	376	100%	376.0
2nd floor	376	100%	376.0
3rd floor	376	100%	376.0
Total	1504		1128.0

*Fire Wall Included,
floor area decreased*

Total Effective Floor Area 1128 m²

STEP C:

Therefore RFF = 11,000 L/min (rounded to nearest 1000 L/min)

STEP D: Occupancy Contents Adjustment Factor

The required fire flow may be reduced by as much as -25% for occupancies having contents with very low fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

Occupancy and Contents Adjustment Factor

Non-Combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Burning	25%

*Refer to Table 3 for recommended Occupancy and Contents Charges by major occupancy examples.

Type of Occupancy	Adjustment Factor
Residential Occupancy	Limited Combustible -15%

Total Reduction % -1,650 L/min (reduction)

RFF = 9,350 L/min (not rounded)

Note: The RFF flow 9350 L/min is used in Step E and F.

Fire Flow Determination Per Fire Underwriters Survey (2020) - Building D

STEP E: Automatic Sprinkler Protection

Sprinklers - The required fire flow may be reduced by up to 50% for complete automatic sprinkler protection depending upon adequacy of system.

	Yes/No/Unknown	*Possible Reduction Available	Actual Reduction Provided
Automatic sprinkler protection designed and installed in accordance with NFPA 13?	No	-30%	0%
Water supply is standard for both the system and Fire Department hose lines?	No	-10%	0%
Fully supervised system?	No	-10%	0%

*Reduction available assumes complete building coverage

*30% reduction typical for building requiring sprinkler system

Total Reduction % 0% (reduction)

Total Reduced Flow 0 L/min (reduction, not rounded)

STEP F: Exposure Adjustment Charge

Exposure - A percentage of water for the exposures should be added to the required fire flow for the subject building to provide adequate flow rates for hose streams used to reduce the spreading of fire from the subject building to exposed risks. The required fire flow of a subject building may be increased depending on the severity of exposed risks to the subject building and the distance between the exposed risks and the subject building. This charge considers the usage of water supplies to prevent exposed risks from igniting or being damaged during a major fire incident in the subject building.

Separation Distance	Maximum Exposure Adjustment Charge
0 to 3m	25%
3.1 to 10m	20%
10.1 to 20m	15%
20.1 to 30m	10%
Greater than 30m	0%

*If a vertical fire wall is properly constructed and has a rating of no less than 2 hours, then the boundary can be treated as protected with no exposure charge

*The maximum exposure adjustment charge to be applied to a subject building is 75%

*The distance in metres from the subject building facing wall to the exposed building facing wall, measured to the nearest metre, between the nearest points of the buildings. Where either the subject building or the exposed building is at a diagonal to the other building, the shortest distance should be increased by 3 metres and this adjusted value used as exposure distance.

Exposed buildings	Distance	Surcharge Factor	Surcharge (L/min)
North	Adjacent Dwelling 27	10%	935
East	Adjacent Dwelling 12.46	15%	1402.5
South	Adjacent Dwelling >30	0%	0
West	Adjacent Dwelling >30	0%	0

Total Reduced Flow 2,338 L/min Surcharge (not rounded)

STEP G: Final Required Fire Flow

Step D - Occupancy Adjusted Fire Flow Demand	9,350 L/min
Step E - Sprinkler (Reduction)	0 L/min
Step F - Exposure Charge	2,338 L/min

Final Fire Flow: 11,688 L/min
 or 12,000 L/min (rounded to nearest 1000L/min)

or 200 L/s

or 3,170 USGPM

Required duration: 2.50 hours

*Refer to Table 1 for Duration

Table 1 - FUS 2020

Required Duration of Fire Flow	
Flow Required (L/min)	Duration (hours)
2,000 or less	1.00
3,000	1.25
4,000	1.50
5,000	1.75
6,000	2.00
8,000	2.00
10,000	2.00
12,000	2.50
14,000	3.00
16,000	3.50
18,000	4.00
20,000	4.50
22,000	5.00
24,000	5.50
26,000	6.00
28,000	6.50
30,000	7.00
32,000	7.50
34,000	8.00
36,000	8.50
38,000	9.00
40,000 and over	9.50

*Interpolate for intermediate figures

Fire Flow Determination Per Fire Underwriters Survey (2020) - Building E

Water Supply for Public Fire Protection - 2020

Fire Underwriters Survey

Part II - Guide for Determination of Fire Flows for Public Fire Protection in Canada

An estimate of fire flow required for a given area may be determined by the formula:

$$RFF = 220 * C * \sqrt{A}$$

where:

RFF = the required fire flow in litres per minute (L/min)

C = the construction coefficient is related to the type of construction of the building

= 1.5 for Type V Wood Frame Construction

= 0.8 for Type IV-A Mass Timber Construction

= 0.9 for Type IV-B Mass Timber Construction

= 1.0 for Type IV-C Mass Timber Construction

= 1.5 for Type IV-D Mass Timber Construction

= 1.0 for Type III Ordinary Construction

= 0.8 for Type II Non-combustible Construction

= 0.6 for Type I Fire Resistive Construction

A = the total effective floor area (effective building area) in square metres (excluding basements at least 50 percent below grade) in the building considered

STEP A: Construction Coefficient (C)

1.5

Wood Frame Construction

STEP B: Total Effective Floor Area
Proposed Building

Building E

Yes/No/Unknown

Is basement at least 50% below grade?

Yes

If yes, basement floor area excluded

Vertical openings protected?

Unknown

*For consideration for effective area calculations

Calculate Effective Floor Area based on the highlighted cell

-C value from 1.0 to 1.5: 100% of all floor areas are used

-C value below 1 and vertical openings are not protected: Consider two largest floors plus 50% of all floor above to a max of eight

-C value below 1 and vertical openings are protected: Consider single largest floor plus 25% of the two immediately adjoining floors

*A building may be subdivided if there is a vertical firewall with a fire-resistance rating greater than 2 hours, and meets the requirements of the National Building Code.

Floor/Building	*Total Floor Area* (m ²)	% of Area Considered	Effective Floor Area (m ²)
Basement	394	0%	0.0
1st floor	394	100%	394.0
2nd floor	394	100%	394.0
3rd floor	394	100%	394.0
Total	1576		1182.0

*Fire Wall Included,
floor area decreased*

Total Effective Floor Area 1182 m²

STEP C:

Therefore RFF = 11,000 L/min (rounded to nearest 1000 L/min)

STEP D: Occupancy Contents Adjustment Factor

The required fire flow may be reduced by as much as -25% for occupancies having contents with very low fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

Occupancy and Contents Adjustment Factor

Non-Combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Burning	25%

*Refer to Table 3 for recommended Occupancy and Contents Charges by major occupancy examples.

Type of Occupancy	Adjustment Factor
Residential Occupancy	Limited Combustible -15%
Total Reduction %	-1,650 L/min (reduction)
RFF =	9,350 L/min (not rounded)

Note: The RFF flow 9350 L/min is used in Step E and F.

Fire Flow Determination Per Fire Underwriters Survey (2020) - Building E

STEP E: Automatic Sprinkler Protection

Sprinklers - The required fire flow may be reduced by up to 50% for complete automatic sprinkler protection depending upon adequacy of system.

	Yes/No/Unknown	*Possible Reduction Available	Actual Reduction Provided
Automatic sprinkler protection designed and installed in accordance with NFPA 13?	No	-30%	0%
Water supply is standard for both the system and Fire Department hose lines?	No	-10%	0%
Fully supervised system?	No	-10%	0%

*Reduction available assumes complete building coverage

*30% reduction typical for building requiring sprinkler system

Total Reduction % **0%** (reduction)

Total Reduced Flow **0** L/min (reduction, not rounded)

STEP F: Exposure Adjustment Charge

Exposure - A percentage of water for the exposures should be added to the required fire flow for the subject building to provide adequate flow rates for hose streams used to reduce the spreading of fire from the subject building to exposed risks. The required fire flow of a subject building may be increased depending on the severity of exposed risks to the subject building and the distance between the exposed risks and the subject building. This charge considers the usage of water supplies to prevent exposed risks from igniting or being damaged during a major fire incident in the subject building.

Separation Distance	Maximum Exposure Adjustment Charge
0 to 3m	25%
3.1 to 10m	20%
10.1 to 20m	15%
20.1 to 30m	10%
Greater than 30m	0%

*If a vertical fire wall is properly constructed and has a rating of no less than 2 hours, then the boundary can be treated as protected with no exposure charge

*The maximum exposure adjustment charge to be applied to a subject building is 75%

*The distance in metres from the subject building facing wall to the exposed building facing wall, measured to the nearest metre, between the nearest points of the buildings. Where either the subject building or the exposed building is at a diagonal to the other building, the shortest distance should be increased by 3 metres and this adjusted value used as exposure distance.

Exposed buildings	Distance	Surcharge Factor	Surcharge (L/min)
North	Adjacent Dwelling 13	15%	1402.5
East	Adjacent Dwelling 27	10%	935
South	Adjacent Dwelling >30	0%	0
West	Adjacent Dwelling >30	0%	0

Total Reduced Flow **2,338** L/min Surcharge (not rounded)

STEP G: Final Required Fire Flow

Step D - Occupancy Adjusted Fire Flow Demand	9,350 L/min
Step E - Sprinkler (Reduction)	0 L/min
Step F - Exposure Charge	2,338 L/min

Final Fire Flow: **11,688** L/min
12,000 L/min (rounded to nearest 1000L/min)

or **200** L/s

or **3,170** USGPM

Required duration: **2.50** hours

*Refer to Table 1 for Duration

Table 1 - FUS 2020

Required Duration of Fire Flow	
Flow Required (L/min)	Duration (hours)
2,000 or less	1.00
3,000	1.25
4,000	1.50
5,000	1.75
6,000	2.00
8,000	2.00
10,000	2.00
12,000	2.50
14,000	3.00
16,000	3.50
18,000	4.00
20,000	4.50
22,000	5.00
24,000	5.50
26,000	6.00
28,000	6.50
30,000	7.00
32,000	7.50
34,000	8.00
36,000	8.50
38,000	9.00
40,000 and over	9.50

*Interpolate for intermediate figures

Fire Flow Determination Per Fire Underwriters Survey (2020) - Building F

Water Supply for Public Fire Protection - 2020

Fire Underwriters Survey

Part II - Guide for Determination of Fire Flows for Public Fire Protection in Canada

An estimate of fire flow required for a given area may be determined by the formula:

$$RFF = 220 * C * \sqrt{A}$$

where:

RFF = the required fire flow in litres per minute (L/min)

C = the construction coefficient is related to the type of construction of the building

= 1.5 for Type V Wood Frame Construction

= 0.8 for Type IV-A Mass Timber Construction

= 0.9 for Type IV-B Mass Timber Construction

= 1.0 for Type IV-C Mass Timber Construction

= 1.5 for Type IV-D Mass Timber Construction

= 1.0 for Type III Ordinary Construction

= 0.8 for Type II Non-combustible Construction

= 0.6 for Type I Fire Resistive Construction

A = the total effective floor area (effective building area) in square metres (excluding basements at least 50 percent below grade) in the building considered

STEP A: Construction Coefficient (C)

1.5

Wood Frame Construction

STEP B: Total Effective Floor Area
Proposed Building

Building F

Yes/No/Unknown

Is basement at least 50% below grade?

Yes

If yes, basement floor area excluded

Vertical openings protected?

Unknown

*For consideration for effective area calculations

Calculate Effective Floor Area based on the highlighted cell

-C value from 1.0 to 1.5: 100% of all floor areas are used

-C value below 1 and vertical openings are not protected: Consider two largest floors plus 50% of all floor above to a max of eight

-C value below 1 and vertical openings are protected: Consider single largest floor plus 25% of the two immediately adjoining floors

*A building may be subdivided if there is a vertical firewall with a fire-resistance rating greater than 2 hours, and meets the requirements of the National Building Code.

Floor/Building	*Total Floor Area* (m ²)	% of Area Considered	Effective Floor Area (m ²)
Basement	556	0%	0.0
1st floor	556	100%	556.0
2nd floor	556	100%	556.0
3rd floor	556	100%	556.0
Total	2224		1668.0

*Fire Wall Included,
floor area decreased*

Total Effective Floor Area 1668 m²

STEP C:

Therefore RFF = 13,000 L/min (rounded to nearest 1000 L/min)

STEP D: Occupancy Contents Adjustment Factor

The required fire flow may be reduced by as much as -25% for occupancies having contents with very low fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

Occupancy and Contents Adjustment Factor

Non-Combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Burning	25%

*Refer to Table 3 for recommended Occupancy and Contents Charges by major occupancy examples.

Type of Occupancy	Adjustment Factor
Residential Occupancy	Limited Combustible -15%

Total Reduction % -1,950 L/min (reduction)

RFF = 11,050 L/min (not rounded)

Note: The RFF flow 11050 L/min is used in Step E and F.

Fire Flow Determination Per Fire Underwriters Survey (2020) - Building F

STEP E: Automatic Sprinkler Protection

Sprinklers - The required fire flow may be reduced by up to 50% for complete automatic sprinkler protection depending upon adequacy of system.

	Yes/No/Unknown	*Possible Reduction Available	Actual Reduction Provided
Automatic sprinkler protection designed and installed in accordance with NFPA 13?	No	-30%	0%
Water supply is standard for both the system and Fire Department hose lines?	No	-10%	0%
Fully supervised system?	No	-10%	0%

*Reduction available assumes complete building coverage

*30% reduction typical for building requiring sprinkler system

Total Reduction % 0% (reduction)

Total Reduced Flow 0 L/min (reduction, not rounded)

STEP F: Exposure Adjustment Charge

Exposure - A percentage of water for the exposures should be added to the required fire flow for the subject building to provide adequate flow rates for hose streams used to reduce the spreading of fire from the subject building to exposed risks. The required fire flow of a subject building may be increased depending on the severity of exposed risks to the subject building and the distance between the exposed risks and the subject building. This charge considers the usage of water supplies to prevent exposed risks from igniting or being damaged during a major fire incident in the subject building.

Separation Distance	Maximum Exposure Adjustment Charge
0 to 3m	25%
3.1 to 10m	20%
10.1 to 20m	15%
20.1 to 30m	10%
Greater than 30m	0%

*If a vertical fire wall is properly constructed and has a rating of no less than 2 hours, then the boundary can be treated as protected with no exposure charge

*The maximum exposure adjustment charge to be applied to a subject building is 75%

*The distance in metres from the subject building facing wall to the exposed building facing wall, measured to the nearest metre, between the nearest points of the buildings. Where either the subject building or the exposed building is at a diagonal to the other building, the shortest distance should be increased by 3 metres and this adjusted value used as exposure distance.

Exposed buildings	Distance	Surcharge Factor	Surcharge (L/min)
North	Adjacent Dwelling >30	0%	0
East	Adjacent Dwelling >30	0%	0
South	Adjacent Dwelling >30	0%	0
West	Adjacent Dwelling 27	10%	1105

Total Reduced Flow 1,105 L/min Surcharge (not rounded)

STEP G: Final Required Fire Flow

Step D - Occupancy Adjusted Fire Flow Demand	11,050 L/min
Step E - Sprinkler (Reduction)	0 L/min
Step F - Exposure Charge	1,105 L/min

Final Fire Flow: 12,155 L/min
 or 12,000 L/min (rounded to nearest 1000L/min)

or 200 L/s

or 3,170 USGPM

Required duration: 2.50 hours

*Refer to Table 1 for Duration

Table 1 - FUS 2020

Required Duration of Fire Flow	
Flow Required (L/min)	Duration (hours)
2,000 or less	1.00
3,000	1.25
4,000	1.50
5,000	1.75
6,000	2.00
8,000	2.00
10,000	2.00
12,000	2.50
14,000	3.00
16,000	3.50
18,000	4.00
20,000	4.50
22,000	5.00
24,000	5.50
26,000	6.00
28,000	6.50
30,000	7.00
32,000	7.50
34,000	8.00
36,000	8.50
38,000	9.00
40,000 and over	9.50

*Interpolate for intermediate figures

Town of Collingwood

Collingwood Water Modeling

C3W-171235

WATERMAIN HYDRAULIC ASSESSMENT OF THE PROPOSED WYLDEWOOD CREEK DEVELOPMENT (DRAFT)



CIMA+ file number: C3W-171235
08 November 2024 - Review 02



Town of Collingwood

Collingwood Water Modeling

C3W-171235

WATERMAIN HYDRAULIC ASSESSMENT OF THE PROPOSED WYLDEWOOD CREEK DEVELOPMENT (DRAFT)

Prepared by:

Maria Rincon, EIT

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CIMA+ file number: C3W-171235
08 November 2024 - Review 02

Table of involved resources

In addition to the signatories of this report, the following individuals have also been involved in the study and writing of the report as technical experts within the project team:

Name	Engineering License Number	Discipline

Register of issues			
Issue No.	Reviewed by	Date	Description of the review
02	S. Ziemann	2024-11-06	QA/QC Review - Update

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Appendix A Site Layout
Appendix B Demand and Fire Flow Calculations

1. Introduction and Background

C3 Water Inc (C3W), now CIMA+, has been asked to conduct a watermain hydraulic assessment of the proposed Wyldeewood Creek development and its impacts on the existing distribution system. Figure 1-1 below provides an overview of the proposed development area. A detailed site plan with proposed watermain, roads and lot types developed by Crozier Consulting Engineers (Crozier) is included in Appendix A.

The proposed development is located in pressure Zone 1 just south of the Georgian Bay Hotel lands at 10 Vacation Inn Drive, encompassing an area of approximately 2.56 ha. The development design includes six apartment buildings consisting of a total of 165 residential units as well as a recreational facility. Existing water distribution infrastructure near the development site include:

- 300 mm trunk watermain on Cranberry Trail
- 200 mm diameter watermain on Trafalgar Road
- 150 mm diameter watermain on Vacation Inn Drive

The Georgian Bay Hotel (Hotel) is an existing development located on Vacation Inn Drive serviced by a private 200 mm watermain on Trafalgar Road which connects to an existing 300 mm watermain on Highway 26. To the south of the proposed development is an existing 300 mm watermain on the unopened extension of Cranberry Trail. There is an existing golf course located between the proposed development and the Cranberry Trail watermain. The proposed development will be serviced via a connection to the existing 300 mm municipal watermain on Cranberry trail. The Town's hydraulic model was used to test sizes of 200, 250 and 300mm. The proposed development watermain will also be connected to the existing private 150 mm watermain on the Hotel lands with a backflow preventer (BFP). The purpose of the BFP is to provide a secondary looped connection for the existing Hotel lands, while preventing water from flowing from the private watermain into the proposed development.



Figure 1-1: Proposed Development Area Site Overview (NTS)

1.1 Design Standards

The Town of Collingwood Development Standards provide design criteria for assessing the impact of proposed developments. The Town Standards recommend that watermains be designed to provide maximum day demands plus fire flows according to the land use type. The Town Standards also outline minimum pressure requirements, as shown in Table 1-1 below.

Table 1-1: Town of Collingwood Design Standards

	Minimum	Preferred
Fire Flow Requirements		
Single-Family Residential	57 L/s	76 L/s
Institutional/Convenience/Commercial	91 L/s	114 L/s
Industrial/Commercial Subdivisions	136 L/s	154 L/s
Downtown Commercial	136 L/s	189 L/s
Pressure Requirements		
Maximum Day Demands + Fire Flows	20 psi	
Standard Operating Conditions	40 psi (Peak Hour)	50 - 80 psi

1.2 Demand and Fire Flow Calculations

Crozier completed calculations for the anticipated water demands for the development. The calculations are based on recommended values from the Ontario Ministry of the Environment and Climate Change (MOECC) Design Guidelines for Drinking Water Systems (2008) and the Town Standards. The Max Day Demands (MDD) and Peak Hour Demands (PHD) were calculated based on the average flows, and recommended peaking factors of 2.0 for MDD and 4.5 for PHD as per MOECC Design Guidelines for Drinking Water Systems 3.4.5.1 and Town Standards. The domestic demands for the proposed development are summarized in Table 1-2 below and provided in Appendix B.

Table 1-2: Demand Calculated Values

Development	Wyldeewood Creek	
Type of Units	Apartment	Recreational Facility
Number of Units	165	1
Average Day Demand (ADD)	1.64 L/s	
Maximum Day Demand (MDD)	3.28 L/s	
Peak Hour Demand (PHD)	7.39 L/s	

Fire Flow calculations were also completed by Crozier using the Fire Underwriters Survey (FUS) Method and the Ontario Building Code (OBC) for buildings A to F. The calculated fire flows for the proposed development are summarized in Table 1-3 below and provided in Appendix B.

Table 1-3: Fire Flow Calculated Values (L/s)

Building	FUS	OBC
A	200	105
B	183	90
C	200	90
D	200	60
E	200	105
F	200	150

The proposed development area was assessed using the recently updated model's existing (2020) and near future average day demand (ADD) and maximum day demand (MDD) scenarios. In the future scenario, the Carmichael BPS is expected to be upgraded with variable frequency drive (VFD) on the pumps and a new inlet configuration that allows water to be pumped to the new Zone 1 West under normal conditions, and to the tower as needed. The valve on Cranberry Trail is open under existing conditions, but is expected to undergo modifications at the same time as the Carmichael Upgrades. Details about the existing and modified valve configuration are still being confirmed, but for the purpose of this assignment, the valve was closed under normal conditions to sustain pressure in Zone 1W, and allow water from Zone 1 to Zone 1W under emergency conditions with a PRV setting of 65 psi.

The proposed development was modelled as a looped system with a connection to Cranberry Trail and to the Hotel with a BFP. A new PVC watermain extending from Cranberry Trail was added to the model and demands were applied to new nodes.

2. Modelling Results

2.1 Fire Flow Results

Modelling was conducted to determine the available fire flows at a residual pressure of 20 psi for a 2-hour fire flow scenario at 12:00pm under MDD conditions. The fire flow simulation was run under existing (2020) near future conditions with the largest pump offline to replicate firm capacity.

The fire flow results predicted by the model are representative of the amount of water available in a watermain and not the extent of flow available from a hydrant. Several hydrants may need to be operated to provide the desired fire flows. For modelling purposes, it was assumed that fires would not occur at multiple locations simultaneously, and therefore the results demonstrate the available flow at each location.

Under existing MDD conditions with a 250 watermain, the available fire flow ranged from 210 - 228 L/s. Under future MDD conditions with a 300 mm watermain, the available fire flow was found to be 203 - 218 L/s. The available flows met the calculated FUS fire flow requirement of 200 L/s with a 300mm pipe under existing and future conditions. Figure 2-1 and Figure 2-2 below show the available fire flows under existing and near future conditions.

Table 2-1: Available Fire Flow (L/s)

Location	MDD 2020 200mm	MDD 2020 250 mm	Future MDD 200mm	Future MDD 300mm
CRANBERRY_CONNECTION	228	228	222	218
JWC2	177	210	179	203
JWC3 (BLDG A & B)	191	214	189	204
JWC4 (BLDG C)	195	216	190	204
JWC5 (BLDG D)	189	211	185	204
JWC6 (BLDG E)	188	210	183	204
JWC7 (BLDG F)	195	218	189	207

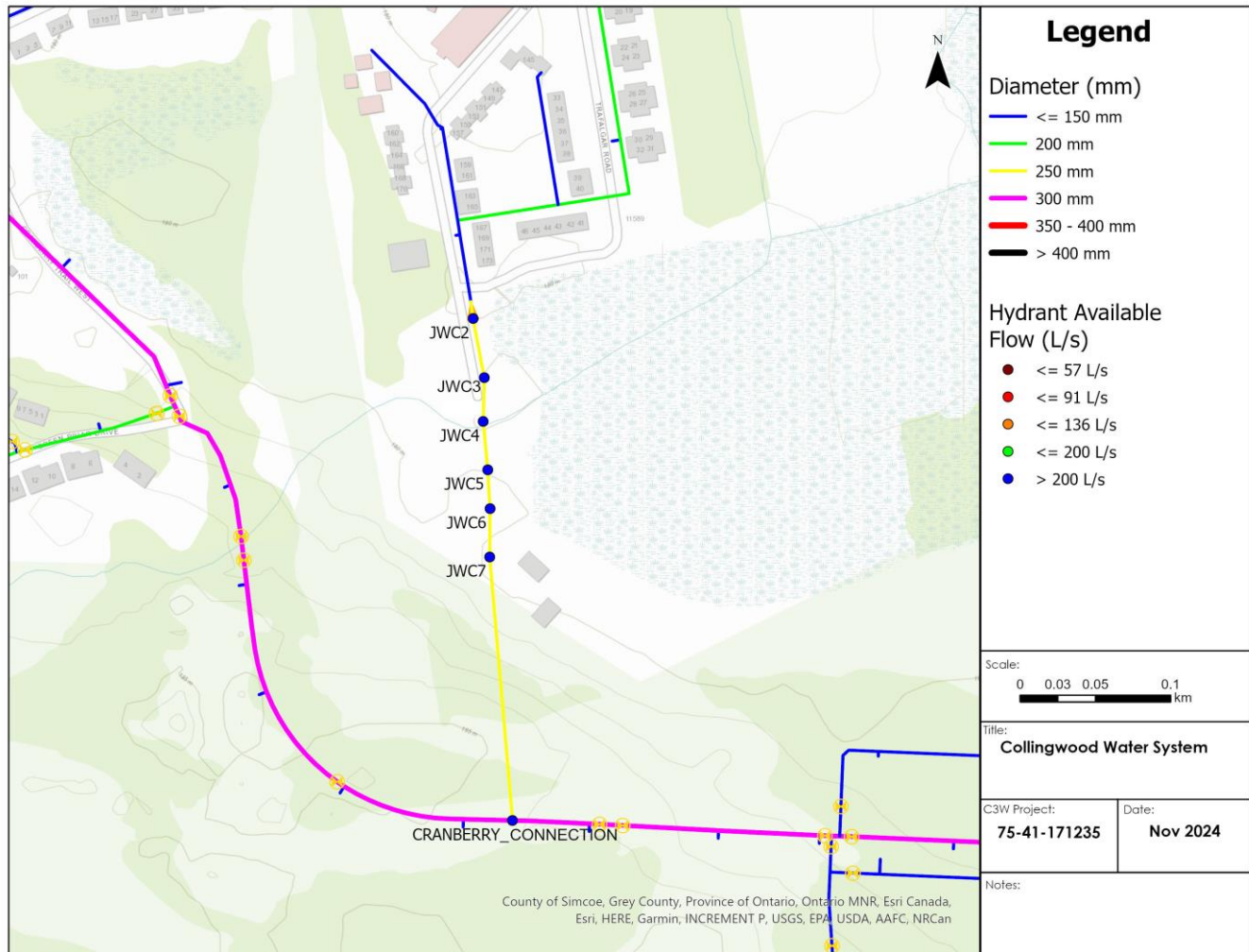


Figure 2-1: Available Fire Flow - MDD Existing Conditions

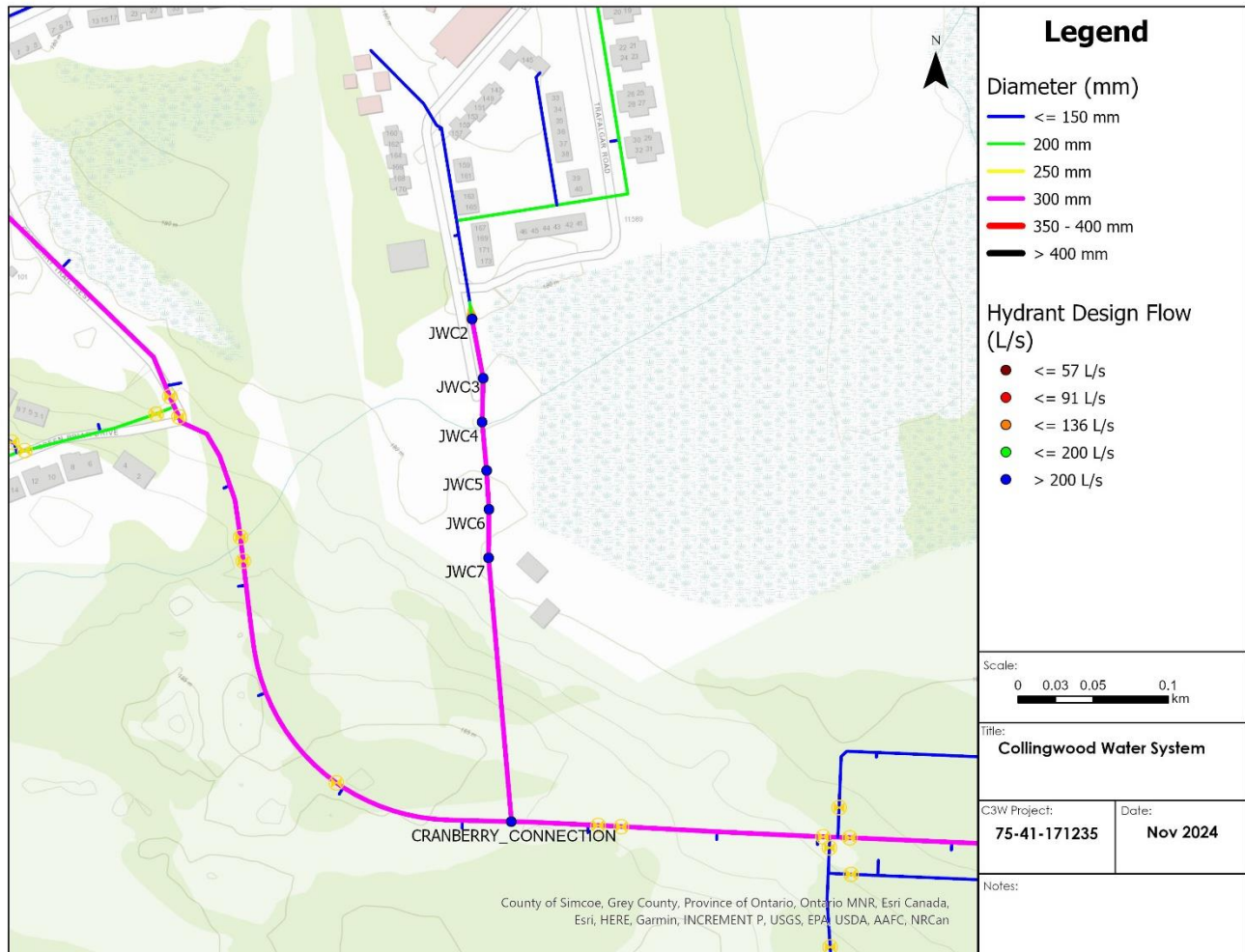


Figure 2-2: Available Fire Flow - MDD Future Conditions

2.2 Pressure Results

The area surrounding the proposed development was first assessed excluding the Wyldeewood Creek development pipes and demands to determine the existing conditions. Under current ADD conditions, the minimum pressures in the surrounding area ranged from 40 - 60 psi. Under MDD conditions, the Georgian Bay Hotel area had minimum pressures ranging from 40 - 50 psi while some developments connected to Cranberry Trail were found to be below 40 psi temporarily when the Carmichael pump turned off. Figure 2-3 shows the existing minimum pressures under MDD conditions.

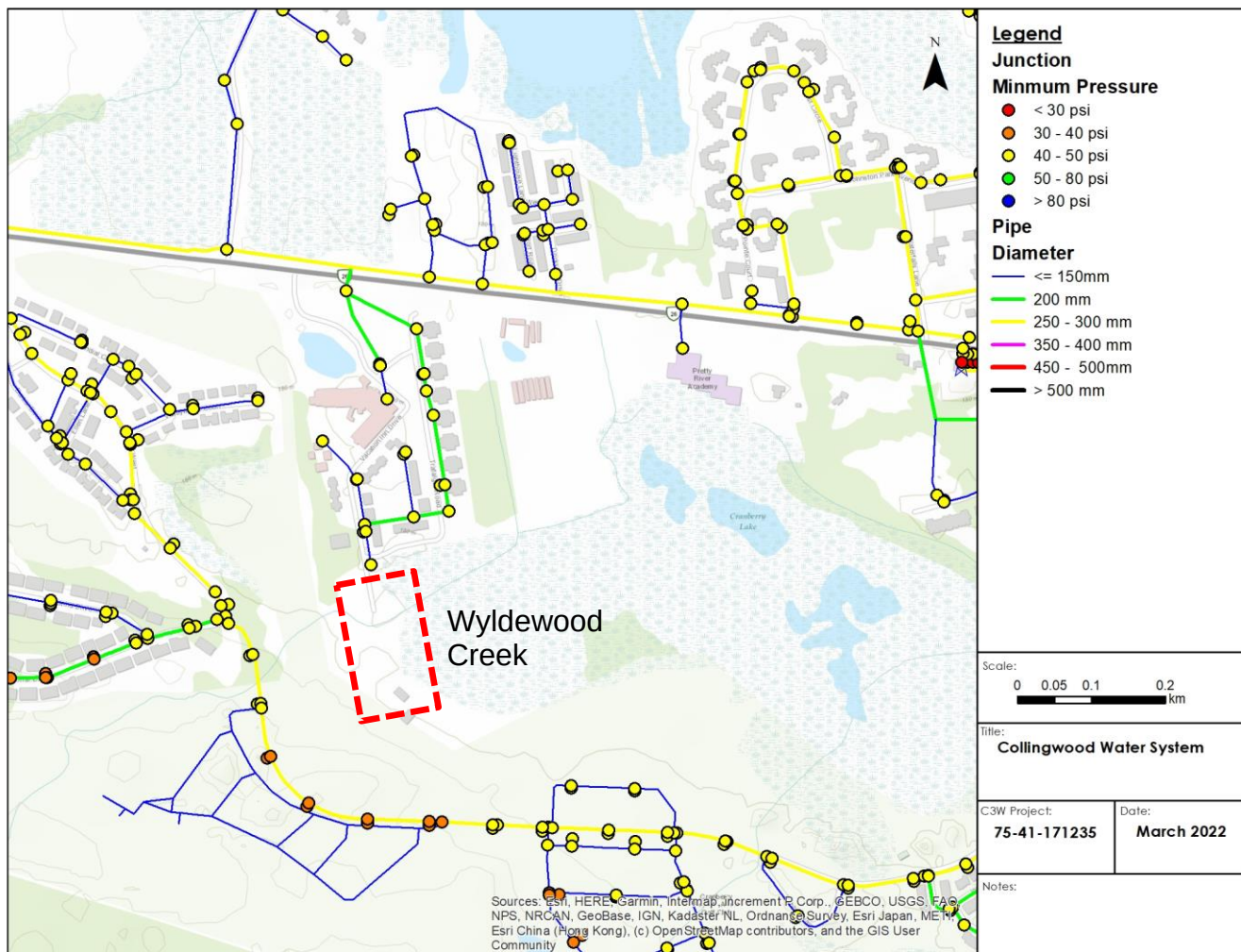


Figure 2-3: Existing Conditions MDD - Minimum Pressure - Excluding Wyldeewood Creek

The range of ground elevations in the Wyldeewood Creek development is approximately 180 - 183 mASL, which is within the preferred Zone 1 elevations of 171 - 192 m. Based on the Zone 1 hydraulic grade line (HGL) of approximately 227m, it is expected that existing static pressures in the development would be 44 - 47 m of head, or 63 - 67 psi.

The pressures in the development were tested in Zone 1 under ADD and MDD scenarios under current conditions, as well as MDD under expected future conditions. The ADD existing pressures were found to be 51 – 68 psi, which is within Town’s preferred operating criteria of 50 – 80 psi. The minimum pressure during MDD was found to be 37 psi under existing conditions for a brief moment when a pump at Carmichael BPS is turned off. The upgrades to Carmichael BPS are anticipated to improve minimum pressures in this area.

Under near future MDD conditions, the development pressures range from 69 – 76 psi which is within the Town’s preferred operating range. Table 2-2 below summarizes the minimum, maximum and average pressures in the proposed development. The minimum pressures under MDD scenarios are shown in Figure 2-4 and Figure 2-5.

Table 2-2: Pressure Results (psi) Post-Development, Existing Conditions

Node	ADD			MDD		
	Max	Min	Avg	Max	Min	Avg
JWC3	69	56	60	61	42	51
JWC4	68	55	59	60	41	50
JWC5	66	52	56	57	38	48
JWC6	65	51	55	56	37	47
JWC7	67	53	58	59	39	49

Table 2-3: Pressure Results (psi) Post-Development, Near Future Conditions

Node	ADD			MDD		
	Max	Min	Avg	Max	Min	Avg
JWC3	76	74	75	73	58	63
JWC4	75	73	74	72	57	62
JWC5	72	70	71	70	55	60
JWC6	72	69	71	69	54	59
JWC7	74	71	73	71	56	61

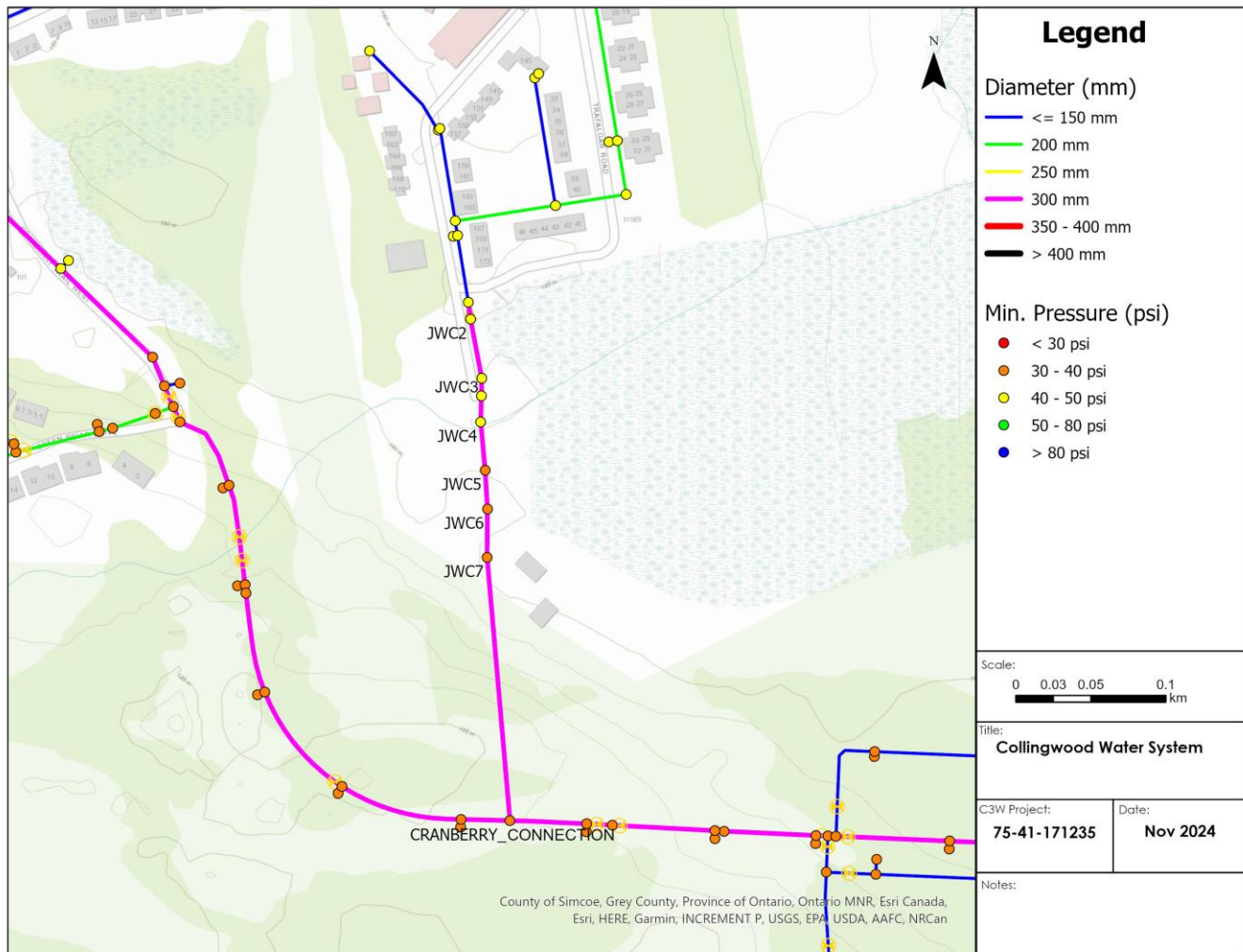


Figure 2-4: Minimum Pressure - Post-Development Existing Conditions MDD

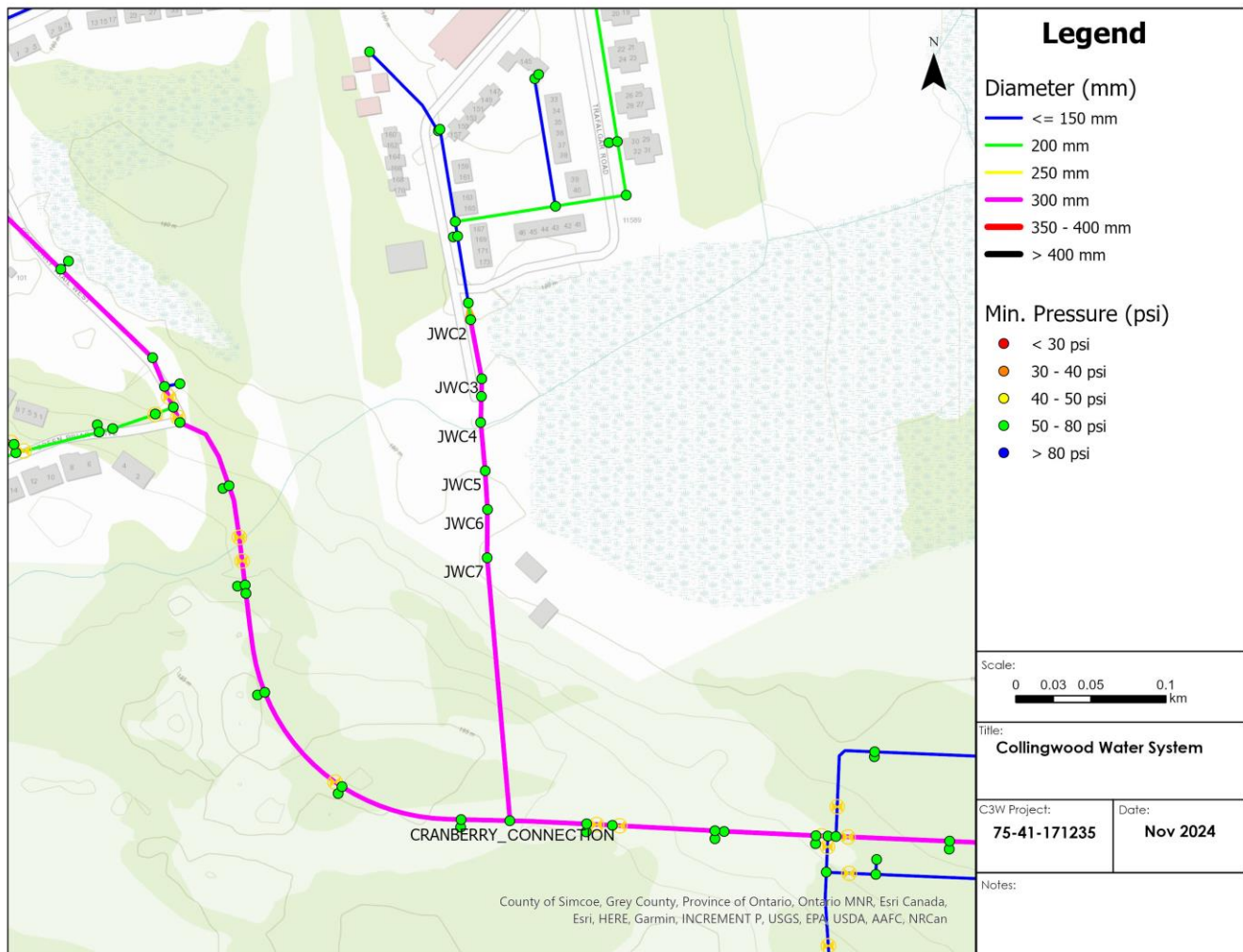


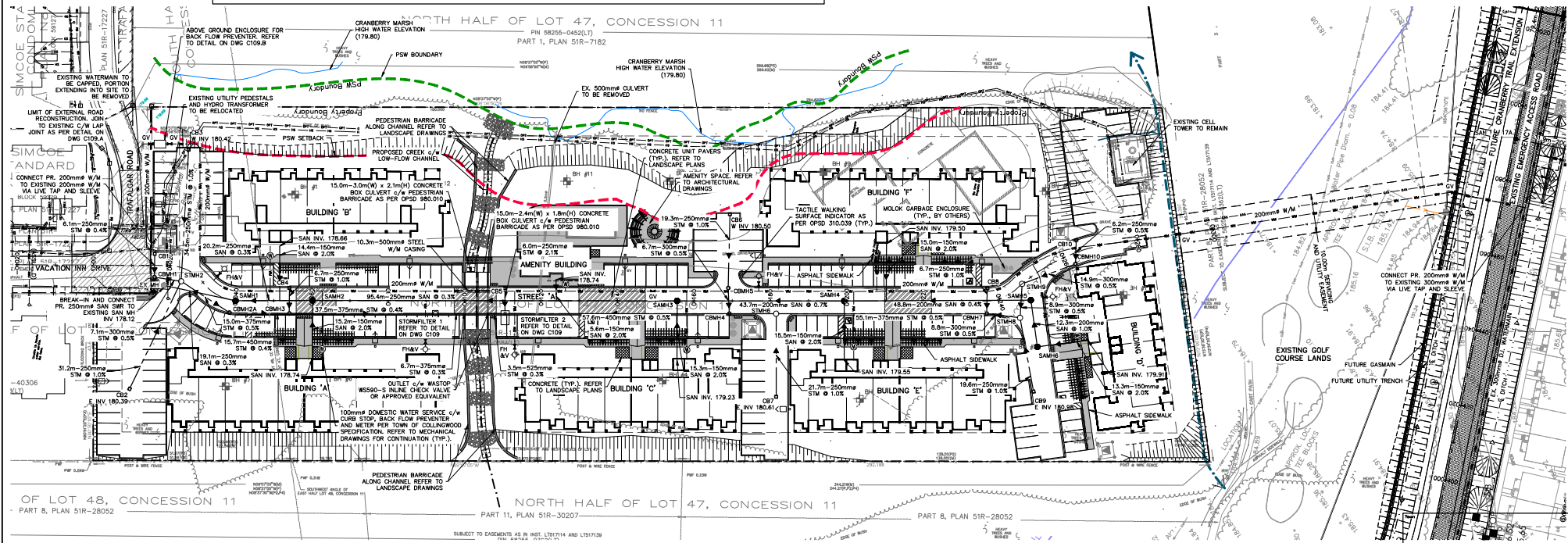
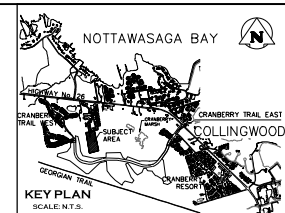
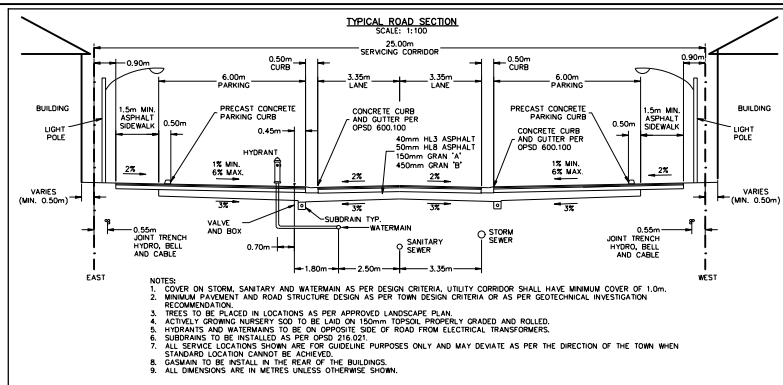
Figure 2-5: Minimum Pressure - Post-Development Near Future Conditions MDD

3. Summary And Recommendations

- A 300 mm watermain enabled the development to meet the required FUS fire flow of 183-200 L/s. Under near future conditions, the available fire flow was found to be 203 - 218 L/s.
- Under current conditions with a 300 mm watermain, the Wyldeewood Creek development pressures range 51 - 68 psi under ADD and 37-61 psi under MDD, which did not meet the minimum operating guidelines for a brief moment when a pump at Carmichael is turned off. Under near-future MDD conditions, the pressures are expected to improve and range from 69 - 76 psi. Timing of upgrades to the Carmichael BPS cannot be guaranteed by the Town.

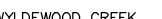
A

Appendix A Site Layout



10 0m 10 20 30 40
SCALE 1:500

NOTES:
REFER TO DRAWINGS GEO-1, DET-1 AND DET-2 BY GEOMORPHIX FOR CHANNEL DESIGN AND RESTORATION DETAILS.

THIS DRAWING IS THE EXCLUSIVE PROPERTY OF C.F. CROZIER & ASSOCIATES INC. AND THE REPRODUCTION OF ANY PART WITHOUT PRIOR WRITTEN CONSENT OF THIS OFFICE IS STRICTLY PROHIBITED. THE USER MUST VERIFY ALL DIMENSIONS, LEVELS, AND DATUMS ON SITE AND REPORT ANY DISCREPANCIES OR CORRECTIONS TO THIS OFFICE PRIOR TO CONSTRUCTION. THIS DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WITH ALL OTHER PLANS AND DOCUMENTS APPLICABLE TO THIS PROJECT. DO NOT SCALE THE DRAWINGS. ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.	BENCHMARKS ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE RELATED TO TOWN OF COLLINGWOOD BENCH MARK NO. 00172031 HAVING AN ELEVATION OF 181.032 METRES. TOPOGRAPHIC SURVEY COMPLETED BY KROMAR SURVEYORS LTD., DATED AUGUST 25, 2018.	<table><tr><th>NO.</th><th>ISSUE</th><th>DATE</th><th>MM/DD/YYYY</th></tr><tr><td>1</td><td>ISSUED FOR 1st ENGINEERING SUBMISSION</td><td>02/04/2018</td><td></td></tr><tr><td>2</td><td>ISSUED FOR DISCUSSION</td><td>02/10/2020</td><td></td></tr><tr><td>3</td><td>ISSUED FOR 2nd ENGINEERING SUBMISSION</td><td>04/08/2021</td><td></td></tr><tr><td>4</td><td>ISSUED FOR 3rd ENGINEERING SUBMISSION</td><td>01/14/2022</td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr></table>	NO.	ISSUE	DATE	MM/DD/YYYY	1	ISSUED FOR 1st ENGINEERING SUBMISSION	02/04/2018		2	ISSUED FOR DISCUSSION	02/10/2020		3	ISSUED FOR 2nd ENGINEERING SUBMISSION	04/08/2021		4	ISSUED FOR 3rd ENGINEERING SUBMISSION	01/14/2022																		ENGINEER  K.A. MORRIS LICENSED PROFESSIONAL ENGINEER PROVINCE OF ONTARIO	ENGINEER  R.A. ALEXANDER LICENSED PROFESSIONAL ENGINEER PROVINCE OF ONTARIO	Project WYLDWOOD CREEK TOWN OF COLLINGWOOD Drawing GENERAL SITE SERVING PLAN	 CROZIER CONSULTING ENGINEERS ADMIRAL BUILDING 1 FIRST STREET, SUITE 200 COLLINGWOOD, ON L9Y 1A1 709-946-5810 / 7 709-446-3520 / F INFO@CROZIER.CA <table><tr><td>Drawn By</td><td>L.W.</td><td>Design By</td><td>L.W.</td><td>Project</td><td>1535-4897</td></tr><tr><td>Check By</td><td>K.M.</td><td>Check By</td><td>R.A.</td><td>Scale</td><td>1:500</td></tr><tr><td></td><td></td><td></td><td></td><td>Drawing</td><td>C101</td></tr></table>	Drawn By	L.W.	Design By	L.W.	Project	1535-4897	Check By	K.M.	Check By	R.A.	Scale	1:500					Drawing	C101
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B

Appendix B Demand and Fire Flow Calculations

Wyldewood Creek - Future Development Water Demand

Southern Sector	2.56	ha
Total Area	2.56	ha
Number of Residential Units and Land Usage		
1) Apartment	165	Units
2) Recreational	1	Facility
Person Per Residential Unit		
1) High Density (per Town Engineering Comments on ZBA/OPA Application)	1.90	persons/unit
2) Recreational	14	person/facility
Total Residential Population	314	Persons
Total Recreational Complex Population	14	Persons
Recreational Equivalent Population	1	Persons
<u>Domestic Water Design Flows</u>		
Residential (Per Collingwood Engineering Standards, 2007)	450	L/C-day
Recreational (Per OBC Table 8.2.1.3.B.)	40	L/person-day
<u>Total Domestic Water Design Flows</u>		
Average Residential Daily Flow	1.64	L/sec
Average Recreational Daily Flow	0.01	L/sec
Total Daily Flow	1.64	L/sec
Max Day Peak Factor (Per Collingwood Engineering Standards, 2007)	2.00	
Max Day Demand Flow	3.28	L/sec
Peak Hour Factor (Per Collingwood Engineering Standards, 2007)	4.50	
Peak Hour Flow	7.39	L/sec

Fire Flow Summary

FIRE UNDERWRITER'S SURVEY

Unit Block #	Total Floor Area (m ²)	Effective Floor Area (m ²)	Flow (L/min)	Reduction (L/min)	Exposure Surcharge (L/min)	Required Flow (L/min)	Required Flow (L/s)
Building A, 3 Story Unit	1,864	1,398	12,000	-1,800	2,040	12,000	200
Building B, 3 Story Unit	1,556	1,167	11,000	-1,650	1,870	11,000	183
Building C, 3 Story Unit	1,548	1,161	11,000	-1,650	2,338	12,000	200
Building D, 3 Story Unit	1,504	1,128	11,000	-1,650	2,338	12,000	200
Building E, 3 Story Unit	1,576	1,182	11,000	-1,650	2,338	12,000	200
Building F, 3 Story Unit	2,224	1,668	13,000	-1,950	1,105	12,000	200

APPENDIX B

Stormwater Management and Water Quality Calculations

Storm Sewer System Design Sheet
Filter Sizing Report
Erosion Control Volume Calculation
Water Balance Calculations
Phosphorous Loading Calculation

WYLDEWOOD CREEK 1535-4897 STORM SEWER DESIGN SHEET																											
C CROZIER CONSULTING ENGINEERS			FREQUENCY - 5 YEARS - Town of Collingwood - Development Standards (July 2007)								MATERIAL PVC/Conc.		MANNINGS "n" 0.013		DESIGNED BY: ML CHECKED BY: RA DATE: 2019.02.02 REVISION NO.: Sub. #5 UPDATED BY: IB DATE: 2024.04.11												
			Coef. A=	1135.4	Coef. B=	7.5	Coef. C=		0.841																		
			FREQUENCY - 50 YEARS - Town of Collingwood - Development Standards (July 2007)																								
			Coef. A=	1973.1	Coef. B=	9	Coef. C=		0.868																		
INITIAL TIME OF CONCENTRATION			10.00																								
CATCHMENT I.D.	FR MH NO	TO MH NO	5 YEAR RUN-OFF		DESIGN STORM	A x C	5 YEAR CUMMUL. A x C	TIME OF CONC. (min.)	5 YEAR I (mm/hr)	Q (RUNOFF) (l/sec)	DESIGN FLOW (l/sec)	SLOPE (%)	PIPE DIA. (mm)	MANNING'S "n"	VEL. (m/sec)	LENGTH (m)	TIME OF FLOW (min)	PIPE CAPACITY (l/sec)	CAPACITY (%)	PIPE INV ELEV.		PIPE OBV ELEV.		GROUND ELEV.		COVER	
			AREA (A) (Ha)	COEFF (C _s)																UPPER END	LOWER END	UPPER END	LOWER END	UPPER END	LOWER END	UPPER END	LOWER END
22 19	CB10	CBMH10	0.06	0.90	5 year	0.05	0.05	10.00	102.27	15.35	15.35	1.00%	250	0.013	1.2	40.7	0.56	59.47	26%	182.21	181.80	182.46	182.05	183.71	183.92	1.25	1.87
	CBMH10	STMH9	0.01	0.80	5 year	0.01	0.06	10.56	99.60	17.17	17.17	0.50%	300	0.013	1.0	11.9	0.21	68.38	25%	181.72	181.66	182.02	181.96	183.92	183.91	1.90	1.95
	STMH9	STMH8	0	0.00	5 year	0.00	0.06	10.76	98.66	17.00	17.00	0.50%	300	0.013	1.0	8.9	0.15	68.38	25%	181.58	181.54	181.88	181.84	183.91	183.82	2.03	1.98
18	CB9	STMH8	0.09	0.80	5 year	0.07	0.07	10.00	102.27	20.47	20.47	1.00%	250	0.013	1.2	19.6	0.27	59.47	34%	181.78	181.58	182.03	181.83	183.70	183.82	1.67	1.99
	STMH8	CBMH7	0	0.00	5 year	0.00	0.13	10.92	97.97	36.49	36.49	0.50%	300	0.013	1.0	8.8	0.15	68.38	53%	181.50	181.46	181.80	181.76	183.82	183.78	2.02	2.02
21	CB8	CBMH7	0.04	0.70	5 year	0.03	0.03	10.00	102.27	7.96	7.96	1.00%	250	0.013	1.2	6.7	0.09	59.47	13%	181.58	181.51	181.83	181.76	183.85	183.78	2.02	2.02
20	CBMH7	STMH6	0.06	0.80	5 year	0.05	0.21	11.07	97.29	56.80	56.80	1.94%	375	0.013	2.2	57.8	0.44	244.21	23%	181.39	180.27	181.77	180.65	183.78	182.32	2.02	1.67
16	CB7	STMH6	0.04	0.90	5 year	0.04	0.04	10.00	102.27	10.24	10.24	1.00%	250	0.013	1.2	21.7	0.30	59.47	17%	180.61	180.39	180.86	180.64	182.33	182.32	1.47	1.68
	STMH6	DCBMH4	0	0.00	5 year	0.00	0.25	11.51	95.41	65.25	65.25	0.64%	375	0.013	1.3	9.6	0.13	140.26	47%	180.24	180.18	180.62	180.56	182.32	182.19	1.70	1.63
13	CB6	DCBMH5	0.03	0.90	5 year	0.03	0.03	10.00	102.27	7.68	7.68	1.10%	250	0.013	1.3	17.5	0.23	62.37	12%	180.50	180.31	180.75	180.56	182.14	182.19	1.39	1.63
14	DCBMH5	DCBMH4	0.19	0.80	5 year	0.15	0.18	10.23	101.16	50.34	50.34	0.50%	300	0.013	1.0	6.7	0.12	68.38	74%	180.28	180.25	180.58	180.55	182.19	182.19	1.61	1.64
15	DCBMH4	Filter 2	0.24	0.80	5 year	0.19	0.62	11.63	94.88	162.75	162.75	0.50%	450	0.013	1.3	57.6	0.76	201.60	81%	180.10	179.81	180.55	180.26	182.19	182.20	1.64	1.94
11	CB5	Filter 2	0.09	0.80	5 year	0.07	0.07	10.00	102.27	20.47	20.47	2.14%	250	0.013	1.8	6.0	0.06	86.99	24%	180.13	180.00	180.38	180.25	182.20	182.20	1.82	1.95
10	Filter 2	S Culvert	0.12	0.80	5 year	0.10	0.79	12.39	91.84	200.42	200.42	0.28%	525	0.013	1.1	3.5	0.06	227.57	88%	179.65	179.64	180.18	180.17	182.20	182.15	2.02	1.99
1	CB2	STMH2	0.06	0.90	5 year	0.05	0.05	10.00	102.27	15.35	15.35	1.00%	250	0.013	1.2	31.2	0.43	59.47	26%	180.39	180.08	180.64	180.33	181.20	181.10	0.56	0.77
4	CB3	STMH2	0.04	0.90	5 year	0.04	0.04	10.00	102.27	10.24	10.24	1.00%	250	0.013	1.2	24.5	0.34	59.47	17%	180.33	180.08	180.58	180.33	181.26	181.10	0.69	0.77
3 2A	CB1	CBMH1	0.07	0.70	5 year	0.05	0.05	10.00	102.27	13.93	13.93	0.40%	250	0.013	0.8	6.1	0.13	37.61	37%	180.11	180.09	180.36	180.34	180.67	180.78	0.31	0.44
	CBMH1	STMH2	0.07	0.70	5 year	0.05	0.10	10.13	101.62	27.69	27.69	0.50%	300	0.013	1.0	7.1	0.12	68.38	40%	180.07	180.03	180.37	180.33	180.78	181.10	0.41	0.77
2B	STMH2	CBMH2A	0	0.00	5 year	0.00	0.19	10.43	100.21	52.37	52.37	0.50%	375	0.013	1.1	15.0	0.22	123.98	42%	180.00	179.92	180.37	180.30	181.10	181.64	0.73	1.35
	CBMH2A	CBMH3	0.04	0.70	5 year	0.03	0.22	10.65	99.17	59.55	59.55	0.39%	375			15.7					0.38	0.38	181.64	182.15			
6	CB4	CBMH3	0.07	0.80	5 year	0.06	0.06	10.00	102.27	15.92	15.92	0.95%	250	0.013	1.2	6.7	0.09	57.96	27%	180.04	179.98	180.29	180.23	182.15	182.15	1.86	1.92
7	CBMH3	Filter 1	0.06	0.80	5 year	0.05	0.32	10.65	99.17	88.22	88.22	0.40%	375	0.013	1.0	37.5	0.62	110.89	80%	179.75	179.60	180.12	179.98	182.15	182.26	2.03	2.29
	Filter 1	N CULVERT	0	0.00	5 year	0.00	0.32	11.27	96.40	85.76	85.76	0.30%	375	0.013	0.9	6.7	0.13	96.03	89%	179.44	179.42	179.82	179.80	182.27	183.26	2.46	3.47



Determining Number of Cartridges for Flow Based Systems

Date

4/6/2021

Black Cells = Calculation

Site Information

Project Name

Wyldwood Creek

Project Location

Collingwood, ON

OGS ID

OGS - North

Drainage Area, Ad

1.01 ac (0.41 ha)

Impervious Area, Ai

0.84 ac (0.34 ha)

Pervious Area, Ap

0.17

% Impervious

83%

Runoff Coefficient, Rc

0.79

Treatment storm flow rate, Q_{treat}

0.41 cfs (11.69 L/s)

Peak storm flow rate, Q_{peak}

TBD cfs -

Filter System

Filtration brand

StormFilter

Cartridge height

18 in

Specific Flow Rate

1.67 gpm/ft²

Flow rate per cartridge

12.53 gpm

SUMMARY

Number of Cartridges

15

Media Type

Phosphosorb

Event Mean Concentration (EMC)

150 mg/L

Annual TSS Removal

80%

Percent Runoff Capture

90%

Recommend one SFPD0811 vault

200 Enterprise Drive
Scarborough, ME 04074
Phone 877-907-8676
Fax 207-885-9825



Determining Number of Cartridges for Flow Based Systems

Date

4/6/2021

Black Cells = Calculation

Site Information

Project Name

Wyldwood Creek

Project Location

Collingwood, ON

OGS ID

OGS - South

Drainage Area, Ad

2.67 ac (1.08 ha)

Impervious Area, Ai

2.15 ac (0.87 ha)

Pervious Area, Ap

0.52

% Impervious

81%

Runoff Coefficient, Rc

0.77

Treatment storm flow rate, Q_{treat}

1.07 cfs (30.18 L/s)

Peak storm flow rate, Q_{peak}

TBD cfs -

Filter System

Filtration brand

StormFilter

Cartridge height

18 in

Specific Flow Rate

1.67 gpm/ft²

Flow rate per cartridge

12.53 gpm

SUMMARY

Number of Cartridges	39
Media Type	Phosphosorb

Event Mean Concentration (EMC)

150 mg/L

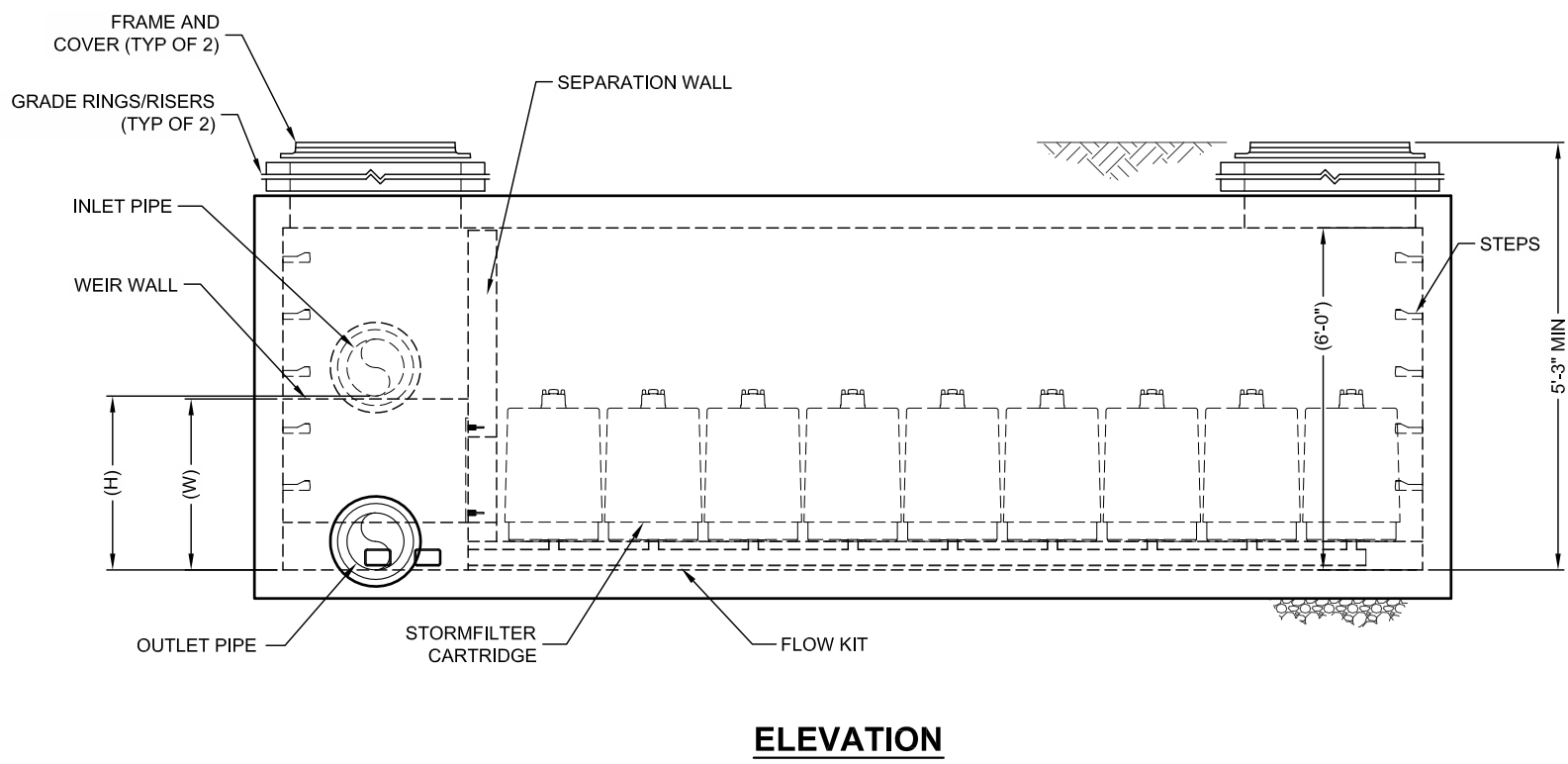
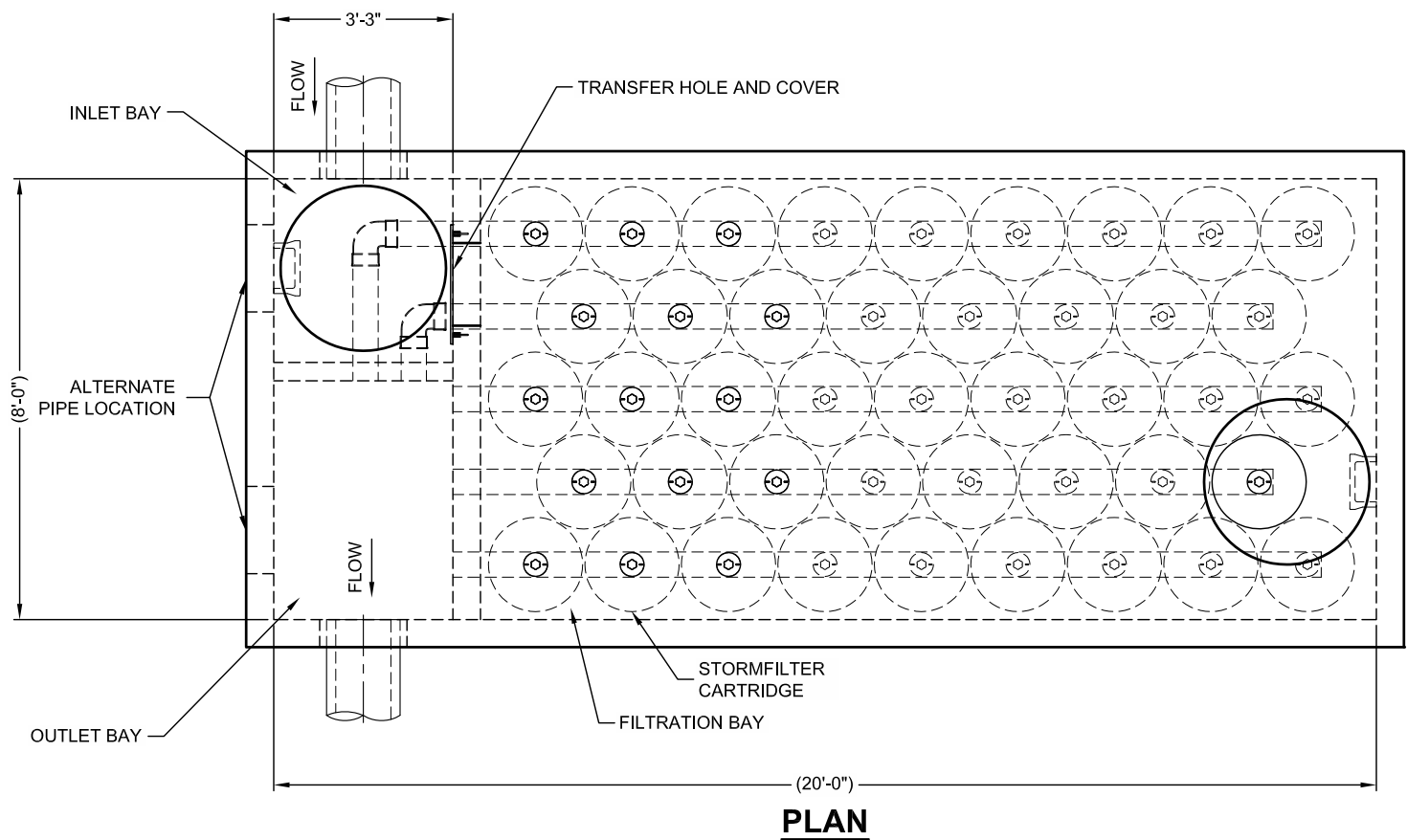
Annual TSS Removal

80%

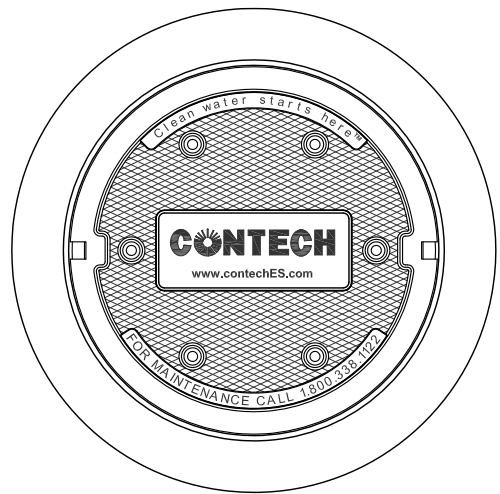
Percent Runoff Capture

90%

Recommend one SFPD0820 vault



STORMFILTER DESIGN TABLE					
• THE 8' x 20' PEAK DIVERSION STORMFILTER TREATMENT CAPACITY VARIES BY CARTRIDGE COUNT AND LOCALLY APPROVED SURFACE AREA SPECIFIC FLOW RATE. PEAK CONVEYANCE CAPACITY TO BE DETERMINED BY ENGINEER OF RECORD. • THE PEAK DIVERSION STORMFILTER IS AVAILABLE IN A LEFT INLET (AS SHOWN) OR RIGHT INLET CONFIGURATION. • ALL PARTS AND INTERNAL ASSEMBLY PROVIDED BY CONTECH UNLESS OTHERWISE NOTED.					
CARTRIDGE HEIGHT	27"		18"		LOW DROP
SYSTEM HYDRAULIC DROP (H - REQ'D. MIN.)	3.05'		2.3'		1.8'
HEIGHT OF WEIR (W)	3.00'		2.25'		1.75'
TREATMENT BY MEDIA SURFACE AREA	2 gpm/ft²	1 gpm/ft²	2 gpm/ft²	1 gpm/ft²	2 gpm/ft² 1 gpm/ft²
CARTRIDGE FLOW RATE (gpm)	22.5	11.25	15	7.5	10 5



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS			
STRUCTURE ID		*	
WATER QUALITY FLOW RATE (cfs)		*	
PEAK FLOW RATE (cfs)		*	
RETURN PERIOD OF PEAK FLOW (yrs)		*	
# OF CARTRIDGES REQUIRED		*	
CARTRIDGE FLOW RATE		*	
MEDIA TYPE (CSF, PERLITE, ZPG)		*	
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE	*	*	*
OUTLET PIPE	*	*	*
INLET BAY RIM ELEVATION		*	
FILTER BAY RIM ELEVATION		*	
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*
NOTES/SPECIAL REQUIREMENTS:			

PERFORMANCE SPECIFICATION
FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF CLEANING. **RADIAL MEDIA DEPTH SHALL BE 7-INCHES**. FILTER MEDIA CONTACT TIME SHALL BE AT LEAST **37 SECONDS**.
SPECIFIC FLOW RATE SHALL BE **2 GPM/SF (MAXIMUM)**. SPECIFIC FLOW RATE IS THE MEASURE OF THE FLOW (GPM) DIVIDED BY THE MEDIA SURFACE CONTACT AREA (SF). MEDIA VOLUMETRIC FLOW RATE SHALL BE **6 GPM/CF OF MEDIA (MAXIMUM)**.

- GENERAL NOTES**
- CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
 - DIMENSIONS MARKED WITH () ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
 - FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH REPRESENTATIVE. www.ContechES.com
 - STORMFILTER WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
 - STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 5' AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.

- INSTALLATION NOTES**
- ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
 - CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMFILTER STRUCTURE (LIFTING CLUTCHES PROVIDED).
 - CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL SECTIONS AND ASSEMBLE STRUCTURE.
 - CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH OUTLET PIPE INVERT WITH OUTLET BAY FLOOR.
 - CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.
 - CONTRACTOR TO REMOVE THE TRANSFER HOLE COVER WHEN THE SYSTEM IS BROUGHT ONLINE.



CONTECH
ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

THE STORMWATER MANAGEMENT STORMFILTER
8' x 20' PEAK DIVERSION STORMFILTER
STANDARD DETAIL



Project Name: Wyldewood Creek

Project No: 1535-4897

Modelled By: ML

Checked By: RA

Date: 2021.03.30

Wyldewood Creek - Erosion Control Volume

Total Impervious Area 1.29 ha
 Target Precipitation Depth 5 mm
 Precipitation Volume 64.5 m³
 Roof Area 0.70 ha
 Equivalent Precipitation Depth 9 m

Building A	Area (m ²)	Precipitation Depth (mm)	Precipitation Volume (m ³)	Thickness (m)	Void Ratio	Storage Volume (m ³)
Building	1371	9	12.6	--	--	--
Riverstone	62	--	--	0.3	0.4	7.5
Planting	58	--	--	0.5	0.3	8.8
Total	12.6					16.2
Building B	Area (m ²)	Precipitation Depth (mm)	Precipitation Volume (m ³)	Thickness (m)	Void Ratio	Storage Volume (m ³)
Building	1134	9	10.4			
Riverstone	41	--	--	0.3	0.4	4.9
Planting	88	--	--	0.5	0.3	13.2
Total	10.4					18.1
Building C	Area (m ²)	Precipitation Depth (mm)	Precipitation Volume (m ³)	Thickness (m)	Void Ratio	Storage Volume (m ³)
Building	1133	9	10.4			
Riverstone	52	--	--	0.3	0.4	6.2
Planting	38	--	--	0.5	0.3	5.7
Total	10.4					11.8
Building D	Area (m ²)	Precipitation Depth (mm)	Precipitation Volume (m ³)	Thickness (m)	Void Ratio	Storage Volume (m ³)
Building	875	9	8.0			
Riverstone	24	--	--	0.3	0.4	2.9
Planting	41	--	--	0.5	0.3	6.1
Total	8.0					9.0



Project Name: Wyldewood Creek

Project No: 1535-4897

Modelled By: ML

Checked By: RA

Date: 2021.03.30

Wyldewood Creek - Erosion Control Volume

Total Impervious Area	1.29 ha
Target Precipitation Depth	5 mm
Precipitation Volume	64.5 m ³
Roof Area	0.70 ha
Equivalent Precipitation Depth	9 m

Building E	Area (m ²)	Precipitation Depth (mm)	Precipitation Volume (m ³)	Thickness (m)	Void Ratio	Storage Volume (m ³)
Building	1131	9	10.4			
Riverstone	44	--	--	0.3	0.4	5.2
Planting	54	--	--	0.5	0.3	8.1
Total			10.4			13.4
Building F	Area (m ²)	Precipitation Depth (mm)	Precipitation Volume (m ³)	Thickness (m)	Void Ratio	Storage Volume (m ³)
Building	1386	9	12.7			
Riverstone	60	--	--	0.3	0.4	7.2
Planting	94	--	--	0.5	0.3	14.1
Total			12.7			21.2
Total Precipitation Volume =			64.5 m ³			
Total Storage Volume =			89.8 m ³			

NOTES:

- 1) Plantings considered above are the perennials, groundcover and shrubs identified on the landscaping plans.
- 2) Refer to the Landscaping Plans prepared by Crozier (April 2021) for river stone and planting details.



Project Name: Wyldewood Creek

Project No: 1535-4897

Modelled By: IB

Checked By:

Date: 2021.12.17

Wyldewood Creek - Subgrade Infiltration Requirement

Total Impervious Area 1.29 ha
 Target Precipitation Depth 5 mm
 Precipitation Volume 64.5 m³
 Roof Area 0.70 ha
 Equivalent Precipitation Depth 9 mm

Building A	Area (m ²)	Precipitation Depth (mm)	Precipitation Volume (m ³)	Water Depth (mm)	Drawdown Time (hr)	Required Infiltration Rate (mm/hr)
Building	1371	9	12.6			
Riverstone	62	--	--			
Planting	58	--	--			
Total			12.6			
Infiltration Area	121		12.6	104	24	4.3
Building B	Area (m ²)	Precipitation Depth (mm)	Precipitation Volume (m ³)	Water Depth (mm)	Drawdown Time (hr)	Required Infiltration Rate (mm/hr)
Building	1134	9	10.4			
Riverstone	41	--	--			
Planting	88	--	--			
Total			10.4			
Infiltration Area	129		10.4	81	24	3.4
Building C	Area (m ²)	Precipitation Depth (mm)	Precipitation Volume (m ³)	Water Depth (mm)	Drawdown Time (hr)	Required Infiltration Rate (mm/hr)
Building	1133	9	10.4			
Riverstone	52	--	--			
Planting	38	--	--			
Total			10.4			
Infiltration Area	89		10.4	117	24	4.9
Building D	Area (m ²)	Precipitation Depth (mm)	Precipitation Volume (m ³)	Water Depth (mm)	Drawdown Time (hr)	Required Infiltration Rate (mm/hr)
Building	875	9	8.0			
Riverstone	24	--	--			
Planting	41	--	--			
Total			8.0			
Infiltration Area	65		8.0	124	24	5.2



Project Name: Wyldewood Creek

Project No: 1535-4897

Modelled By: IB

Checked By:

Date: 2021.12.17

Wyldewood Creek - Subgrade Infiltration Requirement

Total Impervious Area 1.29 ha
 Target Precipitation Depth 5 mm
 Precipitation Volume 64.5 m³
 Roof Area 0.70 ha
 Equivalent Precipitation Depth 9 mm

Building E	Area (m ²)	Precipitation Depth (mm)	Precipitation Volume (m ³)	Water Depth (mm)	Drawdown Time (hr)	Required Infiltration Rate (mm/hr)
Building	1131	9	10.4			
Riverstone	44	--	--			
Planting	54	--	--			
Total			10.4			
Total Infiltration Area	98		10.4	106	24	4.4
Building F	Area (m ²)	Precipitation Depth (mm)	Precipitation Volume (m ³)	Water Depth (mm)	Drawdown Time (hr)	Required Infiltration Rate (mm/hr)
Building	1386	9	12.7			
Riverstone	60	--	--			
Planting	94	--	--			
Total			12.7			
Infiltration Area	153		12.7	83	24	3.5
Minimum Required Infiltration Rate for Imported Fill (mm/hr) =						5.2

NOTES:

1) Refer to the Landscaping Plans prepared by Crozier for river stone and planting details.

Wyldewood Creek - Water Balance
Water Balance/Water Budget Assessment

Overview

- 1 Climate Data
- 2 Climatic Water Budget
- 3 Pre-Development Water Balance
- 4 Post-Development Water Balance (without Mitigation)
- 5 Post-Development Water Balance (with Mitigation)
- 6 Water Budget Summary
- 7 Design Storm Calculation & Mitigation Sizing

Climate Normals 1981-2010 Station Data

Metadata including Station Name, Province, Latitude, Longitude, Elevation, Climate ID, WMO ID, TC ID

STATION_NAME PROVINCE LATITUDE LONGITUD ELEVATION CLIMATE_ID WMO_ID TC_ID
THORNBURY SLAMA ON 44°34'25.C 80°29'07.(213.4 m 611HBEC

Legend

A = WMO "3 and 5 rule" (i.e. no more than 3 consecutive and no more than 5 total missing for either temperature or precipitation)
B = At least 25 years
C = At least 20 years
D = At least 15 years

1981 to 2010 Canadian Climate Normals station data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
Temperature														
Daily Average (°C)	-6.3	-5.4	-1.5	5.5	11.5	16.7	19.8	19.2	15.5	9.1	3.1	-2.7	7	C
Standard Deviation	2.8	2.5	1.9	1.6	1.8	1.4	1.4	1.3	1.4	1.3	1.7	2.6	1.6	C
Daily Maximum (°C)	-2.6	-1.5	2.9	10.2	16.6	22	24.8	24	20.1	13.2	6.5	0.6	11.4	C
Daily Minimum (°C)	-9.9	-9.3	-5.8	0.9	6.2	11.4	14.8	14.3	10.8	4.9	-0.3	-5.9	2.7	C
Extreme Maximum (°)	15	18	24	30.5	32.8	34	35.5	36	33.5	28.9	22.5	20		
Date (yyyy/dd)	1995/14	2000/26	1990/14	2002/16	1977/21	1994/15	Aug-88	Apr-88	Oct-83	Jan-71	May-78	Mar-82		
Extreme Minimum (°C)	-30.6	-31.5	-28	-13.3	-3.3	0.6	5	3.9	-2	-5	-16.5	-26		
Date (yyyy/dd)	1977/18	1979/18	Feb-80	Jul-72	Feb-74	Jan-71	Apr-72	1977/19	1991/30	1975/31	1995/29	1980/25		
Precipitation														
Rainfall (mm)	20.9	19.4	36.7	57.4	82.7	79.1	72.1	78.2	95.9	84	70.4	28.5	725.3	C
Snowfall (cm)	79.1	49	27.4	7.9	0	0	0	0	0	3.3	29.2	70.8	266.6	C
Precipitation (mm)	100	68.4	64	65.3	82.7	79.1	72.1	78.2	95.9	87.3	99.6	99.4	991.9	C
Average Snow Depth (cm)				0	0	0	0	0	0	0	0	0		
Median Snow Depth (cm)				0	0	0	0	0	0	0	0	0		
Extreme Daily Rainfall	26.6	46	39	63.2	67.8	60	67.4	89.4	68	37.2	54.6	30.2		
Date (yyyy/dd)	May-98	1997/21	Nov-90	2000/20	2004/23	2001/21	1980/20	1968/19	May-85	2003/14	Dec-92	1979/24		
Extreme Daily Snowfa	32	23	22	17	1	0	0	0	0	17	31	32		
Date (yyyy/dd)	1979/13	Oct-95	1989/17	Oct-92	Jun-74	Jan-68	Jan-68	Jan-68	Jan-68	1997/22	1987/25	Oct-88		
Extreme Daily Precipi	32	50	39	63.2	67.8	60	67.4	89.4	68	37.2	54.6	32		
Date (yyyy/dd)	1979/13	1997/21	Nov-90	2000/20	2004/23	2001/21	1980/20	1968/19	May-85	2003/14	Dec-92	Oct-88		
Extreme Snow Depth	50	47	28	1	0	0	0	0	0	0	0	19		
Date (yyyy/dd)	2004/31	Jan-04	Jan-04	Jan-92	1983/23	Jan-83	Jan-83	Jan-83	Jan-83	Jan-83	Jan-91	1993/31		
Days with Maximum Temperature														
<= 0 °C	21.1	16.9	10.7	1.1	0	0	0	0	0	0.05	3.6	13.7	67.1	C
> 0 °C	9.9	11.4	20.3	28.9	31	30	31	31	30	31	26.4	17.3	298.1	C
> 10 °C	0.33	0.64	4.3	12.8	26.5	29.9	31	31	29.4	21.1	6.9	1.2	195.1	C
> 20 °C	0	0	0.48	2.5	8.4	18.9	27.3	25.9	14.4	3.3	0.09	0	101.2	C
> 30 °C	0	0	0	0.04	0.22	1.7	2.9	1.8	0.46	0	0	0	7.1	C
> 35 °C	0	0	0	0	0	0	0.09	0.09	0	0	0	0	0.18	C
Days with Minimum Temperature														
> 0 °C	1.5	1.9	4.5	14.7	28.7	30	31	31	29.8	26.9	12.6	3.7	216.3	C
<= 2 °C	30.5	27.5	28.9	20.2	6.2	0.09	0	0	0.67	10.1	22.8	29.6	176.6	C
<= 0 °C	29.5	26.3	26.5	15.3	2.3	0	0	0	0.21	4.1	17.4	27.3	148.9	C
< -2 °C	27.3	23.8	21.5	7.3	0.09	0	0	0	0	0.64	9.3	21.5	111.2	C
< -10 °C	15	12.1	7	0.28	0	0	0	0	0	0	0.61	7.4	42.4	C
< -20 °C	2.2	1.5	0.46	0	0	0	0	0	0	0	0	0.36	4.6	C
< -30 °C	0.04	0	0	0	0	0	0	0	0	0	0	0	0.04	C
Days with Rainfall														
>= 0.2 mm	4.2	3.8	6.9	11.5	12	10.6	9.5	10.8	13.2	15.5	12.5	6.4	116.9	C
>= 5 mm	1.4	1.2	2.1	3.6	5.3	4.3	4	4.2	5.7	5.9	4.5	1.7	43.9	C
>= 10 mm	0.64	0.56	1.1	1.6	2.9	3	2.2	2.5	3	2.5	1.9	0.79	22.6	C
>= 25 mm	0.08	0.04	0.16	0.2	0.4	0.58	0.67	0.71	0.75	0.25	0.29	0.04	4.2	C
Days With Snowfall														
>= 0.2 cm	15.9	10.6	7	2.2	0	0	0	0	0	0.67	5	12.3	53.6	C
>= 5 cm	5.5	3.7	1.8	0.52	0	0	0	0	0	0.29	2	5.7	19.6	C
>= 10 cm	1.8	1.2	0.52	0.24	0	0	0	0	0	0.08	0.75	1.8	6.3	C
>= 25 cm	0.04	0	0	0	0	0	0	0	0	0	0.04	0.17	0.25	C
Days with Precipitation														
>= 0.2 mm	18.9	13.3	12.5	12.6	12	10.6	9.5	10.8	13.2	15.8	16.3	17.6	163	C
>= 5 mm	7.2	5.1	4.1	4.3	5.3	4.3	4	4.2	5.7	6.1	6.8	7.8	65	C
>= 10 mm	2.6	1.8	1.8	1.9	2.9	3	2.2	2.5	3	2.6	2.8	2.6	29.7	C
>= 25 mm	0.12	0.08	0.16	0.24	0.4	0.58	0.67	0.71	0.75	0.25	0.38	0.21	4.6	C
Days with Snow Depth														
>= 1 cm				0	0	0	0	0	0	0	0			
>= 5 cm				0	0	0	0	0	0	0	0			
>= 10 cm				0	0	0	0	0	0	0	0			
>= 20 cm				0	0	0	0	0	0	0	0			
Degree Days														
Above 24 °C	0	0	0	0	0.1	2.1	7.1	4.7	0.7	0	0	0	14.8	C
Above 18 °C	0	0	0.1	2.1	8.2	35	77.9	61.5	21.6	1.6	0	0	207.8	C
Above 15 °C	0	0	0.5	5.5	23.3	79.9	154.6	135	57.6	6.8	0	0.1	463.2	C
Above 10 °C	0	0	3.9	21.2	82.5	204.8	307.9	287.2	168.3	41.2	4.4	0.8	1122.4	C
Above 5 °C	0.7	1.9	15.9	67.4	202.7	353.3	462.9	442.2	313.6	133.4	30.9	5.3	2030	C
Above 0 °C	10.6	14.5	53.5	172.1	354.9	503.3	617.9	597.2	463.5	278.9	109.7	30	3206	C
Below 0 °C	208.7	166.8	99.2	8	0	0	0	0	0	0.1	18.3	110.2	611.4	C
Below 5 °C	353.8	295.3	216.6	53.2	2.8	0	0	0	0.1	9.6	89.6	240.6	1261.6	C
Below 10 °C	508.1	434.7	359.6	157.1	37.6	1.5	0	0.1	4.8	72.5	213.1	391.1	2180.2	C
Below 15 °C	663.1	575.9	511.2	291.3	133.4	26.6	1.7	2.8	44.1	193.1	358.7	545.4	3347.2	C
Below 18 °C	756.1	660.6	603.8	378	211.3	71.7	17.9	22.4	98.1	280.8	448.7	638.3	4187.5	C

1981 to 2010 Canadian Climate Normals station data (Frost-Free)

Frost-Free: Code

Average Date of Last: 11-May D

Average Date of First: 11-Oct D

Average Length of Frc 152 Days D

Probability of last ten 10% 25% 33% 50% 66% 75% 90%

Date 24-May 18-May 14-May 9-May 5-May 3-May 29-Apr

Probability of first ten 10% 25% 33% 50% 66% 75% 90%

Date 28-Sep 4-Oct 8-Oct 12-Oct 16-Oct 18-Oct 1-Nov

Probability of frost-frc 10% 25% 33% 50% 66% 75% 90%

Days 133 147 149 155 158 161 176



Project Name: Wyldewood Creek
Project No: 1535-4897
Modelled By: ML
Checked By: RA
Date: 2021/03/30

Climatic Water Budget - Thornthwaite Method
Wyldewood Creek - Water Balance
THORNBURY SLAMA - Climate Normals 1981-2010 Station Data

Insert Latitude:

Degrees	Minutes	Seconds
44	30	45.1

 *Only Applicable Between Latitudes 40° - 50°

Month	Mean Temperature (°C)	Heat index	" a "	PET - Potential Evapotranspiration (mm)	Daily Correction Value	Adjusted PET - Potential Evapotranspiration (mm)	Total Precipitation (mm)	Surplus (mm)	Deficit (mm)
January	-6.3	0.0	0.49	0.0	0.76	0.0	100.0	100.0	0.0
February	-5.4	0.0	0.49	0.0	0.87	0.0	68.4	68.4	0.0
March	-1.5	0.0	0.49	0.0	0.99	0.0	64.0	64.0	0.0
April	5.5	1.2	0.51	25.7	1.12	28.7	65.3	36.6	0.0
May	11.5	3.5	0.55	56.0	1.24	69.2	82.7	13.5	0.0
June	16.7	6.2	0.60	83.0	1.30	107.9	79.1	0.0	28.8
July	19.8	8.0	0.63	99.4	1.28	126.7	72.1	0.0	54.6
August	19.2	7.7	0.63	96.2	1.18	113.2	78.2	0.0	35.0
September	15.5	5.5	0.59	76.7	1.05	80.5	95.9	15.4	0.0
October	9.1	2.5	0.54	43.7	0.92	40.1	87.3	47.2	0.0
November	3.1	0.5	0.50	14.0	0.80	11.2	99.6	88.4	0.0
December	-2.7	0.0	0.49	0.0	0.73	0.0	99.4	99.4	0.0
Totals		35.1	1.06			577.6	992.0	532.9	118.4

TOTAL WATER DEFICIT = 118.4 mm
TOTAL WATER SURPLUS (SURPLUS - DEFICIT) = 414.4 mm
Precipitation Adjustment Factor : none

NOTES:

1. Water budget adjusted for latitude and daylight.
2. (°C) - Represents calculated mean of daily temperatures for the month.
3. Precipitation and Temperature data from the THORNBURY SLAMA (Station No.611HBEC) Environment Canada Station Data
4. Total Water Surplus (Thornthwaite, 1948) is calculated as total precipitation minus adjusted potential evapotranspiration.

Water Budget - Pre-Development
Wyldewood Creek - Water Balance
Water Balance/Water Budget Assessment

Catchment Designation	Site - Pre-Development		
	Pervious	Impervious	Totals
Area (m ²)	21259	4341	25600
Pervious Area (m ²)	21259	0	21259
Impervious Area (m ²)	0	4341	4341
Infiltration Factors			
Topography Infiltration Factor	0.20	0.20	
¹ Soil Infiltration Factor	0.10	0.10	
Land Cover Infiltration Factor	0.10	0.10	
MOE Infiltration Factor	0.40	0	
Actual Infiltration Factor	0.4	0	
Run-off Coefficient	0.25	0.90	
Runoff from Impervious Surfaces *	0	0.8	
Inputs (per Unit Area)			
Precipitation (mm/yr)	992	992	992
Run-On (mm/yr)	0	0	0
Other Inputs (mm/yr)	0	0	0
Total Inputs (mm/yr)	992	992	992
Outputs (per Unit Area)			
Precipitation Surplus (mm/yr)	414	794	479
Net Surplus (mm/yr)	414	794	479
Evapotranspiration (mm/yr) *	578	198	513
Infiltration (mm/yr)	166	0	138
Soakaway Infiltration (mm/yr)	0	0	0
Total Infiltration (mm/yr)	166	0	138
Runoff Pervious Areas (mm/yr)	249	0	206
Runoff Impervious Areas (mm/yr)	0	794	135
Total Runoff (mm/yr)	249	794	341
Total Outputs (mm/yr)	992	992	992
Difference (Inputs- Outputs)	0	0	0
Inputs (Volumes)			
Precipitation (m ³ /yr)	21089	4306	25395
Run-On (m ³ /yr)	0	0	0
Other Inputs (m ³ /yr)	0	0	0
Total Inputs (m³/yr)	21089	4306	25395
Outputs (Volumes)			
Precipitation Surplus (m ³ /yr)	8810	3445	12255
Net Surplus (m ³ /yr)	8810	3445	12255
Evapotranspiration (m ³ /yr) *	12279	861	13140
Infiltration (m ³ /yr)	3524	0	3524
Soakaway Infiltration (m ³ /yr)	0	0	0
Total Infiltration (m ³ /yr)	3524	0	3524
Runoff Pervious Areas (m ³ /yr)	5286	0	5286
Runoff Impervious Areas (m ³ /yr)	0	3445	3445
Total Runoff (m ³ /yr)	5286	3445	8731
Total Outputs (m³/yr)	21089	4306	25395
Difference (Inputs- Outputs)	0	0	0

NOTES:

* Evaporation from impervious areas was assumed to be 20% of precipitation.



Project Name: Wyldewood Creek
Project No: 1535-4897
Modelled By: ML
Checked By: RA
Date: 2021/03/30

Water Budget - Post-Development without Mitigation
Wyldewood Creek - Water Balance
Water Balance/Water Budget Assessment

Note: site land use areas consistent with the Site Plan

Catchment Designation	Site - Post-Development		
	Pervious	Impervious	Totals
Area (m ²)	12700	12900	25600
Pervious Area (m ²)	12700	0	12700
Impervious Area (m ²)	0	12900	12900
Infiltration Factors			
Topography Infiltration Factor	0.20	0.20	
Soil Infiltration Factor	0.30	0.30	
Land Cover Infiltration Factor	0.10	0.10	
MOE Infiltration Factor	0.60	0	
Actual Infiltration Factor	0.60	0	
Run-off Coefficient	0.25	0.90	
Runoff from Impervious Surfaces *	0	0.80	
Inputs (per Unit Area)			
Precipitation (mm/yr)	992	992	992
Run-On (mm/yr)	0	0	0
Other Inputs (mm/yr)	0	0	0
Total Inputs (mm/yr)	992	992	992
Outputs (per Unit Area)			
Precipitation Surplus (mm/yr)	414	794	605
Net Surplus (mm/yr)	414	794	605
Evapotranspiration (mm/yr) *	578	198	387
Infiltration (mm/yr)	249	0	123
Soakaway Infiltration (mm/yr)	0	0	0
Total Infiltration (mm/yr)	249	0	123
Runoff Pervious Areas (mm/yr)	166	0	82
Runoff Impervious Areas (mm/yr)	0	794	400
Total Runoff (mm/yr)	166	794	482
Total Outputs (mm/yr)	992	992	992
Difference (Inputs- Outputs)	0	0	0
Inputs (Volumes)			
Precipitation (m ³ /yr)	12598	12797	25395
Run-On (m ³ /yr)	0	0	0
Other Inputs (m ³ /yr)	0	0	0
Total Inputs (m³/yr)	12598	12797	25395
Outputs (Volumes)			
Precipitation Surplus (m ³ /yr)	5263	10237	15501
Net Surplus (m ³ /yr)	5263	10237	15501
Evapotranspiration (m ³ /yr) *	7335	2559	9894
Infiltration (m ³ /yr)	3158	0	3158
Soakaway Infiltration (m ³ /yr)	0	0	0
Total Infiltration (m ³ /yr)	3158	0	3158
Runoff Pervious Areas (m ³ /yr)	2105	0	2105
Runoff Impervious Areas (m ³ /yr)	0	10237	10237
Total Runoff (m ³ /yr)	2105	10237	12343
Total Outputs (m³/yr)	12598	12797	25395
Difference (Inputs- Outputs)	0	0	0

Pre-Development Total Infiltration:
 3524 m³/yr

NOTES:

* Evaporation from impervious areas was assumed to be 20% of precipitation.

Water Budget - Post-Development *with Mitigation*
Wyldewood Creek - Water Balance
Water Balance/Water Budget Assessment

Catchment Designation	Site - Post-Development		
	Pervious	Impervious	Totals
Area (m ²)	12700	12900	25600
Pervious Area (m ²)	12700	0	12700
Impervious Area (m ²)	0	12900	12900
Infiltration Factors			
Topography Infiltration Factor	0.20	0.20	
Soil Infiltration Factor	0.30	0.30	
Land Cover Infiltration Factor	0.10	0.10	
MOE Infiltration Factor	0.60	0	
Actual Infiltration Factor	0.60	0	
Run-off Coefficient	0.25	0.90	
Runoff from Impervious Surfaces *	0	0.8	
Inputs (per Unit Area)			
Precipitation (mm/yr)	992	992	992
Run-On (mm/yr)	0	0	0
Other Inputs (mm/yr)	0	0	0
Total Inputs (mm/yr)	992	992	992
Outputs (per Unit Area)			
Precipitation Surplus (mm/yr)	414	893	655
Net Surplus (mm/yr)	414	893	655
Evapotranspiration (mm/yr) *	578	198	387
Infiltration (mm/yr)	249	0	123
Mitigation (mm/yr)	0	91	46
Total Infiltration (mm/yr)	249	91	169
Runoff Pervious Areas (mm/yr)	166	0	82
Runoff Impervious Areas (mm/yr)	0	702	354
Total Runoff (mm/yr)	166	702	436
Total Outputs (mm/yr)	992	992	992
Difference (Inputs- Outputs)	0	0	0
Inputs (Volumes)			
Precipitation (m ³ /yr)	12598	12797	25395
Run-On (m ³ /yr)	0	0	0
Other Inputs (m ³ /yr)	0	0	0
Total Inputs (m³/yr)	12598	12797	25395
Outputs (Volumes)			
Precipitation Surplus (m ³ /yr)	5263	11517	16780
Net Surplus (m ³ /yr)	5263	11517	16780
Evapotranspiration (m ³ /yr) *	7335	2559	9894
Infiltration (m ³ /yr)	3158	0	3158
Mitigation (m ³ /yr)	0	1180	1180
Total Infiltration & Mitigation (m ³ /yr)	3158	1180	4338
Runoff Pervious Areas (m ³ /yr)	2105	0	2105
Runoff Impervious Areas (m ³ /yr)	0	9058	9058
Total Runoff (m ³ /yr)	2105	9058	11163
Total Outputs (m³/yr)	12598	12797	25395
Difference (Inputs- Outputs)	0	0	0

Proposed Infiltration via Mitigation
 Pre-Development Total Infiltration:
 138 mm/yr

Pre-Development Total Infiltration:
 3524 m³/yr

NOTES:

* Evaporation from impervious areas was assumed to be 20% of precipitation.



Project: Wyldewood Creek
Project No: 1535-4897
Modelled By: ML
Date: 2021/03/30

Design Storm Determination & Mitigation Sizing Wyldewood Creek - Water Balance Water Balance/Water Budget Assessment

Design Storm Determination

Days with Precipitation (From Climate Data)

	Apr	May	Jun	Jul	Aug	Sep	Oct	Total
>= 0.2 mm	12.6	12	10.6	9.5	10.8	13.2	15.8	85
>= 5 mm	4.3	5.3	4.3	4	4.2	5.7	6.1	34
>= 10 mm	1.9	2.9	3	2.2	2.5	3	2.6	18
>= 25 mm	0.24	0.4	0.58	0.67	0.71	0.75	0.25	4

Available Precipitation

Storm Event (mm)	Total Days Per Year	Incremental Precipitation (mm/yr)	Cummulative Precipitation (mm/yr)
0.2	85	16.9	16.9
5	34	169.5	186.4
10	18	181.0	367.4
25	4	90.0	457.4
Total	140	457.4	

10mm storm event from roof areas is directed to planters for infiltration & evapotranspiration.

5mm storm event	186.4 mm/year
Total Roof Area	0.70 ha
Runoff Coefficient	0.9
Total Annual Infiltration & Evapotranspiration	1180 m ³ /year
Impervious Area	1.29 ha
Mitigation	91.4 mm/year

Water Budget Summary Wyldewood Creek - Water Balance Water Balance/Water Budget Assessment

Characteristic	Site				
	Pre-Development	Post-Development	Post-Development <i>with Mitigation</i>	Change (Pre to Post)	Change (Pre to Post) <i>with Mitigation</i>
Inputs (Volumes)					
Precipitation (m ³ /yr)	25395	25395	25395	0%	0%
Run-On (m ³ /yr)	0	0	0	0%	0%
Other inputs (m ³ /yr)	0	0	0	0%	0%
Total Inputs (m³/yr)	25395	25395	25395	0	0
Outputs (Volumes)					
Precipitation Surplus (m ³ /yr)	12255	15501	15501	26%	26%
Net Surplus (m ³ /yr)	12255	15501	15501	26%	26%
Evapotranspiration (m ³ /yr)	13140	9894	9894	-25%	-25%
Infiltration (m ³ /yr)	3524	3158	3158	-10%	-10%
Mitigation (m ³ /yr)	0	0	1180	-	1180 m3/yr
Total Infiltration & Mitigation (m ³ /yr)	3524	3158	4338	-10%	23%
Runoff Pervious Areas (m ³ /yr)	5286	2105	2105	-60%	-60%
Runoff Impervious Areas (m ³ /yr)	3445	10237	9058	-	-
Total Runoff (m ³ /yr)	8731	12343	11163	41%	28%
Total Outputs (m³/yr)	25395	25395	25395	0%	0%



Project: Wyldwood Creek Development
Project No.: 1535-4897
Created By: IB
Checked By: ML
Date: 2021.03.30

Pre-Development Phosphorus Loading

Pre - Development Conditions						
Catchment	Land Use	Area (ha)	Area (m ²)	P coeff (kg/ha/yr)	P Load (kg/yr)	P Load Total (kg/yr)
Pre-Development Site	Transition	2.56	25,600	0.07	0.18	0.18
Total		2.56	25,600		0.18	0.18

Note:

1. Phosphorus Coefficient for Transition Area identified in NVCA Phosphorus Loading Tool & Hutchinson Report.

Post-Development Phosphorus Loading

Parameter	North Area	South Area	Unit
Total Phosphorus Concentration	0.41	0.41	kg/yr
Total Annual Precipitation	992	992	mm/yr
Total Precipitation Runoff	703	686	mm/yr
Fraction Runoff	0.71	0.69	
% Impervious	83%	80%	
Runoff Coefficient (Rv)	0.79	0.77	
Phosphorus Coefficient	2.28	2.17	kg/ha/yr

(Per Hutchinson Report Table 8, residential)

Water Balance Calculation

Water Balance Calculation

$$TP \text{ export coef } \left(\frac{kg}{ha} \right) = TP \times Precip \times P_f \times R_v \times 10^{-2}$$

Post - Development Conditions					
Catchment	Land Use	Area (ha)	Area (m ²)	P coeff (kg/ha)	P Load (kg/yr)
Post Site-Developed (North Area)	Residential	0.41	4,100	2.28	0.93
Post Site-Landscape (South Area)	Residential	1.08	10,800	2.17	2.34
² Untreated Area	Low Intensity Residential	1.07	10,700	0.13	0.14
Total		2.56	25,600		3.41

Note:

1. Phosphorus Coefficient for Residential Development calculated per Equation 3 of the Hutchinson Phosphorus Report for the NVCA Phosphorus Tool.
2. Untreated Area consists primarily of untouched land or pervious grass with a portion of rooftop area

Post-Development Phosphorus Loading with Mitigation

Parameter	North Area	South Area	Unit	
Total Phosphorus Concentration	0.41	0.41	kg/yr	(Per Hutchinson Report Table 8, residential)
Total Annual Precipitation	992	992	mm/yr	Water Balance Calculation
Total Precipitation Runoff	703	686	mm/yr	Water Balance Calculation
Fraction Runoff	0.71	0.69		
% Impervious	0.83	0.8		
Runoff Coefficient (Rv)	0.79	0.77		
Phosphorus Coefficient	2.28	2.17	kg/ha/yr	

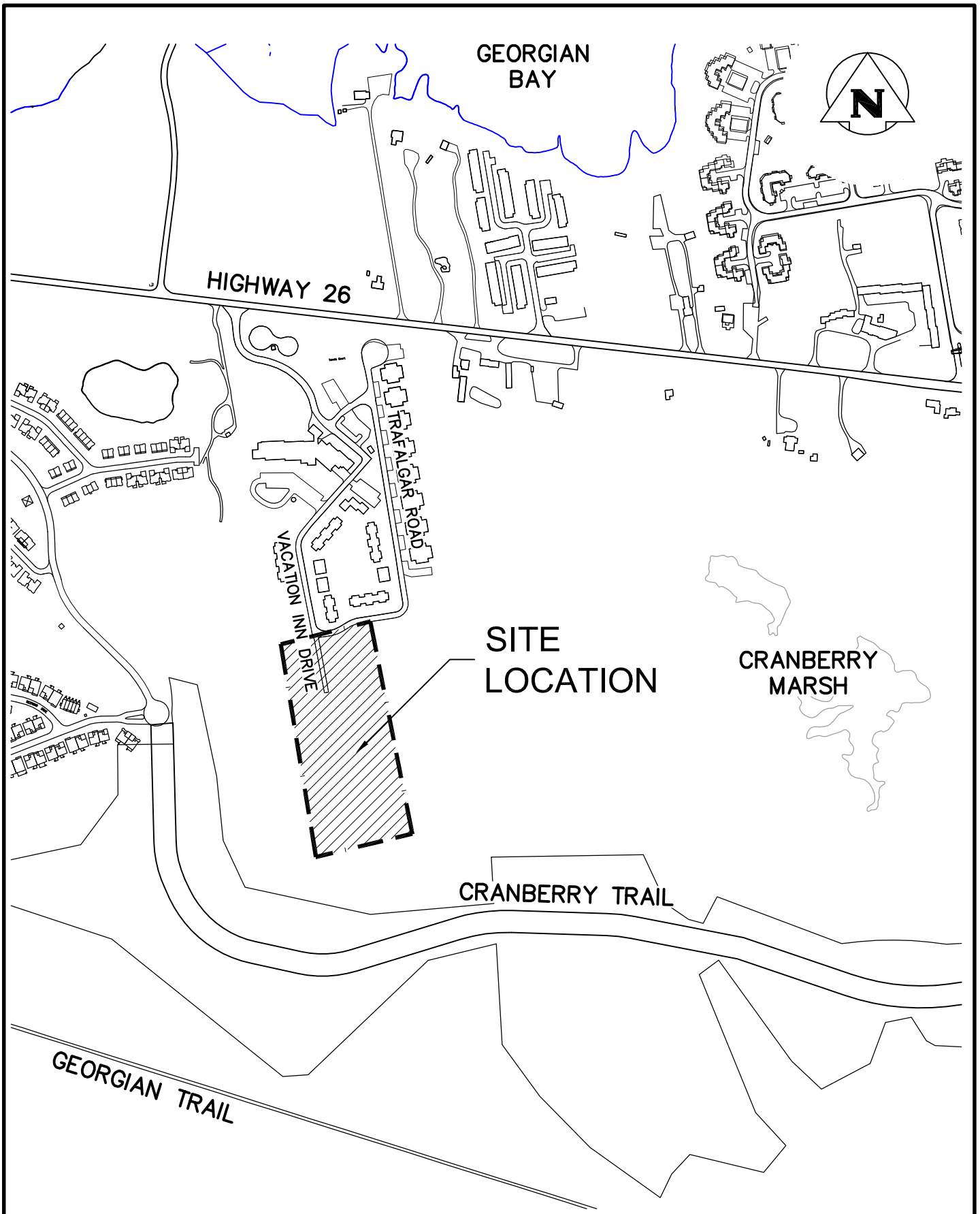
Post - Development Conditions With Mitigation							
Catchment	Land Use	Area (ha)	P coeff (kg/ha)	P Load (kg/yr)	Mitigation Applied	Reduction Factor	P Load With BMPs (kg/yr)
Post Site-Developed (North Area)	Residential	0.41	2.28	0.93	Storm Filter	0.77	0.21
Post Site-Developed (South Area)	Residential	1.08	2.17	2.34	Storm Filter	0.77	0.54
Untreated Area	Low Intensity Residential	1.07	0.13	0.14	None	0.00	0.14
Total - Site		2.56		3.41			0.89

Total Post-Development Load Without BMPs **3.41 kg/yr**
Total Post-Development Load With BMPs **0.89 kg/yr**

Notes:

1. Phosphorus Coefficient for Residential Development calculated per Equation 3 of the Hutchinson Phosphorus Report for the NVCA Phosphorus Tool.
2. Phosphorus Coefficient for Low Intensity Residential identified in NVCA Phosphorus Loading Tool & Hutchinson Report. Used as the contributing area consists of rooftops and landscape areas.
3. Precipitation values per water balance calculations.
4. Reduction factors identified in NVCA Phosphorus Loading Tool

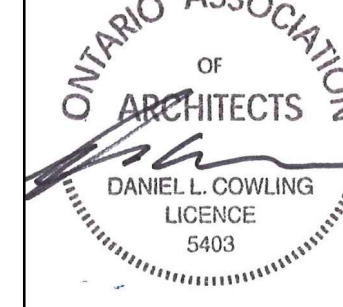
FIGURES & DRAWINGS

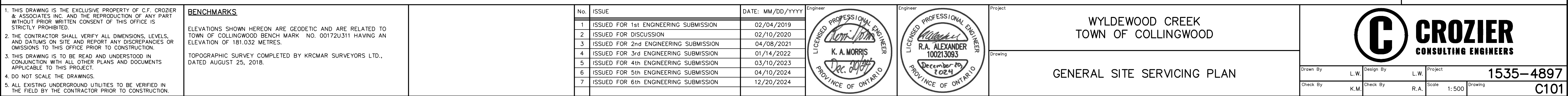
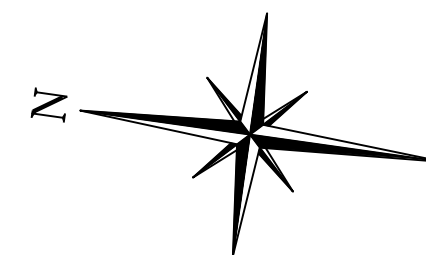
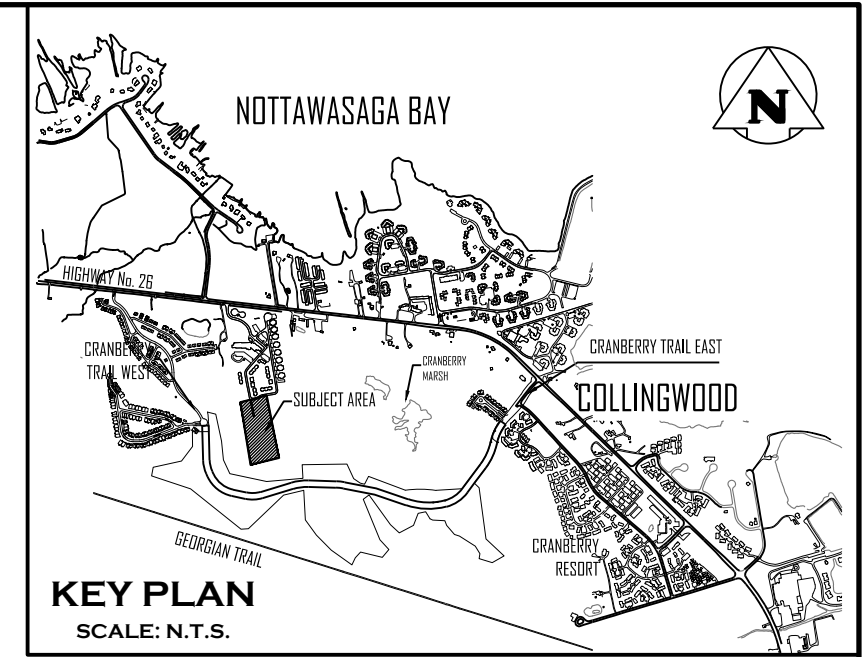


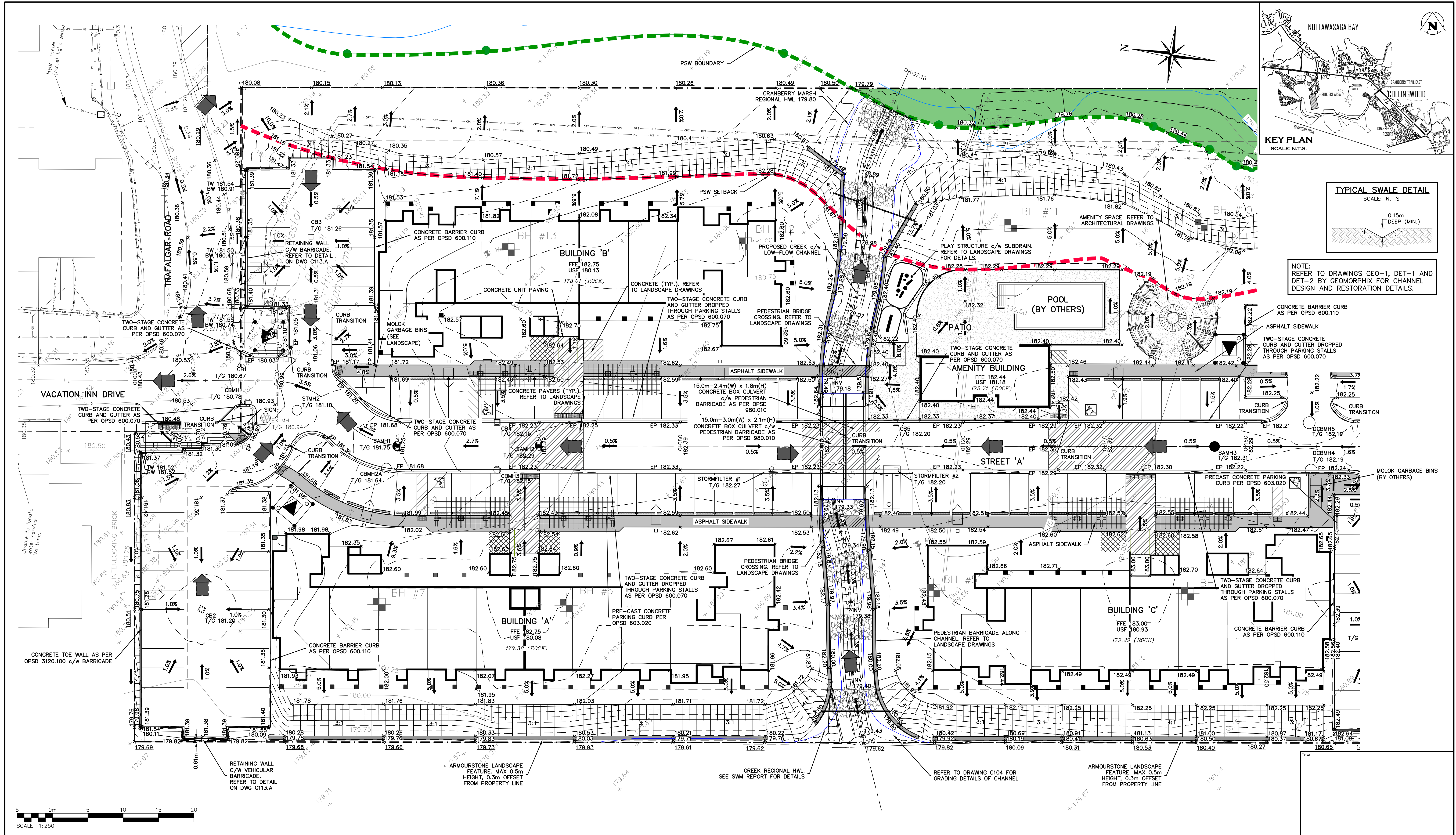
Legend	Project	Drawing	= SUBJECT LANDS WYLDEWOOD CREEK TOWN OF COLLINGWOOD SITE LOCATION						CROZIER CONSULTING ENGINEERS THE HARBOUREDGE BUILDING, 40 HURON STREET, SUITE 301, COLLINGWOOD, ON L9Y 4R3 705 446-3510 T 705 446-3520 F WWW.CFCROZIER.CA INFO@CFCROZIER.CA Drawn By L.W. Design By L.W. Project 1519-4897 Scale N.T.S. Date 01/29/2019 Check By R.A. Drawing FIG. 1					

REVISIONS AND DISTRIBUTION LOG		
No.	Date	Note
1	2019/02/04	ISSUED FOR SITE PLAN APPROVAL
2	2021/04/05	RE-ISSUED FOR SITE PLAN APPROVAL
3	2022/01/14	RE-ISSUED FOR SITE PLAN APPROVAL
4	2023/03/28	RE-ISSUED FOR SITE PLAN APPROVAL
5	2024/03/11	RE-ISSUED FOR SITE PLAN APPROVAL
6		
7		
8		

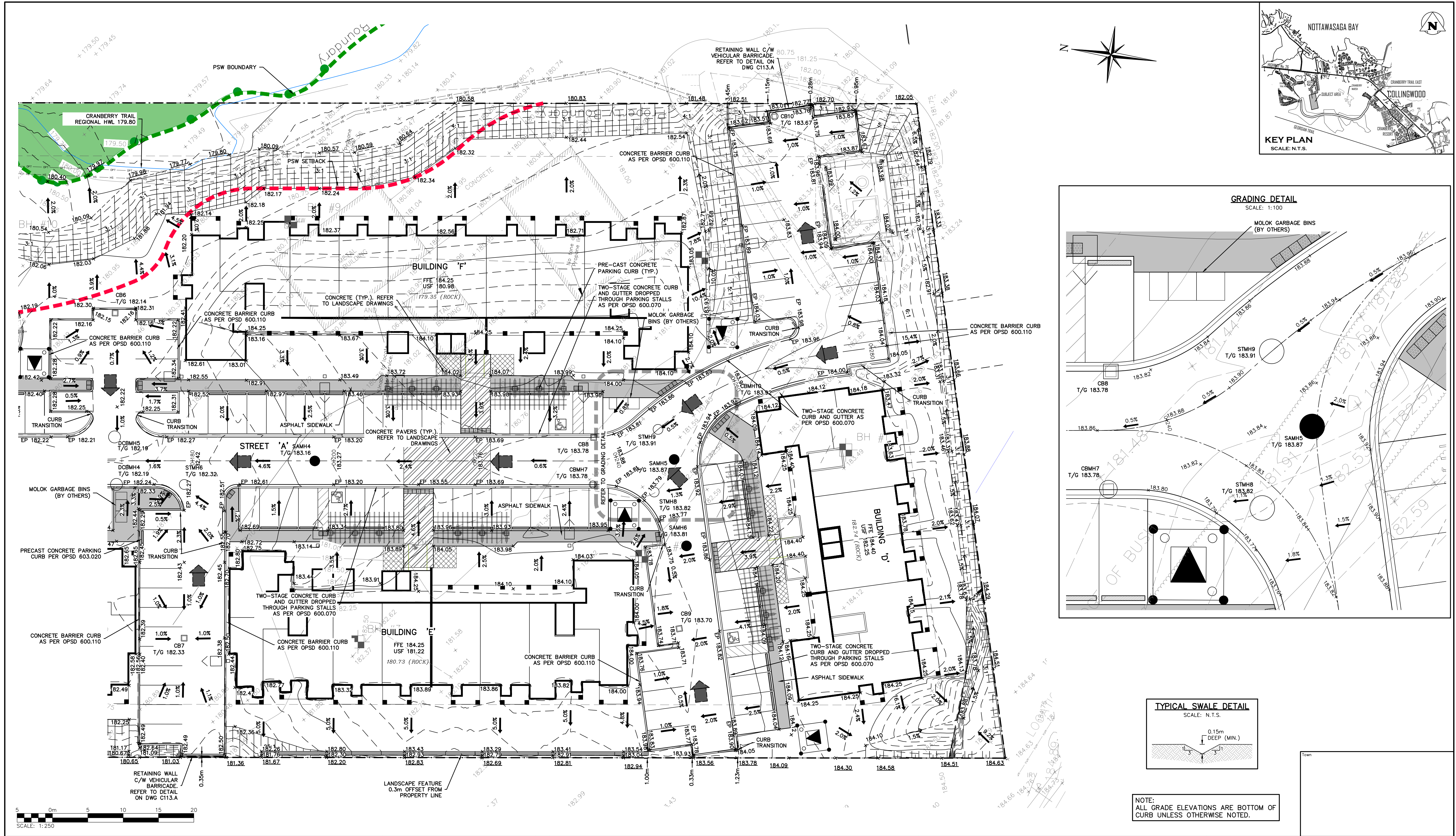


 WYLDWOOD Creek			
			
247 Spadina Avenue, 4th floor Toronto, Ontario M5T 1A6 www.smacm.com T 416.506.1000 F 416.506.0996			
Project: WYLDEWOOD CREEK DESIGN DEVELOPMENT WYLDEWOOD DEVELOPMENT CORPORATION			
COLLINGWOOD		ONTARIO	
Drawing Title: SITE PLAN			
Drawn By: Mar 11, 2024 - 12:33pm	Checked By: CMV	Date Checked: Mar 11, 2024 - 12:33pm	Project No.: 18A143
Drawing No.: A100		Scale: AS NOTED	
Revision No.:		Revision No.:	

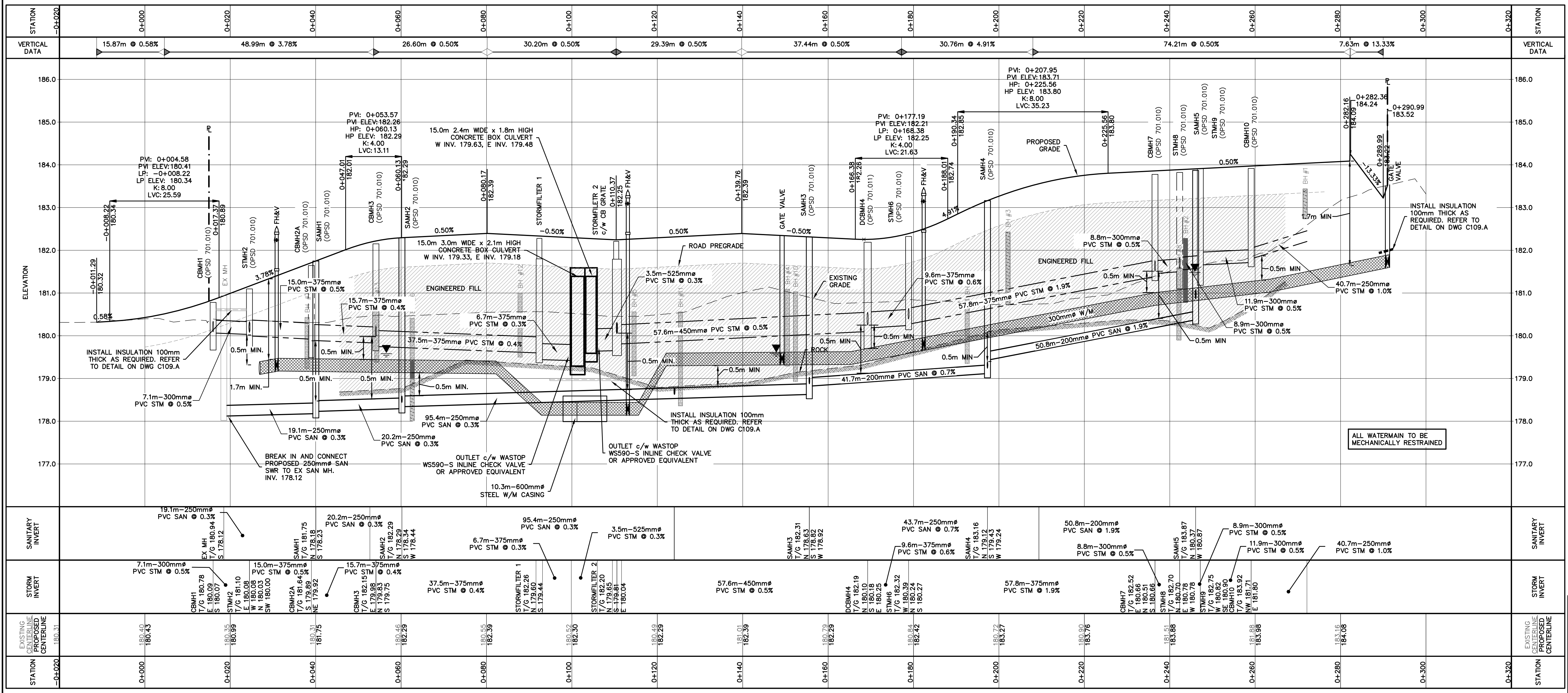
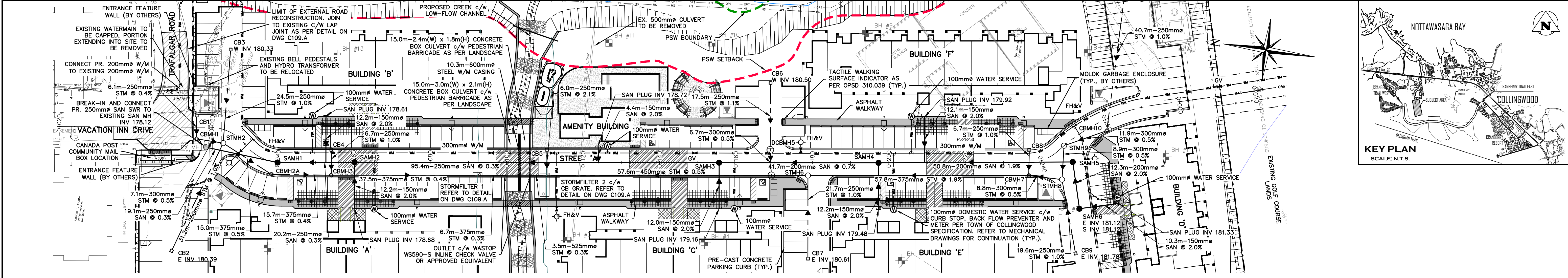




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No.	ISSUE	DATE: MM/DD/YYYY																												
1	ISSUED FOR 1st ENGINEERING SUBMISSION	02/04/2019																												
2	ISSUED FOR DISCUSSION	02/10/2020																												
3	ISSUED FOR 2nd ENGINEERING SUBMISSION	04/08/2021																												
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5	ISSUED FOR 4th ENGINEERING SUBMISSION	03/10/2023																												
6	ISSUED FOR 5th ENGINEERING SUBMISSION	04/10/2024																												
7	ISSUED FOR 6th ENGINEERING SUBMISSION	12/20/2024																												



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BENCHMARKS

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7	ISSUED FOR 6th ENGINEERING SUBMISSION	12/20/2024

Engineer

K. A. MORRIS

PROVINCE OF ONTARIO

Engineer

R. A. ALEXANDER

PROVINCE OF ONTARIO

Project

WYLDEWOOD CREEK
TOWN OF COLLINGWOOD

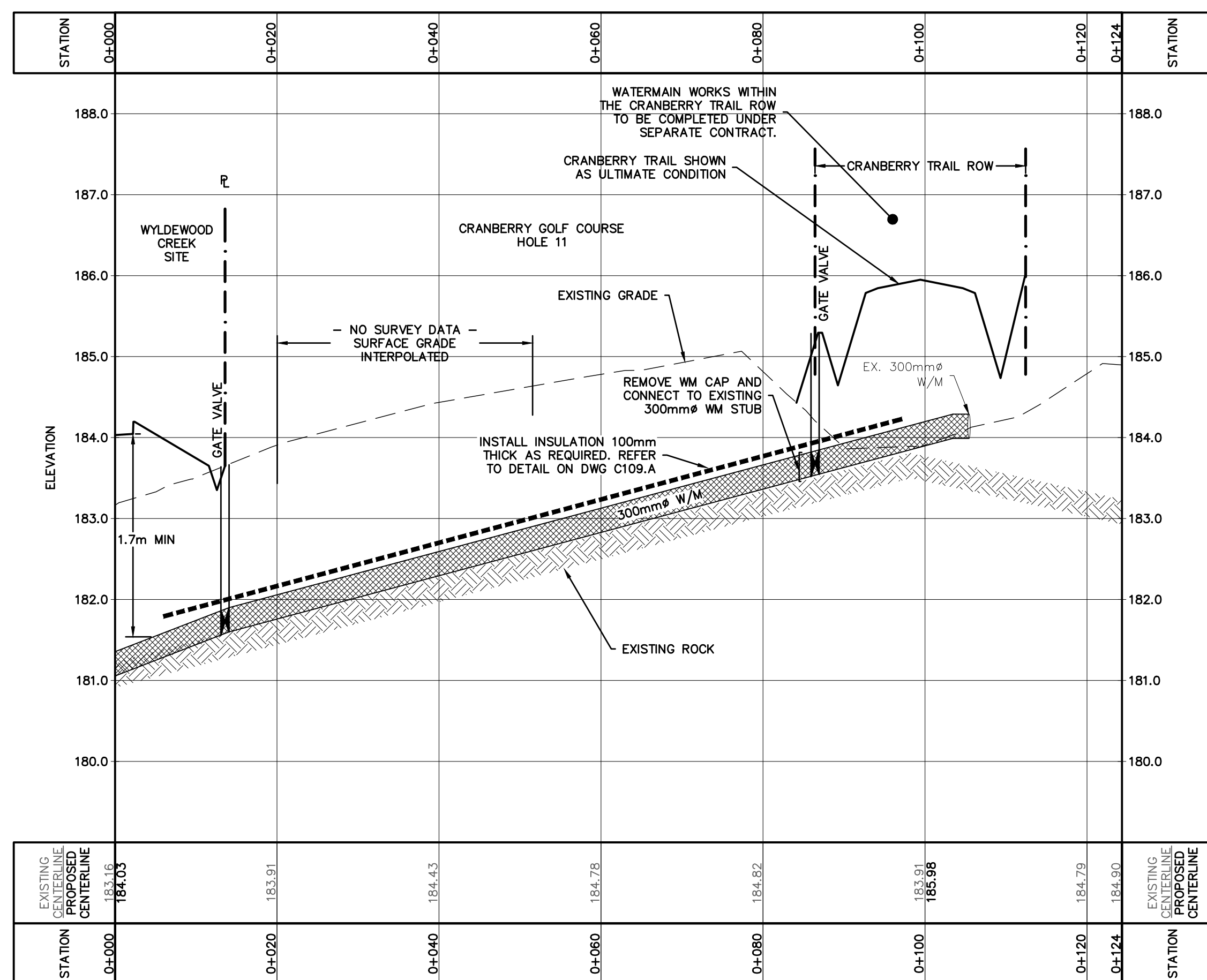
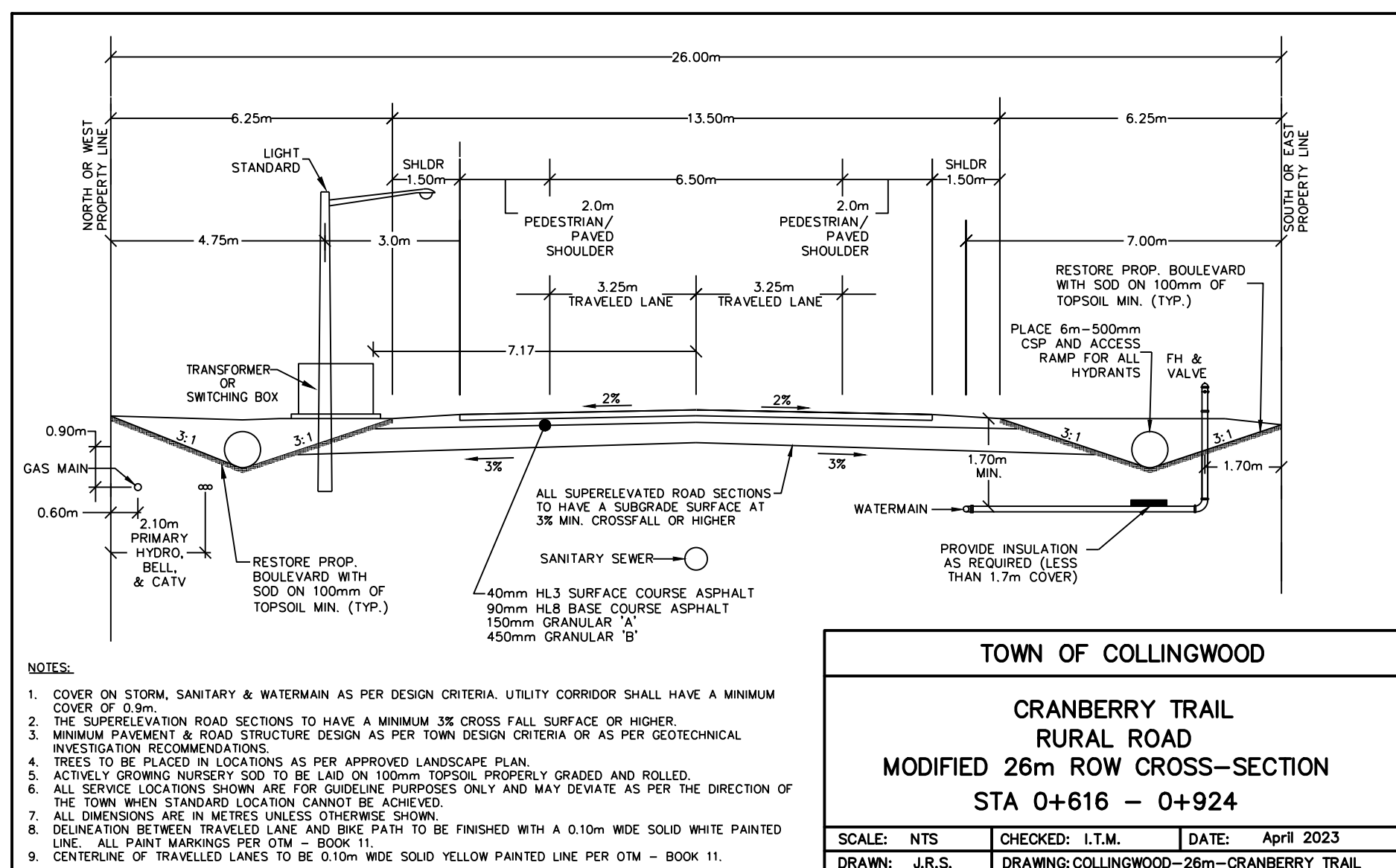
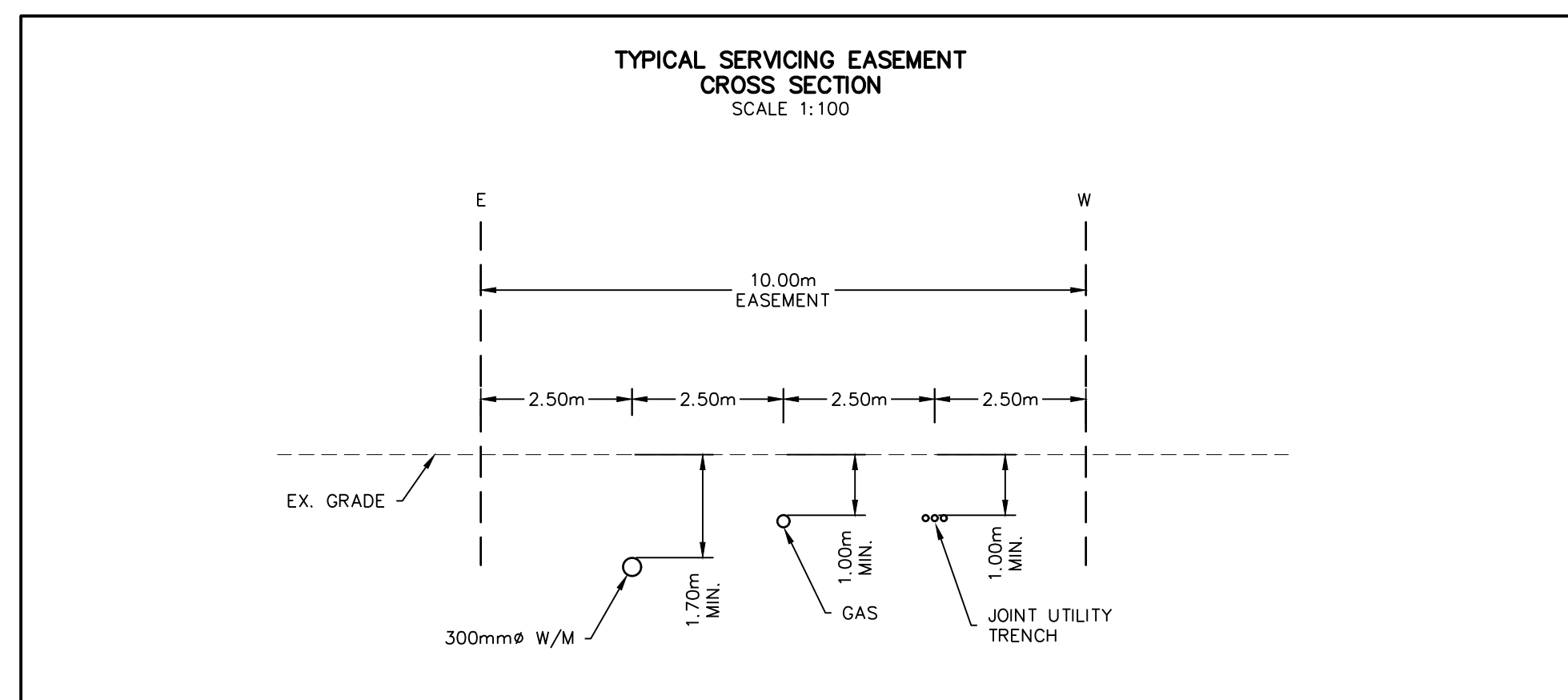
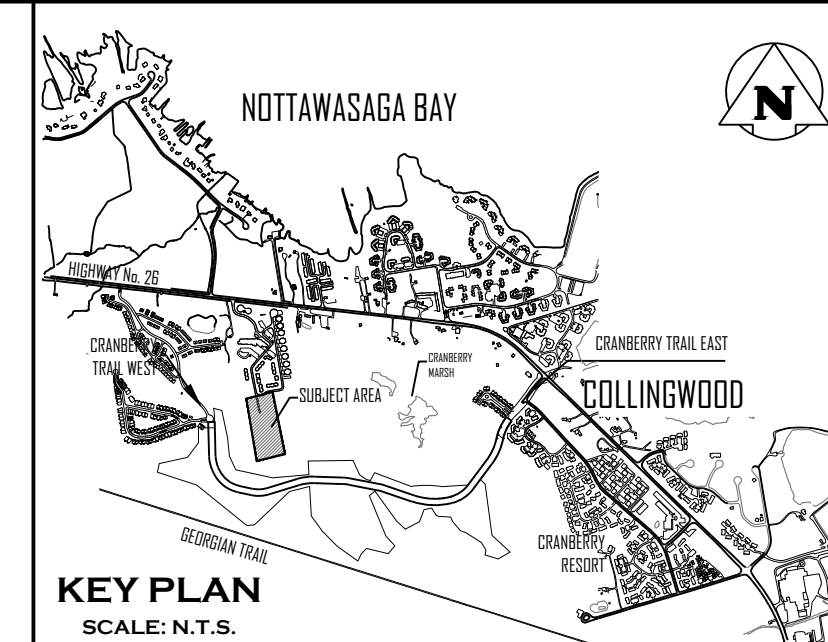
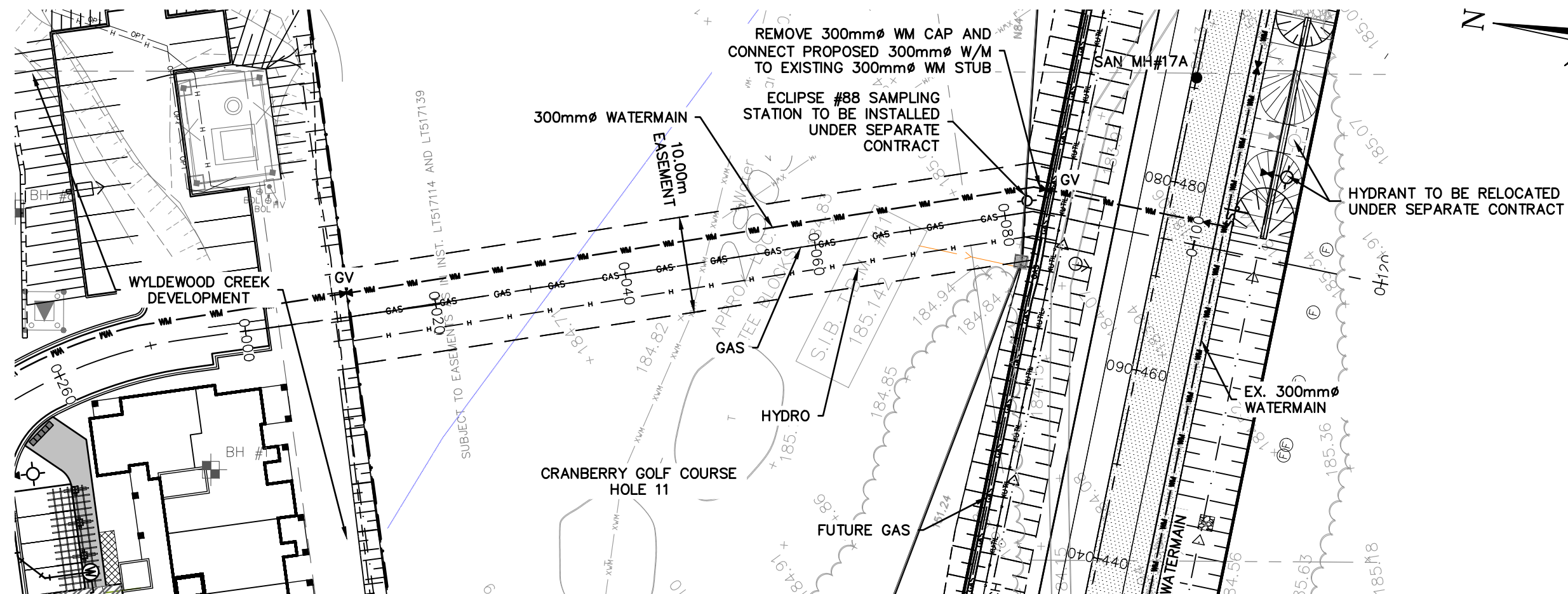
Drawing

PLAN & PROFILE STREET 'A'
(STA 0+000 - 0+288.22)

Drawn By	L.W.	Design By	L.W.	Project	1535-4897
Check By	K.M.	Check By	R.A.	Scale H: 1:500 V: 1:50	Drawing C103.A

CROZIER
CONSULTING ENGINEERS

J:\1500\1535-Brandy Lane Corp\4897-Georgian Bay Hotel South Block\CAD\Civil_Sheets\4897_C103 P&P.dwg, C103.A, 2024-12-20 4:11:50 PM, lwaters



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7	ISSUED FOR 6th ENGINEERING SUBMISSION	12/20/2024

Engineer



LICENSED PROFESSIONAL ENGINEER
R.A. ALEXANDER
100213093
December 29
2024
PROVINCE OF ONTARIO

	Project
--	---------

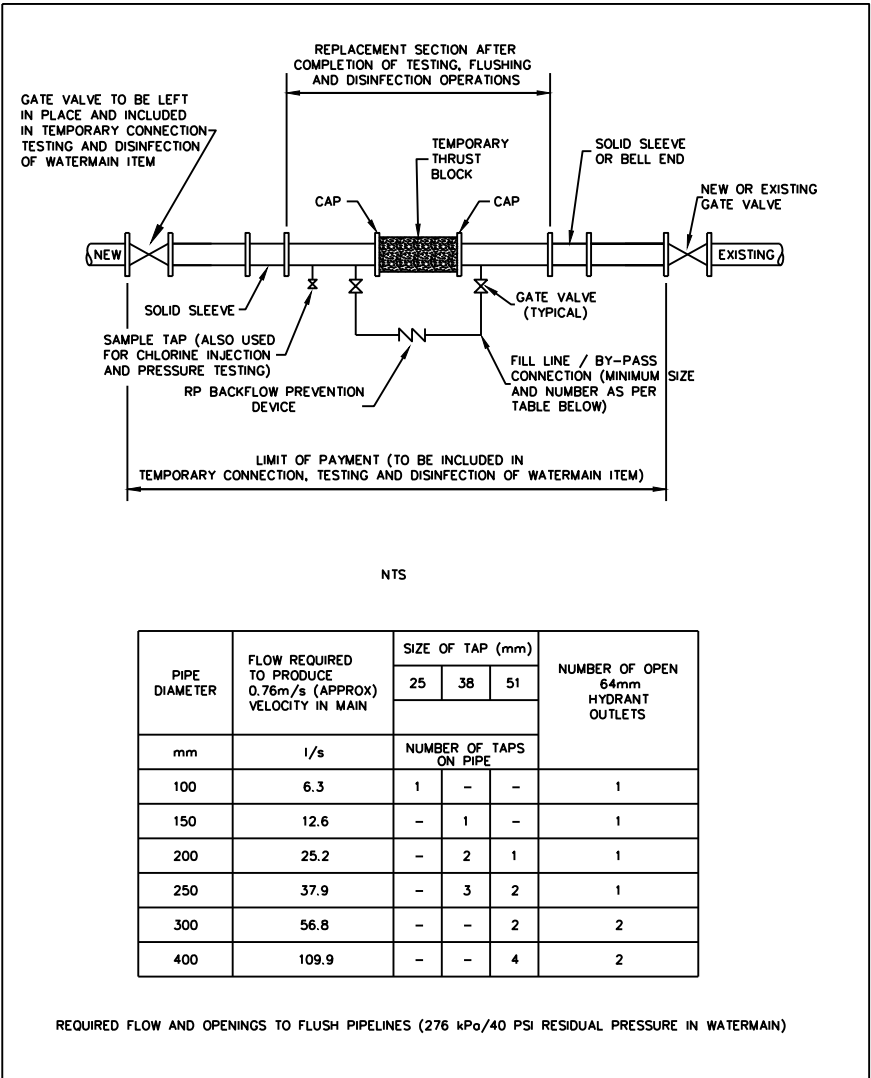
WYLDEWOOD CREEK
TOWN OF COLLINGWOOD

PLAN & PROFILE SERVICING EASEMENT

Drawn By L.W.	Design By L.W.	Project 1535-4897	
Check By K.M.	Check By R.A.	Scale H 1:500 V 1:50	Drawing C103.B







NOTE:
GRADING AND RIP-RAP EROSION PROTECTION AT CHANNEL OUTLET TO BE FIELD FIT TO ENSURE POSITIVE DRAINAGE TO CRANBERRY MARSH

NOTE:
REFER TO DRAWINGS GEO-1, DET-1 AND DET-2 BY GEOMORPHIX FOR CHANNEL DESIGN AND RESTORATION DETAILS.

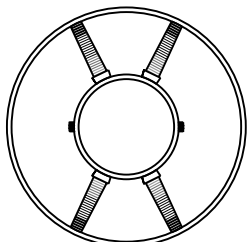
NOTE:
CONTRACTOR TO OBTAIN AND PROVIDE SEALED SHOP DRAWINGS WITH ENGINEER'S STAMP FOR CONCRETE CULVERTS, RETAINING WALLS AND PARAPET HEADWALLS.

CASING SPACERS

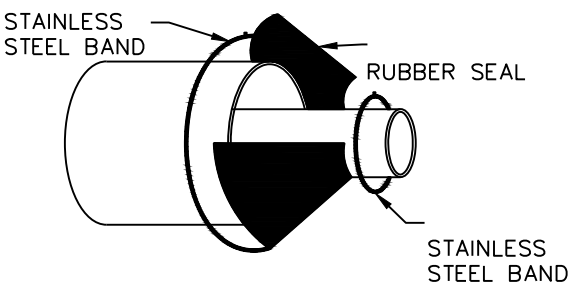
- CASCADE: CCS - 1320-8 (OR APPROVED EQUAL)

NOTES:

- CONTRACTOR TO SUBMIT SHOP DRAWINGS OF MATERIAL AND INSTALLATION METHODOLOGY FOR REVIEW AND APPROVAL.
- ALL CASING SPACERS ARE TO BE MADE OF T-304 STAINLESS STEEL.
- BEARING SURFACES (RUNNERS) SHALL BE ULTRA HIGH MOLECULAR WEIGHT POLYMER OR EQUIVALENT.
- POSITIONING OF SPACERS ALONG THE WATERMAIN IS TO BE AS PER MANUFACTURER'S SPECIFICATIONS.
- POSITION OF WATERMAIN WITHIN LINER TO BE CENTERED AND RESTRAINED, SUFFICIENT ENOUGH TO PROVIDE NO LESS THAN 19mm (¾") CLEARANCE BETWEEN THE CASING PIPE AND THE OUTSIDE DIAMETER OF THE BELL.



- WATERMAIN SHALL BE RESTRAINED Laterally FOR THE ENTIRE LENGTH OF THE LINER PLUS ONE FULL PIPE LENGTH BEYOND END OF CASING.
- LINER TO BE SEALED USING WRAP AROUND RUBBER ENDS COMPLETE WITH STAINLESS STEEL (T-304) BANDING.



GENERAL CONSTRUCTION SCHEDULE

- IN STREAM WORKS TO COMPLY WITH NVCA TIMING GUIDELINES AND ASSOCIATED PERMITTING.
- MAINTAIN TEMPORARY WATER MANAGEMENT WORKS AND OVERLAND SPILL ROUTE PRIOR TO ANY EXCAVATION.
- COMPLETE ASSOCIATED SEDIMENT CONTROLS, CULVERT AND UNDERGROUND SERVICES ENSURING WORKING IN THE DRY AT ALL TIMES.

GENERAL NOTES

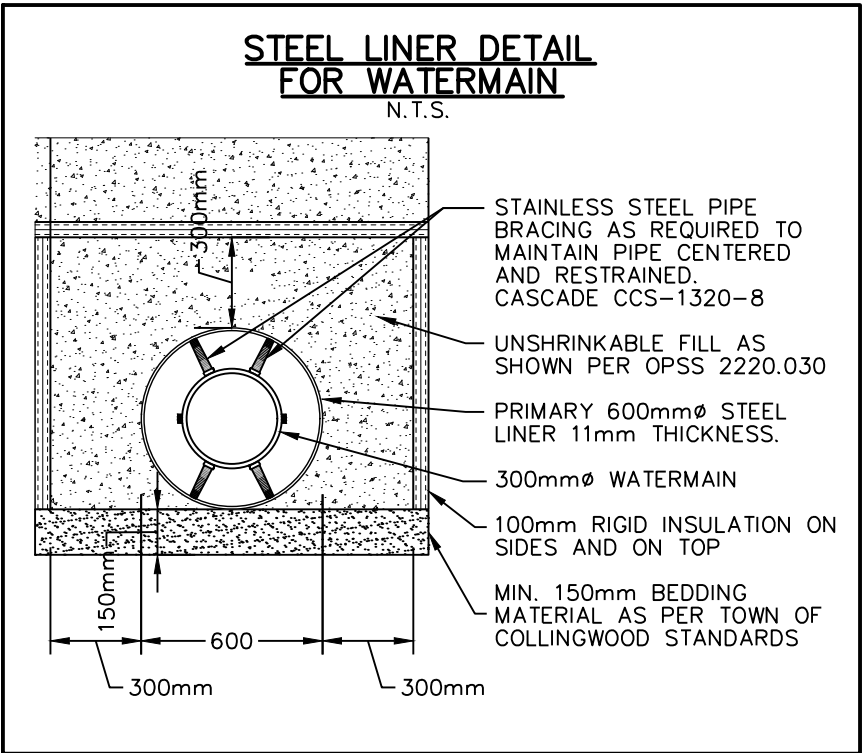
- ALL WORK TO BE PERFORMED IN DRY DEWATERED CONDITIONS USING APPROVED WATER MANAGEMENT PLAN.
- NO MAINTENANCE OR REPAIR WORK ON CONSTRUCTION EQUIPMENT IS ALLOWED WITHIN 30 METRES OF WATERCOURSE.
- ALL SEDIMENT & EROSION CONTROL FACILITIES AND WORKS ARE TO BE CONSTRUCTED AND IN PLACE TO THE APPROVAL OF THE SITE ENGINEER PRIOR TO EXCAVATION WORKS COMMENCING.
- ALL TEMPORARY SOIL OR DIRT TO BE STOCKPILED PER DESIGNATED AREAS.
- FLOW INFORMATION PROVIDED HEREIN CONCERNING CRANBERRY MARSH OUTLET FOR CONTRACTOR USE ONLY.
- THE SEDIMENT & EROSION CONTROLS SPECIFIED HEREIN DO NOT NECESSARILY CONSTITUTE ALL MEASURES REQUIRED GIVEN FIELD CONDITIONS. CONTRACTOR TO PROVIDE ANY SUPPLEMENTARY SEDIMENT & EROSION CONTROL MEASURES AS REQUIRED TO ENSURE NO RELEASE OF DELETERIOUS SUBSTANCES TO WATERCOURSE.
- FINAL RETAINING WALL DESIGN SPECIFICATIONS TO BE CONFIRMED AND APPROVED BY ENGINEER

GENERAL BRIDGE NOTES

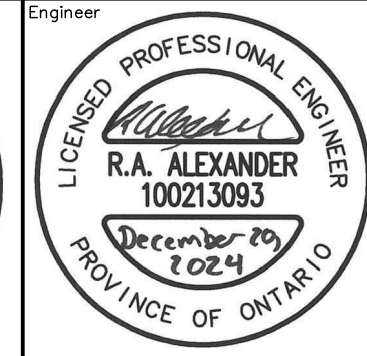
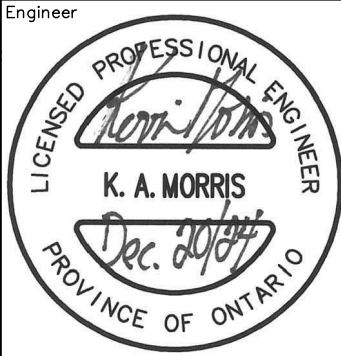
- FOOTING DETAILS (DIMENSIONS & REINFORCING) FOR MUNICIPAL APPROVAL PROCESS ONLY. ACTUAL SIZE OF FOOTINGS AND REINFORCING AS PER DESIGN BY CONTRACTOR.
- FOOTINGS ARE ASSUMED TO BE FOUNDED ON BEDROCK; CONTRACTOR TO CONFIRM IN FIELD.
- DESIGN IN ACCORDANCE WITH THE CANADIAN HIGHWAY BRIDGE DESIGN CODE (CAN/CSA-S6-06).
- CONTRACTOR IS TO EXPOSE THE BEDROCK AROUND THE PROPOSED FOOTING FOR REVIEW BY GEOTECHNICAL ENGINEER. ANY LOOSE OR DELETERIOUS MATERIALS SHALL BE REMOVED AT THE DIRECTION OF THE GEOTECHNICAL ENGINEER.
- CLASS OF CAST-IN-PLACE CONCRETE = 30 MPa.
- CLEAR COVER TO REINFORCING: FOOTINGS = 100+25 DISTRIBUTION SLAB = AS NOTED ON DWG.
- BAR MARKS WITH SUFFIX 'C' DENOTE COATED BARS.
- REINFORCING BARS SHALL BE GRADE 400 MPa.
- CONTRACTOR TO PROVIDE MIN. 0.75m GRANULAR ABOVE CULVERT STRUCTURE DURING CONSTRUCTION.

REQUIREMENTS FOR THE CONTRACTOR

- PROVIDE STAMPED SHOP DRAWINGS INDICATING THAT THE BRIDGE STRUCTURE HAS BEEN DESIGNED IN ACCORDANCE WITH THE CANADIAN HIGHWAY BRIDGE DESIGN CODE (CHBDC) (CAN/CSA-S6-06). CONTRACTOR TO ALSO PROVIDE COPIES OF ALL SHOP DRAWINGS TO THE TOWN FOR THEIR RECORDS.
- SUBMISSION SHALL INCLUDE DETAILS ON REACTION LOADS, BOTH HORIZONTAL & VERTICAL, TO BE RESISTED BY FOUNDATION AS WELL AS DETAILS ON PROPOSED ANCHORAGE FOR CULVERT & FOOTINGS.
- ENSURE THAT THE SHOP DRAWINGS ARE SPECIFIC TO THIS CONTRACT, AND REFERENCED TO CFCA PROJECT No. 1535-4897, AND NOT A "STOCK ITEM".
- ENSURE THAT SHOP DRAWINGS SHOW AND SPECIFY ALL JOINT FILLERS, SEALS AND COMPOUNDS, GROUT, AND GEOTEXTILE INSTALLATIONS AND APPLICATIONS.



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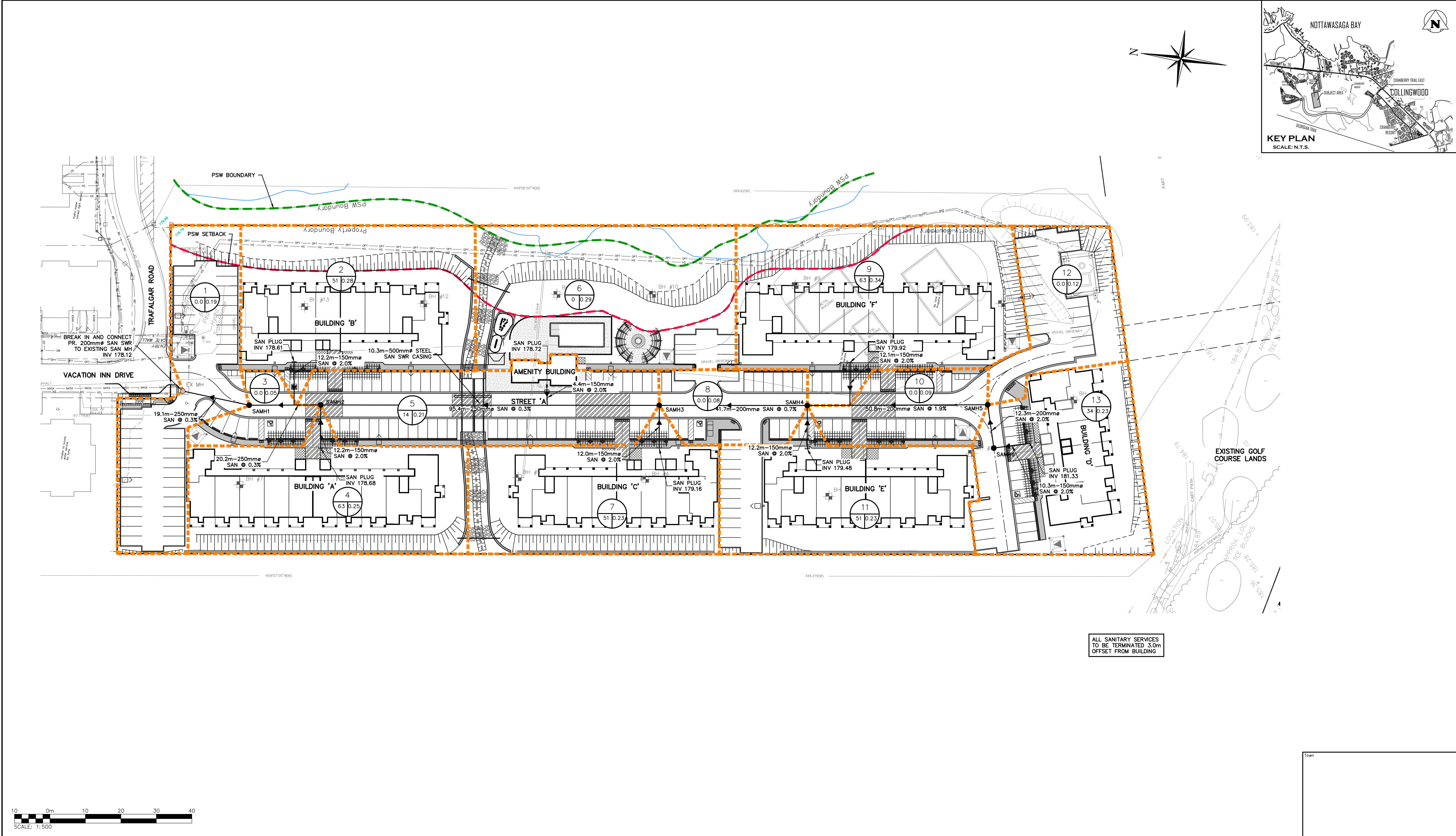


Project	WYLDEWOOD CREEK TOWN OF COLLINGWOOD
Drawing	CULVERT CROSSING NOTES AND DETAILS

Drawn By	L.W.	Design By	L.W.	Project	1535-4897
Check By	K.M.	Check By	R.A.	Scale	AS NOTED
				Drawing	C105

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ENGINEER

K. A. MORRIS

K. A. MORRIS

PROVINCE OF ONTARIO

ENGINEER

R. A. ALEXANDER

R. A. ALEXANDER

100213093

December 20, 2024

PROVINCE OF ONTARIO

Project: WYLDEWOOD CREEK TOWN OF COLLINGWOOD

Drawing: SANITARY DRAINAGE PLAN

Drawn By: L.W.

Check By: K.M.

Design By: L.W.

Check By: R.A.

Project: 1535-4897

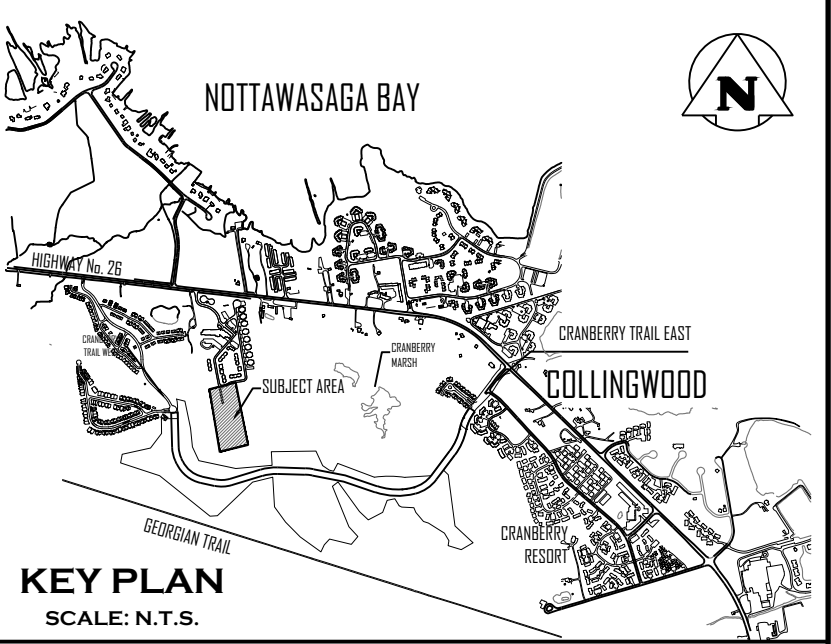
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Drawing: C106

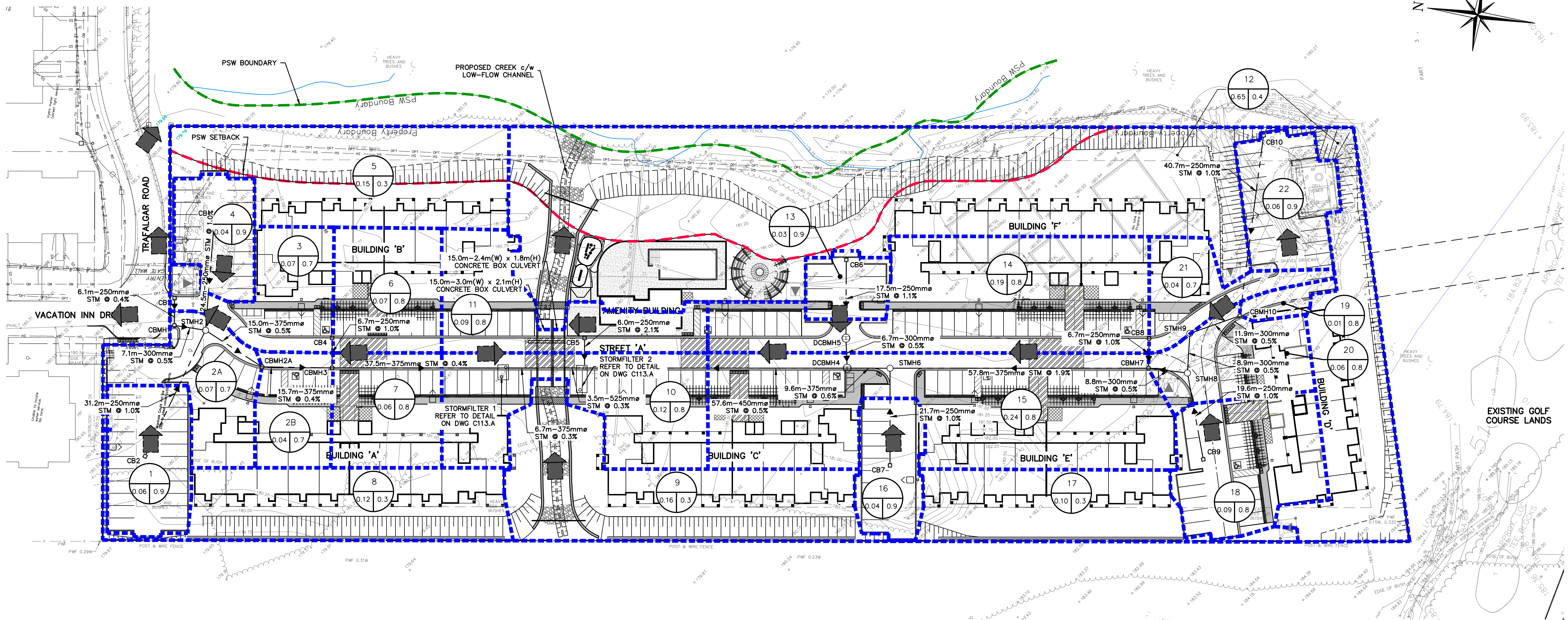
CROZIER

CONSULTING ENGINEERS

J:\1500\1535-Brandy Lane Corp\4897-Georgian Bay Hotel South Block\CAD\Civil_Sheets\4897_C106 SAN.dwg, C106, 2024-12-20 4:14:19 PM, lwaters



NOTE: ROOFS TO DISCHARGE TO LANDSCAPED AREAS



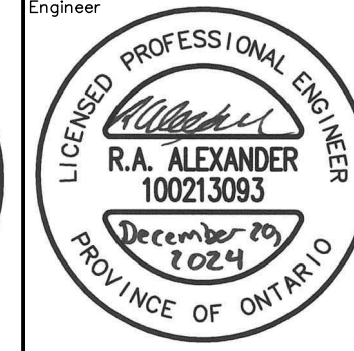
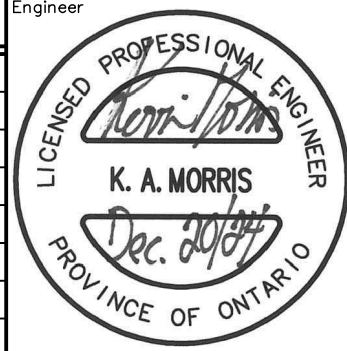
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Project	WYLDEWOOD CREEK TOWN OF COLLINGWOOD
Drawing	STORM DRAINAGE PLAN



Drawn By	L.W.	Design By	L.W.	Project	1535-4897
Check By	K.M.	Check By	R.A.	Scale	1:500
				Drawing	C107

STAINLESS STEEL PIPE BRACING AS REQUIRED TO MAINTAIN PIPE CENTERED AND RESTRAINED
CASCADE CCS-1320-8

UNSHRINKABLE FILL AS SHOWN PER OPSS 2220.030

PRIMARY 600mmØ STEEL LINER 11mm THICKNESS

300mmØ WATERMAIN

100mm RIGID INSULATION ON SIDES AND ON TOP

MIN. 150mm BEDDING MATERIAL AS PER TOWN OF COLLINGWOOD STANDARDS

300mm

600

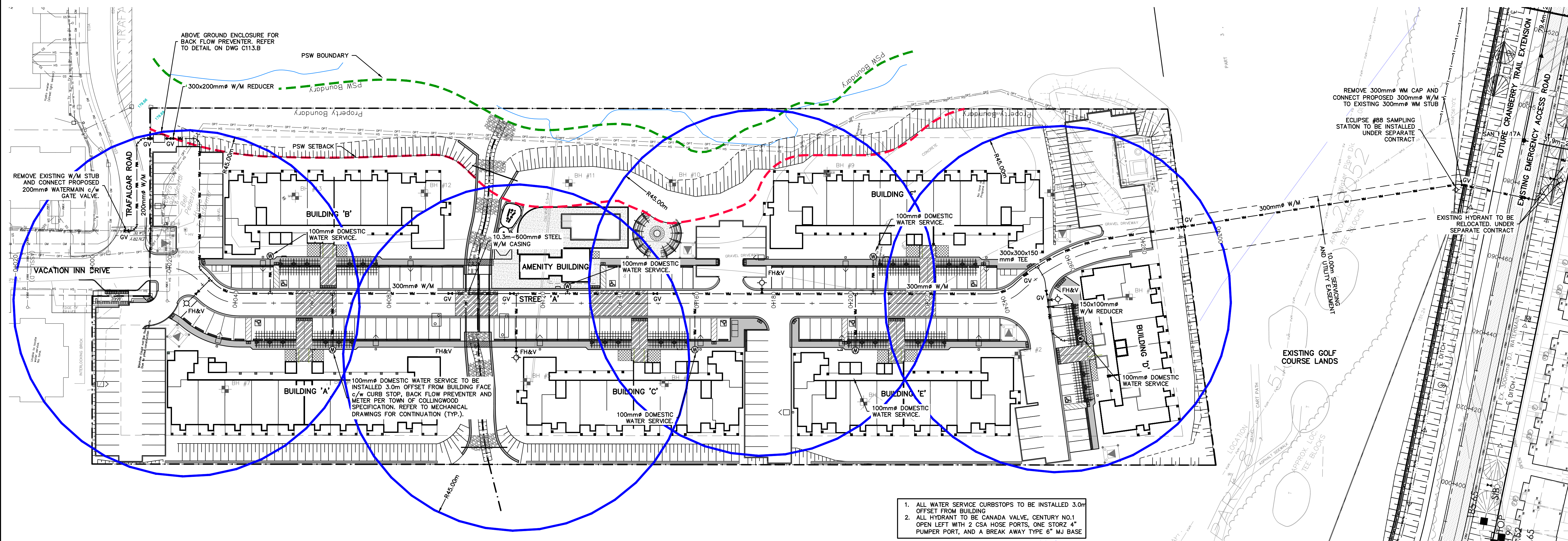
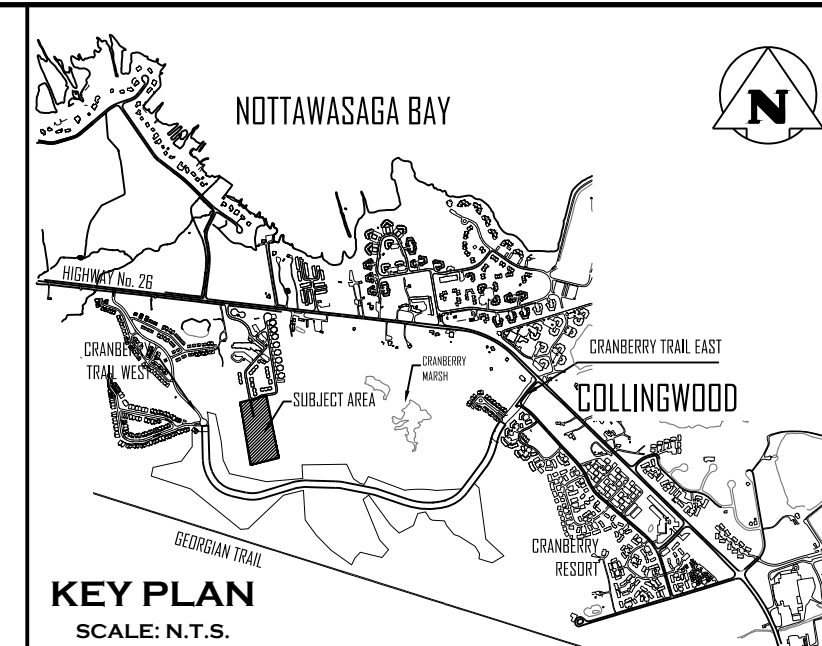
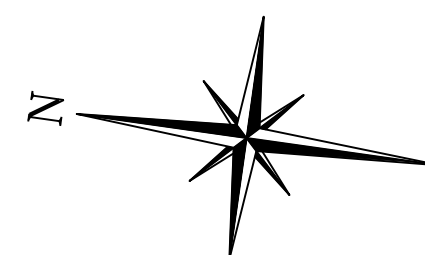
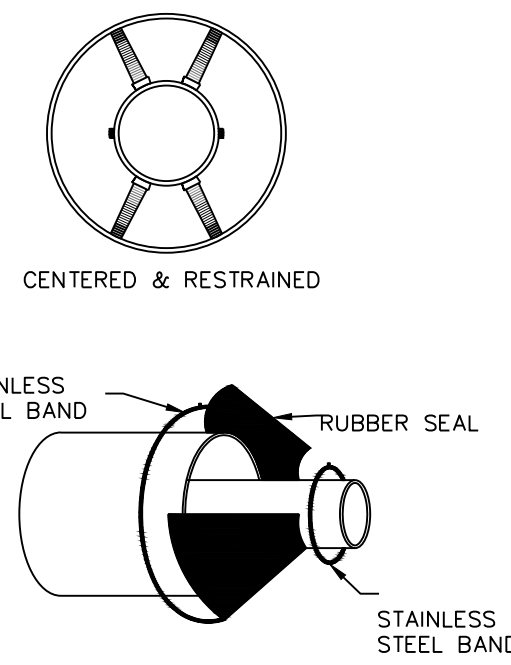
150mm

300mm

- CASCADE: CCS – 1320-8 (OR APPROVED EQUAL)

NOTES:

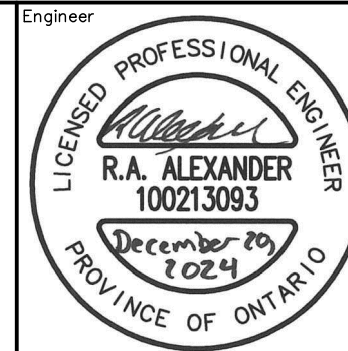
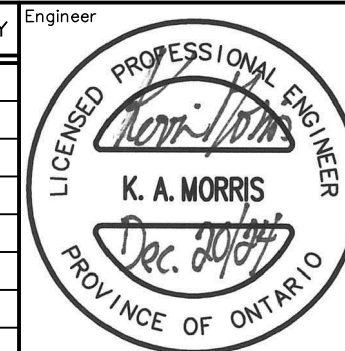
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6. WATERMAIN SHALL BE RESTRAINED LATEROALLY FOR THE ENTIRE LENGTH OF THE LINER PLUS ONE FULL PIPE LENGTH BEYOND END OF CASING.
7. LINER TO BE SEALED USING WRAP AROUND RUBBER ENDS COMPLETE WITH STAINLESS STEEL (T-304) BANDING.



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TOPOGRAPHIC SURVEY COMPLETED BY KRCMAR SURVEYORS LTD.
DATED AUGUST 25, 2018.

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7	ISSUED FOR 6th ENGINEERING SUBMISSION	12/20/2024



Drawing

WATER DISTRIBUTION PLAN

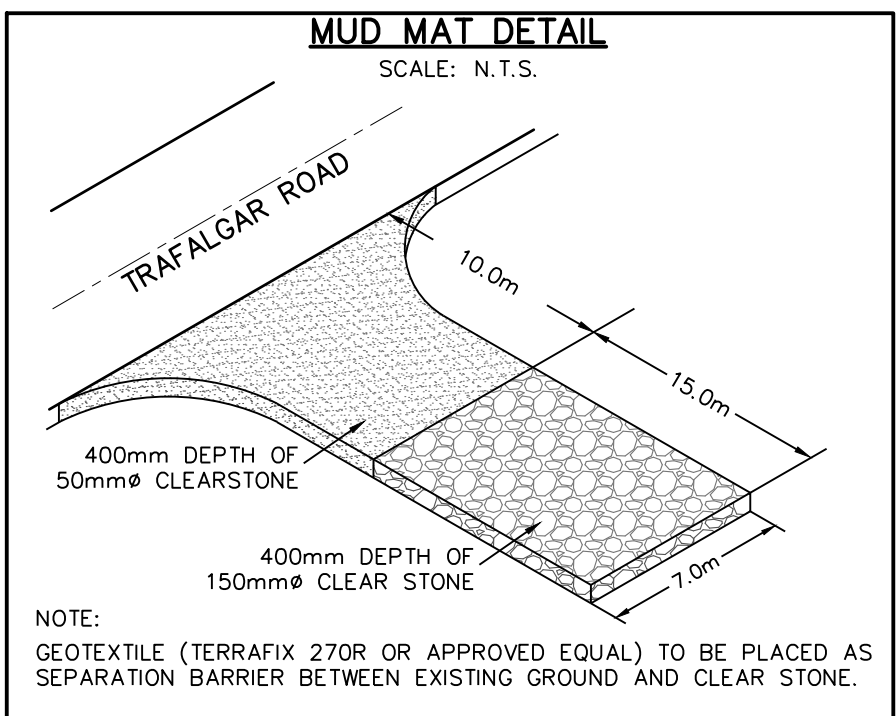
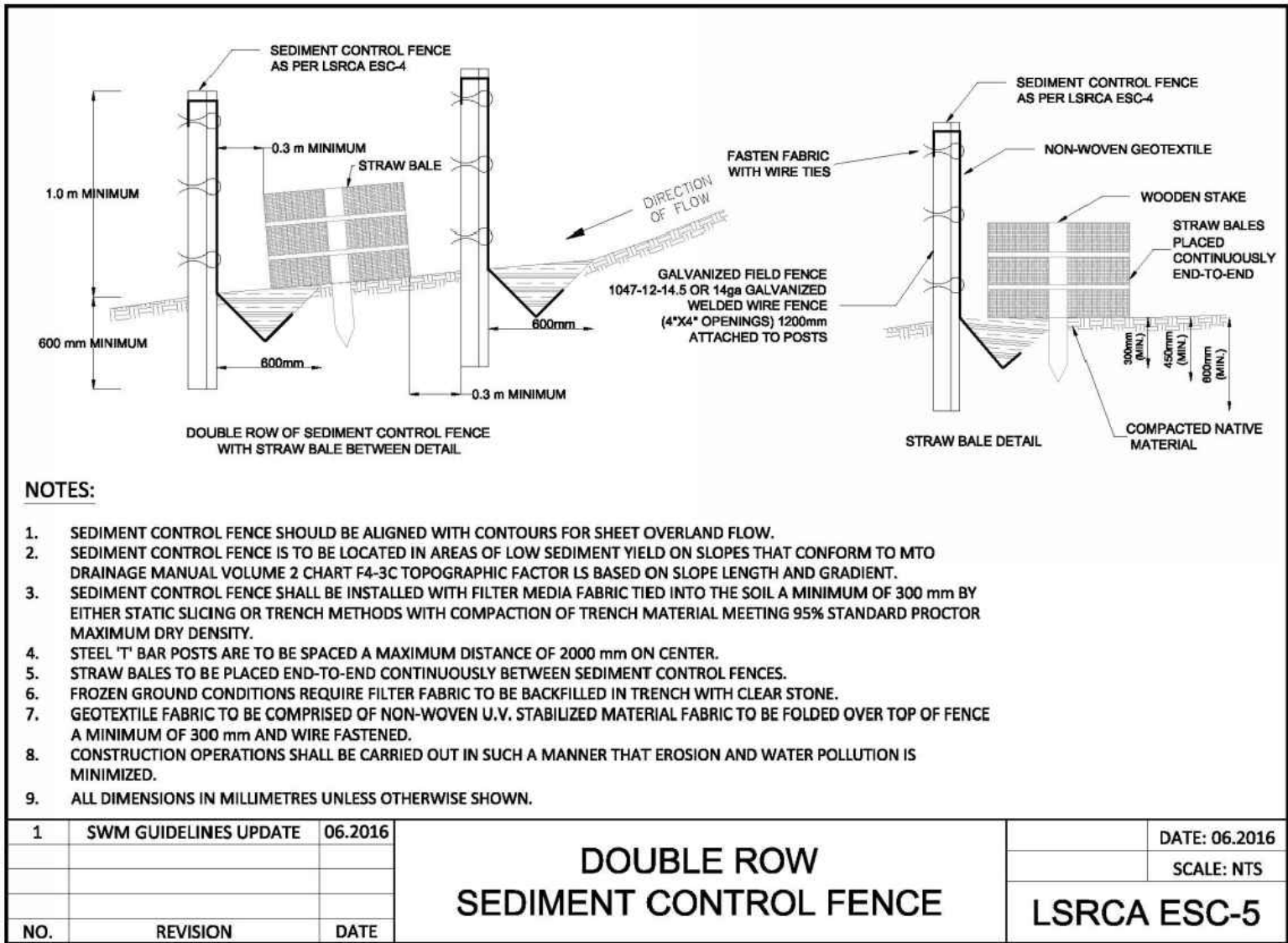


Drawn By	L.W.	Design By	L.W.	Project	1535-4897
Check By	K.M.	Check By	R.A.	Scale	1: 500
				Drawing	C108

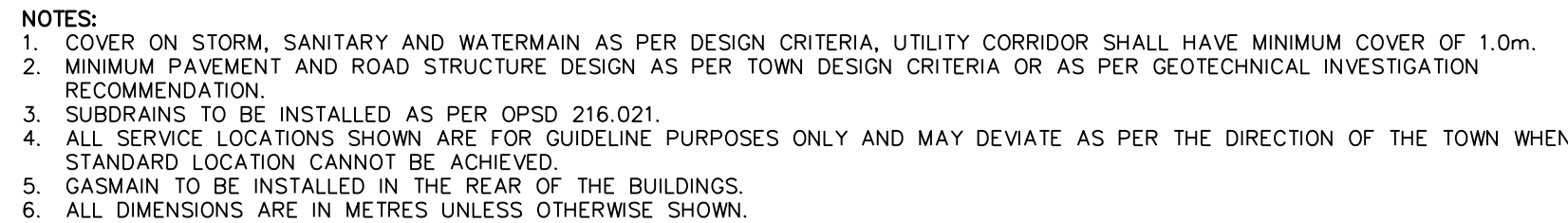
1. ALL CONSTRUCTION EQUIPMENT TO USE MAIN CONSTRUCTION ACCESS POINT LOCATED AT THE SOUTH END OF VACATION INN DRIVE VIA THE CONSTRUCTION ACCESS ROAD TO THE CONSTRUCTOR TO DRAWING C111 "CONSTRUCTION ACCESS ROAD PLAN" FOR DETAILS.
2. NO MAINTENANCE OR REPAIR WORK ON CONSTRUCTION EQUIPMENT IS ALLOWED WITHIN 30 METRES OF AN EXISTING WATER COURSE OR DITCH.
3. ALL EXISTING AND NEW CONSTRUCTION SHALL BE PROTECTED AND TO BE CONSTRUCTED AND IN PLACE TO THE APPROVAL OF THE SITE ENGINEER PRIOR TO ANY GRADING OPERATIONS COMMENCING. TYPICAL WORKS INCLUDE CONSTRUCTION OF CONSTRUCTION ACCESS ROADS, EROSION CONTROL.
4. ALL TEMPORARY TOPSOIL STOCKPILES ARE TO BE PROVIDED WITH THE NECESSARY SEDIMENT AND EROSION CONTROL FEATURES, IF STOCKPILES ARE TO BE STORED FOR MORE THAN 7 DAYS, STOCKPILES SHALL BE HYDROSEDED AND SURROUNDED WITH SILT FENCE.
5. THE SITE ENGINEER SHALL UNDERTAKE WEEKLY INSPECTIONS OF ALL SEDIMENT/EROSION CONTROL FACILITIES DURING THE EXTENT OF THE ENTIRE CONSTRUCTION PERIOD. INSPECTIONS SHALL BE COMPLETED ON A DAILY OR GREATER. THE WEEKLY INSPECTIONS ARE TO BE COMPLETED ON AN EROSION AND SEDIMENT CONTROL INSPECTION REPORT.
6. THE PROJECT ENGINEER SHALL ADVISE THE LOCAL COUNCIL REPORTS TO THE MUNICIPALITY AND CONSERVATION AUTHORITY ADVISING OF THE CONDITION OF STRUCTURES AND MAINTENANCE WORKS THAT HAVE BEEN UNDERTAKEN.
7. THE PROJECT ENGINEER SHALL ADVISE THE LOCAL COUNCIL ADVISING OF THE INITIATED CONSTRUCTION. A STREET CLEANING SCHEDULE WILL BE UNDERTAKEN ON A MINIMUM WEEKLY BASIS, OR AS DIRECTED BY THE SITE ENGINEER OR MUNICIPALITY.
8. THE PROJECT ENGINEER SHALL ADVISE THE EROSION AND SEDIMENT CONTROLS MADE BY THE CONTRACTOR SHALL BE DOCUMENTED IN WRITING.

- A) PRE-CONSTRUCTION
 1. SITE ENGINEER TO ADVISE TOWN OF STAFF RESPONSIBLE FOR SITE SEDIMENT CONTROL SUPERVISION, INSPECTION AND MAINTENANCE, INCLUDING AFTER HOUR CONTACTS.
 2. CONTRACTOR TO PROVIDE WRITTEN INSPECTION AND MAINTENANCE SCHEDULE OF SEDIMENT CONTROL DEVICES.
 3. CONTRACTOR TO INSTALL ALL SEDIMENT CONTROL DEVICES AS IDENTIFIED ON THE APPROVED EROSION CONTROL PLAN PRIOR TO EARTHWORKS OPERATIONS.
- B) DURING CONSTRUCTION (SITE AND BUILDING WORKS)
 1. CONTRACTOR TO ENSURE TOPSOIL STRIPPING, GRADING AND UNDERGROUND WORKS CONFORM TO APPROVED GRADING, SERVICING AND EROSION CONTROL PLANS.
 2. SITE ENGINEER TO CONDUCT REQUIRED WEEKLY INSPECTION, MAINTENANCE AND REPORTING OF SEDIMENT CONTROLS TO THE TOWN.
 3. CONTRACTOR TO STABILIZE SITE AS REQUIRED THROUGHOUT SITE CONSTRUCTION SCHEDULE.
- C) POST CONSTRUCTION (INCLUDING BUILDING CONSTRUCTION)
 1. CONTRACTOR TO COMPLETE FINAL SITE STABILIZATION AND REVEGETATION WORKS, ALL SWALES EXPECTED TO REMAIN IN EXCESS OF 30 DAYS TO BE STABILIZED BY CONTRACTOR VIA HYDROSEEDING.
 2. CONTRACTOR TO REMOVE ALL SEDIMENT CONTROL DEVICES AFTER THE SITE

- A) SILT FENCE
1. SILT FENCE TO BE LOCATED ON CRANBERRY TRAIL PROPERTY LINE.
2. SILT FENCE MUST BE INSPECTED WEEKLY FOR RIPS OR TEARS, BROKEN STAKES, BLOW-OUTS AND ACCUMULATION OF SEDIMENT.
3. SILT FENCE MUST BE INSPECTED FOLLOWING ALL 13mm or GREATER RAIN STORM EVENT OR AS DIRECTED BY SITE ENGINEER.
4. SEDIMENT MUST BE REMOVED FROM THE FENCE WHEN ACCUMULATION REACHES 50% OF THE HEIGHT OF THE FENCE.
5. ALL SILT FENCES MUST BE REMOVED ONLY WHEN THE ENTIRE SITE IS STABILIZED AND AS DIRECTED BY THE SITE ENGINEER.
- B) ROCK & STRAW BALE FLOW CHECK DAM
1. REMOVE ACCUMULATED SEDIMENT UP STREAM OF THE CHECK DAM IF GREATER THAN 50% OF THE DAM DEPTH.
2. SILT REMOVAL MUST BE UNDERTAKEN WITH CARE TO MINIMIZE DOWN STREAM SEDIMENTATION IN SWALE OR DITCH.
3. CHECK DAMS AND ALL ACCUMULATED SEDIMENT MUST BE REMOVED WITH CARE ONCE THE CONSTRUCTION SITE IS STABILIZED AND AS DIRECTED BY THE SITE ENGINEER.
C) SEDIMENT TRAP
1. REMOVE ACCUMULATED SEDIMENT FROM THE SEDIMENT TRAP IF THE DEPTH IS GREATER THAN 50% OF THE TRAP DEPTH.
2. SILT REMOVAL MUST BE UNDERTAKEN WITH CARE TO MINIMIZE DOWN STREAM SEDIMENTATION IN SWALE OR DITCH.
3. CHECK TRAPS AND ALL ACCUMULATED SEDIMENT MUST BE REMOVED WITH CARE ONCE THE CONSTRUCTION SITE IS STABILIZED AND AS DIRECTED BY THE SITE ENGINEER.



 CROZIER CONSULTING ENGINEERS				
Drawn By	L.W.	Design By	L.W.	Project
Check By	K.M.	Check By	R.A.	Scale 1: 500
				1535-4897 C109



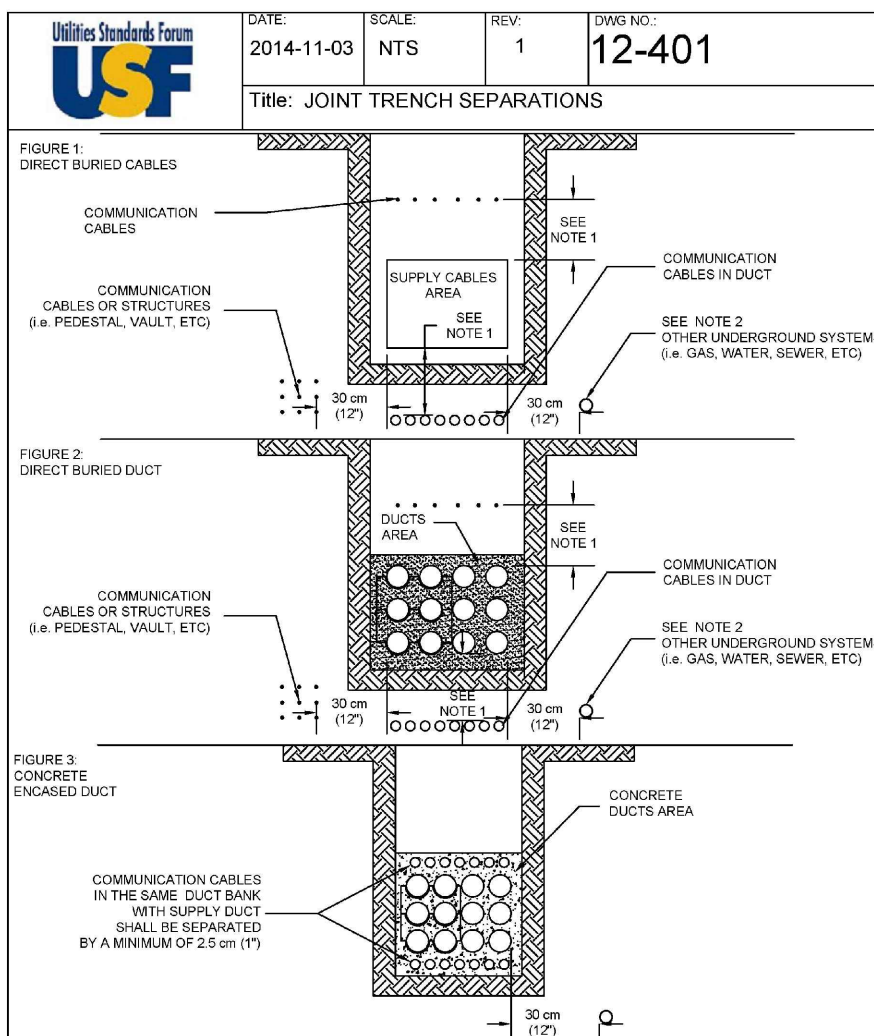
THIS PLAN HAS BEEN PREPARED BY G.F. CROZIER & ASSOCIATES INC. TO CONSOLIDATE THE DESIGNS COMPLETED BY THE RESPECTIVE UTILITIES. OUR FIRM HAS REVIEWED EACH UTILITY DESIGN TO CONFIRM IT COMPLIES WITH THE APPLICABLE MUNICIPAL GUIDELINES AND ROAD STANDARDS AND TO CONFIRM THERE ARE NO CONFLICTS WITH THE PROPOSED CIVIL SERVICING AND DRAINAGE SYSTEMS. WE HAVE NOT CHECKED NOR ACCEPTED RESPONSIBILITY FOR THE ACCURACY AND VERACITY OF EACH UTILITY DESIGN. WE USE WHICH THIRD PARTY MAKES OF OR ANY RELIANCE ON OR DECISIONS BASED ON IT, ARE THE RESPONSIBILITIES OF SUCH THIRD PARTIES. IT IS RECOMMENDED THAT DURING CONSTRUCTION THE THIRD PARTY REFERENCE OR MAKE USE OF THE APPROVED FOR CONSTRUCTION PLANS PREPARED BY EACH RESPECTIVE UTILITY.

GENERAL CONSTRUCTION SCHEDULE

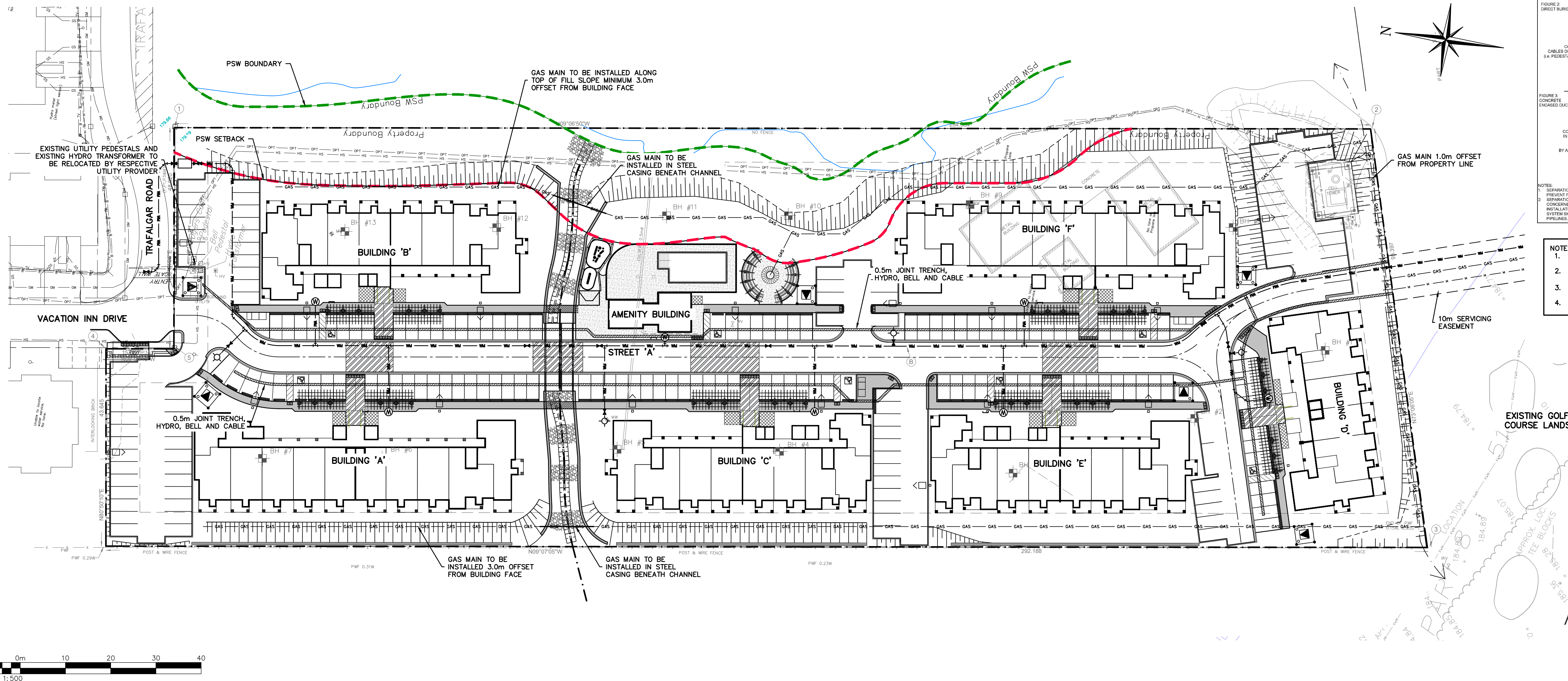
1. IN STREAM WORKS TO COMPLY WITH NVCA TIMING GUIDELINES AND ASSOCIATED PERMITTING.
 2. MAINTAIN TEMPORARY WATER MANAGEMENT WORKS AND OVERLAND SPILL MONITORING PRIOR TO ANY EXCAVATION WORKS.
 3. COMPLETE ASSOCIATED SEDIMENT CONTROLS, CULVERT AND UNDERGROUND SERVICES ENSURING WORKING IN THE DRY AT ALL TIMES.
- GENERAL NOTES**
1. ALL WORK TO BE PERFORMED IN DRY Dewatered CONDITIONS USING APPROVED WATER MANAGEMENT PLAN.
 2. NO MAINTENANCE OR REPAIR WORK ON CONSTRUCTION EQUIPMENT IS ALLOWED WITHIN 30 METRES OF WATERCOURSE.
 3. ALL SEDIMENT & EROSION CONTROL FACILITIES AND WORKS ARE TO BE MAINTAINED AND IN PLACE TO THE APPROVAL OF THE SITE ENGINEER PRIOR TO EXCAVATION WORKS COMMENCING.
 4. ALL TEMPORARY SOIL OR DIRT TO BE STOCKPILED PER DESIGNATED AREAS.
 5. FLOW INFORMATION PROVIDED HEREIN CONCERNING CRANBERRY MARSH ARE FOR CONSIDERATION ONLY.
 6. THE SEDIMENT & EROSION CONTROLS SPECIFIED HEREIN DO NOT NECESSARILY CONSTITUTE ALL MEASURES REQUIRED GIVEN FIELD CONDITIONS. CONTRACTOR TO PROVIDE AN ADDITIONAL SEDIMENT & EROSION CONTROL MEASURES REQUIRED TO ENSURE NO RELEASE OF DELETERIOUS SUBSTANCES TO WATERCOURSE.

GENERAL NOTES

1. ALL WORK TO BE PERFORMED IN DRY Dewatered CONDITIONS USING APPROVED WATER MANAGEMENT PLAN.
2. ALL EXCAVATION AND EROSION CONTROL CONSTRUCTION EQUIPMENT IS ALLOWED WITHIN 30 METRES OF WATERCOURSE.
3. ALL SEDIMENT & EROSION CONTROL FACILITIES AND WORKS ARE TO BE COMPLETED PRIOR TO COMMENCEMENT OF REMOVAL OF THE SITE EROSION PRIOR TO EXCAVATION WORKS COMMENCING.
4. ALL TEMPORARY SOIL OR DIRT TO BE STOCKPILED IN PRE DESIGNATED AREAS. STOCKPILES TO BE COVERED WITH EROSION CONTROL CRANES/GEOTEXTILE MARSH OUTLET FOR CONTRACTOR USE ONLY.
5. THE SEDIMENT & EROSION CONTROL MEASURES SPECIFIED HEREIN DO NOT NECESSITATELY CONSTITUTE ALL MEASURES REQUIRED GIVEN FIELD CONDITIONS. CONTRACTOR TO PROVIDE ANY SUPPLEMENTARY SEDIMENT & EROSION CONTROL MEASURES REQUIRED TO ENSURE NO RELEASE OF DELETERIOUS SUBSTANCES TO WATERCOURSE.



- NOTES:
1. FOR INFORMATION TO COMMUNICATION CABLE SHALL BE A MINIMUM OF 30" WITHIN OR OUTSIDE MECHANICAL PROTECTION TO PREVENT FUTURE CONTACT. CONTACT MAY OCCUR PROVIDED THE PARTIES CONSIDERED MUTUALLY AGREE.
2. INSTALLATION OF CABLE SHALL BE IN CONFORMANCE WITH THE CITY OF LOS ANGELES AND THE CITY OF LONG BEACH. THE PARTIES CONSIDERED THE MUTUALLY AGREE AND INSTALLATIONS ARE TAKEN TO ENSURE THAT IN THE EVENT OF FAILURE, REPAIR OR REPLACEMENT OF CABLE SHALL BE IN CONFORMANCE WITH THE CITY OF LOS ANGELES AND THE CITY OF LONG BEACH.
3. THE SYSTEM SHARED THE SAME TRENCH INSTALLATION IN THE SAME OF TRENCH WITHIN THE GAS DISTRIBUTION OR TRANSMISSION PIPELINES. THE MINIMUM HORIZONTAL SEPARATION BETWEEN THE EXIST SYSTEMS AND GAS PIPELINE SHALL BE NINE FEET.
- NOTE:
1. FOR ELECTRICAL DESIGN OF PRIMARY AND SECONDARY POWER SYSTEM SEE OFGA.
 2. FOR STREET LIGHT LIGHTING DESIGN SEE C.F. CROZIER AND ASSOCIATES (DWG. E300-E301)
 3. FOR TELECOMMUNICATION (CABLE, TELEPHONE) SEE ROGERSON AND BELL RESPECTIVELY
 4. FOR NATURAL GAS SERVING SEE ENBRIDGE.



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BENCHMARKS

ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE RELATED TO TOWN OF COLLINGWOOD BENCH MARK NO. 00172U311 HAVING AN ELEVATION OF 181.032 METRES.

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Y Engineer

LICENSED PROFESSIONAL ENGINEER
K. A. MORRIS
Dec. 20/07
PROVINCE OF ONTARIO

Engineer



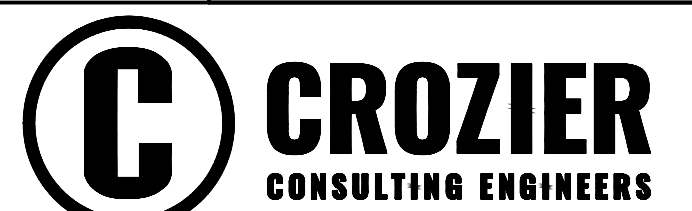
LICENSED PROFESSIONAL ENGINEER
R.A. ALEXANDER
100213093
December 29
2024
PROVINCE OF ONTARIO

	Project
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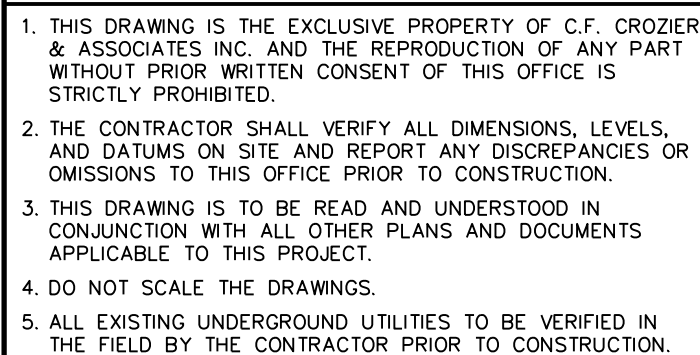
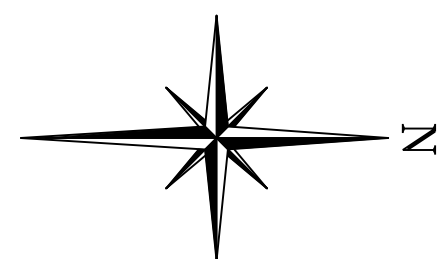
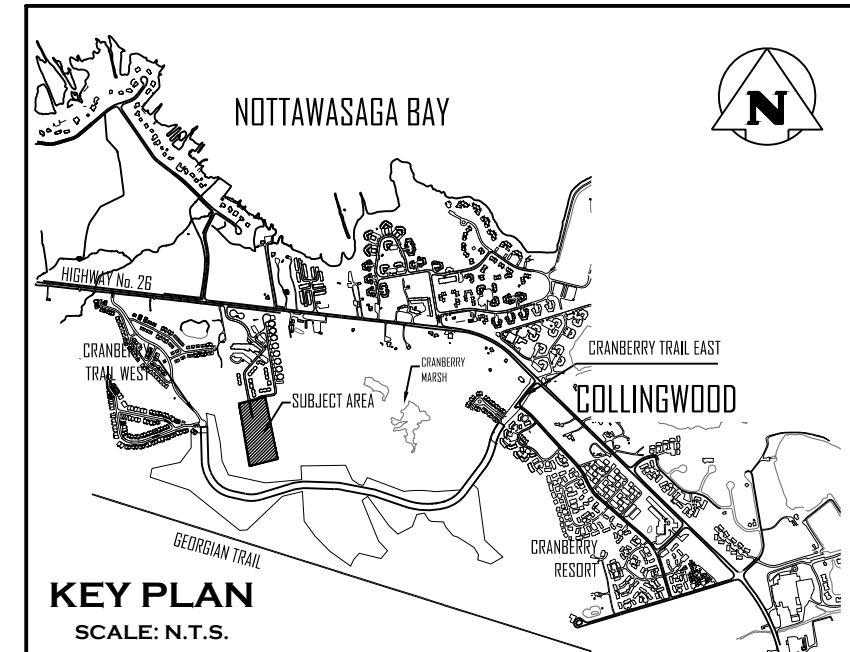
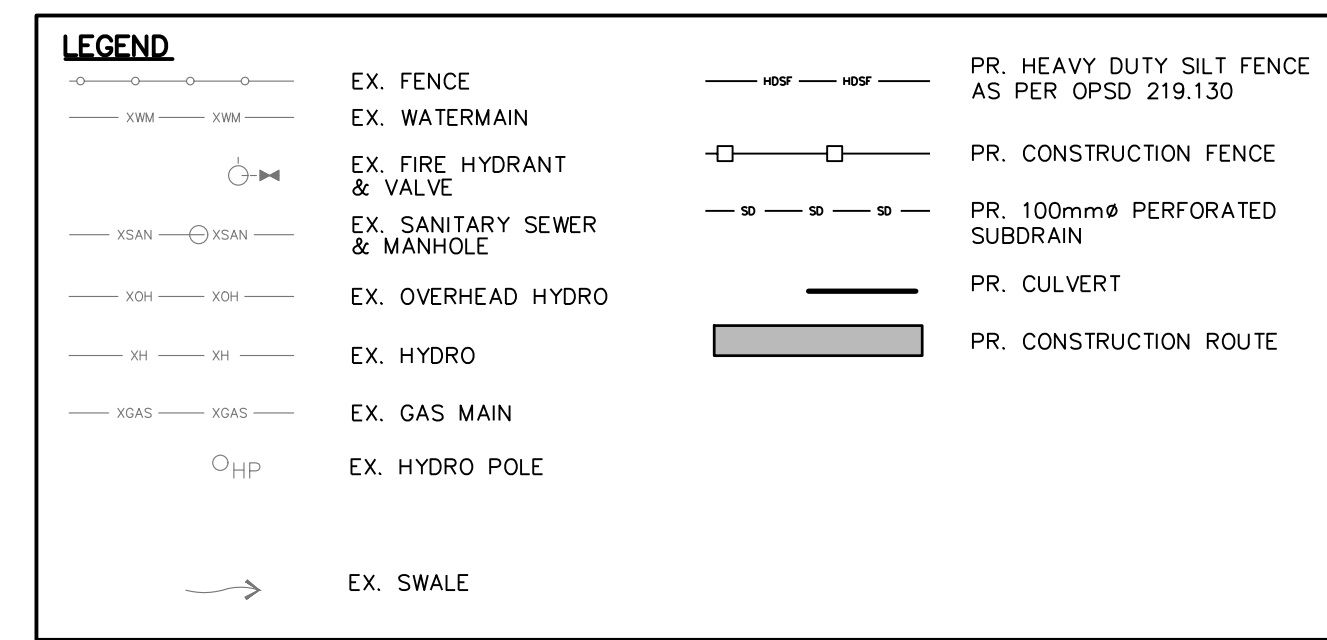
Drawing

WYLDEWOOD CREEK
TOWN OF COLLINGWOOD

COMPOSITE UTILITY PLAN



Drawn By	L.W.	Design By	L.W.	Project	1535-4897	
Check By	K.M.	Check By	R.A.	Scale	1:500	Drawing

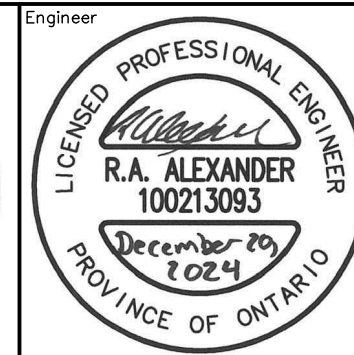
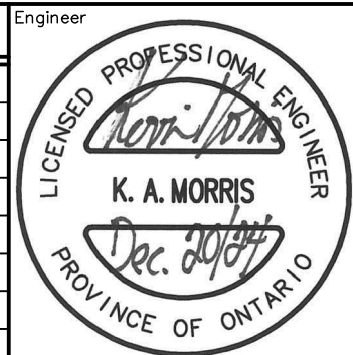


BENCHMARKS

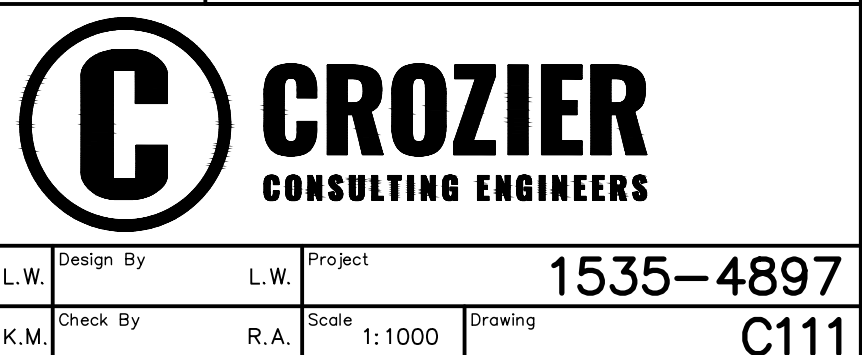
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Project	WYLDEWOOD CREEK TOWN OF COLLINGWOOD
	Drawing
	CONSTRUCTION ACCESS ROAD PLAN





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LICENSED PROFESSIONAL ENGINEER

K. A. MORRIS

Dec. 2018

PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER

R. A. ALEXANDER

100213093

December 20, 2024

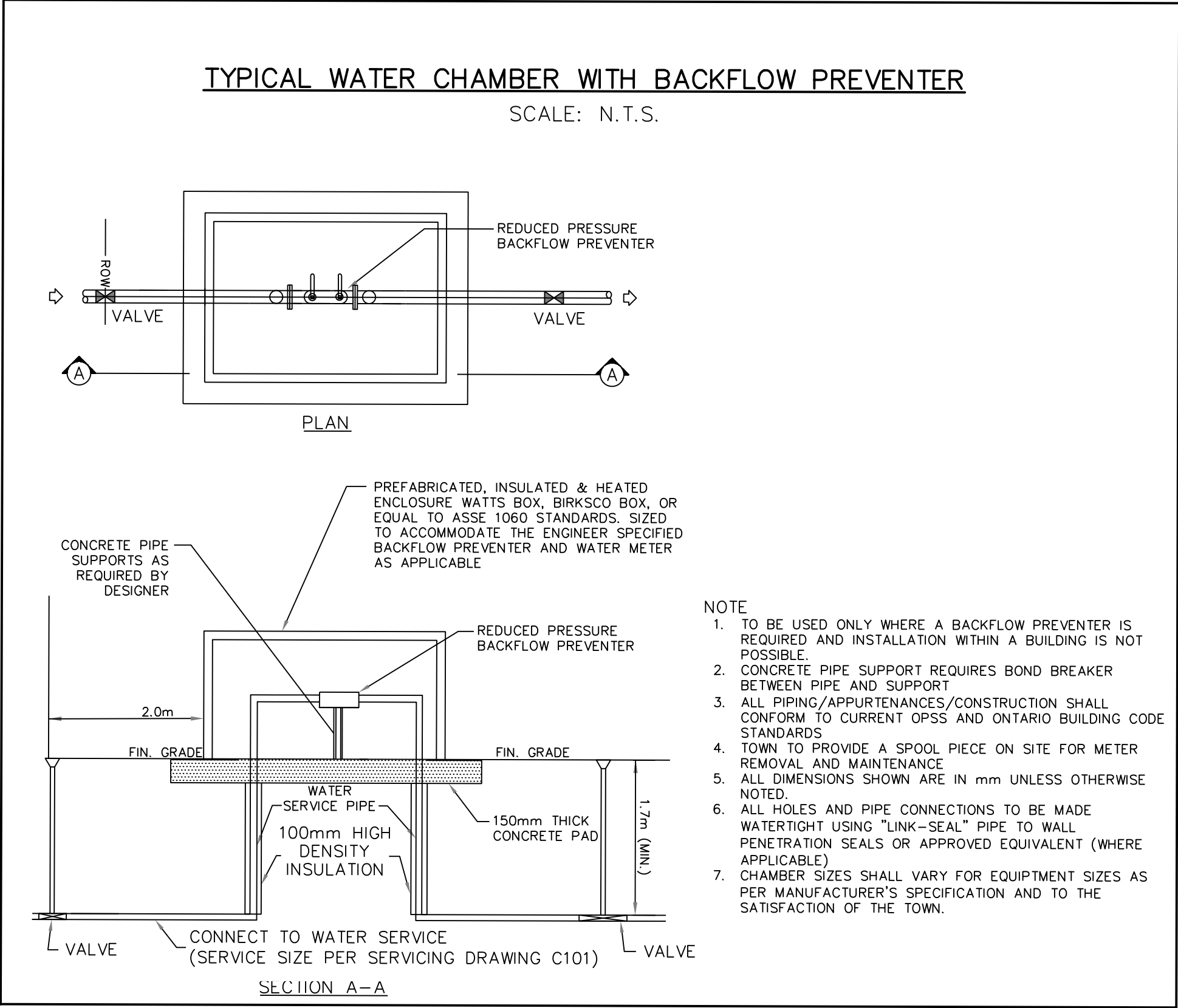
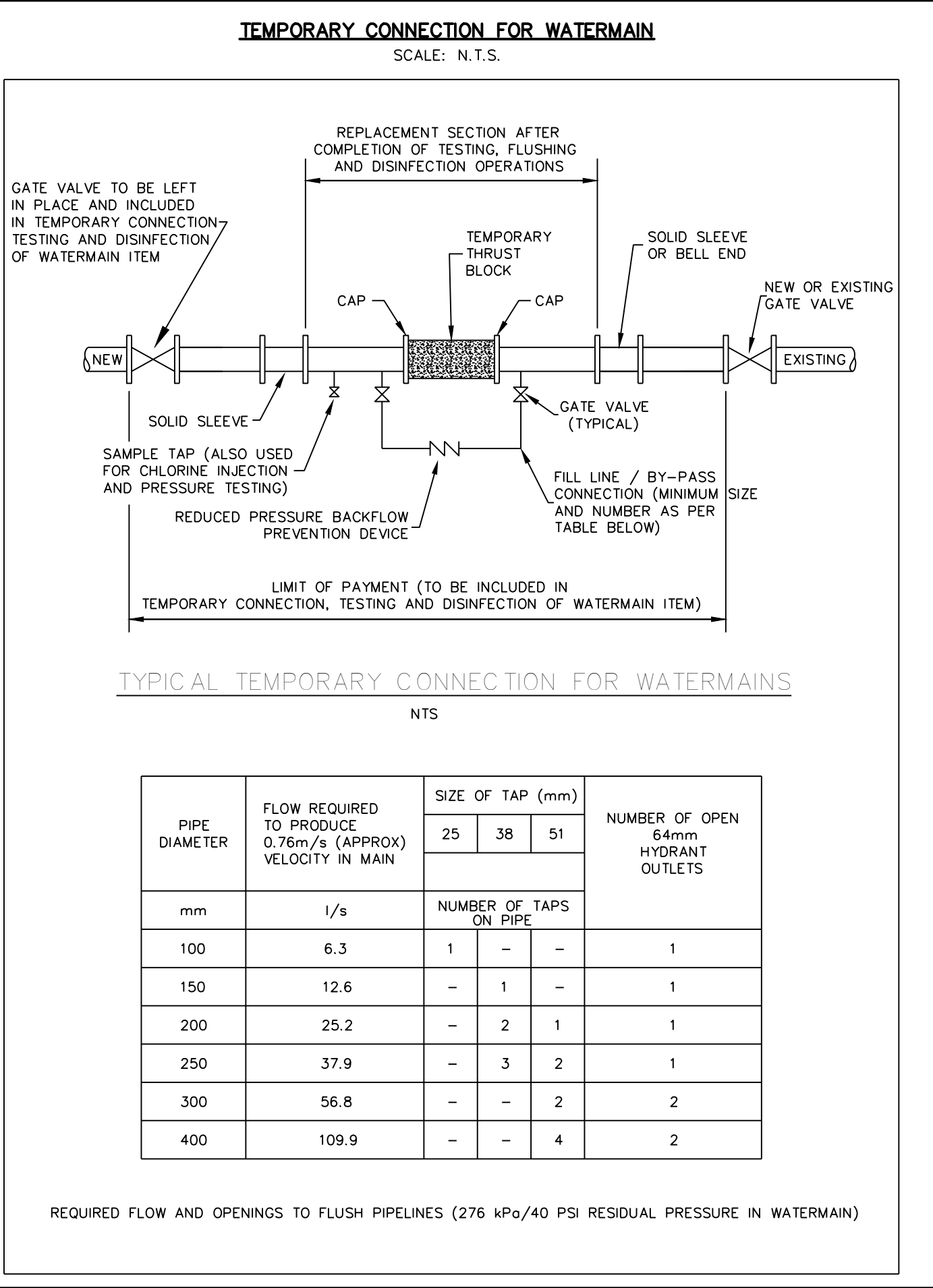
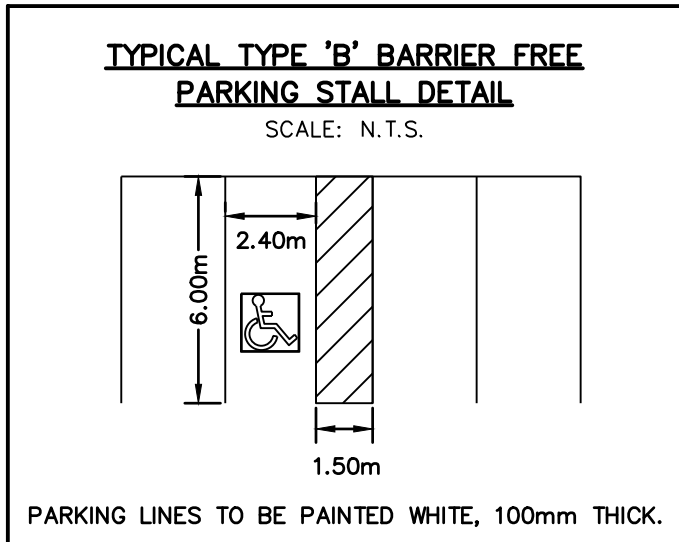
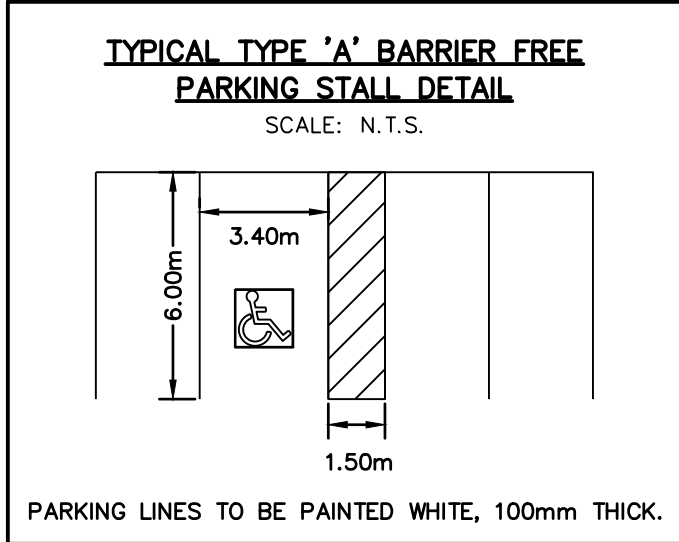
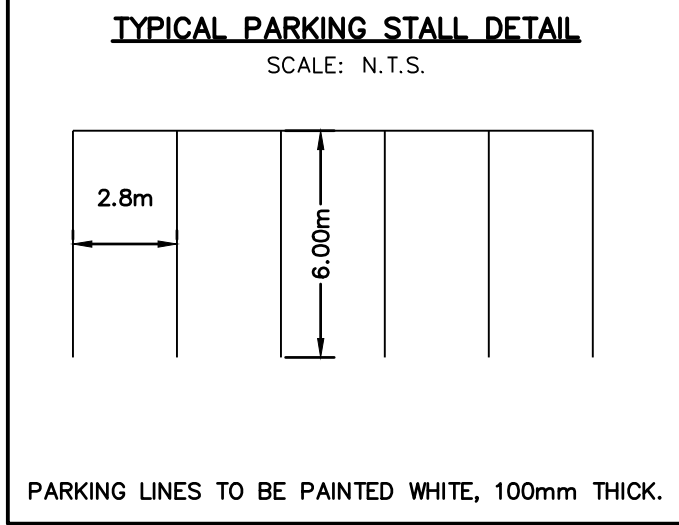
PROVINCE OF ONTARIO

Project: WYLDEWOOD CREEK TOWN OF COLLINGWOOD

Drawing: VEHICLE MOVEMENT PLAN

CROZIER
CONSULTING ENGINEERS

Drawn By	L.W.	Design By	L.W.	Project	1535-4897
Check By	K.M.	Check By	R.A.	Scale	1:500
				Drawing	C112



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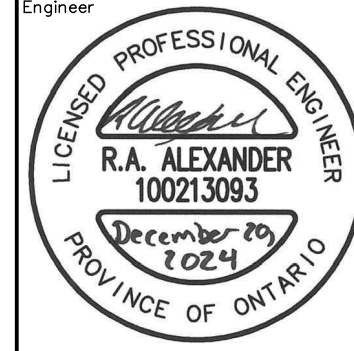
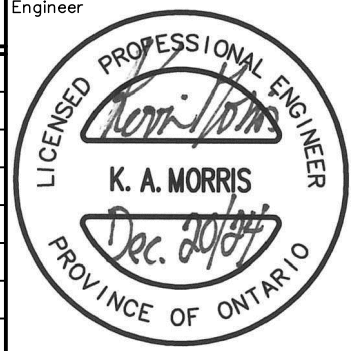
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Project

WYLDEWOOD CREEK
TOWN OF COLLINGWOOD

Drawing

CONSTRUCTION NOTES AND
STANDARD DETAILS

CROZIER CONSULTING ENGINEERS

Drawn By	L.W.	Design By	L.W.	Project	1535-4897
Check By	K.M.	Check By	R.A.	Scale	AS NOTED
				Drawing	C113.B