MARCH 14, 2023

Project No. 2020-030

32 OAK STREET, COLLINGWOOD FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

TOWN OF COLLINGWOOD

CAPES ENGINEERING

355310 BLUE MOUNTAINS-EUPHRASIA TOWNLINE
CLARKSBURG, ON N0H 1J0

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1.0 Introduction

CAPES Engineering Ltd. has been retained by Mr. Cimetta and Ms. Schnarre to prepare a functional servicing and stormwater management report in support of a Site Plan application for 32 Oak Street in the Town of Collingwood. The existing lot is 0.102 ha in size and currently contains a single-family residential dwelling and a detached garage/shed. The Site is located on the West side of Oak Street between First and Second Streets in the Town of Collingwood. It is proposed to demolish the existing residence and detached garage to allow for the proposed re-development of the existing lot.

The proposed re-development is for a mixed use commercial building that will provide 2 commercial units and 5 residential units contained in a 3 storey building. Also included on the proposed Site Plan is a driveway, parking areas, sidewalks and outdoor amenity area.

The proposed servicing and stormwater management are designed to meet the standards and guidelines of the Town of Collingwood (the Town), and the Nottawasaga Valley Conservation Authority (NVCA).

The purpose of this report is to provide support for Site Plan Approval for the proposed re-development. The Site requires approvals from the Town of Collingwood and any work within the Oak Street right-of-way (ROW) requires approvals from the NVCA.

2.0 Existing Site Conditions

The lot is legally described as Lot 14 West of Oak Street, Registered Plan 73 in the Town of Collingwood, County of Simcoe. The legal plan prepared by Zubek, Emo, Patten & Thomsen Ltd. in 2020 is included in **Appendix A** for reference.

The Site has a frontage of 20.27 m along Oak Street. The lot is rectangular in size with a depth of approximately 50 m. The current land use designation for the Site is Mixed Use Commercial. The land use designation for the adjacent lots to the north, east and west is also Mixed Use Commercial. The land use designation for the adjacent lot to the south is Low Density Residential. The lots to the north, east and south currently contain single family residential dwellings and the lot to the west contains a gas station.

As per previous comments provided by the NVCA, the site itself is not located in a NVCA regulated area. However, the Oak Street ROW is regulated by the NVCA for flood and meander erosion hazards and any construction for servicing or grading within the ROW will require a permit from the NVCA.

The existing lot is currently developed with a single family residential dwelling complete with a detached shed/garage, asphalt driveway and other landscaping. The landscaped areas are generally maintained lawn. Some fencing and existing trees are located within the lot, found mostly along property limits. The site generally slopes from the western property boundary easterly towards the Oak Street ROW at a grade of approximately 0.5%.

Oak Street is located in a 20 m ROW and is a paved urban road with 4.75 m lanes, curb and gutter, sidewalk on the eastern side only, and utility poles and overhead utilities on the eastern side. The road contains stormwater, water and sanitary sewer infrastructure. Record drawings for Oak Street received from the Town are included in **Appendix B** for reference.

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2.1 Geotechnical Information

A Geotechnical Test Pit Investigation has been completed by Central Earth Engineering (now GEI) dated October 8, 2020 for the Site and is included in **Appendix C**. The geotechnical investigation consists of two test pits dug to a depth of 1.9 m where bedrock was encountered in both test pits. Test pit #1 is located in approximately the south east corner of the Site and test pit #2 is located in the north west corner of the Site.

The test pits consist of 0.2 m to 0.4 m depth of topsoil and roots, followed by 1.4 m to 1.5 m thickness of sand and then 0.1 m to 0.3 m thickness of silty sand glacial till and then encountering the bedrock. No water was encountered in test pit #1 and minor seepage was encountered in test pit #2. Samples were taken for both the sand and the silty sand glacial till layers to determine estimated percolation rates for both soil types. The estimate percolation rate for the sand is 75 mm/hr and the estimate percolation rate for the till is 30 mm/hr.

Piezometers were installed in each of the test pits so that stabilized ground water elevations could be taken. The stabilized ground water elevation for test pit #1 is 178.02 and the ground water elevation for test pit #2 is 178.03.

OGS mapping identifies the area as till with stone-poor, sandy silt to silty sand-textured till. Generally, the OGS texture supports the information from the geotechnical investigation.

2.2 Existing Stormwater Infrastructure

The lot is very flat but overland flow generally occurs towards Oak Street. The existing lot has a depression in the back yard that allows for some ponding and infiltration before flow reaches Oak Street. The surrounding lots are mostly flat as well and flows appear to mostly be contained within the lots themselves. The Site and the adjacent lots to the north and the south likely pass minor flows between each other; however, this is due to the flat topography and it appears that no significant flows are passing from the Site into the adjacent lots. Accordingly, the limits for the modelled catchment area are the property boundaries for the Site.

There is a catch basin within the Oak Street ROW in front of the Site. This catch basin drains into a large concrete box culvert located on the east side of Oak Street via a 300 mm dia. pipe. The concrete box culvert forms part of the “Oak Street Canal” which is a municipal drain flowing north towards First Street. The capacity of the Oak Street Canal is unknown and any available capacity is anticipated to be minimal (based on discussions with Town and NVCA staff). Outflows from the Site to the Oak Street ROW will be limited to match the existing outflows from the site and the flows will drain into the existing catch basin, mimicking existing conditions.

Due to the Oak Street Canal drain, the Oak Street ROW is regulated by NVCA for flood and meander erosion hazards. A flood study is currently being completed for the Oak Street Canal, however, both the Town and NVCA have noted that this has not been finalized. NVCA advised that additional policies and restrictions may result from the finalization of this study. Any grading or servicing work within the Oak Street ROW will require a permit from NVCA.

The Oak Street Canal was originally an open channel in which “Underwood Creek” flowed through. In approximately 1982, a 1.5 m by 3.7 m concrete box culvert was installed from just north of the Oak

Street and Second Street intersection to the existing concrete structure at the intersection of Oak Street and First Street. From this intersection, the water flows north through open channels, and culverts as needed, until reaching Georgian Bay.

2.2.1 Stormwater Management Approval Criteria

The Town has indicated that both quantity and quality control measures shall be addressed for the Site. Post re-development peak runoff rates will not exceed the existing condition runoff rates. Per NVCA requirements, the stormwater design for the Site will be aiming to achieve retention of 5 mm of rainfall, best efforts towards a water balance, minimum 80% TSS removal and phosphorous loading matching pre-development levels with best efforts towards a 20% reduction in phosphorous loading.

2.2.2 Existing Condition Stormwater Modelling

We have utilized PCSWMM 2020 modelling software (Version 7.3.3095, SWMM version 5.0.013-5.1.015 to undertake the analysis of the existing site.

The contributing drainage area for the Site was determined by using a combination of aerial imagery from Grey County GIS Mapping, a topographic survey of the site completed in 2020 and a site visit completed in 2020.

The total drainage area for the site is 0.102 ha. The existing topography is mostly flat with an average slope from west to east of approximately 0.5%. There is a depression located in the middle of the lot allowing some ponding and infiltration of a portion of the lot. The Site in existing condition is approximately 15.7% impervious.

The Geotechnical Test Pit Investigation completed by CEE identified the infiltration rate of the sand layer as 75 mm/hr. Using Supplementary Standard SB-6: Percolation Time and Soil Descriptions from the Ministry of Municipal Affairs and Housing, the field saturated hydraulic conductivity (K_{fs}) is determined to be 0.001 cm/s or 36 mm/hr. Using this hydraulic conductivity of 36 mm/hr we have determined the Suction Head and Initial Soil Deficit based on a loamy sand referenced to Rawls (1983).

K_{fs} = 36.0 mm/hr (as per Geotechnical Investigation and MMAH SB-6)

Suction Head = 61.3 mm (as per Rawls 1983)

Initial Deficit (fraction) = 0.312 (as per Rawls 1983)

Additional PCSWMM model input parameters for the Manning's roughness coefficient (*n*) and depression storage were determined from the USDA TR55 and UNESCO SWM Manual as follows:

Table 5.9: Manning Roughness Coefficients - Overland Flow

Cover	*n*
Impervious areas	0.013
Woods	
with light underbrush	0.4
with dense underbrush	0.8
Lawns	
Short grass	0.15
Dense grass	0.24
Agriculture Land	0.050-0.170

Ref: Adapted from Soil Conservation Service, Urban Hydrology for Small Watersheds, U.S. Dept. of Agriculture, Soil Conservation Service, Engineering Division, Technical Release 55, June 1986

10.2 Initial Abstraction/Depression Storage

Table 10.2: Initial abstraction/depression storage

Cover	Depth (mm)
Woods	10
Pasture/Meadow	8
Cultivated	7
Lawns	5
Wetland	12/16
Impervious areas	2

Ref: UNESCO, Manual on Drainage in Urbanized Areas, 1987.

The pervious portion of the pre-development drainage area are grassed areas that appear to be mostly maintained and as such we have used an overall Manning's value of 0.15 and depression storage value of 5 mm.

The IDF curves and equations as per the Town Standard 110 were utilized to model the 2-100 year 4-Hour Chicago storms. Additional rainfall data was obtained from the Ministry of Transportation – IDF Curve Look-up website for the Collingwood station to model the 2-100 year 24 hour SCS Type II, Regional Timmins storm and the 4 hour 25 mm Chicago (quality control) storm events.

Please refer to **Table 1** on the following page for a summary of the results from the model.

Table 1 – Existing Condition Modelling Results

Storm Event	Peak Flow Offsite Total (m^3/s)
4 Hr Chicago	
2-year	0.01
5-year	0.01
10-year	0.01
25-year	0.01
50-year	0.01
100-year	0.01
24 Hr SCS	
2-year	0.00
5-year	0.00
10-year	0.01
25-year	0.01
50-year	0.02
100-year	0.02
25 mm	0.00
Timmins	0.00

The PCSWMM summary output file for the 100-year 24 Hour SCS Type II storm has been included in **Appendix D** for reference. The remaining output files can be provided upon request in either digital or hardcopy format.

The peak runoff of 0.02 m^3/s for the existing condition occurs from the 100-year 24 Hour SCS Type II storm event. Most other storm events modeled have some runoff, however the 2 and 5-year 24 Hour SCS Type II, the 25 mm quality storm and Timmins regional storm do not have any runoff.

2.3 Existing Sanitary Infrastructure

There is an existing sanitary sewer main on Oak Street. The existing sanitary main is 450mm dia. and was installed in approximately 1962 with reinforced concrete pipe. The sanitary sewer main flows north towards First Street, where it outflows into the sanitary sewer main on First Street. Record drawings do not indicate any change to the main on Oak Street.

The sizing of the existing service is unclear from the provided record drawings but anticipated to be 125mm dia. installed at a minimum slope of 1%. The existing sanitary service sizing and slope is to be confirmed.

2.4 Existing Water Supply Infrastructure

There is an existing service to the site providing water from a 150 mm dia. water main located on the west side of Oak Street. The Town has indicated it may be possible to reuse this service if the size and condition are sufficient.

The service is anticipated to be 19mm dia. as this matches adjacent services. Sometime between 1962 and 1982 the watermain on Oak Street was upgraded to a 150 mm dia. There does not appear to be record drawings available for when the watermain increased from 25 mm and 50 mm dia. to 150 mm dia., however, we anticipate the service size was not increased at this time.

Per previous comments, the Town has noted that the Water Treatment Plant is operating at 82% capacity and they have initiated an expansion process with completion expected in 5 years. It is understood that the Town will add the flows into their model to ensure adequate flow and pressure is available. This is site is subject to the Town water allocation policy and must demonstrate a high enough score to be eligible for any increase in water usage.

3.0 Proposed Site Plan

The proposed re-development includes the demolition of the existing dwelling and detached garage. The proposed site plan consists of 1 three storey building containing 2 commercial units and 5 residential units. Included in the site plan is 1 barrier-free parking space at the west side (rear yard) of the Site and 8 regular parking spaces, 3 of which are covered, on the west side of the Site. Additionally, there are 4 bike parking spaces, concrete walkways, landscaped areas and an outdoor amenity area in the front yard. The Site will be accessed via one 6.0 m wide driving entrance on the south side of the Site. Pedestrian access will be via sidewalks off of Oak Street. Please refer to the site plan prepared by Westsmith Design dated March 10, 2023 included in **Appendix E**.

Water and sanitary sewer servicing will be via the same Town owned mains on Oak Street currently used in the existing condition. The site will feature the use of permeable pavers to treat the stormwater runoff for both quality and quantity purposes.

3.1 Proposed Stormwater Management Plan

The Town has requested a review of the stormwater management to support the Site Plan application being completed for the re-development of the Site. We have utilized the same software for modelling of the re-development conditions as was used for the existing conditions (PCSWMM 2022 Version 7.5.3406, SWMM version 5.0.013-5.1.015).

We have utilized the same Green Ampt infiltration parameters as the pre-development condition as the soil will remain the same. The pervious Mannings n value and depression storage values for post re-development have been recalculated with regard to anticipated site conditions. Most of the proposed pervious area will be maintained lawn and consequently the Mannings n value and depression storage will match existing condition values of 0.15 and 5 mm respectively.

The permeable pavers are designed with reference to the document produced by the CVC/TRCA titled Low Impact Development Stormwater Management Planning and Design Guide. A safety correction factor of 2.5 was applied to the soil infiltration parameter used for the permeable paver infiltration rate.

The paver covered driveway has been graded to slope away from the building and any excess runoff will be directed east to the street via a concrete curb and gutter. At the request of the Town we have added a new catchbasin at the south edge of the driving lane within the property limits to act as an overflow for the permeable pavers in the event that they do not function as designed. This catchbasin is to connect to the existing catchbasin within the ROW with a new 250 mm dia. pipe.

The overall imperviousness of the site will increase from 15.7% to 87%. Of the 87% impervious area on the proposed re-development site plan, 38% will be permeable pavers or 37% of the overall site will be permeable pavers. The permeable pavers will allow for flatter grading along the driveway and provide required stormwater treatment and will also be placed within the amenity area.

The concrete walkway along the north edge of the site will have a concrete barrier curb along the north edge to prevent runoff from discharging into the neighbouring site. A trench drain will be providing inside the curb to ensure runoff does not pool or pond on the sidewalk. The drain will include a subdrain connecting to the subsurface storage layer below the permeable pavers for infiltration. The canopies above the sidewalk are to be flat and will have drains discharging onto permeable pavers or to the sidewalk subdrain.

The proposed condition model is divided into 3 subcatchments as follows:

Subcatchment A1 – 0.0093 ha – This is a small area at the front of the property including the amenity space, walkway and grassed snow storage area. It is 50% impervious with 19 sq. m of permeable pavers proposed in the amenity area. The proposed grading is to the east towards Oak Street, however between the permeable pavers and the pervious grassed area it is not anticipated that any runoff will be generated from this small area.

Subcatchment A2 – 0.0019 ha – This is the narrow pervious area along the south edge of the site which can not be graded to drain into the site. Runoff from this small, vegetated strip is anticipated to drain south towards the neighbouring property.

Subcatchment A3 – 0.0906 ha - This is the majority of the site including the building, asphalt parking spaces and permeable paver driving lane. There is a small amount of pervious green space along the south and west side of the subcatchment.

Pervious areas are primarily grassed and have been assigned a mannings n of 0.15 and a depression storage of 5 mm. The permeable paving areas are assumed to be impervious within the subcatchment input part of the model and the pervious nature of these areas is accounted for by adding in an LID feature which is equal to size. This ensures the pervious nature of the pavers is not “double counted” within the model.

The permeable pavers (Ecoraster Bloxx or approved equivalent) will have a stone storage layer 480 mm thick consisting of 19 mm clear stone and we have used an infiltration rate of 14.4 mm/hr which includes the 2.5x reduction as a factor of safety.

The runoff that is not absorbed by either the permeable pavers or by the pervious areas would discharge directly via sheet flow to Oak Street or be collected by the proposed new catchbasin and

discharge to the storm sewer. Please refer to the grading and stormwater details on the proposed Grading and Servicing Plan **Drawing C2**.

Please refer to **Table 2** for a summary of the existing and post re-development Peak Flows and to **Appendix F** for the 100yr, 25 mm and Timmins storm PCSWMM output results.

Table 2 – Pre and Post Modelling Results

Storm Event	Existing Peak Flow Offsite Total (m^3/s)	Proposed Peak Flow Offsite Total (m^3/s)
4 Hr Chicago		
2-year	0.01	0.00
5-year	0.01	0.00
10-year	0.01	0.00
25-year	0.01	0.00
50-year	0.01	0.00
100-year	0.01	0.00
24 Hr SCS Type II		
2-year	0.00	0.00
5-year	0.00	0.00
10-year	0.01	0.00
25-year	0.01	0.00
50-year	0.02	0.00
100-year	0.02	0.00
25 mm	0.00	0.00
Timmins	0.00	0.00

The proposed post re-development peak flows are reduced to 0.00 m^3/s for each of the modelled storm events resulting in a reduction in post development flows of up to 0.02 m^3/s.

3.1.1 Stormwater Quality Control

Stormwater quality has been analyzed using a 25 mm 4-hour Chicago design storm. The 25 mm design storm represents 95% of all rainfall activities in an average year. By basing quality controls off of the 25 mm design storm, quality measures will be effective for most rain events in a given year.

Through the use of permeable pavers, the peak outflow from the 25 mm design storm is 0.00 m^3/s for the proposed re-development of the Site. Without outflow occurring, full treatment is achieved for TSS removal and phosphorous removal. A formal phosphorous budget analysis using the NVCA P Budget

Tool can be provided, if required, however we feel that having no outflow for the 25 mm design storm is sufficient to demonstrate the phosphorous removal.

3.1.2 Water Balance and Infiltration Target

We have included a Thornthwaite water balance calculation in **Appendix G** for the Site. The water balance indicates 177 m^3 of precipitation would be recharged per year. With no stormwater measures installed, an estimated 27 m^3 would be recharged per year resulting in a reduction of 150 m^3 per year. The proposed permeable pavers will greatly increase the amount of precipitation recharged per year. Each of the design storms indicate a post re-development peak flow of 0.00 m^3/s suggesting a significant amount of infiltration occurs.

The Thornthwaite Method is not specifically designed to incorporate LID features, however as all storms modelled produce no runoff and the 25 mm storm represents the rainfall depth of more than 95% of all rainfall that falls in a year we believe that the site provides a full water balance, and may actually increase the amount of infiltration compared to the existing condition.

The NVCA requirement is for the Site to retain 5 mm of rainfall for the entire Site. This results in a total infiltration goal of 5.1 m^3 for the entire 0.102 ha Site. The following is taken from the output for the 25 mm design storm from the PCSWMM model (full output included in **Appendix G**). The results from the 25 mm design storm indicate infiltration of 23.96 mm over the site equal to 24.43 m^3 significantly above the required 5.1 m^3.

**************************	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
**************************	---------	-------
Total Precipitation	0.003	24.999
Evaporation Loss	0.000	0.000
Infiltration Loss	0.002	23.956
Surface Runoff	-0.000	-0.000
Final Storage	0.000	1.070
Continuity Error (%)	0.000	

3.1.3 Permeable Pavers

The permeable pavers for the Site are designed for use the Ecoraster Bloxx or approved equivalent. The Bloxx permeable pavers system provides a smooth surface for pedestrian access. The pavers are 50 mm thick with a 30 mm leveling base layer. The base, storage and substructure layers combined result in a total of 480 mm depth composed primarily of 19 mm dia. clear stone.

The lowest surface elevation for the permeable pavers is 179.59. With a combined thickness of 530 mm for the paver system, the lowest point of the paving system is 179.06. The groundwater elevation provided in the Test Pit Investigation Letter (included in **Appendix C**) is 178.03 providing more than 1 m of separation between the groundwater and underside of the permeable paver system.

3.2 Proposed Water Servicing

The Ontario Building Code (OBC) was utilized for calculation purposes for both the domestic and fire flows.

The two commercial units each contain the following fixtures:

- 1 Bathroom Sink (1 FU/unit x 2 units = 2 FU)
- 1 Flush Toilet (2.2 FU/unit x 2 units = 4.4 FU)

Each of the 5 residential units contain the following fixtures:

- 1 Kitchen Sink (1.4 FU/unit x 5 units = 7 FU)
- 1 Dishwasher (1.4 FU/unit x 5 units = 7 FU)
- 1 Washing Machine (1.4 FU/unit x 5 units = 7 FU)
- 1 Three Fixture Bathroom Group (3.6 FU/unit x 5 units = 18 FU)

Total = 45.4 fixture units

The total fixture unit count is 45.4. Using the OBC Table 7.4.10.5 the equivalent average day demand hydraulic load for a total fixture unit below 260 is the minimum load of 2,360 L/day, or 0.027 L/s. The Town specifies a daily peak factor of 1.77 and an hourly peak factor of 2.7. Considering the Town specified peak factors, the hydraulic load for the peak day condition is 0.048 L/s and the peak hourly hydraulic load is 0.074 L/s.

Assuming a minimum water pressure of 200 kPa at the building, the water pipe sizing as per Table 7.6.3.4 from the OBC would require a 32 mm dia. pipe to service the multi-dwelling unit.

The assumed 19 mm dia. service must be verified, however, it is assumed that a 32 mm dia. or larger service was not installed to service the existing residential dwelling and therefore the water service will need to be abandoned to the Oak Street watermain with a new 32 mm dia. service installed.

The required peak fire flow required for the site is calculated using the Office of the Fire Marshal, OFM Guideline, Fire Protection Water Supply Guideline for Part 3 in the OBC (1999). Calculated fire flows are 45.0 L/s resulting in a combined fire and domestic flow of 45.07 L/s.

The closest fire hydrant is located on the south side of the adjacent property to the south. The unobstructed distance from the fire hydrant to the furthest entrance to the building is less than 90 m (40 m from the hydrant to where the truck would park on the street and 35 m from the truck to the entrance).

Please refer to **Appendix H** for detailed calculations for the domestic and fire flows required to service the site. It is understood that the Town will model the required flows in their system to determine if sufficient flow and pressure is available to service the re-development for the required domestic and fire flows.

3.3 Proposed Sanitary Servicing

As per the Town Engineering Standards, the following design parameter was used for the calculation of the sanitary sewage discharge for the residential units:

- Average Daily per capita Flow: 260 L/capita/day

For each 1 bedroom apartment, flows will be calculated for 2 people per OBC Section 3.1.17.1. Average Daily flow per person using OBC Table 8.2.1.3.A is 275 L/day for an apartment. The Town specifies a lower daily flow of 260 L/capita/day so the OBC values will be used for calculation purposes as a conservative measure. The calculated flow for only the apartment portion of the building is equal to 2,612.5L/day (1.9 people/unit x 5 units x 275 L/capita/day) or 0.03 L/s.

The sanitary flows for the commercial portion of the building are calculated using OBC Table 8.2.1.3.B for an office building. The flow is calculated using floor space as the number of employees is unknown at this time. The specified flow is 75 L per 9.3 sq m of floor space. The proposed building has a total commercial floor space of 195.59 sq m. The total flow calculated for the commercial portion is equal to 1,577 L/day or 0.02 L/s.

The total combined sanitary sewage flow is equal to 4,189.5 L/day or 0.05 L/s. Using Manning's Formula to check the capacity of the existing sanitary service results in 9 L/s for a 125 mm dia. service installed at a slope of 1%.

The Town Engineering Standards specify commercial lots shall have a sanitary service with a minimum size of 200 mm dia. per section 4.3.3.4. If the service is 125 mm dia. installed at a minimum slope of 1% there is sufficient capacity in the service lateral to service, the proposed building.

It is proposed to use the existing sanitary lateral to service the proposed building. The size, slope and condition of existing lateral are to be confirmed before construction occurs as any of these factors may result in the requirement for a new service to be installed. If a new service is required, it shall be the Town specified size of 200 mm dia.

3.4 Erosion and Sediment Control

We recommend that silt fence per OPSD 219.130 be installed along the exterior of the limit of re-development of the Site as shown in **Drawing C3.** These controls should remain in place and be maintained until the vegetation is re-established on the lots.

We would recommend that the permeable paving system be installed following the completion of the building construction to reduce the chance of construction materials damaging the paving system or clogging the open spaces in the surface. The paving system should be cleaned using a vacuum truck with a sweeping attachment in the event of sediment or debris being stored or left on the surface.

3.5 Site Operation and Maintenance

The proposed permeable paving system within the driving lanes is designed to require little maintenance. Please refer to **Appendix I** for the manufacturer's recommendations for the Bloxx.

Due to the small size of the site, it is anticipated that snow removal will likely be completed using walk behind snow blowers in which case the bottom edge of the blower should be lifted slightly to not "catch" the permeable paving stones.

In general, it is advised to not utilize sand to deal with ice on the adjacent sidewalks and asphalt areas as the sand can cause the openings between the concrete blocks to become clogged or plugged. If areas do become plugged we recommend a vac truck with a sweeping attachment be used to remove the sediment.

We would also recommend limiting the amount of road salt used on the surface as this can be damaging to the environment. We would recommend de-icing agents in favour of road salt and the amount used should be limited as much as possible.

3.6 Utilities

Coordination with utilities is being completed by others. It is anticipated that the building will require a standard hydro connection from Oak Street. Telecommunications and Hydro connections will be coordinated directly by the Owner with the utilities at Building Permit stage.

4.0 Conclusions

The proposed re-development of 32 Oak Street, Collingwood will include 2 commercial units and 5 residential units. The Site will feature 1 three-storey building and will include various parking areas, sidewalks, driveway and landscaped areas to service the proposed building.

This report seeks the approval from the Town to service the proposed re-development. In addition, it is anticipated that NVCA will review the report as an approval will be required for works within the Oak Street ROW. An approval from NVCA is only needed for work within the ROW as the Site itself is not located in a NVCA regulated area.

It is proposed to use the existing sanitary service if condition/sizing allow to service the proposed building. A new water service will be installed as a larger size is needed to accommodate the proposed units. Stormwater management on the Site will be provided through the use of permeable pavers for both quantity and quality treatment.

We believe this report achieves the intended purpose of demonstrating the Site is feasible from an engineering perspective and can be constructed to meet the Town of Collingwood requirements.

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CAPES Engineering

32 OAK STREET INC.

32 OAK STREET, TOWN OF COLLINGWOOD

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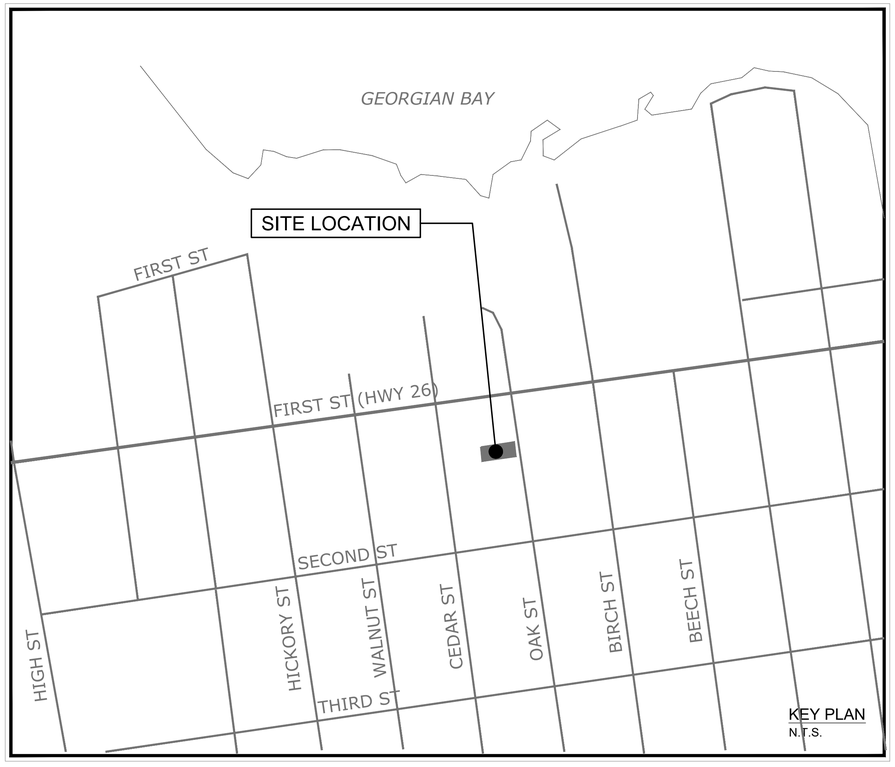


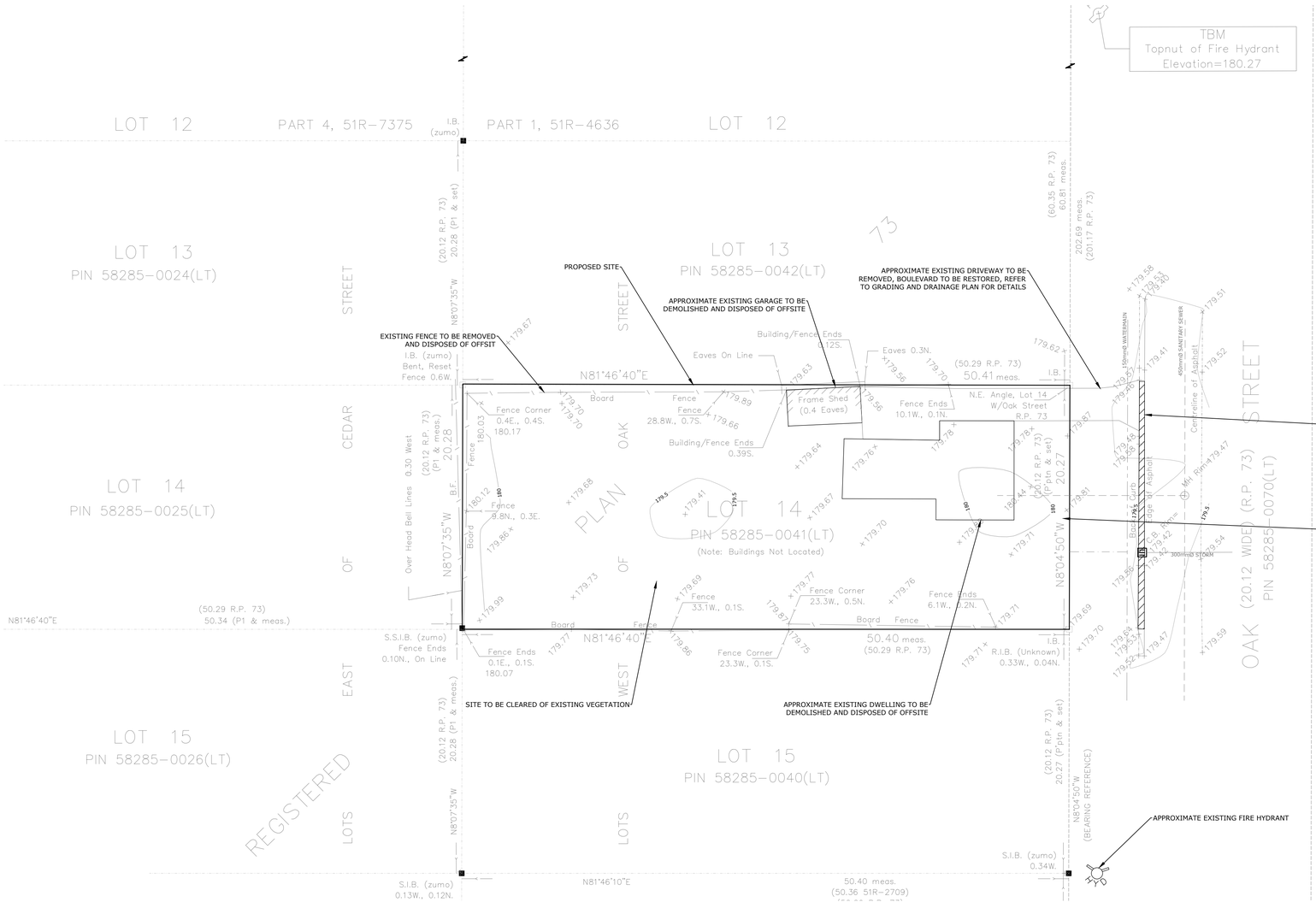
32 OAK STREET INC.
32 OAK STREET
COLLINGWOOD, ON
L9Y 2X6

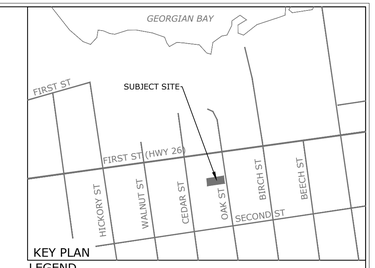
Project No. 2020-030

REISSUED FOR APPROVALS - 23/03/13

CAPES ENGINEERING

2020-030 - 32 OAK STREET, COLLINGWOOD - 32 OAK STREET INC.
REISSUED FOR APPROVALS - 23/03/13





LEGEND

- EXISTING SANITARY SERVCE
- EXISTING WATER SERVCE
- SANITARY SERVCE
- WATER SERVCE
- SWALE
- BUILDING ENVELOPE
- ROOF LEADER DISCHARGE LOCATION
- S/P SUMP PUMP DISCHARGE LOCATION TO SPLASH PAD, c/w AIR GAP
- TEST PIT LOCATION
- 3:1 SLOPING (MAXIMUM)
- × 184.90 PROPOSED GRADE
- × 184.90 EXISTING GRADE
- EXTERIOR BUILDING MOUNTED LIGHTS (TO REMAIN)
- EXISTING BELL BOX
- EXISTING CURB STOP
- EXISTING SANITARY CLEANOUT
- EXISTING TREE TO REMAIN
- EXISTING TREE TO BE REMOVED

	DENOTES SET
	DENOTES FOUND
S.I.B.	DENOTES STANDARD IRON BAR
I.B.	DENOTES IRON BAR
S.S.I.B.	DENOTES SHORT STANDARD IRON BAR
C.C.	DENOTES CUT CROSS
P.B.	DENOTES PLASTIC BAR
R.I.B.	DENOTES ROUND IRON BAR
wit	DENOTES WITNESS
meas.	DENOTES MEASURE
R.P.	DENOTES REGISTERED PLAN
N, S, E, W	DENOTES NORTH, SOUTH, EAST, WEST
P'ptn	DENOTES PROPORTION
CB	DENOTES CATCH BASIN
MH	DENOTES SANITARY MANHOLE
FH	DENOTES FIREHYDRANT
P1	REFERS TO PLAN OF SURVEY BY ZUBEK, EMO, PATTEN & THOMSEN LTD., O.L.S., DATED AUGUST 17, 2001.

LOT 14
WEST OF OAK STREET
REGISTERED PLAN 73
TOWN OF COLLINGWOOD
COUNTY OF SIMCOE

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2	REISSUED FOR APPROVALS	22/08/24
3	REISSUED FOR APPROVALS	23/03/13

BENCH MARK

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NOTE:

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LICENSED PROFESSIONAL ENGINEER
C. CAPES
100056104
MARCH 13, 2023
PROVINCE OF ONTARIO

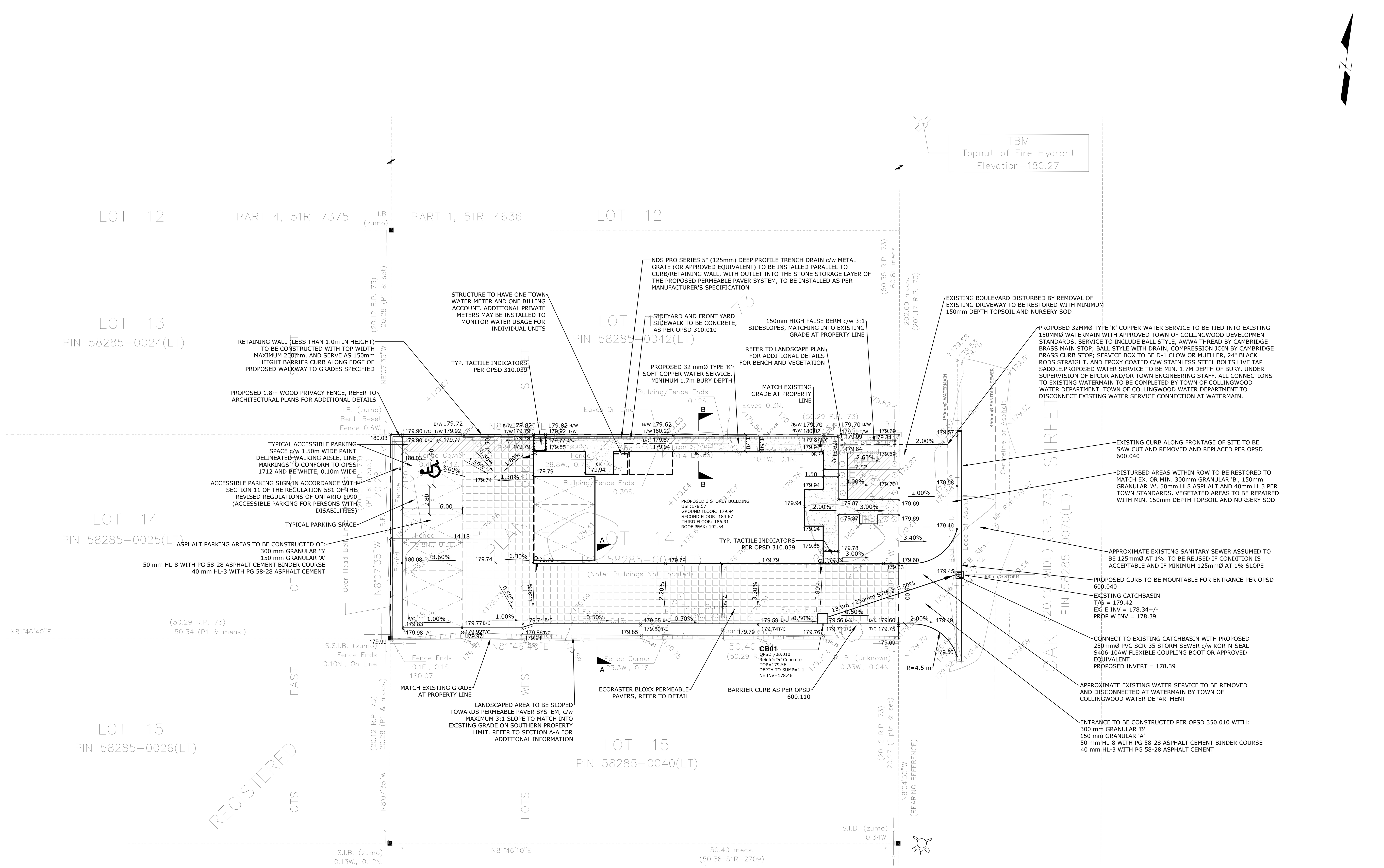
Client
32 OAK STREET INC.
32 OAK STREET
COLLINGWOOD, ON
L9Y 2X6

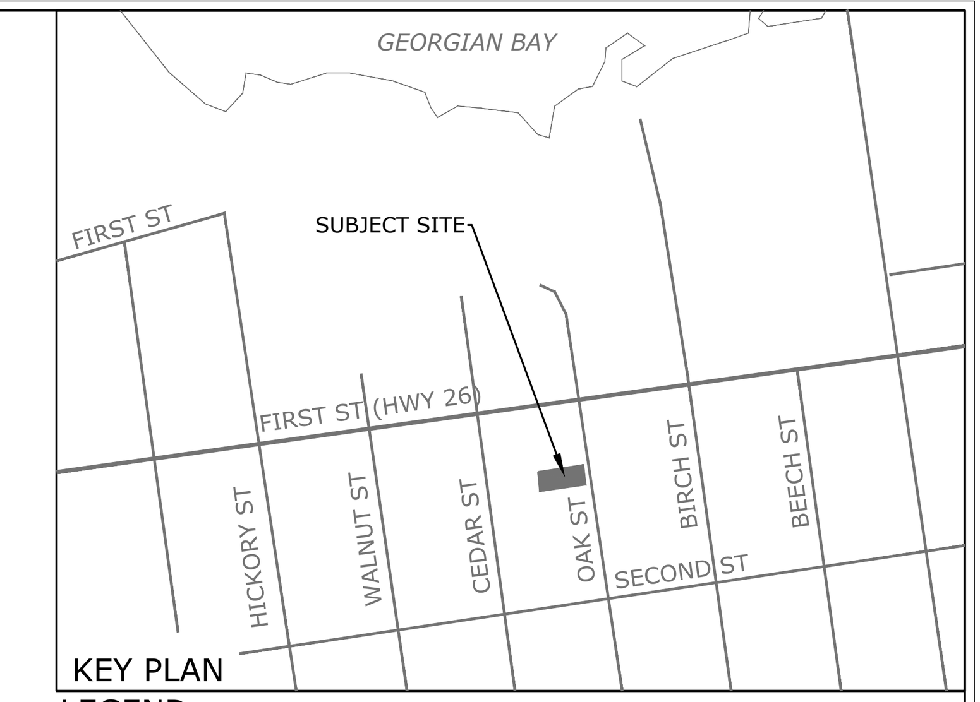
CAPES ENGINEERING
355310 BLUE MOUNTAINS - EUPHRASIA TOWNLINE
CLARKSBURG, ON N0H 1J0
WWW.CAPESENGINEERING.COM

32 OAK STREET, TOWN OF COLLINGWOOD

EXISTING CONDITION PLAN

Designed	Checked	Date	Drawing No.
B. COLLINS	C. CAPES	20/10/29	C1
Project No. 2020-030		Rev No. 3	
Scale 1:200	0 4.0 8.0 12.0m		





KEY PLAN

LEGEND

- EXISTING SANITARY SERVCE
- EXISTING WATER SERVCE
- SANITARY SERVCE
- WATER SERVCE
- SWALE
- BUILDING ENVELOPE
- ROOF LEADER DISCHARGE LOCATION
- S/P SUMP PUMP DISCHARGE LOCATION TO SPLASH PAD, c/w AIR GAP
- TEST PIT LOCATION
- 3:1 SLOPING (MAXIMUM)
- × 184.90 PROPOSED GRADE
- × 184.90 EXISTING GRADE
- EXTERIOR BUILDING MOUNTED LIGHTS (TO REMAIN)
- EXISTING BELL BOX
- EXISTING CURB STOP
- EXISTING SANITARY CLEANOUT
- EXISTING TREE TO REMAIN
- EXISTING TREE TO BE REMOVED
- PERMEABLE PAVERS

	DENOTES SET
	DENOTES FOUND
S.I.B.	DENOTES STANDARD IRON BAR
I.B.	DENOTES IRON BAR
S.S.I.B.	DENOTES SHORT STANDARD IRON BAR
C.C.	DENOTES CUT CROSS
P.B.	DENOTES PLASTIC BAR
R.I.B.	DENOTES ROUND IRON BAR
wit	DENOTES WITNESS
meas.	DENOTES MEASURE
R.P.	DENOTES REGISTERED PLAN
N, S, E, W	DENOTES NORTH, SOUTH, EAST, WEST
P'ptn	DENOTES PROPORTION
CB	DENOTES CATCH BASIN
MH	DENOTES SANITARY MANHOLE
FH	DENOTES FIREHYDRANT
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7. ALL SWALES SHALL HAVE A MINIMUM DEPTH OF 150mm; 150mm DIAMETER SUBDRAINS SHALL BE PROVIDED UNDER ALL SWALES WITH GRADIENTS LESS THAN 1.0%, SUBDRAINS SHALL BE PERFORATED, CORRUGATED PIPE WITH GEOTEXTILE AND BE BEDDED IN A 300mmx300mm CLEAR STONE TRENCH WRAPPED WITH FILTER CLOTH.
8. EXISTING VEGETATION ON SITE TO BE REMOVED AND DISPOSED OF OFF SITE BEFORE LOT GRADING WORK AS SPECIFIED.
9. ALL DISTURBED AREAS ARE TO BE SODDED OVER A MINIMUM OF 150MM OF TOPSOIL OR APPROVED ALTERNATIVE GROUND COVER.
10. FOOTINGS WITHIN GROUNDWATER SHALL BE A FACTOR OF STANDARD WIDTH AS PER O.B.C. SECTION 9.15.3.4.

LOT 14
WEST OF OAK STREET
REGISTERED PLAN 73
TOWN OF COLLINGWOOD
COUNTY OF SIMCOE

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LICENSED PROFESSIONAL ENGINEER
C. CAPES
100056104
MARCH 13, 2023
PROVINCE OF ONTARIO

Client
32 OAK STREET INC.
32 OAK STREET
COLLINGWOOD, ON
L9Y 2X6

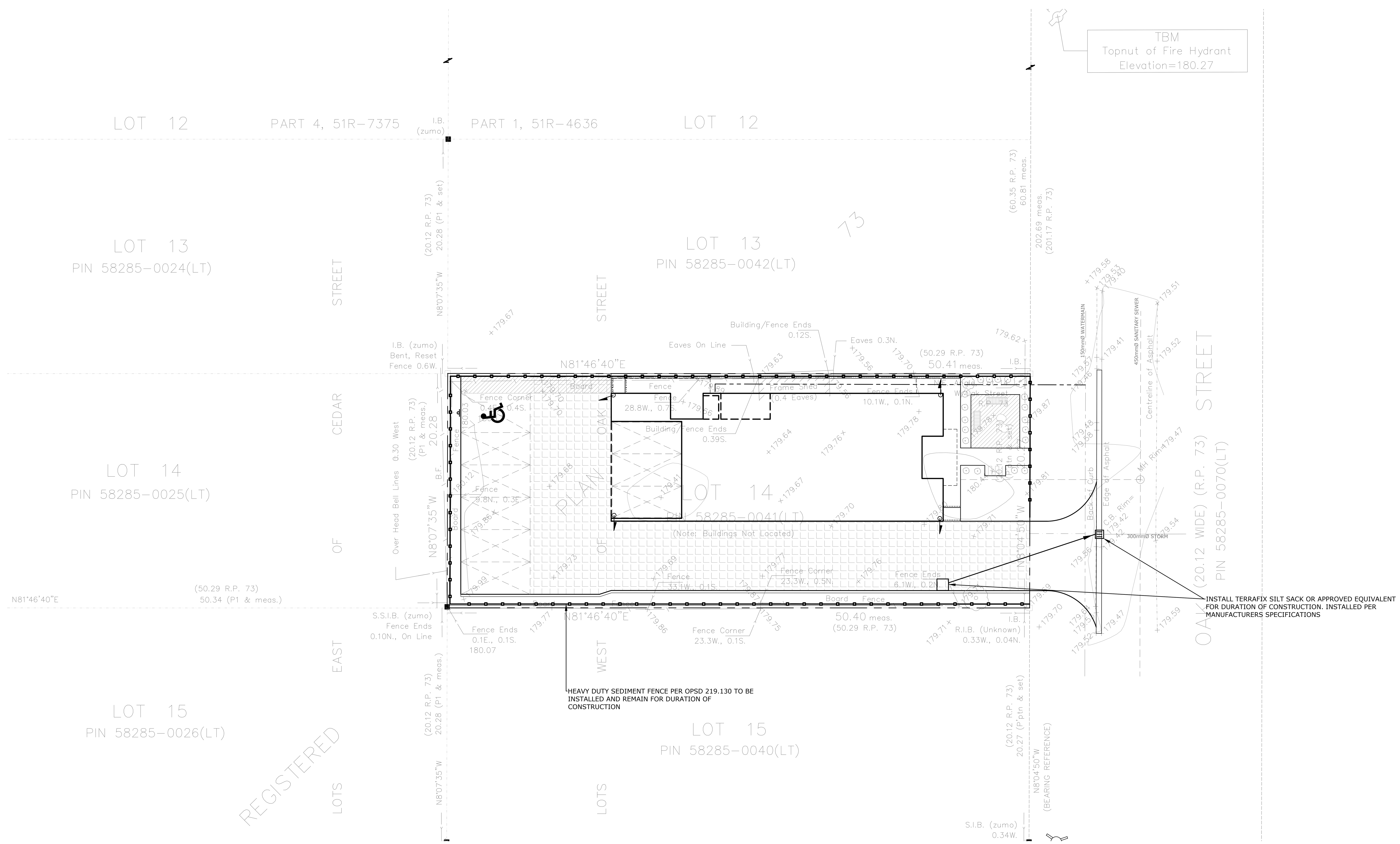
CAPES ENGINEERING
355310 BLUE MOUNTAINS - EUPHRASIA TOWNLINE
CLARKSBURG, ON N0H 1J0
WWW.CAPESENGINEERING.COM

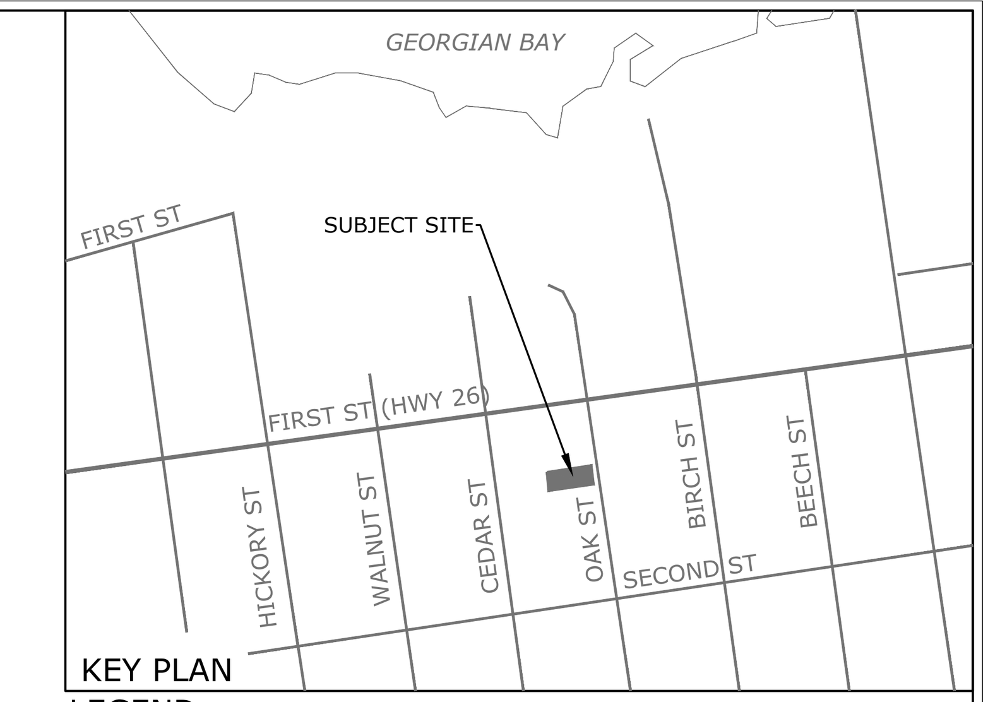
32 OAK STREET, TOWN OF COLLINGWOOD

GRADING AND SERVICING PLAN

Designed	Checked	Date	Drawing No.
B. COLLINS	C. CAPES	20/10/29	C2
Project No. 2020-030		Rev No. 3	
Scale 1:200			

File: C:\CE\Capes Engineering Dropbox\Projects\2020\2020-030 32 Oak Street Site Plan\Drawings\03_ProductionDwg\2020-030 GRADING.dwg Date Plotted: March 14, 2023 - 9:33 AM





KEY PLAN

LEGEND

- EXISTING SANITARY SERVCE
- EXISTING WATER SERVCE
- SANITARY SERVCE
- WATER SERVCE
- SWALE
- BUILDING ENVELOPE
- ROOF LEADER DISCHARGE LOCATION
- S/P SUMP PUMP DISCHARGE LOCATION TO SPLASH PAD, c/w AIR GAP
- TEST PIT LOCATION
- 3:1 SLOPING (MAXIMUM)
- × 184.90 PROPOSED GRADE
- × 184.90 EXISTING GRADE
- EXISTING BELL BOX
- EXISTING CURB STOP
- EXISTING SANITARY CLEANOUT
- EXISTING TREE TO REMAIN
- EXISTING TREE TO BE REMOVED
- HEAVY DUTY SEDIMENT FENCE PER OPSD 219.130

	DENOTES SET
	DENOTES FOUND
S.I.B.	DENOTES STANDARD IRON BAR
I.B.	DENOTES IRON BAR
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LOT 14
WEST OF OAK STREET
REGISTERED PLAN 73
TOWN OF COLLINGWOOD
COUNTY OF SIMCOE

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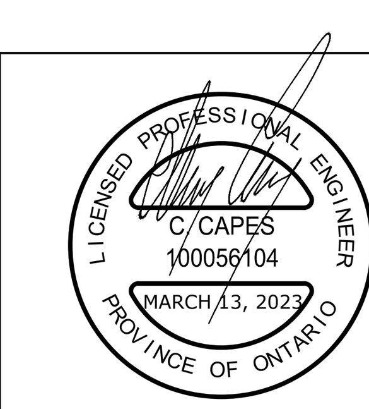


Client
32 OAK STREET INC.
32 OAK STREET
COLLINGWOOD, ON
L9Y 2X6

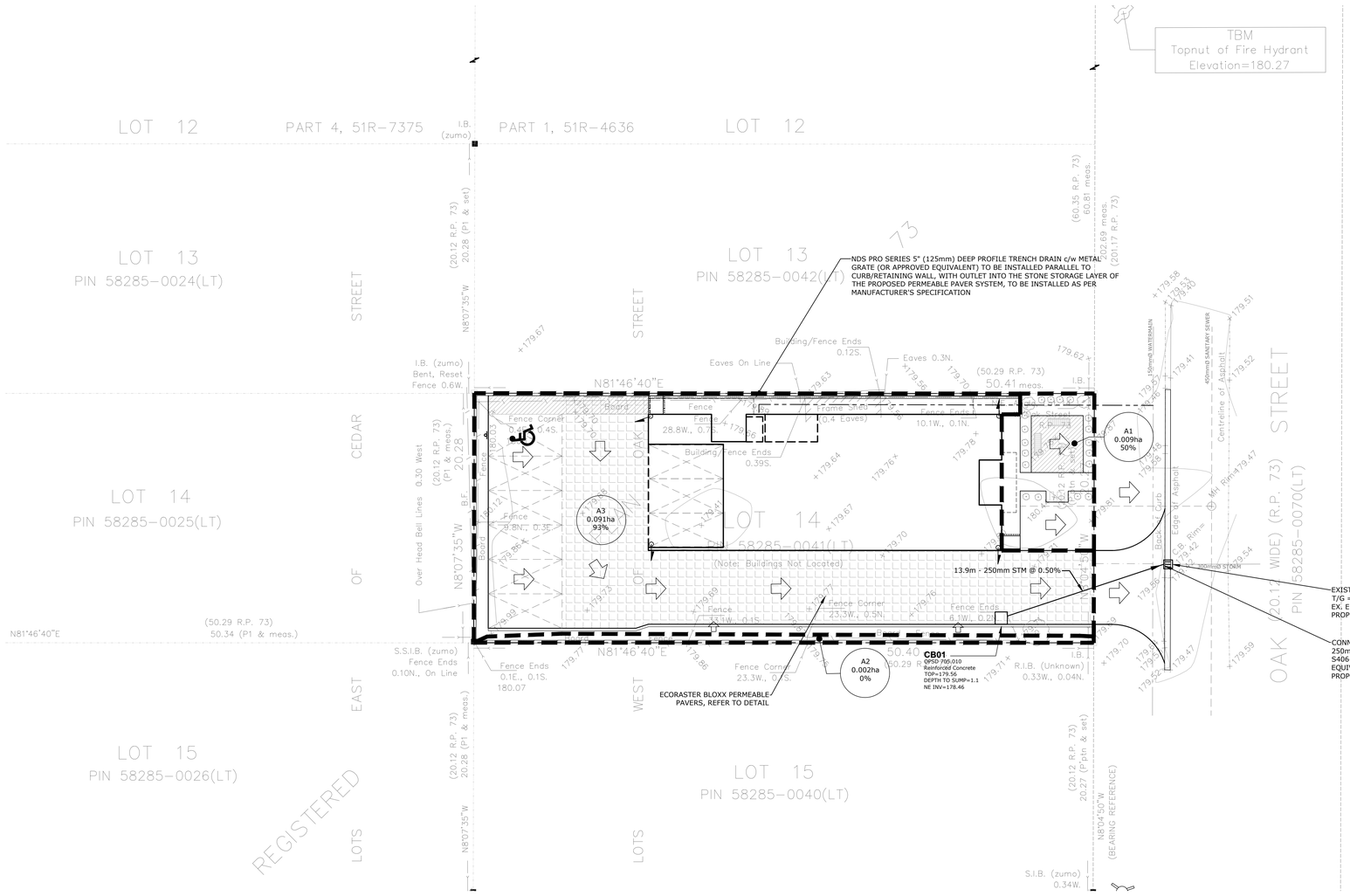
CAPES ENGINEERING
355310 BLUE MOUNTAINS - EUPHRASIA TOWNLINE
CLARKSBURG, ON N0H 1J0
WWW.CAPESENGINEERING.COM

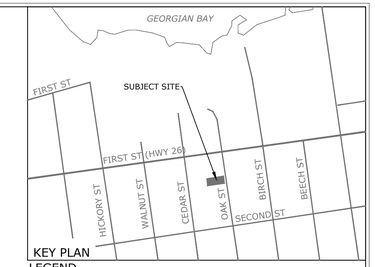
32 OAK STREET, TOWN OF COLLINGWOOD

EROSION AND SEDIMENT CONTROL PLAN

Designed	Checked	Date	Drawing No.
B. COLLINS	C. CAPES	20/10/29	C3
Project No. 2020-030		Rev No. 3	
Scale 1:200	0 4.0 8.0 12.0m		

File: C:\CE\Capes Engineering Dropbox\Projects\2020\2020-030 32 Oak Street Site Plan\Drawings\03_ProductionDwg\2020-030 ESC.dwg Date Plotted: March 14, 2023 - 9:33 AM





LEGEND

- EXISTING SANITARY SERVCE
- EXISTING WATER SERVCE
- SANITARY SERVCE
- WATER SERVCE
- SWALE
- BUILDING ENVELOPE
- ROOF LEADER DISCHARGE LOCATION
- S/P — SUMP PUMP DISCHARGE LOCATION TO SPLASH PAD, c/w AIR GAP
- TEST PIT LOCATION
- 3:1 SLOPING (MAXIMUM)
- EXISTING BELL BOX
- EXISTING CURB STOP
- EXISTING SANITARY CLEANOUT
- EXISTING TREE TO REMAIN
- EXISTING TREE TO BE REMOVED
- OVERLAND FLOW DIRECTION
- DWY BORDER 0.006ha 0% — SUBCATCHMENT NAME, AREA (ha) & % IMPERVIOUS

- DENOTES SET
- DENOTES FOUND
- S.I.B. DENOTES STANDARD IRON BAR
- I.B. DENOTES IRON BAR
- S.S.I.B. DENOTES SHORT STANDARD IRON BAR
- C.C. DENOTES CUT CROSS
- P.B. DENOTES PLASTIC BAR
- R.I.B. DENOTES ROUND IRON BAR
- wit DENOTES WITNESS
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- N, S, E, W DENOTES NORTH, SOUTH, EAST, WEST
- P'ptn DENOTES PROPORTION
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- P1 REFERS TO PLAN OF SURVEY BY ZUBEK, EMO, PATTEN & THOMSEN LTD., O.L.S., DATED AUGUST 17, 2001.

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LOT 14
WEST OF OAK STREET
REGISTERED PLAN 73
TOWN OF COLLINGWOOD
COUNTY OF SIMCOE

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3	REISSUED FOR APPROVALS	23/03/13

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LICENSED PROFESSIONAL ENGINEER
C/CAPES
100056104
MARCH 13, 2023
PROVINCE OF ONTARIO

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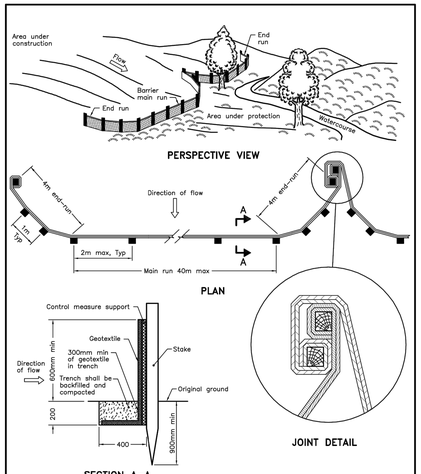
WWW.CAPESENGINEERING.COM

32 OAK STREET, TOWN OF COLLINGWOOD

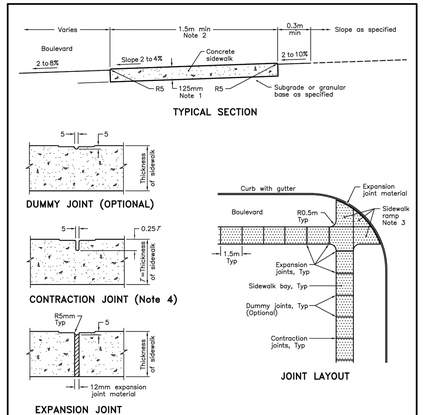
POST DEVELOPMENT DRAINAGE PLAN

Designed	Checked	Date	Drawing No.
B. COLLINS	C. CAPES	20/10/29	C4
Project No.		Rev No.	
2020-030		3	
Scale	0 4.0 8.0 12.0m		
1:200			



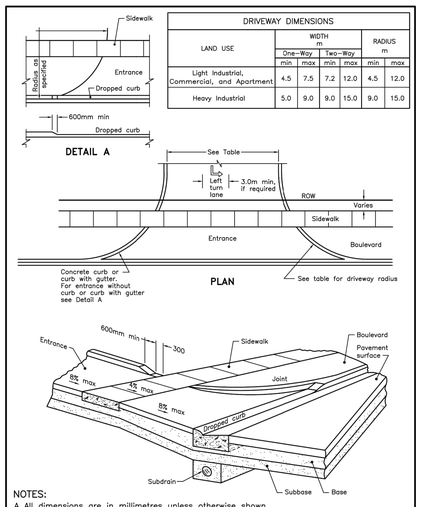
NOTE:
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 2
HEAVY–DUTY SILT FENCE BARRIER		OPSD 219.130



NOTES:
1 Sidewalk thickness at residential driveways and adjacent to curb shall be 150mm. At commercial and industrial driveways, the thickness shall be 200mm.
2 Sidewalk width shall be wider when specified.
3 This OPSD shall be read in conjunction with OPSD 310.030, 310.031, 310.033, and 310.039.
4 Contraction Joint may be tooled or sawcut.
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2019	Rev 3
CONCRETE SIDEWALK		OPSD 310.010



DRIVEWAY DIMENSIONS

LAND USE	WIDTH m				RADIUS m	
	One–Way		Two–Way			
	min	max	min	max	min	max
Light Industrial, Commercial, and Apartment	4.5	7.5	7.2	12.0	4.5	12.0
Heavy Industrial	5.0	9.0	9.0	15.0	9.0	15.0

NOTES:
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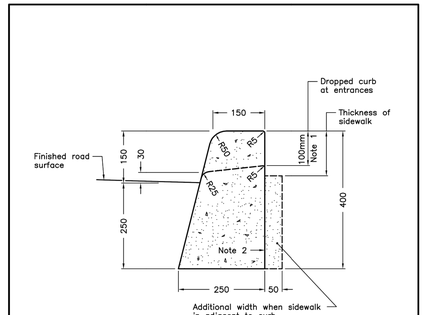
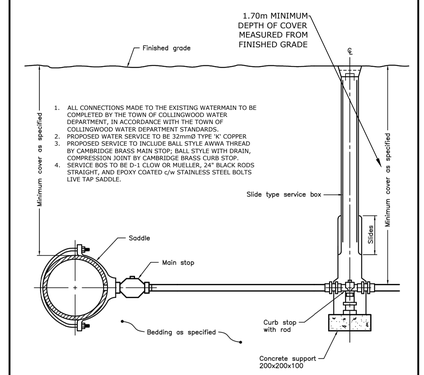
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2018	Rev 2
URBAN INDUSTRIAL, COMMERCIAL, AND APARTMENT ENTRANCES		OPSD 350.010



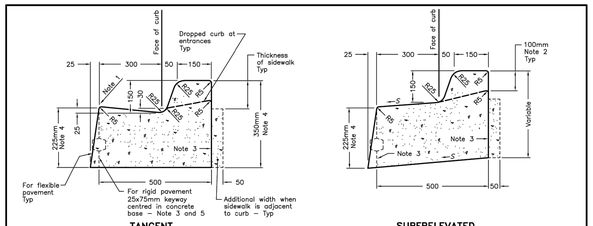
NOTES:
1 When sidewalk is continuously adjacent, the dropped curb at entrances shall be reduced to 75mm.
2 For slipforming procedure a 5% batter is acceptable.
A Treatment at entrances shall be according to OPSD 351.010.
B Outlet treatment shall be according to the OPSD 610 Series.
C The transition from one curb type to another shall be a minimum length of 3.0m, except in conjunction with guide rail where it shall be according to the OPSD 900 Series.
D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev 2
CONCRETE BARRIER CURB		OPSD 600.110



NOTES:
A Couplings shall not be permitted unless the service length exceeds 20m between the main stop and curb stop.
B All water services shall be installed 90° to the longitudinal axis of the watermain.
C Backfill material within 500mm of service box shall be native or imported, as specified.
D All dimensions are in millimetres unless otherwise shown.

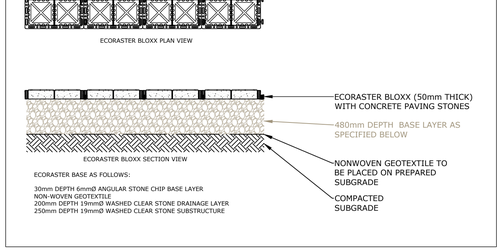
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2018	Rev 3
WATER SERVICE CONNECTION 32, 38, and 50mm DIAMETER SIZES		OPSD 1104.020

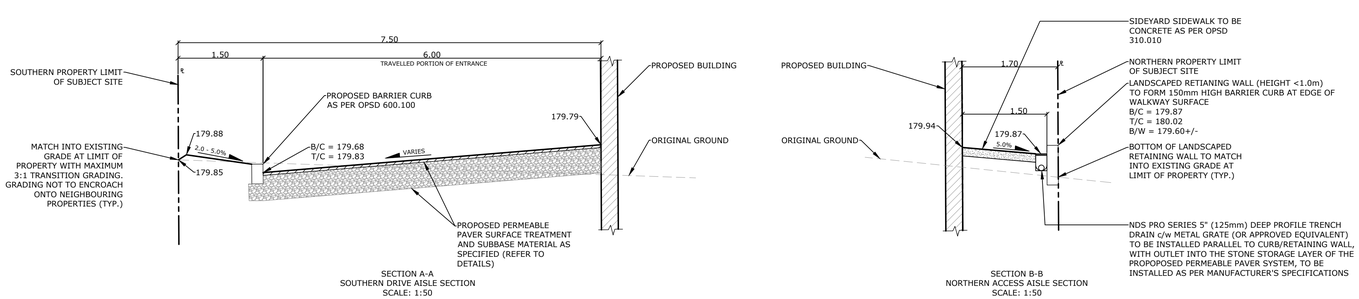


LEGEND:
S – Rate of pavement superelevation in percent, %.

NOTES:
1 Flexible and composite pavement shall be placed 5mm above the adjacent edge of gutter.
2 When sidewalk is continuously adjacent, the dropped curb at entrances shall be reduced to 75mm.
3 For slipforming procedure a 5% batter is acceptable.
4 For composite pavement the depth of concrete curb shall be adjusted to depth of concrete pavement.
5 When tie bars are specified, refer to OPSD 552.010 and 552.020 for details.
A Treatment at entrances shall be according to OPSD 351.010.
B Outlet treatment shall be according to the OPSD 610 Series.
C The transition from one curb type to another shall be a minimum length of 3.0m, except in conjunction with guide rail where it shall be according to the OPSD 900 Series.
D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev 2
CONCRETE BARRIER CURB WITH STANDARD GUTTER		OPSD 600.040





GEOTECHNICAL NOTES:
1. The topsoil and weathered native soils encountered in the test pits are not suitable for conventional strip and spread footing foundations. Proposed strip and spread footing foundations must extend to and be founded on the native soil deposits with compact relative density or directly to the bedrock. Proposed strip and spread footing foundations may be designed as follows:
- On soil (the sand or glacial till deposit) using a maximum geotechnical reaction at SLS of 75 kPa for a maximum of 25 mm of settlement. The factored geotechnical resistance at ULS is 115 kPa.
- On bedrock using a maximum geotechnical reaction at SLS of 200 kPa (no appreciable settlement will occur). The factored geotechnical resistance at ULS is 300 kPa.

2. It is recommended that footings either be set uniformly on soil or uniformly on bedrock. Where foundations straddle both soil and bedrock, the strain incompatibility (i.e. bedrock does not settle whereas soil has some settlement) can increase the risk for foundation wall cracking. The minimum strip footing widths to be used shall be dictated as per the Ontario Building Code, regardless of loading considerations. Footings stepped from one level to another must be at a slope not exceeding 7 vertical to 10 horizontal. Foundations exposed to ambient air temperature throughout the year must be provided with a minimum of 1.4 metres of earth cover for frost protection.
3. Prior to pouring concrete for the footings, the footing subgrade must be cleaned of deleterious materials, softened, disturbed, or caved materials, and any standing water. During the excavation and construction of the footings CEE should be retained to inspect the founding base to ensure the subgrade has been properly prepared and that the integrity of the founding soil has been maintained. Soils tend to weather and deteriorate on exposure to the atmosphere or to surface water, therefore foundation bases that will remain open and exposed to the atmosphere for an extended period shall be protected by applying a skim coat of lean concrete. If construction is to proceed in freezing conditions, temporary frost protection for the footing bases and concrete must be provided. Construction traffic should be prohibited from travelling over the exposed subgrade.
4. A lightly loaded unreinforced concrete slab can be constructed at this site provided the subgrade is stripped of all topsoil and does not contain any significantly weathered or soft soils, or soils that contain a high percentage of organics. The backfill to raise the sub-excavation back to underside of concrete slab should be placed in maximum 200 mm thick loose lifts and compacted to a minimum of 95% Standard Proctor Maximum Dry Density. To achieve adequate compaction, backfill material should be placed within ±2% of optimum moisture content. In addition, it is recommended that the soil used to bring the soil up to the base of the slab should consist of Select Subgrade Material if possible (cohesionless silty sand to gravelly sand type soil). It is necessary that the floor slabs be provided with a capillary moisture barrier and drainage layer. This is made by placing the slab on a minimum 200 mm layer of clear stone compacted by vibration to a dense state. The upper 50 mm of clear stone can be replaced with 19 mm crusher run limestone for a working surface.
Perimeter and under-slab drainage at the foundation level is not required, provided that the underside of concrete slab is at least 200 mm above the prevailing grade of the site and the surrounding surfaces slope away from the building at a gradient of at least 2% to promote surface water run-off and to reduce groundwater infiltration adjacent to foundations. To minimize infiltration of surface water onto the foundation wall, the upper 150 mm of backfill could comprise compacted relatively impervious soil material.
5. A review of the test pit data in the proposed driveway and parking areas indicates that the pavement subgrade will consist of a native sand with a generally compact relative density. The subgrade must be exposed by the removal of any vegetation, topsoil, existing pavements structures or disturbed soil. The pavement subgrade should be proof-rolled and inspected by the geotechnical engineer. Any loose, soft, wet or unstable areas must be sub-excavated and backfilled with clean, approved and compacted earth fill and compacted to a minimum of 95% SPMDD.
6. The industry pavement design methods are based on a design life of 15 to 20 years for typical weather conditions depending on actual traffic volumes. The following pavement thickness design is provided on the above noted considerations and subgrade basis for an asphaltic concrete pavement structure:
Surface Course Asphaltic Concrete:
Minimum 40 mm thick HL-3 (OPSS 1150) with PG 58-28 Asphalt Cement (OPSS.MUNI 1101) Compacted per OPSS 310
Binder Course Asphaltic Concrete:
Minimum 50 mm thick HL-8 (OPSS 1150) with PG 58-28 Asphalt Cement (OPSS.MUNI 1101) Compacted per OPSS 310
Base Course:
Minimum 150 mm Granular A (OPSS.MUNI 1010) 100% Standard Proctor Maximum Dry Density (ASTM-D698)
Subbase Course:
Minimum 300 mm Granular B (OPSS.MUNI 1010) Compacted to 100% Standard Proctor Maximum Dry Density (ASTM-D698)
7. The granular materials must be compacted to a minimum of 100% SPMDD. Asphalt materials should be rolled and compacted as per OPSS 310. The granular and asphalt pavement materials and their placement should conform to OPSS 310, 501, 1010 and 1150.
8. If the pavement construction occurs in wet, winter or inclement weather, it may be necessary to provide additional subgrade support for heavy construction traffic by increasing the thickness of the granular subbase, base or both. Further, traffic areas for construction equipment may experience unstable subgrade conditions. These areas may be stabilized utilizing additional thickness of granular materials.
9. It should be noted that in addition to adherence of the above pavement design recommendations, a close control on the pavement construction process will also be required in order to obtain the desired pavement life. Therefore, it is recommended that regular inspection and testing should be conducted during the pavement construction to confirm material quality, thickness, and to ensure adequate compaction.

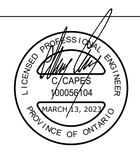
No	Revision	Date
1	ISSUED FOR APPROVALS	20/11/13
2	REISSUED FOR APPROVALS	22/08/24
3	REISSUED FOR APPROVALS	23/03/13

BENCH MARK

ELEVATIONS HEREON ARE GEODETIC AND ARE REFERRED TO THE GEODETIC MONUMENT No. 72U313 HAVING AN ELEVATION OF 179.633 METRES (CGVD 28:78).

NOTE:

LEGAL AND TOPOGRAPHIC SURVEY INFORMATION PROVIDED BY THE OWNER, PREPARED BY ZUBEK, EMO, PATTEN & THOMSEN LTD. THIS PLAN DOES NOT ATTEMPT TO REPLICATE OR INTERPRET THE PLAN OF SURVEY PREPARED, AND DOES NOT CONSTITUTE A PLAN OF SURVEY



Client
32 OAK STREET INC.
32 OAK STREET
COLLINGWOOD, ON
L9Y 2X6

32 OAK STREET, TOWN OF COLLINGWOOD

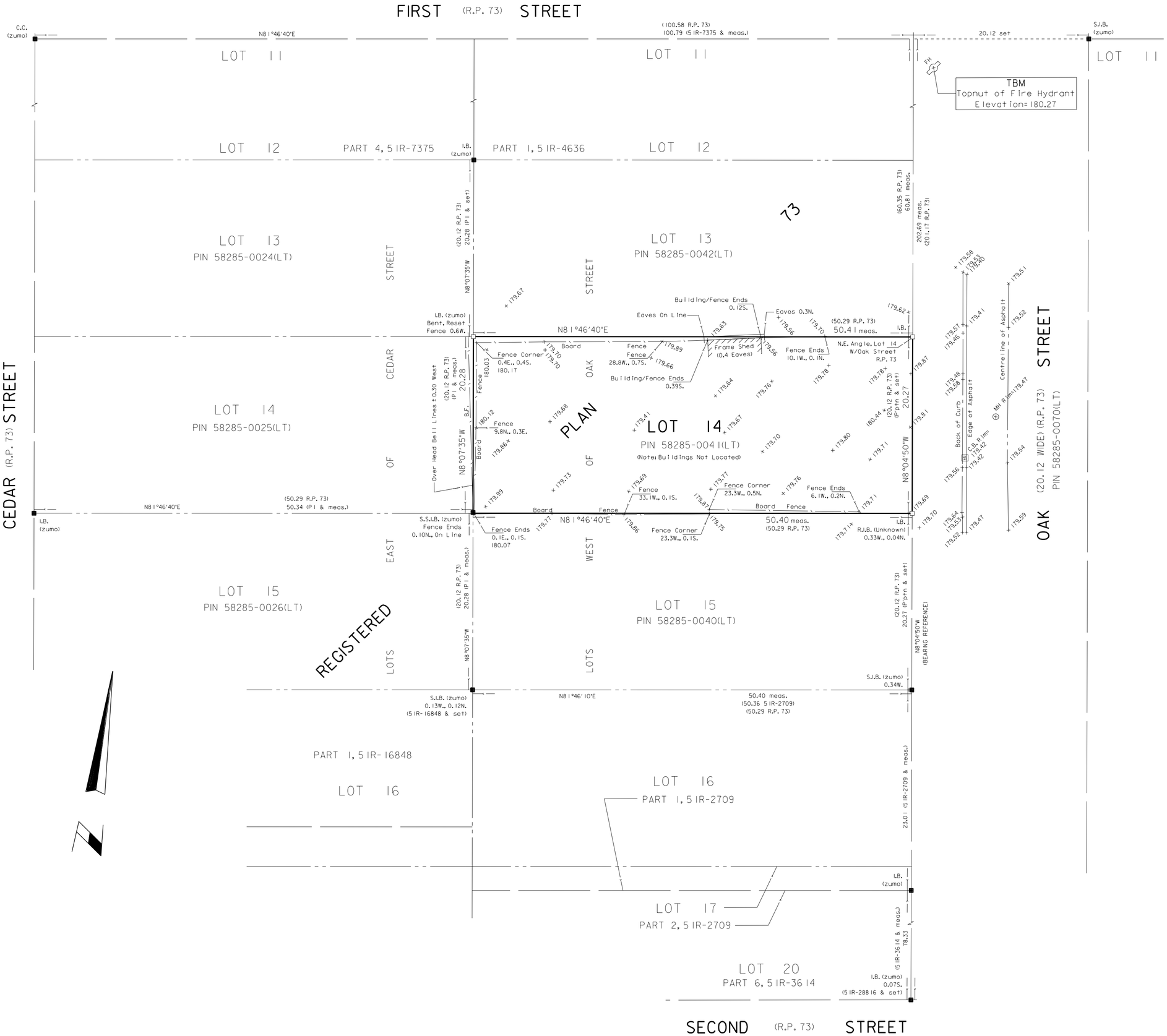
STANDARD DETAILS

CAPES ENGINEERING
355310 BLUE MOUNTAINS - EUPHRASIA TOWNLINE
CLARKSBURG, ON N0H 1J0
WWW.CAPESENGINEERING.COM

Designed	Checked	Date	Drawing No.
B. COLLINS	C. CAPES	20/10/29	C5
Project No. 2020-030		Rev No. 3	
Scale NOT TO SCALE			

Appendices

Appendix A – Legal Plan



PLAN OF SURVEY AND TOPOGRAPHICAL PLAN OF LOT 14 WEST OF OAK STREET REGISTERED PLAN 73 TOWN OF COLLINGWOOD COUNTY OF SIMCOE

SCALE 1:300

0 1 2 3 4 5 6 12 METRES

METRIC

DISTANCES ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

NOTES

BEARINGS HEREON ARE ASTRONOMIC AND ARE REFERRED TO THE BEARING OF THE WESTERLY LIMIT OF OAK STREET BEING N8°04'50"W IN ACCORDANCE WITH PLAN 5 IR-2709.

- ⊕ DENOTES SET
- ■ DENOTES FOUND
- ⊕ S.I.B. DENOTES STANDARD IRON BAR
- ⊕ I.B. DENOTES IRON BAR
- ⊕ S.S.I.B. DENOTES SHORT STANDARD IRON BAR
- ⊕ C.C. DENOTES CUT CROSS
- ⊕ P.B. DENOTES PLASTIC BAR
- ⊕ R.I.B. DENOTES ROUND IRON BAR
- wit DENOTES WITNESS
- meas. DENOTES MEASURE
- R.P. DENOTES REGISTERED PLAN
- N. S. E. W. DENOTES NORTH, SOUTH, EAST, WEST
- P'ptn DENOTES PROPORTION
- CB DENOTES CATCH BASIN
- MH DENOTES SANITARY MANHOLE
- FH DENOTES FIREHYDRANT
- P1 REFERS TO PLAN OF SURVEY BY ZUBEK, EMO, PATTEN & THOMSEN LTD., O.L.S., DATED AUGUST 17, 2001.

CAUTION

UNDERGROUND SERVICES WERE NOT LOCATED AND MUST BE VERIFIED ON SITE PRIOR TO EXCAVATION.

BENCH MARK

ELEVATIONS HEREON ARE GEODETIC AND ARE REFERRED TO THE GEODETIC MONUMENT No. 72U313 HAVING AN ELEVATION OF 179.633 METRES (CGVD 28:78).

THIS REPORT WAS PREPARED FOR 32 OAK STREET INC. AND THE UNDERSIGNED ACCEPTS NO RESPONSIBILITY FOR USE BY OTHER PARTIES

NOTE

NO ADDITIONAL PRINTS OF THIS REPORT CAN BE ISSUED FROM THIS OFFICE WITHOUT A FIELD EXAMINATION AND UPDATING OF THE PLAN

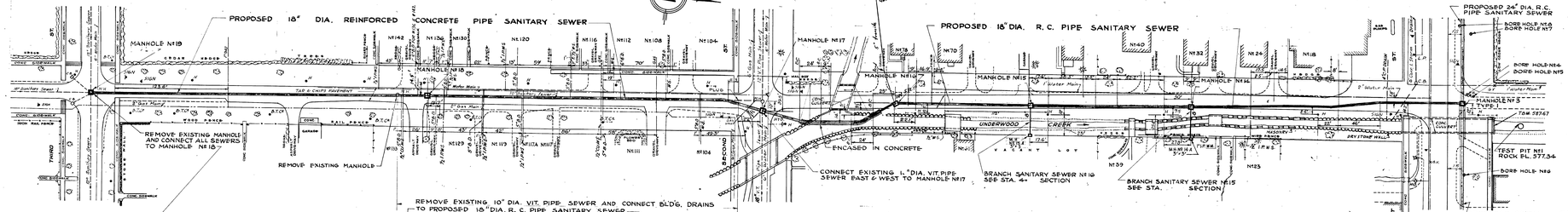
ZUBEK, EMO
PATTEN & THOMSEN LIMITED
ONTARIO LAND SURVEYORS
200 MOUNTAIN ROAD
UNIT 4
COLLINGWOOD, ONTARIO L9Y 4V5
PHONE: (705) 445-4910

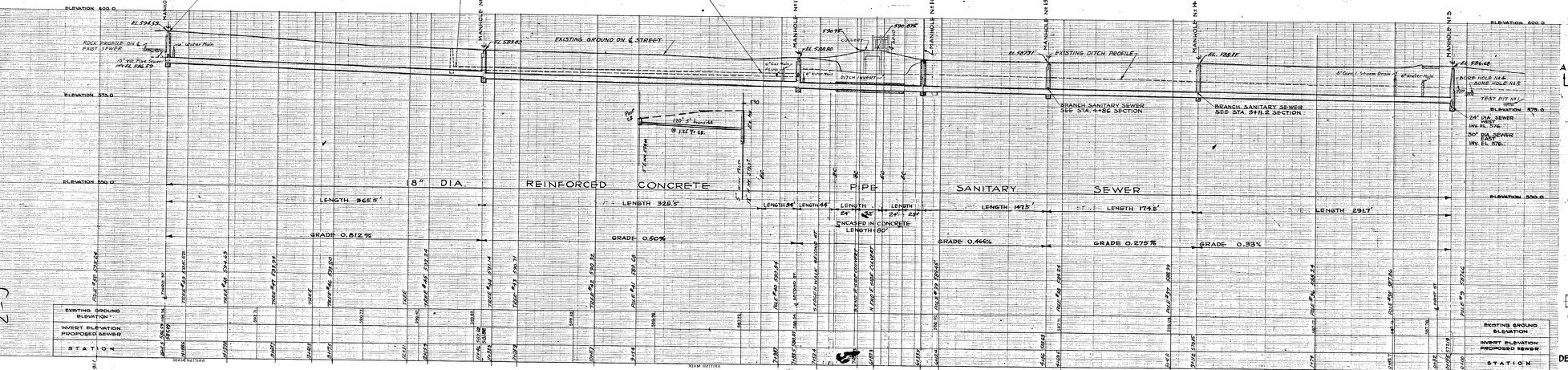
JOB No. B73-14-10 SURVEY FOR: 32 OAK STREET INC.

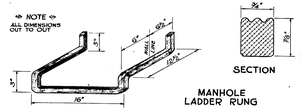
DGN FILE=C:\DGN\ 2020-DC\ B73-14-10pst.DGN

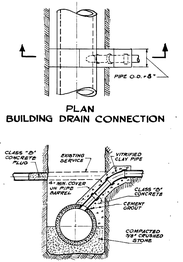
Appendix B – Record Drawings

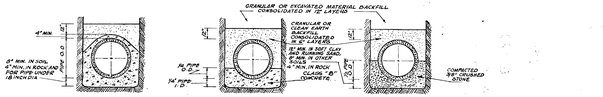
OAK STREET

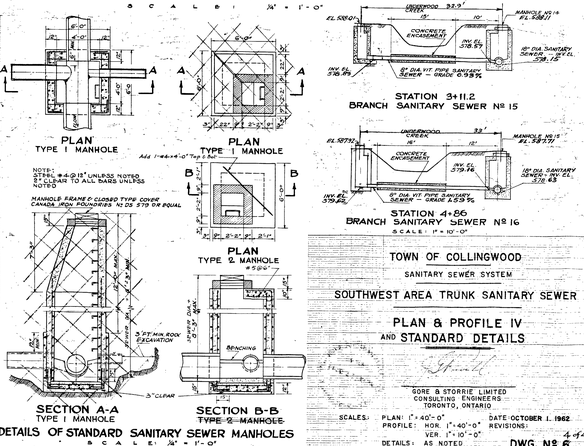












TOWN OF COLLINGWOOD

SANITARY SEWER SYSTEM

SOUTHWEST AREA TRUNK SANITARY SEWER

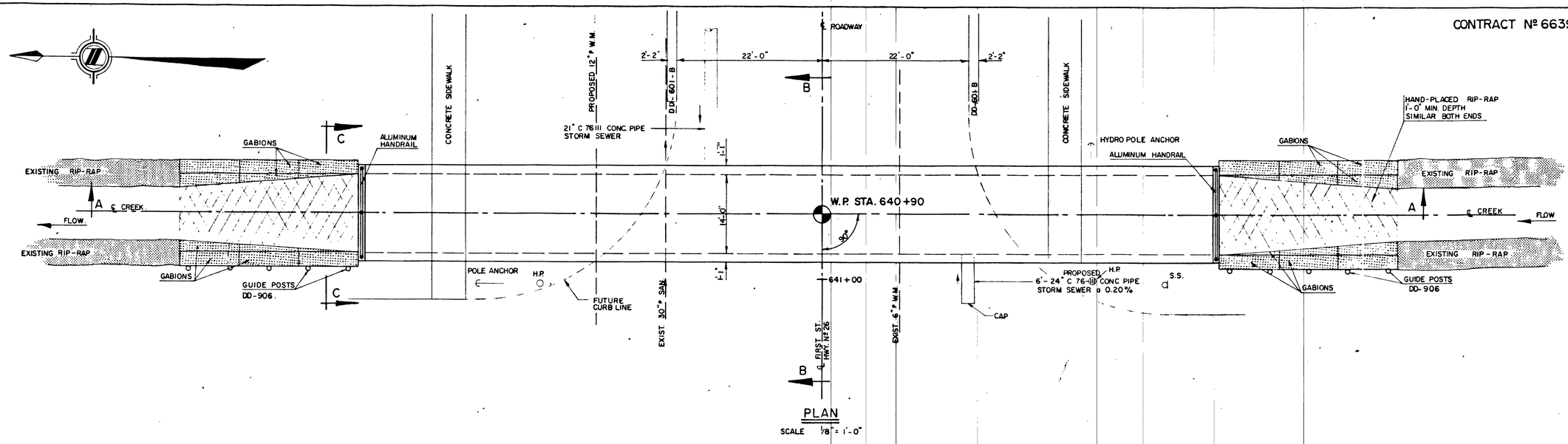
PLAN & PROFILE IV AND STANDARD DETAILS

GORE & STORRIE LIMITED
CONSULTING ENGINEERS
TORONTO, ONTARIO

SCALES: PLAN 1"=40'-0" DATE OCTOBER 1, 1962
PROFILE: HOR. 1"=40'-0" REVISIONS:
VER. 1"=10'-0"
DETAILS: AS NOTED DWG. Nº 6
REVISED AS CONSTRUCTED MARCH 10 1964

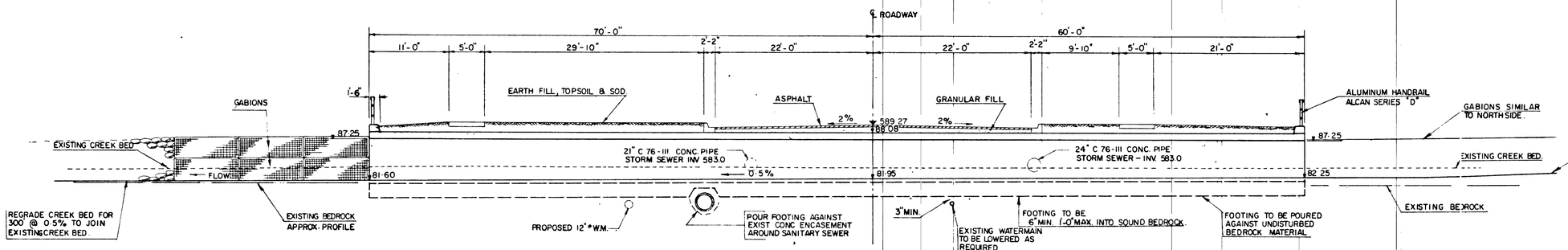
FILE Nº 109-12-P-663

CONTRACT Nº 6639



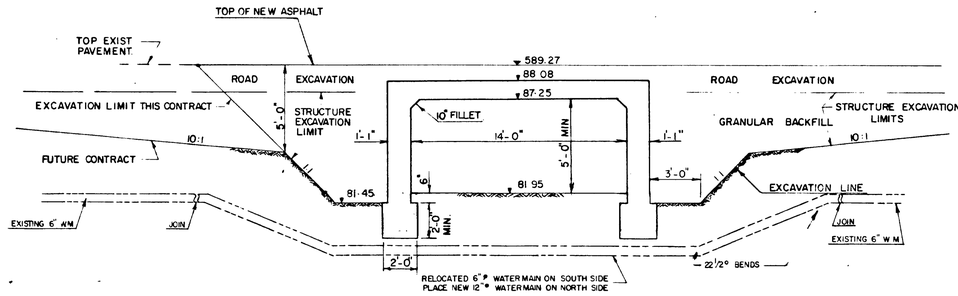
PLAN

SCALE 1/8" = 1'-0"



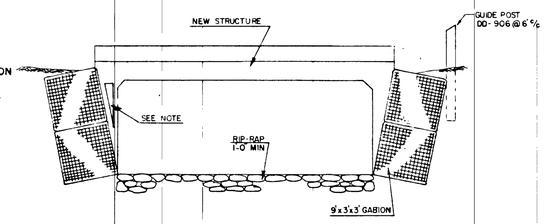
SECTION A-A

SCALE 1/8" = 1'-0"



SECTION B-B

SCALE 1/4" = 1'-0"



SECTION C-C (GABION DETAILS)

SCALE 1/4" = 1'-0"

NOTES: MAXIMUM BATTER 1:1
MINIMUM BATTER TO CONFORM TO EXISTING SLOPE AT DOWNSTREAM END
GABIONS TO BE 9'x 3'x 3' FROST GABIONS AND STONE FILLED.
COMPACTED EARTH BACKFILL BEHIND GABIONS

NOTE:

1. CONCRETE COVER FOR REINFORCING STEEL SHALL BE 3" CLEAR, EXCEPT AS NOTED
2. ALL EXPOSED CORNERS TO HAVE 1"x 1" CHAMFER, EXCEPT AS NOTED
3. DESIGN LOAD ON DECK H20, S16 TRUCK LOAD AND 15" (MAX) GRANULAR FILL
4. REINFORCING STEEL SHALL BE HIGH BOND, HARD GRADE RAIL OR BILLET STEEL
5. STRUCTURE TO BE BUILT ACCORDING TO OHO FORM 9, LATEST REVISION, AND THE ENGINEERS SPECIFICATIONS
6. CONCRETE TO BE 3000 PSI AT 28 DAYS
7. FILL BEHIND ABUTMENTS TO BE PLACED SIMULTANEOUSLY BEHIND BOTH ABUTMENTS

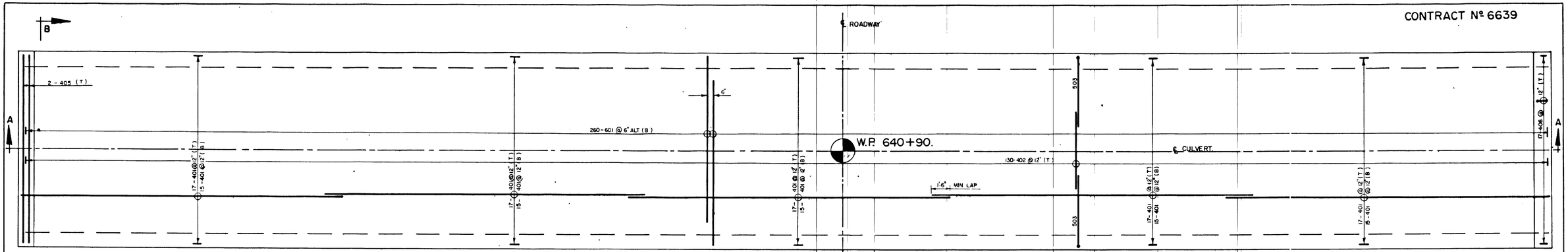
REGISTERED PROFESSIONAL ENGINEER P. W. AINLEY

REGISTERED PROFESSIONAL ENGINEER CIVIL W. M. TROTTER PROVINCE OF ONTARIO

TOWN OF COLLINGWOOD	
CULVERT AT OAK STREET FIRST STREET CONNECTING LINK	
GENERAL ARRANGEMENT	
AINLEY and ASSOCIATES Ltd. Consulting Engineers COLLINGWOOD	
DESIGN W.M.T.	CHECKED P.W.A.
DRAWN A.Y.	DATE DEC., 1967
	Dwg. Nº 6788-1

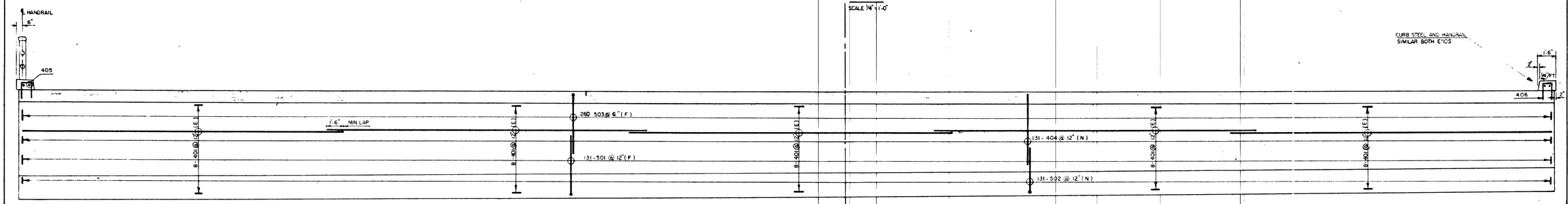
DBR-0401

CONTRACT Nº 6639



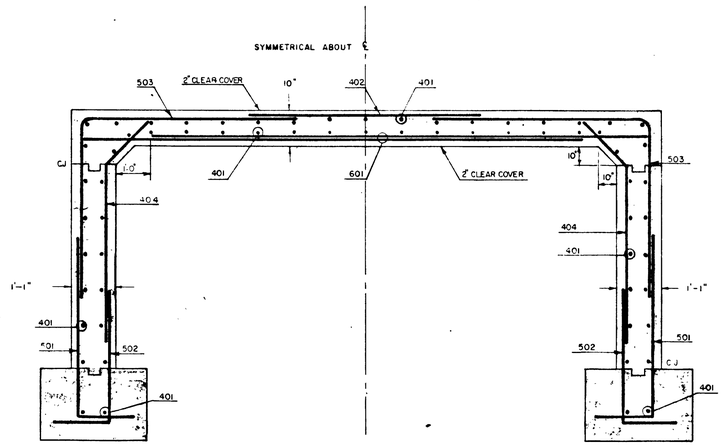
PLAN

SCALE 1/4" = 1'-0"



SECTION A-A

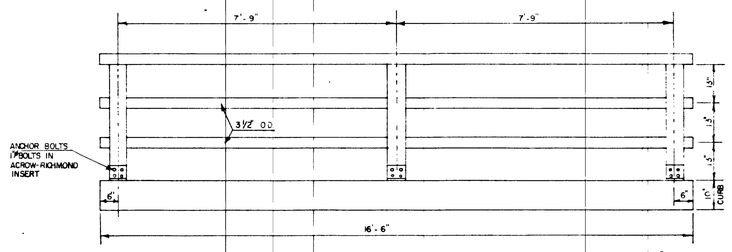
SCALE 1/4" = 1'-0"



SECTION B-B

SCALE 1/2" = 1'-0"

NOTE
FOR PLACEMENT OF STORM SEWERS IN WALL OF STRUCTURE, HORZ STEEL TO BE CUT, VERT STEEL TO BE DISPLACED LATERALLY



HANDRAIL DETAIL

SCALE 1/2" = 1'-0"
(ALCAN ALUMINUM RAILING SERIES "D")

(N)	DENOTES	NEAR	FACE
(F)	"	FAR	"
(B)	"	BOTTOM	"
(T)	"	TOP	"
(E)	"	EACH	"
ALT	"	ALTERNATING	
C J	"	CONSTRUCTION JOINT	

NOTE
- CULVERT TO BE CONSTRUCTED IN MINIMUM OF 4 SECTIONS, MAXIMUM LENGTH 35 FEET
- VERTICAL C J TO BE SIMILAR TO HORIZONTAL AS SHOWN ON SECTION B-B
- APPROXIMATE WEIGHT OF REINFORCING STEEL, 12.3 TONS

REVISED MAY 29, 1968.

P W AINLEY — CIVIL

A W HUNTER — CIVIL

TOWN OF COLLINGWOOD

CULVERT AT OAK STREET
FIRST STREET CONNECTING LINK

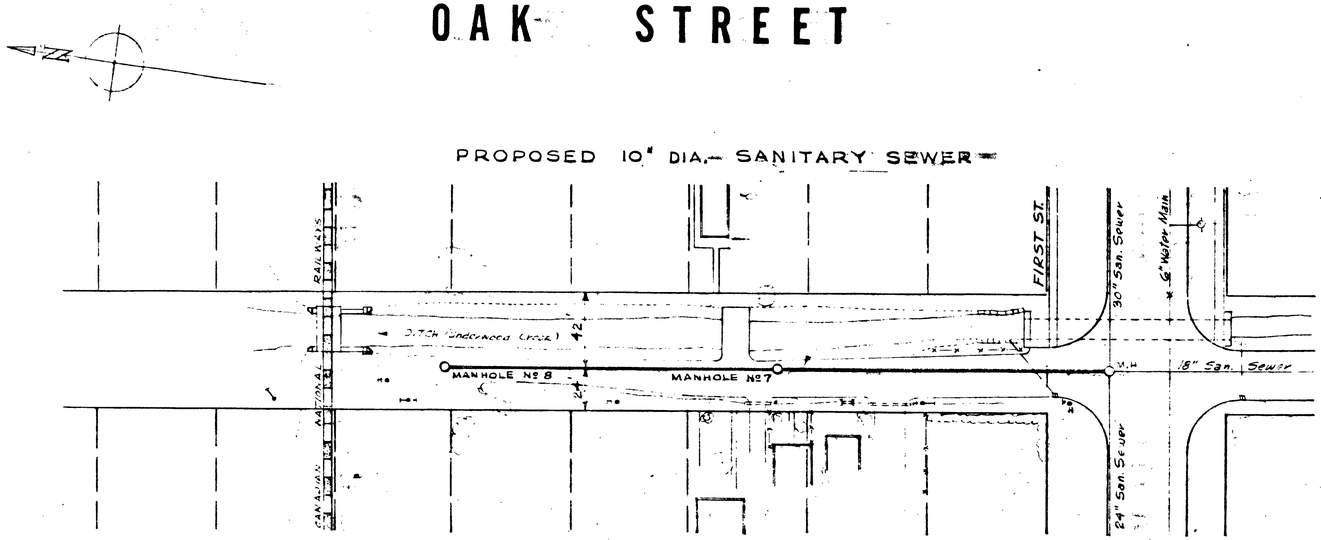
REINFORCING & HANDRAIL DETAILS

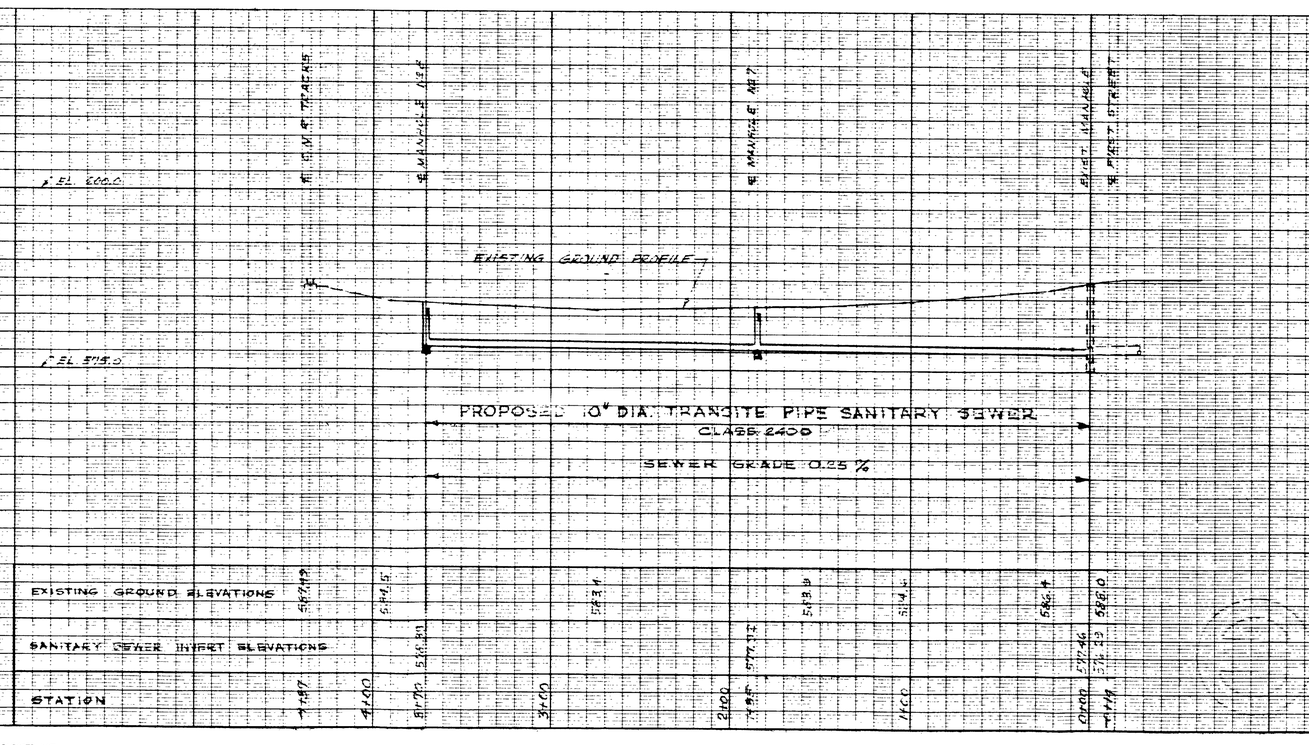
AINLEY and ASSOCIATES Ltd.
Consulting Engineers
COLLINGWOOD

DESIGN W.M.T.	CHECKED P.W.A.	Dwg. Nº 6788-2
DRAWN A.Y.	DATE DEC., 1967	

DBR-0402

OAK STREET





TOWN OF COLLINGWOOD
WORKS DEPARTMENT

PROPOSED SANITARY SEWER ON OAK STREET

GORE & STORRIE LIMITED
CONSULTING ENGINEERS
TORONTO

SCALES: HOR. 1"=40'
VERT. 1"=10'

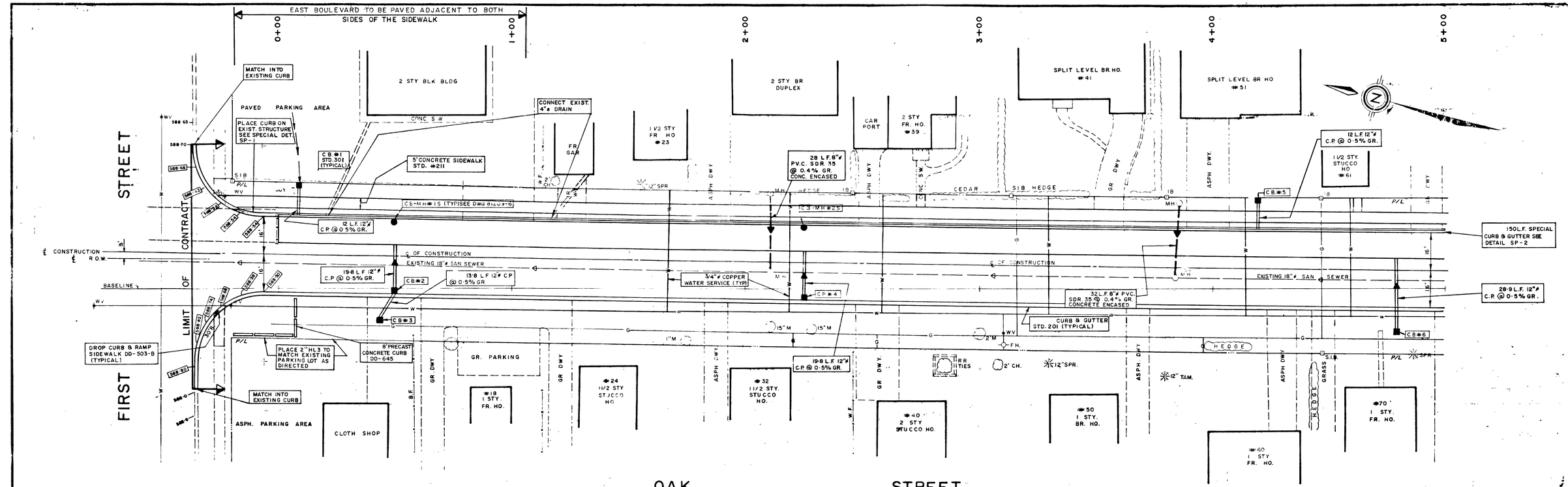
DATE DEC. 1970

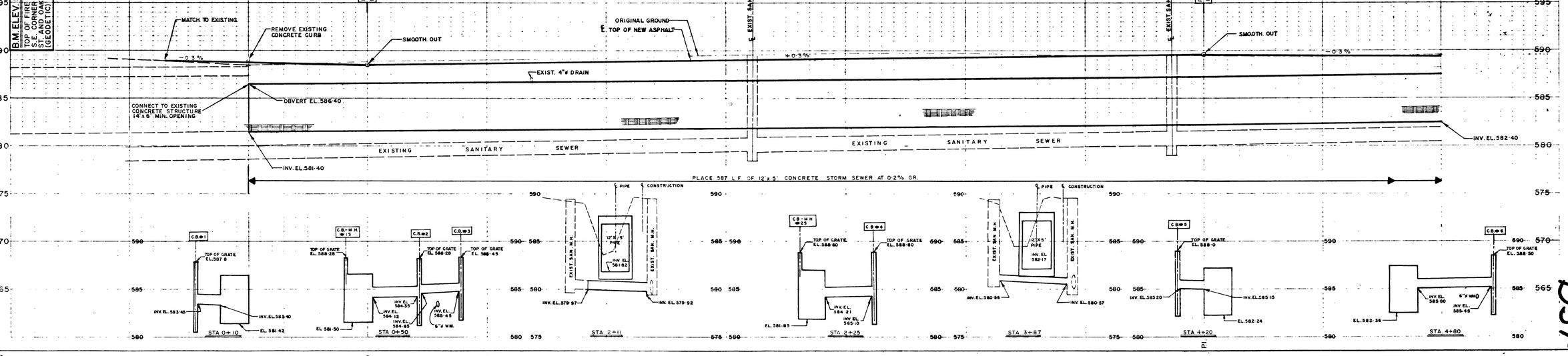
DWG. No 4

FILE 109.59-D-10896

DSA 1501

59





℄ ASPHALT GRADES		588.86	588.75	588.60	588.75	588.90	589.05	589.20	589.35	589.50	589.65	589.65	589.50	589.35							
EXISTING GRADES	589.2	589.9	588.5	589.9	589.0																
CHAINAGE	0+59	0+35	0+00	+50	1+00	+50	2+00	+50	3+00	+50	4+00	+50	5+00								

Notes
1. ▨ DENOTES APPROXIMATE LOCATION OF ROCK.
2. LOCATION OF EXISTING UTILITIES IS APPROX ONLY
3. ALL CONC. PIPE TO BE CSA A257.2 CLASS III
4. PIPE BEDDING TO BE CLASS B-3, NATIVE BACKFILL
5. FINAL TOP OF GRATE ELEV. TO BE DETERMINED IN THE FIELD
6. P.U.C. REQUIRE 12" MIN. CLEARANCE BETWEEN WM. & NEW STRUCTURES
7. HYDRO POLES TO BE RELOCATED BY OTHERS
8. RELOCATE STREET SIGNS AS DIRECTED
9. WHERE COVER OVER W.M. IS REDUCED STYROFOAM SM SHALL BE PLACED
10. BARRIER CURB SHALL BE DEPRESSED AT DRIVEWAYS
: COMMERCIAL - 30' OR WIDTH OF EXIST. MAX.
: RESIDENTIAL - 16' OR WIDTH OF EXIST. MAX.
11. ▨ DENOTES AREA OF CLEARING & GRUBBING
12. PAVE DWYS. TO P/L WITH 2" HL 4
13. 588-7 DENOTES EXISTING EDGE OF PAVEMENT ELEVATION.
588-66 DENOTES NEW EDGE OF PAVEMENT ELEVATION

No.		DATE	BY
1	AS CONSTRUCTED	DEC./82.	D.J.W/L.G.B

Approved
REGISTERED PROFESSIONAL ENGINEER
T. M. PROKOPEC
PROVINCE OF ONTARIO

TOWN OF COLLINGWOOD
OAK STREET STORM SEWER
PLAN and PROFILE

Ainley and Associates Ltd.
Consulting Engineers and Planners
Collingwood — Barrie — Belleville — Midland

SCALE HORZ. 1" = 20'
VERT. 1" = 5'
DESIGN G.A.K. CHECKED L.Y.
DRAWN L.G.B. DATE MAY 1982
DWG. No 81209 - 1

DST-1301

Notes:

1. [rock hatching] DENOTES APPROXIMATE LOCATION OF ROCK.
2. LOCATION OF EXISTING UTILITIES IS APPROX ONLY
3. ALL CONC. PIPE TO BE CSA A257.2 CLASS III
4. PIPE BEDDING TO BE CLASS B-3, NATIVE BACKFILL
5. FINAL TOP OF GRATE ELEV TO BE DETERMINED IN THE FIELD.
6. P.U.C. REQUIRE 12" MIN CLEARANCE BETWEEN WM. & NEW STRUCTURES
7. HYDRO POLES TO BE RELOCATED BY OTHERS
8. RELOCATE STREET SIGNS AS DIRECTED
9. WHERE COVER OVER WM. IS REDUCED STYROFOAM SM SHALL BE PLACED
10. BARRIER CURB SHALL BE DEPRESSED AT DRIVEWAYS
    : COMMERCIAL - 30' OR WIDTH OF EXIST MAX.
    . RESIDENTIAL - 16' OR WIDTH OF EXIST MAX
11. [X X X] DENOTES AREA OF CLEARING & GRUBBING

No.	Revision	Date	By
3	AS CONSTRUCTED	Dec 82	D.J.W.
2	REVISION TO S/W and CURBS AT INTERS.	Sept 82	[illegible]
1	Box Culvert Extension	[illegible]	[illegible]

REGISTERED PROFESSIONAL ENGINEER — T. M. PROKOPEC — PROVINCE OF ONTARIO

TOWN OF COLLINGWOOD

OAK STREET STORM SEWER

PLAN and PROFILE

Ainley and Associates Ltd.

G.A.K. L.Y.

MAY, 1982

8.209 2

BSP 1302

Appendix C – Geotechnical Report

October 8, 2020 Project No. 20-1200A

32 Oak Street Inc.

Attn: Robert Cimetta & Monica Schnarre

RE: Geotechnical Test Pit Investigation
32 Oak Street
Collingwood, Ontario

Dear Mr. Cimetta & Ms. Schnarre,

It is proposed to construct a slab-on-grade 3-storey commercial/residential building at the above noted address. A site location plan is provided as Figure 1.

On September 22nd, 2020 a representative of our technical staff visited the site to observe the existing soil and ground water conditions within two test pit excavations, advanced using an excavator provided by CEE, to determine the suitability of the native soil for foundations and infiltration. The location of Test Pit #1 was at the northwest corner of the proposed building and the second was located at the northeast corner of the proposed building. Soil samples were obtained from the test pits to determine the infiltration rate in support of the design of low impact development measures. The approximate test pit locations are provided in Figure 2.

Introduction & Scope of Work

The property is bounded by residential properties to the west, north and south with Oak Street to the east. The property is rectangular in shape and is approximately 50 metres long (east to west) and 20 metres wide (north to south). The property currently contains a single-family dwelling with a detached garage, with the remainder of the lot consisting of manicured lawns and mature trees. Based on survey information provided to CEE the study area is generally flat.

As part of the test pit investigation CEE noted the competency of the soils as well as observations pertaining to existing ground water conditions. This information enabled CEE to provide geotechnical recommendations including geotechnical design parameters for foundations.

Site and Test Pit Observations

A detailed breakdown of the results of each test pit is provided in the table below. Photographs of each test pit are also enclosed.

	Test Pit #1	Test Pit #2
GPS Coordinates	N: 4927846 E: 561601	N: 4927848 E: 561570
Stratigraphy Encountered	0.0 to 0.4m – Topsoil, roots 0.4m to 1.8m – NATIVE – Brown Sand, trace fines, inferred compact, moist, becoming wet with depth. 1.8m to 1.9m – NATIVE – Grey Silty Sand Glacial Till, some gravel, trace clay, inferred compact, moist. 1.9m – BEDROCK	0.0 to 0.2m – Topsoil, roots 0.2m to 1.7m – NATIVE – Brown Sand, trace fines, inferred compact, moist, becoming wet with depth. 1.7m to 2.0m – NATIVE – Grey Silty Sand Glacial Till, some gravel, trace clay, inferred compact, moist. 1.9m – BEDROCK at south side of test pit as deep as 2.2m at the north side of the test pit
Geodetic Elevation*	179.69 metres	179.60 metres
Ground Water and Caving Conditions	No free water observed and no caving	Minor Seepage observed at the interface of the sand and glacial till. Minor caving observed

*Top of manhole (in front of 32 Oak Street) was used as benchmark with a geodetic elevation of 179.47 metres.

Inferred consistency or relative density of the soil strata was determined based on tactile probing of the material, and in the case of cohesive soils, based on the results of pocket penetrometer readings. A 19 mm diameter piezometer was installed in each of the test pits which was screened from the base of the test pit (at the bedrock surface) to approximately 1 metre above the base of the test pit excavation.

Ground Water and Infiltration Rate

Upon completion of the excavation of the test pits, no ground water seepage was encountered in Test Pit #1 while minor seepage was observed in Test Pit #2. There was no appreciable caving of the sidewalls in either of the test pits. To confirm the depth and elevation of the prevailing groundwater, 19 mm diameter piezometers were installed in each of the test pits. Stabilized ground water elevations were taken on September 29th, 2020. The below table shows the ground water data recorded.

Monitoring Well	Ground Surface Elev. (m)	Ground Water Level on September 29, 2020	
		Depth (m)	Elev. (m)
TP 1	179.69	1.67	178.02
TP 2	179.60	1.57	178.03

Soil samples were taken from the different strata found during the test pit investigation. Two samples were tested in our laboratory for grain size determination. The fist sample tested was from Test Pit #1 at approximately 1.8 metres below existing grade within the silty sand glacial till deposit and in Test Pit #2 within the sand deposit at approximately 1.1 metres below existing grade. For the purposes of this report, the samples tested were identified as TP 1, Sa 2 and TP 2, Sa 1.

Grain size distribution curves were developed by testing the soil sample in accordance with applicable Ontario LS standards in reference to ASTM D6913 (sieve analysis) and ASTM D7928 (sedimentation / hydrometer analysis). The result of the laboratory test and graphical representation of this grain size analysis is enclosed.

Determination of percolation rate are based on the ""*Ministry of Municipal Affairs and Housing (MMAH) Supplementary Guidelines SB-6, Percolation Time and Soil Descriptions, September 14, 2012*". Based on this document, a summary of the results and the estimated percolation rate of the soil is as follows:

Sample	Soil Description	USCS Soil Classification	Estimated Percolation Rate or "*T-Time*"
TP 1, Sa 2	SILTY SAND GLACIAL TILL, Some Gravel, Trace Clay	S.M.	20 mins/cm (30 mm/hr)
TP 2, Sa 1	SAND, Trace Fines	S.P.	8 min/cm (75 mm/hr)

It is noted that percolation time not only varies based on the grain size distribution but is also influenced by other soil characteristics such as the density of the soil, the structure of the soil, the percentage/mineralogy of clay, the plasticity of the soil, the organic content of the soil, and the groundwater table level which are not expressly calculated as part of a grain size analysis.

Engineering Design Parameter & Analysis

It is understood that the current residential dwelling will be demolished, and a 3-storey commercial/residential building will be constructed. As part of the construction new servicing, driveways and parking areas will be constructed. Due to stormwater constraints the development may require the installation of infiltration based low impact development measures. Based on our correspondence it is anticipated that no major changes to grading will occur to accommodate the proposed development scheme.

Foundation and Building Design Considerations

The topsoil and weathered native soils encountered in the test pits are not suitable for conventional strip and spread footing foundations. Proposed strip and spread footing foundations must extend to and be founded on the native soil deposits with compact relative density or directly to the bedrock. Proposed strip and spread footing foundations may be designed as follows:

- On soil (the sand or glacial till deposit) using a maximum geotechnical reaction at SLS of 75 kPa for a maximum of 25 mm of settlement. The factored geotechnical resistance at ULS is 115 kPa.
- On bedrock using a maximum geotechnical reaction at SLS of 200 kPa (no appreciable settlement will occur). The factored geotechnical resistance at ULS is 300 kPa.

It is recommended that footings either be set uniformly on soil or uniformly on bedrock. Where foundations straddle both soil and bedrock, the strain incompatibility (i.e. bedrock does not settle whereas soil has some settlement) can increase the risk for foundation wall cracking.

The minimum strip footing widths to be used shall be dictated as per the Ontario Building Code, regardless of loading considerations. Footings stepped from one level to another must be at a slope not

exceeding 7 vertical to 10 horizontal. Foundations exposed to ambient air temperature throughout the year must be provided with a minimum of 1.4 metres of earth cover for frost protection.

Prior to pouring concrete for the footings, the footing subgrade must be cleaned of deleterious materials, softened, disturbed, or caved materials, and any standing water. During the excavation and construction of the footings CEE should be retained to inspect the founding base to ensure the subgrade has been properly prepared and that the integrity of the founding soil has been maintained.

Soils tend to weather and deteriorate on exposure to the atmosphere or to surface water, therefore foundation bases that will remain open and exposed to the atmosphere for an extended period shall be protected by applying a skim coat of lean concrete. If construction is to proceed in freezing conditions, temporary frost protection for the footing bases and concrete must be provided. Construction traffic should be prohibited from travelling over the exposed subgrade.

Building Floor Slab

A lightly loaded unreinforced concrete slab can be constructed at this site provided the subgrade is stripped of all topsoil and does not contain any significantly weathered or soft soils, or soils that contain a high percentage of organics. The backfill to raise the sub-excavation back to underside of concrete slab should be placed in maximum 200 mm thick loose lifts and compacted to a minimum of 95% Standard Proctor Maximum Dry Density. To achieve adequate compaction, backfill material should be placed within ±2% of optimum moisture content. In addition, it is recommended that the soil used to bring the soil up to the base of the slab should consist of Select Subgrade Material if possible (cohesionless silty sand to gravelly sand type soil).

It is necessary that the floor slabs be provided with a capillary moisture barrier and drainage layer. This is made by placing the slab on a minimum 200 mm layer of clear stone compacted by vibration to a dense state. The upper 50 mm of clear stone can be replaced with 19 mm crusher run limestone for a working surface.

Perimeter and under-slab drainage at the foundation level is not required, provided that the underside of concrete slab is at least 200 mm above the prevailing grade of the site and the surrounding surfaces slope away from the building at a gradient of at least 2% to promote surface water run-off and to reduce groundwater infiltration adjacent to foundations. To minimize infiltration of surface water onto the foundation wall, the upper 150 mm of backfill could comprise compacted relatively impervious soil material.

Pavement Design

Subgrade Preparation

A review of the test pit data in the proposed driveway and parking areas indicates that the pavement subgrade will consist of a native sand with a generally compact relative density. The subgrade must be exposed by the removal of any vegetation, topsoil, existing pavements structures or disturbed soil. The pavement subgrade should be proof-rolled and inspected by the geotechnical engineer. Any loose, soft, wet or unstable areas must be sub-excavated and backfilled with clean, approved and compacted earth fill and compacted to a minimum of 95% SPMDD.

The long-term performance of the pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures must be maintained to ensure that uniform subgrade moisture and density conditions are achieved as much as possible when fill is placed, and the natural subgrade is not disturbed or weakened after it is exposed

Drainage

Control of surface water is an important factor in achieving a good pavement life. The subgrade must be free of depressions and sloped (preferably at a minimum grade of 2 percent) to provide effective drainage toward subgrade drains. Grading adjacent to pavement areas should be designed to ensure that water is not allowed to pond adjacent to the outside edges of the pavement. It is recommended that continuous pavement subdrains be provided along the edge of pavement and drained into available LID measures or municipal ditches by means of gravity to facilitate drainage of the subgrade and the granular materials. The subdrain invert should try to be maintained at least 0.3 metres below subgrade level.

Pavement Structure

The industry pavement design methods are based on a design life of 15 to 20 years for typical weather conditions depending on actual traffic volumes. The following pavement thickness design is provided on the above noted considerations and subgrade basis for an asphaltic concrete pavement structure:

Pavement Layer	Compaction Requirements	Minimum Component Thickness
Surface Course Asphaltic Concrete: HL-3 (OPSS 1150) with PG 58-28 Asphalt Cement (OPSS.MUNI 1101)	OPSS 310	40 mm
Binder Course Asphaltic Concrete: HL-8 (OPSS 1150) with PG 58-28 Asphalt Cement (OPSS.MUNI 1101)		50 mm
Base Course: Granular A (OPSS.MUNI 1010)	100% Standard Proctor Maximum Dry Density (ASTM-D698)	150 mm
Subbase Course: Granular B (OPSS.MUNI 1010)		300 mm

The granular materials must be compacted to a minimum of 100% SPMDD. Asphalt materials should be rolled and compacted as per OPSS 310. The granular and asphalt pavement materials and their placement should conform to OPSS 310, 501, 1010 and 1150.

If the pavement construction occurs in wet, winter or inclement weather, it may be necessary to provide additional subgrade support for heavy construction traffic by increasing the thickness of the granular subbase, base or both. Further, traffic areas for construction equipment may experience unstable subgrade conditions. These areas may be stabilized utilizing additional thickness of granular materials.

It should be noted that in addition to adherence of the above pavement design recommendations, a close control on the pavement construction process will also be required in order to obtain the desired pavement life. Therefore, it is recommended that regular inspection and testing should be conducted during the pavement construction to confirm material quality, thickness, and to ensure adequate compaction.

Closure

We trust this information is sufficient for your present purposes. Should you have any questions concerning the above, or can be of any further assistance, please do not hesitate to contact the undersigned.

Regards,

Alexander Winkelmann, P.Eng.
President, Geotechnical Engineer

FIGURES

Site Location Plan

Test Pit Location Plan

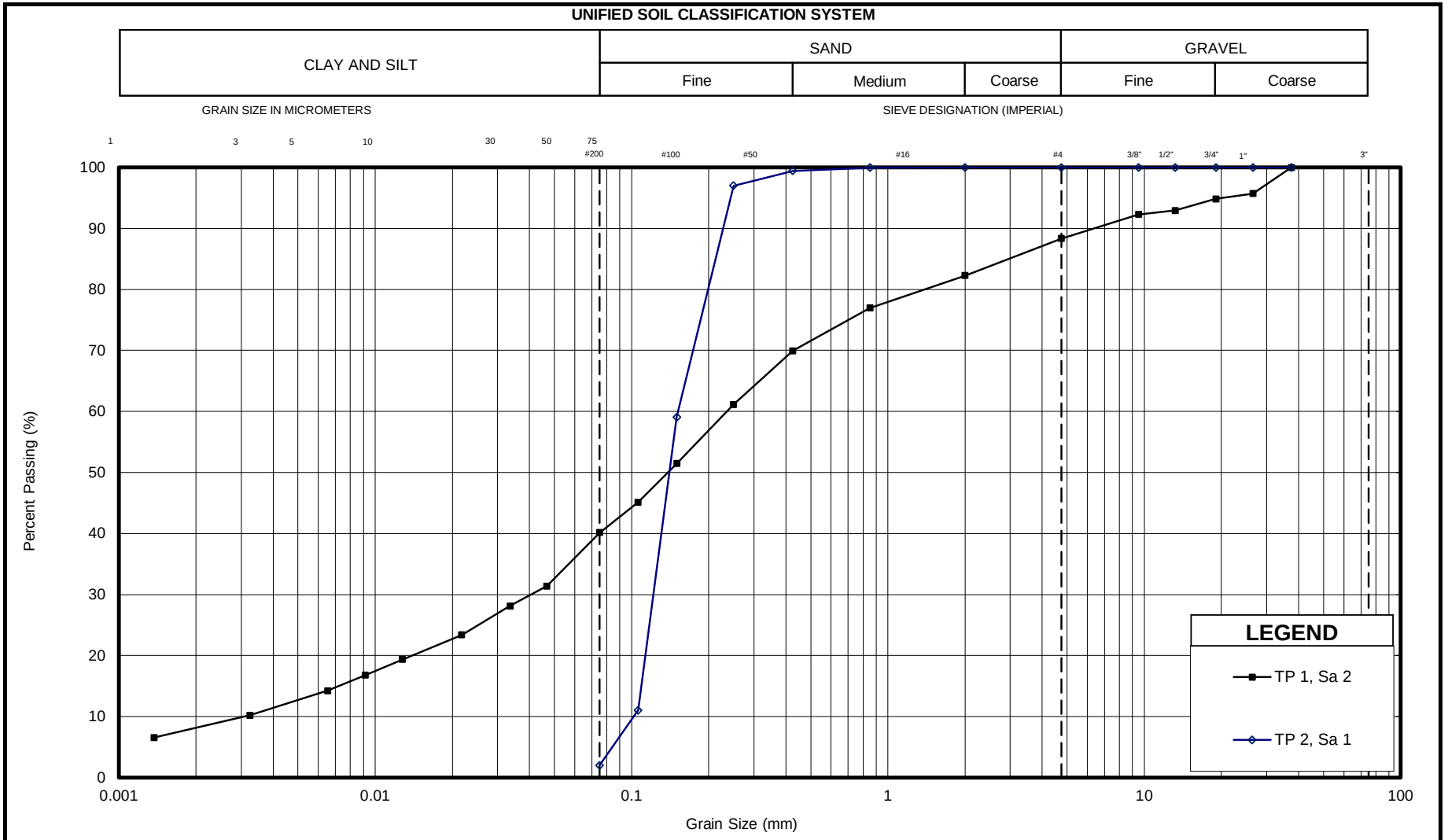
Central Earth ENGINEERING *Geotechnical Engineering and Construction Materials Testing & Inspection Services*	Client: 32 Oak Street Inc.	Scale: N.T.S
		Date: Sept. 2020
	Project: 32 Oak Street, Collingwood, ON	Drawn By: E.P.
		Project No: 20-1200A
	Title: SITE LOCATION PLAN	FIGURE 1

Central Earth ENGINEERING

Geotechnical Engineering and Construction Materials Testing & Inspection Services

Client: 32 Oak Street Inc.	Scale: N.T.S
	Date: Sept. 2020
Project: 32 Oak Street, Collingwood, ON	Drawn By: E.P.
	Project No: 20-1200A
Title: TEST PIT LOCATION PLAN	FIGURE 2

GRAIN SIZE DISTRIBUTION (T-TIME)



Sample	Description	Gr.	Sa.	Si.	Cl.	D_{10}	D_{30}	D_{60}	C_u	C_c
TP 1, Sa 2	SILTY SAND, Some Gravel, Trace Clay (Glacial Till) (S.M.)	12	48	32	8	-	0.04	0.24	79.49	2.27
TP 2, Sa 1	SAND, trace fines (S.P.)	0	98	2		0.10	0.12	0.15	1.49	0.96

Central Earth ENGINEERING

GRAIN SIZE DISTRIBUTION -32 Oak Street, Collingwood, ON

Gradation Analysis

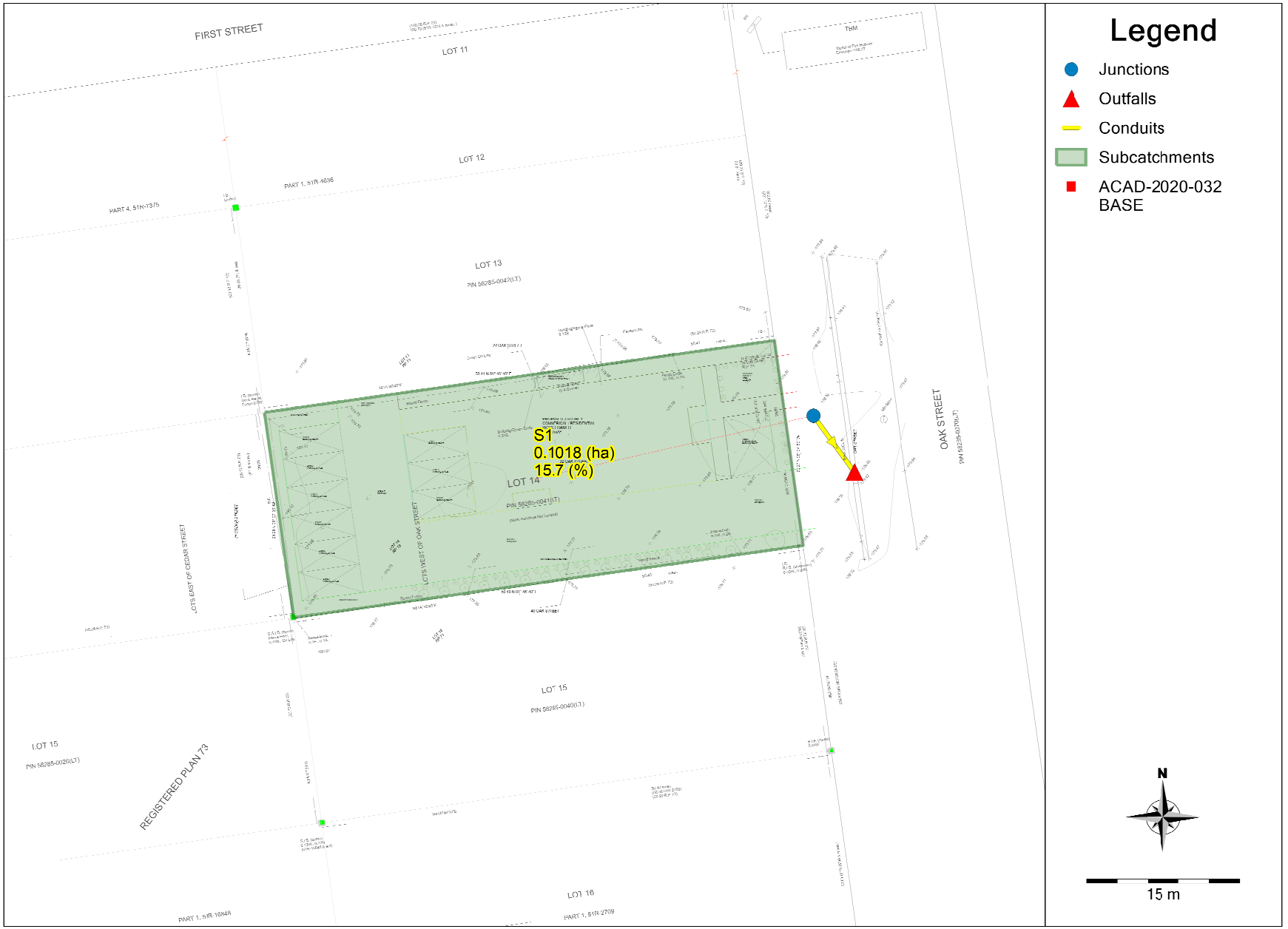
FIGURE No.	Grain Size Curve
REF. No.	20-1200A
DATE	October 2020

TEST PIT PHOTOGRAPHS

PHOTOGRAPH 1 Description: Detailed view of Test Pit #1 (depth measured).

PHOTOGRAPH 2 Description: Detailed view of Test Pit #2 (depth measured).

Appendix D – PCSWMM Existing Condition Model Output


FIRST STREET
LOT 11
LOT 12
PART 4, 51R-7375
PART 1, 51R-4636
LOT 13
PIN 58285-0042(LT)
S1
0.1018 (ha)
15.7 (%)
LOT 14
PIN 58285-0041(LT)
OAK STREET
LOTS WEST OF OAK STREET
LOTS EAST OF CEDAR STREET
LOT 15
PIN 58285-0040(LT)
LOT 15
PIN 58285-0026(LT)
REGISTERED PLAN 73
LOT 16
PART 1, 51R-2709
PART 1, 51R-10848
Legend
Junctions
Outfalls
Conduits
Subcatchments
ACAD-2020-032 BASE
N
15 m

2020-030 32 Oak Street - Pre-development
Model Results (100 year SCS Type II)

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

****
Element Count
****
Number of rain gages 14
Number of subcatchments ... 1
Number of nodes 2
Number of links 1
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
25mmQuality	25mmQuality	INTENSITY	5 min.
Chicago_4h_100yr	Chicago_4h_100yr	INTENSITY	5 min.
Chicago_4h_10yr	Chicago_4h_10yr	INTENSITY	5 min.
Chicago_4h_25yr	Chicago_4h_25yr	INTENSITY	5 min.
Chicago_4h_2yr	Chicago_4h_2yr	INTENSITY	5 min.
Chicago_4h_50yr	Chicago_4h_50yr	INTENSITY	5 min.
Chicago_4h_5yr	Chicago_4h_5yr	INTENSITY	5 min.
SCS_Type_II_100yr	SCS_Type_II_100yr	INTENSITY	15 min.
SCS_Type_II_10yr	SCS_Type_II_10yr	INTENSITY	15 min.
SCS_Type_II_25yr	SCS_Type_II_25yr	INTENSITY	15 min.
SCS_Type_II_2yr	SCS_Type_II_2yr	INTENSITY	15 min.
SCS_Type_II_50yr	SCS_Type_II_50yr	INTENSITY	15 min.
SCS_Type_II_5yr	SCS_Type_II_5yr	INTENSITY	15 min.
Timmins	Timmins	CUMULATIVE	60 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
S1	0.10	20.20	15.70	0.5000	SCS_Type_II_100yr	J1

```
************
Node Summary
************
```

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	178.58	1.00	0.0	
OakCB	OUTFALL	178.42	0.00	0.0	

```
************
Link Summary
************
```

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	J1	OakCB	CONDUIT	6.8	2.3388	0.0100

```
*********************
Cross Section Summary
*********************
```

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	DUMMY	0.00	0.00	0.00	0.00	1	0.00

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

****************
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
```

```
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 10/23/2020 00:00:00
Ending Date .............. 10/25/2020 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m
```

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	0.012	120.800
Evaporation Loss	0.000	0.000
Infiltration Loss	0.009	91.509
Surface Runoff	0.003	29.325
Final Storage	0.000	0.314
Continuity Error (%)	-0.288	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.003	0.030
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.003	0.030
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

```
**************************
Time-Step Critical Elements
```

****
None

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

****
Routing Time Step Summary
****
Minimum Time Step : 4.50 sec
Average Time Step : 5.00 sec
Maximum Time Step : 5.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 2.00
Percent Not Converging : 0.00
Time Step Frequencies :
5.000 - 3.155 sec : 100.00 %
3.155 - 1.991 sec : 0.00 %
1.991 - 1.256 sec : 0.00 %
1.256 - 0.792 sec : 0.00 %
0.792 - 0.500 sec : 0.00 %

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
S1	120.80	0.00	0.00	91.51	18.68	10.65	29.33	0.03	0.02	0.243

****
Node Depth Summary
****

	Average Depth	Maximum Depth	Maximum HGL	Time of Max Occurrence	Reported Max Depth

Node	Type	Meters	Meters	Meters	days hr:min	Meters
J1	JUNCTION	0.00	0.00	178.58	0 00:00	0.00
OakCB	OUTFALL	0.00	0.00	178.42	0 00:00	0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.019	0.019	0 12:00	0.0299	0.0299	0.000
OakCB	OUTFALL	0.000	0.019	0 12:00	0	0.0299	0.000

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J1	JUNCTION	48.00	0.000	1.000

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

	Flow	Avg	Max	Total

Outfall Node	Freq Pcnt	Flow CMS	Flow CMS	Volume 10^6 ltr
OakCB	46.80	0.000	0.019	0.030
System	46.80	0.000	0.019	0.030

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	DUMMY	0.019	0 12:00			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Thu Nov 12 12:55:09 2020
Analysis ended on: Thu Nov 12 12:55:10 2020
Total elapsed time: 00:00:01

Appendix E – Proposed Site Plan

32 OAK STREET
COLLINGWOOD ON L9Y 1B2

LOT 14
WEST OF OAK STREET
REGISTERED PLAN 73
TOWN OF COLLINGWOOD
COUNTY OF SIMCOE

LOT AREA = 1021.90 m² = 0.102 ha

SITE PLAN DRAWN WITH
INFORMATION FROM SURVEY BY
ZUBEK, EMO, PATTEN & THOMSEN LTD. OLS
2020

N

LIGHTING NOTE:
ALL SITE ILLUMINATION TO BE DIRECTED WITHIN THE PROPERTY. NO SPILLAGE.

24 OAK STREET

LOT 13 RP 73

1.5m WIDE RAISED CONC. WALKWAY FLUSH WITH GRND FLR OF BUILDING. 0.15m ABOVE DRIVEWAY

0.2m CONC. CURB ALONG PROPERTY LINE

INTERIOR BIKE STORAGE FOR RESIDENTS W/ WALL MOUNTED BIKE RACKS

FLAT CANOPY DRAINED TO LANDSCAPED AREA

RESIDENTIAL ENTRANCE 2

FLAT CANOPY DRAINED TO PERMEABLE PAVERS

INTERIOR REFUSE STORAGE BINS TO BE PICKED UP AT CURB BY PRIVATE COLLECTOR

RESIDENTIAL ENTRANCE 1

RAISED CONC. WALKWAY FLUSH WITH GRND FLR OF BUILDING. 0.15m ABOVE DRIVEWAY

1.5m WIDE BARRIER-FREE PATH PAINTED OR ACCENT COLOUR PAVERS TO HIGHLIGHT BARRIER-FREE PATH

RAMP UP WITH BARRIER-FREE TACTILE STRIPS

1.8m SOLID BOARD WOOD FENCE DETAIL ON A103 & A104

BLACK STEEL BENCH SPECS ON A102 (2)

3.4x6.0 BARRIER-FREE PARKING SPACE W/ PAINTED BARRIER FREE SIGNAGE

50.41 N 81° 46' 40" E

CONC. WALKWAY

EMERALD CEDAR SPECS A101

OUTDOOR AMENITY AREA 38.72m²

BARRIER-FREE SIGNAGE ON POST SEE DETAIL ON A105

1.50

6.00

3.40

14.16

7.00

BIKE STOR.

28.71 [94'-2"]

GRASS

GREEN VELVET BOXWOODS SPECS ON A101

1.8m SOLID BOARD WOOD FENCE DETAIL ON A103 & A104

BARRIER FREE ENTRANCE TO COMM. UNIT 2

NOTE:
ALL SITE ILLUMINATION TO BE DIRECTED WITHIN THE PROPERTY. NO SPILLAGE.

DECORATIVE BOULDER TABLES

2.8x6.0 PARKING SPACE

PERMEABLE PAVERS ACCENT COLOUR

31 CEDAR STREET

N 08° 07' 35" W

SNOW PILING AREA

20.28

LINE OF BLDG ABOVE

PROPOSED 3 STOREY COMMERICAL / RESIDENTIAL WOOD FRAMED
317.85 m²

32 OAK STREET

11.06 [36'-4"]

1.70

1.50

BARRIER FREE ENTRANCE TO COMM. UNIT 1

FLAT CANOPY DRAINED TO LANDSCAPED AREA

SNOW PILING AREA

BIKE RACK SPECS ON A105 (MIN. 4 BIKES)

N 08° 04' 50" W

7.52

LANDSCAPED AREA (GRASS)

ASPHALT PARKING SURFACE

COVERED PARKING NO DOOR

LOT 14 RP 73

RAMP UP WITH BARRIER-FREE TACTILE STRIPS

20.27

ECORASTER BLOXX PERMEABLE PAVERS ON DRIVEWAY SURFACE REFER TO DETAIL A102

6.00

7.50

GRASS

SNOW PILING AREA

1.5m WIDE LANDSCAPED AREA

SNOW PILING AREA

1.50

1.17

50.40 N 81° 46' 40" E

1.8m SOLID BOARD WOOD FENCE DETAIL ON A103 & A104

GRASS

GRASS

GINKGO BILOBA TREE

OAK STREET

LOT 15 RP 73

40 OAK STREET

LIGHTING NOTE:
ALL SITE ILLUMINATION TO BE DIRECTED WITHIN THE PROPERTY. NO SPILLAGE.

APPROVAL STAMP

No.	Issue/Revision	Date
1	ZONING REVIEW	JAN 10 20
2	DESIGN REVIEW	MAR 01 20
3	DESIGN REVIEW	MAR 20 20
4	SITE PLAN CONTROL	APR 27 20
5	SITE PLAN APPROVAL	JUL 15 20
6	SITE PLAN APPROVAL	NOV 02 20
7	SITE PLAN APPROVAL	DEC 23 20
8	ICBL EXEMPTION	JUN 03 21
9	SITE PLAN APPROVAL	JUL 04 22
10	SITE PLAN APPROVAL	MAR 10 23

WESTSMITH DESIGN
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Douglas E. Smith, C.E.T. (BCIN 105709)
104 Katherine Street Collingwood ON L9Y 3R5
705-351-1360 doug@westsmithdesign.com
REGISTERED BCIN 106658

SIGNATURE — MAR 10 23 DATE

DRAWINGS MUST BE SIGNED AND DATED IN ORDER TO BE ISSUED FOR BUILDING PERMIT, ROOF TRUSS DESIGN OR CONSTRUCTION

Project Name
OAKWOOD BUILDING
32 OAK STREET
COLLINGWOOD ON
L9Y 2X6

Project Number
1927

Drawing Title
SITE PLAN

Drawn By	Designed By
DES	DES
Scale: 1:200 metric	Date: DEC 13 2019

Drawing Number
A100

Appendix F – PCSWMM Proposed Condition Model Output

Post Development PCSWMM Model View

Legend

- Junctions
- Outfalls
- Conduits
- Subcatchments
- ACAD-2020-030 GRADING DXF

Post Development - 25 mm Storm PCSWMM Results

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
--------------------------------------------------------------


*************
Element Count
*************
Number of rain gages ...... 14
Number of subcatchments ... 3
Number of nodes ........... 5
Number of links ........... 3
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                  Data       Recording
Name                 Data Source                  Type       Interval
------------------------------------------------------------------------
25mmQuality          25mmQuality                  INTENSITY     5 min.
Chicago_4h_100yr     Chicago_4h_100yr             INTENSITY     5 min.
Chicago_4h_10yr      Chicago_4h_10yr              INTENSITY     5 min.
Chicago_4h_25yr      Chicago_4h_25yr              INTENSITY     5 min.
Chicago_4h_2yr       Chicago_4h_2yr               INTENSITY     5 min.
Chicago_4h_50yr      Chicago_4h_50yr              INTENSITY     5 min.
Chicago_4h_5yr       Chicago_4h_5yr               INTENSITY     5 min.
SCS_Type_II_100yr    SCS_Type_II_100yr            INTENSITY    15 min.
SCS_Type_II_10yr     SCS_Type_II_10yr             INTENSITY    15 min.
SCS_Type_II_25yr     SCS_Type_II_25yr             INTENSITY    15 min.
SCS_Type_II_2yr      SCS_Type_II_2yr              INTENSITY    15 min.
SCS_Type_II_50yr     SCS_Type_II_50yr             INTENSITY    15 min.
SCS_Type_II_5yr      SCS_Type_II_5yr              INTENSITY    15 min.
Timmins              Timmins                      CUMULATIVE   60 min.


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

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
A1	0.01	3.04	50.00	1.8010	25mmQuality	EXCB
A2	0.00	12.67	0.00	1.6260	25mmQuality	J2
A3	0.09	52.11	93.00	17.8700	25mmQuality	CB01

****
LID Control Summary
****

Subcatchment	LID Control	No. of Units	Unit Area	Unit Width	% Area Covered	% Imperv Treated	% Perv Treated
A1	PermPavers	1	19.00	6.00	20.43	100.00	0.00
A3	PermPavers	1	360.00	7.00	39.74	100.00	100.00

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
CB01	JUNCTION	178.46	1.10	0.0	
EXCB	JUNCTION	178.34	1.11	0.0	
J2	JUNCTION	179.75	0.25	0.0	
OakCB	OUTFALL	178.30	0.30	0.0	
OF1	OUTFALL	179.70	0.00	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	EXCB	OakCB	CONDUIT	2.5	1.6015	0.0130
C2	J2	OF1	CONDUIT	1.4	3.6655	0.0100
C3	CB01	EXCB	CONDUIT	14.3	0.4902	0.0130

****

Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	CIRCULAR	0.30	0.07	0.07	0.30	1	0.12
C2	DUMMY	0.00	0.00	0.00	0.00	1	0.00
C3	CIRCULAR	0.25	0.05	0.06	0.25	1	0.04

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

****
Analysis Options
****
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Infiltration Method ..... GREEN_AMPT
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 10/23/2020 00:00:00
Ending Date 10/25/2020 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials 8

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

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	0.003	24.999
Evaporation Loss	0.000	0.000
Infiltration Loss	0.002	23.956
Surface Runoff	-0.000	-0.000
Final Storage	0.000	1.070
Continuity Error (%)	0.000	

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

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

****
Highest Flow Instability Indexes
****

All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step	:	4.50 sec
Average Time Step	:	5.00 sec
Maximum Time Step	:	5.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00
Percent Not Converging	:	0.00
Time Step Frequencies	:	
5.000 - 3.155 sec	:	100.00 %
3.155 - 1.991 sec	:	0.00 %
1.991 - 1.256 sec	:	0.00 %
1.256 - 0.792 sec	:	0.00 %
0.792 - 0.500 sec	:	0.00 %

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
A1	25.00	0.00	0.00	24.23	9.18	0.00	0.00	0.00	0.00	0.000
A2	25.00	0.00	0.00	25.00	0.00	0.00	0.00	0.00	0.00	0.000
A3	25.00	0.00	0.00	23.91	12.92	0.00	-0.00	-0.00	0.00	-0.000

****
LID Performance Summary
****

	Total Inflow	Evap Loss	Infil Loss	Surface Outflow	Drain Outflow	Initial Storage	Final Storage	Continuity Error

Subcatchment	LID Control	mm	mm	mm	mm	mm	mm	mm	%
A1	PermPavers	25.00	0.00	25.00	0.00	0.00	0.00	0.00	0.00
A3	PermPavers	57.51	0.00	57.51	0.00	0.00	0.00	0.00	0.00

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
CB01	JUNCTION	0.00	0.00	178.46	0 07:35	0.00
EXCB	JUNCTION	0.00	0.00	178.34	0 00:00	0.00
J2	JUNCTION	0.00	0.00	179.75	0 00:00	0.00
OakCB	OUTFALL	0.00	0.00	178.30	0 00:00	0.00
OF1	OUTFALL	0.00	0.00	179.70	0 00:00	0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent	
CB01	JUNCTION	-0.000	0.000	0 07:30	-6.86e-19	1.12e-24	-0.000	ltr
EXCB	JUNCTION	0.000	0.000	0 00:00	0	0	0.000	ltr
J2	JUNCTION	0.000	0.000	0 00:00	0	0	0.000	ltr
OakCB	OUTFALL	0.000	0.000	0 00:00	0	0	0.000	ltr
OF1	OUTFALL	0.000	0.000	0 00:00	0	0	0.000	ltr

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J2	JUNCTION	48.00	0.000	0.250

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OakCB	0.00	0.000	0.000	0.000
OF1	0.00	0.000	0.000	0.000
System	0.00	0.000	0.000	0.000

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth

C1	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
C2	DUMMY	0.000	0	00:00			
C3	CONDUIT	0.000	0	00:00	0.00	0.00	0.00

****
Flow Classification Summary
****

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

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Tue Mar 14 08:22:58 2023
Analysis ended on: Tue Mar 14 08:22:58 2023
Total elapsed time: < 1 sec

Post Development - 100yr SCS 24hr Storm - PCSWMM Results

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
--------------------------------------------------------------


*************
Element Count
*************
Number of rain gages ...... 14
Number of subcatchments ... 3
Number of nodes ........... 5
Number of links ........... 3
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                  Data       Recording
Name                 Data Source                  Type       Interval
------------------------------------------------------------------------
25mmQuality          25mmQuality                  INTENSITY     5 min.
Chicago_4h_100yr     Chicago_4h_100yr             INTENSITY     5 min.
Chicago_4h_10yr      Chicago_4h_10yr              INTENSITY     5 min.
Chicago_4h_25yr      Chicago_4h_25yr              INTENSITY     5 min.
Chicago_4h_2yr       Chicago_4h_2yr               INTENSITY     5 min.
Chicago_4h_50yr      Chicago_4h_50yr              INTENSITY     5 min.
Chicago_4h_5yr       Chicago_4h_5yr               INTENSITY     5 min.
SCS_Type_II_100yr    SCS_Type_II_100yr            INTENSITY    15 min.
SCS_Type_II_10yr     SCS_Type_II_10yr             INTENSITY    15 min.
SCS_Type_II_25yr     SCS_Type_II_25yr             INTENSITY    15 min.
SCS_Type_II_2yr      SCS_Type_II_2yr              INTENSITY    15 min.
SCS_Type_II_50yr     SCS_Type_II_50yr             INTENSITY    15 min.
SCS_Type_II_5yr      SCS_Type_II_5yr              INTENSITY    15 min.
Timmins              Timmins                      CUMULATIVE   60 min.


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

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
A1	0.01	3.04	50.00	1.8010	SCS_Type_II_100yr	EXCB
A2	0.00	12.67	0.00	1.6260	SCS_Type_II_100yr	J2
A3	0.09	52.11	93.00	17.8700	SCS_Type_II_100yr	CB01

****
LID Control Summary
****

Subcatchment	LID Control	No. of Units	Unit Area	Unit Width	% Area Covered	% Imperv Treated	% Perv Treated
A1	PermPavers	1	19.00	6.00	20.43	100.00	0.00
A3	PermPavers	1	360.00	7.00	39.74	100.00	100.00

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
CB01	JUNCTION	178.46	1.10	0.0	
EXCB	JUNCTION	178.34	1.11	0.0	
J2	JUNCTION	179.75	0.25	0.0	
OakCB	OUTFALL	178.30	0.30	0.0	
OF1	OUTFALL	179.70	0.00	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	EXCB	OakCB	CONDUIT	2.5	1.6015	0.0130
C2	J2	OF1	CONDUIT	1.4	3.6655	0.0100
C3	CB01	EXCB	CONDUIT	14.3	0.4902	0.0130

****

Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	CIRCULAR	0.30	0.07	0.07	0.30	1	0.12
C2	DUMMY	0.00	0.00	0.00	0.00	1	0.00
C3	CIRCULAR	0.25	0.05	0.06	0.25	1	0.04

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

****
Analysis Options
****
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Infiltration Method ..... GREEN_AMPT
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 10/23/2020 00:00:00
Ending Date 10/25/2020 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials 8

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

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	0.012	120.801
Evaporation Loss	0.000	0.000
Infiltration Loss	0.012	117.135
Surface Runoff	0.000	2.978
Final Storage	0.000	1.070
Continuity Error (%)	-0.318	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.003
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.000	0.003
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

****
Time-Step Critical Elements
****
Link C1 (3.22%)

****
Highest Flow Instability Indexes
****

All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step	:	0.48 sec
Average Time Step	:	4.92 sec
Maximum Time Step	:	5.00 sec
Percent in Steady State	:	-0.00
Average Iterations per Step	:	2.00
Percent Not Converging	:	0.00
Time Step Frequencies	:	
5.000 - 3.155 sec	:	97.66 %
3.155 - 1.991 sec	:	0.83 %
1.991 - 1.256 sec	:	1.51 %
1.256 - 0.792 sec	:	0.00 %
0.792 - 0.500 sec	:	0.00 %

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
A1	120.80	0.00	0.00	93.42	47.32	27.23	27.23	0.00	0.00	0.225
A2	120.80	0.00	0.00	99.05	0.00	26.27	26.27	0.00	0.00	0.218
A3	120.80	0.00	0.00	119.95	66.61	1.18	-0.00	-0.00	0.00	-0.000

****
LID Performance Summary
****

	Total Inflow	Evap Loss	Infil Loss	Surface Outflow	Drain Outflow	Initial Storage	Final Storage	Continuity Error

Subcatchment	LID Control	mm	mm	mm	mm	mm	mm	mm	%
A1	PermPavers	120.80	0.00	120.80	0.00	0.00	0.00	0.00	0.00
A3	PermPavers	291.39	0.00	291.39	0.00	0.00	0.00	0.00	0.00

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
CB01	JUNCTION	0.00	0.00	178.46	0 12:05	0.00
EXCB	JUNCTION	0.00	0.03	178.37	0 12:00	0.03
J2	JUNCTION	0.00	0.00	179.75	0 00:00	0.00
OakCB	OUTFALL	0.00	0.03	178.33	0 12:00	0.03
OF1	OUTFALL	0.00	0.00	179.70	0 00:00	0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
CB01	JUNCTION	-0.000	0.000	0 12:00	-1.75e-18	9.4e-19	-0.000 ltr
EXCB	JUNCTION	0.003	0.003	0 12:00	0.00253	0.00253	0.032
J2	JUNCTION	0.001	0.001	0 12:00	0.000499	0.000499	0.000
OakCB	OUTFALL	0.000	0.003	0 12:00	0	0.00253	0.000
OF1	OUTFALL	0.000	0.001	0 12:00	0	0.000499	0.000

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J2	JUNCTION	48.00	0.000	0.250

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OakCB	3.15	0.001	0.003	0.003
OF1	1.77	0.000	0.001	0.000
System	2.46	0.002	0.003	0.003

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth

C1	CONDUIT	0.003	0	12:00	0.71	0.02	0.10
C2	DUMMY	0.001	0	12:00			
C3	CONDUIT	0.000	0	00:00	0.00	0.00	0.00

****
Flow Classification Summary
****

	Adjusted	Fraction of Time in Flow Class								
Conduit	/Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.24	0.00	0.00	0.72	0.04	0.00	0.00	0.00	0.00
C3	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Mon Mar 13 17:04:24 2023
Analysis ended on: Mon Mar 13 17:04:24 2023
Total elapsed time: < 1 sec

Proposed Condition - Timmins Storm PCSWMM Results

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
--------------------------------------------------------------


*************
Element Count
*************
Number of rain gages ...... 14
Number of subcatchments ... 3
Number of nodes ........... 5
Number of links ........... 3
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                  Data       Recording
Name                 Data Source                  Type       Interval
------------------------------------------------------------------------
25mmQuality          25mmQuality                  INTENSITY     5 min.
Chicago_4h_100yr     Chicago_4h_100yr             INTENSITY     5 min.
Chicago_4h_10yr      Chicago_4h_10yr              INTENSITY     5 min.
Chicago_4h_25yr      Chicago_4h_25yr              INTENSITY     5 min.
Chicago_4h_2yr       Chicago_4h_2yr               INTENSITY     5 min.
Chicago_4h_50yr      Chicago_4h_50yr              INTENSITY     5 min.
Chicago_4h_5yr       Chicago_4h_5yr               INTENSITY     5 min.
SCS_Type_II_100yr    SCS_Type_II_100yr            INTENSITY    15 min.
SCS_Type_II_10yr     SCS_Type_II_10yr             INTENSITY    15 min.
SCS_Type_II_25yr     SCS_Type_II_25yr             INTENSITY    15 min.
SCS_Type_II_2yr      SCS_Type_II_2yr              INTENSITY    15 min.
SCS_Type_II_50yr     SCS_Type_II_50yr             INTENSITY    15 min.
SCS_Type_II_5yr      SCS_Type_II_5yr              INTENSITY    15 min.
Timmins              Timmins                      CUMULATIVE   60 min.


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

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
A1	0.01	3.04	50.00	1.8010	Timmins	EXCB
A2	0.00	12.67	0.00	1.6260	Timmins	J2
A3	0.09	52.11	93.00	17.8700	Timmins	CB01

****
LID Control Summary
****

Subcatchment	LID Control	No. of Units	Unit Area	Unit Width	% Area Covered	% Imperv Treated	% Perv Treated
A1	PermPavers	1	19.00	6.00	20.43	100.00	0.00
A3	PermPavers	1	360.00	7.00	39.74	100.00	100.00

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
CB01	JUNCTION	178.46	1.10	0.0	
EXCB	JUNCTION	178.34	1.11	0.0	
J2	JUNCTION	179.75	0.25	0.0	
OakCB	OUTFALL	178.30	0.30	0.0	
OF1	OUTFALL	179.70	0.00	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	EXCB	OakCB	CONDUIT	2.5	1.6015	0.0130
C2	J2	OF1	CONDUIT	1.4	3.6655	0.0100
C3	CB01	EXCB	CONDUIT	14.3	0.4902	0.0130

****

Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	CIRCULAR	0.30	0.07	0.07	0.30	1	0.12
C2	DUMMY	0.00	0.00	0.00	0.00	1	0.00
C3	CIRCULAR	0.25	0.05	0.06	0.25	1	0.04

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

****
Analysis Options
****
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Infiltration Method ..... GREEN_AMPT
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 10/23/2020 00:00:00
Ending Date 10/25/2020 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials 8

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

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	0.020	193.000
Evaporation Loss	0.000	0.000
Infiltration Loss	0.019	190.142
Surface Runoff	0.000	2.155
Final Storage	0.000	1.070
Continuity Error (%)	-0.190	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.002
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.000	0.002
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

****
Time-Step Critical Elements
****
Link C1 (8.39%)

****
Highest Flow Instability Indexes
****

All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step	:	1.41 sec
Average Time Step	:	4.87 sec
Maximum Time Step	:	5.00 sec
Percent in Steady State	:	-0.00
Average Iterations per Step	:	2.00
Percent Not Converging	:	0.00
Time Step Frequencies	:	
5.000 - 3.155 sec	:	96.42 %
3.155 - 1.991 sec	:	3.58 %
1.991 - 1.256 sec	:	0.00 %
1.256 - 0.792 sec	:	0.00 %
0.792 - 0.500 sec	:	0.00 %

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
A1	193.00	0.00	0.00	169.61	76.14	22.94	22.94	0.00	0.00	0.119
A2	193.00	0.00	0.00	190.20	0.00	3.16	3.16	0.00	0.00	0.016
A3	193.00	0.00	0.00	192.25	107.41	0.15	-0.00	-0.00	0.00	-0.000

****
LID Performance Summary
****

	Total Inflow	Evap Loss	Infil Loss	Surface Outflow	Drain Outflow	Initial Storage	Final Storage	Continuity Error

Subcatchment	LID Control	mm	mm	mm	mm	mm	mm	mm	%
A1	PermPavers	193.00	0.00	193.00	0.00	0.00	0.00	0.00	0.00
A3	PermPavers	463.68	0.00	463.68	0.00	0.00	0.00	0.00	0.00

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
CB01	JUNCTION	0.00	0.00	178.46	0 06:55	0.00
EXCB	JUNCTION	0.00	0.01	178.35	0 08:00	0.01
J2	JUNCTION	0.00	0.00	179.75	0 00:00	0.00
OakCB	OUTFALL	0.00	0.01	178.31	0 08:00	0.01
OF1	OUTFALL	0.00	0.00	179.70	0 00:00	0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
CB01	JUNCTION	-0.000	0.000	0 06:50	-4.29e-18	3.74e-19	-0.000 ltr
EXCB	JUNCTION	0.001	0.001	0 08:00	0.00213	0.00213	0.028
J2	JUNCTION	0.000	0.000	0 08:00	6.01e-05	6.01e-05	0.000
OakCB	OUTFALL	0.000	0.001	0 08:00	0	0.00213	0.000
OF1	OUTFALL	0.000	0.000	0 08:00	0	6.01e-05	0.000

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J2	JUNCTION	48.00	0.000	0.250

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OakCB	7.78	0.000	0.001	0.002
OF1	1.41	0.000	0.000	0.000
System	4.59	0.000	0.001	0.002

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth

C1	CONDUIT	0.001	0	08:00	0.43	0.00	0.05
C2	DUMMY	0.000	0	08:00			
C3	CONDUIT	0.000	0	00:00	0.00	0.00	0.00

****
Flow Classification Summary
****

	Adjusted	---------- Fraction of Time in Flow Class ----------								
Conduit	/Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.14	0.00	0.00	0.76	0.09	0.00	0.00	0.02	0.00
C3	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Tue Mar 14 08:28:33 2023
Analysis ended on: Tue Mar 14 08:28:33 2023
Total elapsed time: < 1 sec

Appendix G – Thornthwaite Water Balance Calculations & 25 mm Design Storm Model Output

THORNTHWAITE WATER BALANCE CALCULATIONS

PROJECT No. 2020-030
32 Oak Street
Town of Collingwood

CAPES ENGINEERING

TABLE 1

Pre- and Post-Development Monthly Water Balance Components

Potential Evapotranspiration Calculation	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**YEAR**
Average Temperature (Degree C) [1]	-7.7	-6.6	-2.1	5.6	12.3	17.9	20.8	19.7	15.3	8.7	2.7	-3.5	**6.9**
Heat index: i = (t/5)$^{1.514}$	0.00	0.00	0.00	1.19	3.91	6.90	8.66	7.97	5.44	2.31	0.39	0.00	**36.8**
Unadjusted Daily Potential Evapotranspiration U (mm)	0.00	0.00	0.00	25.18	58.76	88.02	103.48	97.59	74.33	40.47	11.47	0.00	**499**
Adjusting Factor for U (Latitude 44° 22' N)[2]	0.81	0.82	1.02	1.13	1.27	1.29	1.3	1.2	1.04	0.95	0.8	0.76	
Adjusted Potential Evapotranspiration PET (mm)	0	0	0	28	75	114	135	117	77	38	9	0	**593**
PRE-DEVELOPMENT WATER BALANCE	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**YEAR**
Precipitation (P)[3]	83	62	58	62	82	85	77	90	84	78	89	74	**923**
Potential Evapotranspiration (PET)	0	0	0	28	75	114	135	117	77	38	9	0	**593**
P - PET	83	62	58	34	8	-29	-57	-27	7	39	80	74	**330**
Change in Soil Moisture Storage	0	0	0	0	0	-29	-57	-14	7	39	54	0	**0**
Soil Moisture Storage max 100 mm	100	100	100	100	100	71	14	0	7	46	100	100	
Actual Evapotranspiration (AET)	0	0	0	28	75	114	135	104	77	38	9	0	**580**
Soil Moisture Deficit max 100 mm	0	0	0	0	0	29	86	100	93	54	0	0	
Water Surplus - available for infiltration or runoff	83	62	58	34	8	0	0	0	0	0	25	74	**343**
Potential Infiltration (based on MOE metholodogy*; independent of temperature)	50	37	35	20	5	0	0	0	0	0	15	44	**206**
Potential Direct Surface Water Runoff (independent of temperature)	33	25	23	13	3	0	0	0	0	0	10	29	**137**
POST-DEVELOPMENT WATER BALANCE	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**YEAR**
Precipitation (P)	83	62	58	62	82	85	77	90	84	78	89	74	**923**
Potential Evaporation (PE) from impervious areas (assume 20%)	17	12	12	12	16	17	15	18	17	16	18	15	**185**
P-PE (surplus available for runoff from impervious areas)	66	49	46	50	66	68	62	72	67	62	71	59	**738**
Water surplus change compared to pre-condition (for areas that change from vegetated open areas to impervious areas)	-17	-12	-12	16	58	68	62	72	67	62	46	-15	**395**

Soil Moisture Storage: 100 mm <-- See "Water Holding Capacity" values in Table 3.1, MOE SWMPDM, 2003

Forest	0%
Urban Lawn	84%
Pasture	0%
Crops	0%
Impervious	16%

*MOE SWM infiltration calculations

topography - hilly land	0.1	<-- Infiltration Factors from Table 3.1, MOE SWMPDM, 2003
soils - fine sand	0.4	<-- Infiltration Factors from Table 3.1, MOE SWMPDM, 2003
cover - 84% lawn, 16% impervious	0.1	<-- Infiltration Factors from Table 3.1, MOE SWMPDM, 2003
Infiltration factor	**0.6**	

Latitude of site (or climate station): 44 ° N.

USER INPUTS

THORNTHWAITE WATER BALANCE CALCULATIONS

PROJECT No. 2020-030
32 Oak Street
Town of Collingwood

CAPES ENGINEERING

Thornthwaite Water Balance

Land Use Description	Approx. Land Area* (m^2)	Estimated Impervious Fraction for Land Use	Estimated Impervious Area (m^2)	Runoff from Impervious Area (m/a)	Runoff Volume from Impervious Area (m^3/a)	Estimated Pervious Area (m^2)	Runoff from Pervious Area (m/a)	Runoff Volume from Pervious Area (m^3/a)	Recharge from Pervious Area (m/a)	Recharge Volume from Pervious Area (m^3/a)	Total Runoff (Direct and Indirect) Volume (m^3/a)	Total Recharge Volume (m^3/a)
Pre Development Site	1,020	0.16	160	0.738	118	860	0.137	118	0.206	177	236	177
TOTAL PRE-DEVELOPMENT	**1,020**		**160**		**118**	**860**		**118**		**177**	**236**	**177**
Post Development Site	1,020	0.87	887	0.738	655	133	0.137	18	0.206	27	673	27
TOTAL POST-DEVELOPMENT	**1,020**		**887**		**655**	**133**		**18**		**27**	**673**	**27**
										% Change from Pre to Post	285	85
										Effect of development (**with no mitigation**)	**2.47 times increase in runoff**	**85% reduction of recharge**

To balance pre- to post-, the recharge target (m^3/a)= **150**

Appendix H – Water Servicing Calculations

CAPES ENGINEERING

Domestic & Fire Protection Water Supply/Storage

Project: **32 Oak Street**
Collingwood

Prepared by:	C. Capes
Checked by:	C. Capes
Project No:	2020-030
Date:	March 1, 2023

Domestic Flow Calculations

Number of Water Fixture Units =	45.4		OBC Table 7.6.3.2 Hydraulic Load
Water Demand =	2360	L	OBC Table 7.4.10.5 Conversion of WFSU to L/min (minimum value when FU <260)
Operating Hours =	24	hrs	
Average Day Demand =	2360	L/day	
=	1.6	L/min	
=	0.027	L/s	
Peak Day Factor =	1.77		Town Recommended Peak Day Factor = 1.77
Peak Day Demand =	0.048	L/s	
Peak Hourly Factor =	2.7		Town Recommended Peak Day Factor = 2.7
Peak Hourly Demand =	0.074	L/s	
Total Domestic Peak Demand =	**0.07**	**L/s**	

Fire Flow Calculations

Office of the Fire Marshal, OFM Guideline, Fire Protection Water Supply Guideline for Part 3 in the Ontarion Building Code (Oct 1999)
Subsection 3.2.2 of the Ontario Building Code, 2012

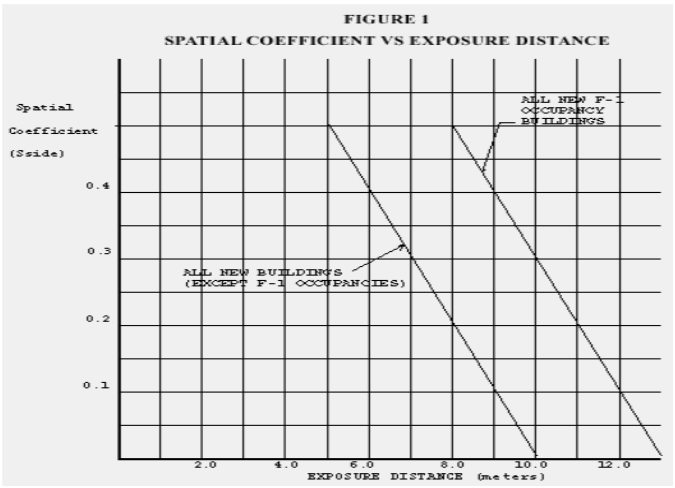
$Q=KVS_{Total}$ where

Q = Minimum supply of water in Litres (L)
K = water supply coefficient from Table 1
V = total building volume in cubic meters
S_{Tot} = total of the spacial coefficient values from the property line exposures on all sides as obtained from the formula:

$S_{Tot} = 1.0 + [(S_{Side1}) + (S_{Side2}) + (S_{Side3}) + \ldots etc.]$

where S_{Side} values are obtained from Figure 1, as modified by Sections 6.39(e) and 6.3(f) of the OBC Guideline
S_{Tot} need not exceed 2.0

FIGURE 1
SPATIAL COEFFICIENT VS EXPOSURE DISTANCE



1 Building Classification:

Building is of combustible construction. Floor assemblies are fire separations but with no fire-resistance rating. Roof assemblies, mezzanines, loadbearing walls, columns and arches do not have a fire-resistance rating.

Water Supply Coefficient - K — Table 1 of OBC A.3.2.5.7

K = 23 — Type C and D, OBC Table 3.1.2.1

2 Building Volumes

Bldg.	Area (m^2)	Height (m)	Volume (m^3)
Bldg. 1	333	10.95	3649
		Total	**3649**

← Total Building Volume

3 Exposure Distances $S_{Tot} = 1.0 + [(S_{Side1}) + (S_{Side2}) + (S_{Side3}) + \ldots etc.]$

Bldg.	North (m)	S_{Side} (N)	East (m)	S_{Side} (E)	South (m)	S_{Side} (S)	West (m)	S_{Side} (W)	S_{Tot}
Bldg. 1	10.00	0.01	>10 m	0	9.20	0.08	>10 m	0	**0.09**

← Max S_{Tot}

S_{Tot} = 1.09 — Max. Value = 2.0

4 **Minimum Fire Water Supply**

$Q=KVS_{Total}$ = **91469** Litres

5 **Fire Water Supply Flow Rate** = **2700** L/min — Table 2 Required Minimum Water Supply Flow Rate (L/min), provided in the OBC A.3.2.5.7

= **45.00** L/s

6 **Domestic + Fire Flow Rate** = **45.07** L/s

Appendix I – Permeable Paving Information

ECORASTER®

Permeable Ground Reinforcement

Maintenance

ECORASTER® Bloxx | E Series

ECORASTER® E Series and Bloxx Maintenance Guidelines

Ecoraster® products are designed to be maintenance-free.

» For ECORASTER® gravel-filled applications, the surface should be inspected from time to time to identify signs of slight cell infill loss. The pavement should be monitored to ensure traffic frequency and loading does not exceed the pavement design.

» For ECORASTER® grass-filled applications, maintenance is limited to the grass element of the system. Irrigation, fertilizing, cutting etc. should be done according to the grass type and climate.

» For ECORASTER® Bloxx systems, no special maintenance or vacuuming is required. Leaves and other organic materials or garbage can be raked, swept or blown. Care should be taken not to remove the gravel, grass, or Bloxx inserts.

» ECORASTER® Bloxx inserts can be carefully removed and replaced if they are damaged or stained.

ECORASTER® E Series and Bloxx Snow Removal Guidelines

To ensure that the ECORASTER® products are not damaged, remove snow using one of the following methods:

» Use a plow blade with a flexible rubber edge or spacer pucks.

» Use a plow blade with skids on the lower outside corners so the plow blade does not come in contact with the ECORASTER® units.

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