Robinson
Land Development

Servicing & Stormwater Management Report

Carroll Subdivision
3112 Carp Road
City of Ottawa, ON

Prepared For:

T & L Carroll Holdings Inc.

Prepared By:

Robinson Land Development

Project No. 24104
Version 2
March 2026

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LEGAL NOTIFICATION

This report was prepared by Robinson Land Development for the account of **T & L Carroll Holdings Inc.** Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. **Robinson Land Development** accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this project

1.0 INTRODUCTION

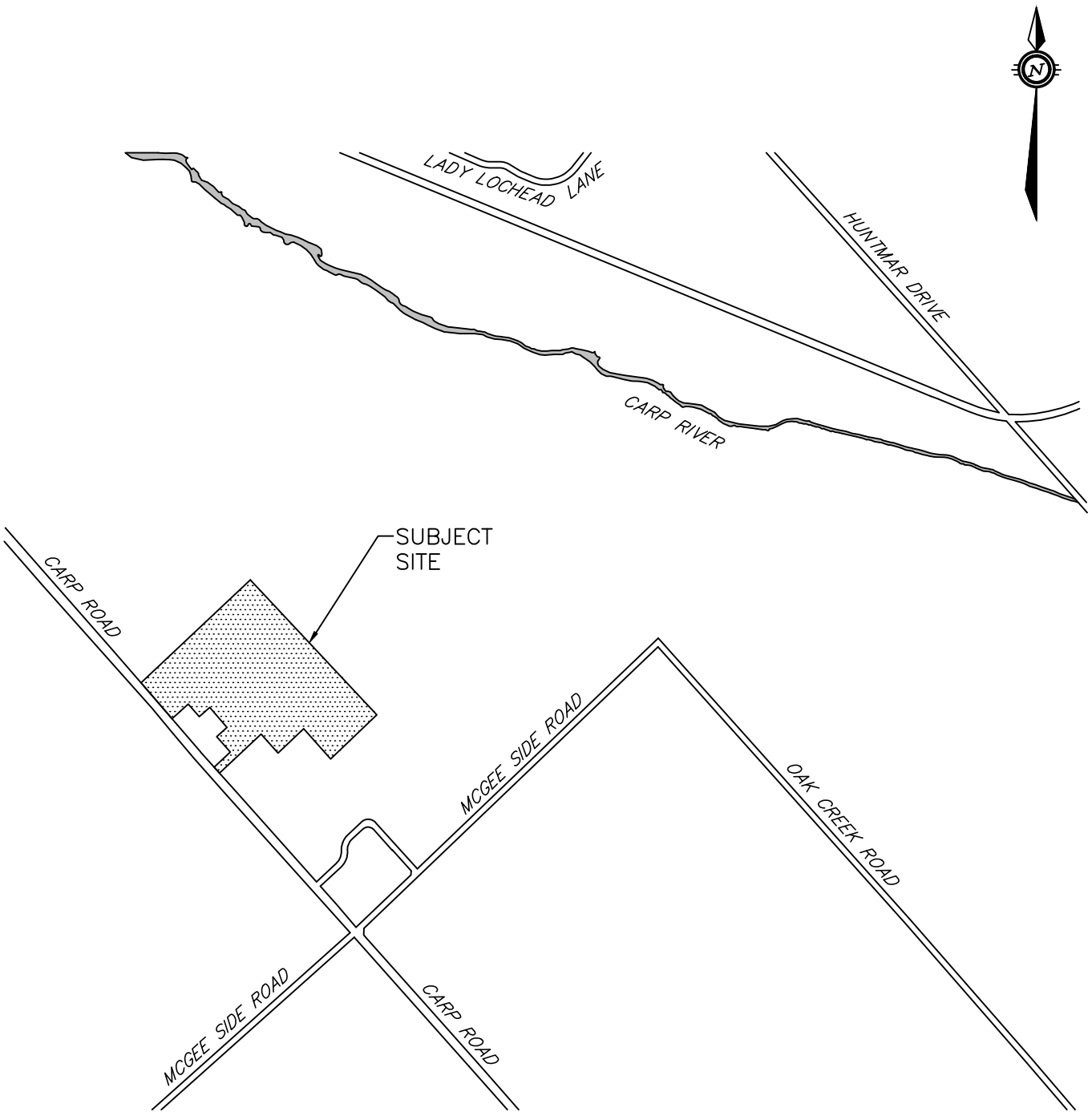
Robinson Land Development have been retained by T & L Carroll Holdings Inc. to prepare a Servicing & Stormwater Management Report for a proposed rural industrial/commercial subdivision located at 3112 Carp Road in the City of Ottawa. The subject site (herein referred to as the Carroll Subdivision) is 21.25 hectares in area and will be accessed from two new road connections to Carp Road (refer to **Figure 1 – Key Plan** following page 1).

In support of achieving draft plan approval, this report will provide sufficient details to demonstrate that the Carroll Subdivision can be developed in accordance with current City of Ottawa guidelines and overarching studies to the satisfaction of the approval authorities.

2.0 GUIDELINES, STUDIES AND REPORTS

The designs for the proposed Carroll Subdivision have been prepared in keeping with the following documents:

- **Sewer Design Guidelines**, City of Ottawa, December 2025 (herein referred to as OSDG).
- **Water Distribution Design Guidelines**, City of Ottawa, December 2025 (herein referred to as OWDG).
- **Environmental Compliance Approval for a Municipal Stormwater Management System, Appendix A**, Ministry of the Environment, Conservation and Parks, December 2024 (herein referred to as CLI-ECA SWM Criteria).
- **Stormwater Management Planning and Design Manual,** Ministry of the Environment, 2003 (herein referred to as MECP SWM Manual).
- **Runoff Volume Control Targets for Ontario, Final Report**, Aquafor Beech Ltd. & Earthfx Inc., October 27, 2016 (herein referred to as the Aquafor Beech Report).
- **Carp River Watershed/ Subwatershed Study Volume I – Main Report**, Robinson Consultants Inc., December 2004 (herein referred to as the CRWSS).
- **Low Impact Development Stormwater Management Planning and Design Guide,** CVC, TRCA, 2010 (herein referred to as LID Design Guide).
- **Water Supply for Public Fire Protection,** Fire Underwriters Survey, 2020 (herein referred to as FUS Guidelines).
- **Geotechnical Investigation, Proposed Industrial Development, 3160 Carp Road**, GEMTEC, September 13, 2023.
- **Environmental Impact Statement, Proposed Plan of Subdivision, 3160 Carp Road**, GEMTEC.
- **Hydrogeological Investigation & Terrain Analysis, Proposed Industrial Subdivision, 3160 Carp Road**, GEMTEC, March 26, 2026.



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scale N.T.S.	CARROLL SUBDIVISION	project no. 24104
date 06/03/25		
drawn by BLM	KEY PLAN	FIG 1.0

A pre-consultation was held with the City of Ottawa and Rideau Valley Conservation Authority (RVCA) on September 9th, 2022 to discuss requirements for the proposed development. The pre-consultation meeting notes have been provided under **Appendix A** for reference.

3.0 EXISTING CONDITIONS

The subject site is 21.25 hectares in area and is zoned rural commercial subzone 9 (RC9 – Highway Commercial). The site is bound by Carp Road and highway commercial properties to the west, highway commercial properties to the north and south, and agricultural land to the east. The subject site is currently undeveloped with limited tree coverage. The topography of the property slopes from west to east. The site contains multiple drainage features (refer to **Section 7.11** for more details) which capture and convey surface runoff from the property. An existing watercourse is located at the easternmost corner of the site. The existing watercourse conveys stormwater runoff in a northeast direction, ultimately discharging into the Carp River approximately 1550 metres downstream of the subject site. The site is located within the Carp River Watershed and within the Mississippi Valley Source Protection Area. Approximately half of the site falls within the boundary of a highly vulnerable aquifer (as per source protection mapping). Refer to the Draft Plan of Subdivision, prepared by Callon Dietz Inc., under **Appendix A**. Refer also to **Figure 2** below for an aerial view of the subject site under its pre-development state.

Figure 2: Existing Conditions

4.0 DEVELOPMENT PROPOSAL

The Draft Plan of Subdivision for the Carroll Subdivision will provide a total of (12) rural industrial/commercial use blocks. The blocks will range from 0.96 hectares up to 3.83 hectares in area. The blocks will be accessed by a new municipal roadway (i.e. Street A) with two connections to Carp Road. The southerly connection will coincide with the existing entrance connection to the 3108 Carp Road property. As part of the development, new entrance connections for the 3108 Carp Road property will be provided off the new municipal roadway. The new municipal roadway will have a rural cross-section and will be contained within a 26.0 metre right-of-way. The total length of the proposed roadway is approximately 919 metres.

The Draft Plan of Subdivision also includes a stormwater management block (i.e. Block 4) which will ultimately be municipally owned and will provide stormwater management controls for the subdivision (as discussed further under **Section 8.0**). Refer to the Draft Plan of Subdivision, provided under **Appendix A**, for more details.

The site development will be constrained by a 30 metre Blanding's Turtle Habitat setback measured from the existing watercourse as identified in the Environmental Impact Statement (EIS) prepared by GEMTEC.

The proposed blocks will be serviced by individual well and septic systems as discussed under **Section 5.0** and **Section 6.0** below. Detailed development plans for the blocks will require individual Site Plan Applications (SPAs) with the City of Ottawa as they become developed.

5.0 WATER SERVICING

5.1 Existing System

There are no municipal watermain systems available in proximity to the subject site. Existing developments in the area receive water supply via private drilled wells.

5.2 Domestic Water Supply

Domestic water supply for the individual blocks will be provided by private drilled wells. GEMTEC completed a groundwater supply investigation to determine the quantity and quality of groundwater available for domestic water supply. The investigation required the drilling of four test wells on the subject site to characterize the hydrogeology and meet MECP D-5-5 minimum test well requirements. The field procedures included 8-hour constant rate pumping tests and simultaneously pumping of two test wells to assess well interference. The test wells were pumped at a constant flow rate of 21 L/min. A flow rate of 21 L/min over an 8-hour period (≈10,000 L) is considered to be representative of the water usage expected for the future uses on the site. Water level measurements and groundwater sampling were also completed. Based on the investigations completed to date, GEMTEC has provided the following conclusions regarding the use of drilled wells for domestic water supply:

- The water quality available from the drilled wells on the site is safe for consumption based on the absence of health-related exceedances.
- The quality of groundwater meets the Ontario Drinking Water Quality Standards, Guidelines and Objectives with the exception of hardness, sodium, and sulphide.
    - The levels of hardness are considered to be reasonably treatable using a conventional water softener.

  - The levels of sodium remain well below the 200 mg/L aesthetic objective; however, three of the test wells exceed the 20 mg/L warning limit for persons on sodium restricted diets.
  - The levels of hydrogen sulphide exceed the ODWS aesthetic objective of 0.05 mg/L. An unofficial addendum to MECP Guideline D-5-5 (July 6, 1995) indicates that sulphide concentrations of up to 2.5 mg/L can be reasonably treated with manganese greensand filters.
- No negative water quality impacts from neighbouring properties have been identified.
- The trace metals (associated with neighbouring cemeteries) tested from TW2 and TW4 reported non-detectable concentrations or concentrations well below the applicable maximum acceptable concentration, aesthetic objective or operational guideline.
- The water quality determined in the course of the investigation is representative of long-term water quality from which future lot owners are likely to obtain from their wells constructed in accordance with the well construction recommendations.
- The quantity of groundwater available from the proposed water supply aquifer is more than sufficient for the proposed development and will sustain repeated pumping at the test rate and duration at 24-hour intervals over the long term.
- The well yields determined in the course of this investigation are representative of the long-term yields which future lot owners are likely to obtain from their wells constructed in accordance with the well construction recommendations.
- Additional water quantity testing is recommended should future lot owners require groundwater in excess of the maximum allowable septic flows (e.g. processing waters).
- Interference between drinking water wells is expected to be acceptable under typical usage for commercial/industrial developments.

The exact locations of the proposed drilled wells will be determined at the SPA stage as the individual blocks become developed. GEMTEC has prepared a *Conceptual Lot Development Plan* which provides recommended locations for the future drilled wells and septic systems (refer to *Figure 10* under **Appendix C**). The general placement should be maintained to ensure that future systems do not conflict with the neighbouring blocks. If adjustments to well or septic locations are required at the SPA stage, a Qualified Professional should review the revised placements to confirm that they will not cause interference. Proposed drilled wells must maintain a minimum setback of 15 metres from any proposed septic systems. The minimum setback is increased to 18 metres if fully raised septic beds are used. GEMTEC has provided the following construction recommendations to assist in the future development of the subject site:

- Any original test wells which are not located in suitable locations for future development use and any other existing wells located on the property should be abandoned by a licensed well driller in accordance with MECP regulations following draft plan approval of the subdivision.
- Wells should be located so that they meet the minimum setback distances from septic systems, property lines and any other sources of contamination, as required in the Ontario Building Code and/or Ontario Reg. 903. If possible, the setback distance for the location of drinking water wells should be maximized.
- All wells shall remain accessible for future inspection and testing and large equipment for future maintenance, repair, and replacement.
- All wells that are drilled in the subdivision should be constructed in accordance with MECP regulations (Ontario Reg. 903).
- All wells that are drilled in the subdivision should be maintained in accordance with the document entitled ‘Water Supply Wells – Requirements and Best Management Practices’ (MECP December 2009).

- Well casings should be extended at least 11.6 metres below ground surface. The entire annular space between the steel casing and the overburden/bedrock should be filled with a suitable cement or bentonite grout.
- In addition to the minimum recommended well casing lengths specified in the preceding recommendation, all well casings should be completed a minimum of 4.57 metres into sound, competent bedrock.
- Multi-day well development may be required to reduce turbidity levels in newly drilled wells on the site. If a newly drilled well is required at the time of Site Plan Control for the Site, a qualified professional should be retained to confirm that turbidity levels are at acceptable levels after well development.
- A well grouting certification inspection should be conducted during the installation and grouting of the well casing for all future wells installed on the subject site. The well grouting certification inspection should be conducted under the supervision of a professional engineer or professional geoscientist.
- Hydrofracturing of all four on-site test wells was required to obtain the minimum pumping requirements of MECP Procedure D-5-5. Future lot owners should be aware that additional well development such as hydrofracturing, surging and/or additional pumping may be required to reach the well yields demonstrated in the Hydrogeological Investigation & Terrain Analysis report.
- The test wells completed for the study were completed at depths of 61 metres below ground surface. Future drinking water wells completed on the site at depths greater than 61 metres may encounter different hydrogeological conditions and the quality and quantity of water available from drilled wells may differ than that presented in the study.

The findings of GEMTEC's testing are detailed in the Hydrogeological Investigation and Terrain Analysis report (available under a separate cover); relevant excerpts have been provided under **Appendix C**.

5.3 Water Supply for Fire Protection

Since there are no existing pressurized watermain distribution systems in proximity to the subject site, water supply for fire protection will need to be provided in accordance with the current OWDG *Appendix J* (formerly IWSTB-2024-05). Sample calculations have been provided below for Block 11. The following parameters have been used in the calculations:

- Building Area — 20% Lot Coverage (Max. 25% as per RC9 Zoning)
- Building Height — 4.0 m (Max. 11.0m as per RC9 Zoning)
- Occupancy — F2 – Medium Hazard Industrial Occupancies
- Type of Construction — Non-combustible
- Sprinkler Protection — None

Using the process outlined in *Appendix J*, the minimum water supply for fire protection shall be first calculated using the equation below from the Ontario Building Code (OBC):

$Q = KVS_{tot}$

Where:

Q = minimum supply of water (L)
K = water supply coefficient (derived from OBC Table 1)
V = total building volume (m^3)
S_{tot} = total of spatial coefficient (derived from OBC Figure 1)

Water Supply Coefficient

The water supply coefficient (K) is derived from OBC *Table 1* which provides a coefficient based on the building group/division classification (in accordance with OBC *Table 3.1.2.1*) and the type of construction. Given that the blocks will be developed for rural industrial/commercial uses, an F2 classification (medium hazard industrial occupancy) and non-combustible construction type have been assumed. Using OBC *Table 1*, a water supply coefficient of 17 has been selected.

Total Building Volume

V = (Block Area) x (Lot Coverage) x (Building Height)
V = (11,400 m^2) x (0.20) x (4.0 m)
V = 9,120 m^3

Total of Spatial Coefficient

The total of spatial coefficient (S_{tot}) is calculated using the following equation:

$S_{tot} = 1.0 + [(S_{side1}) + (S_{side2}) + (S_{side3}) + \ldots etc.]$

Where:

S_{side} = values obtained from OBC *Figure 1*
S_{tot} shall not exceed 2.0

Exposure distances from a new building are measured from the exterior building faces to the property lines. When facing a street, the property line shall be deemed to be the centre of the street. For all new buildings (excluding F1 occupancies), if the exposure distance is 10 m or greater, the spatial coefficient for that side is zero. Given the size of the proposed blocks, it is feasible that a minimum setback of 10 metres from the property lines can be achieved. However, to be conservative it is assumed that the building will be offset 3.0 metres from a single property line (minimum interior yard setback) which returns an S_{side} value of 0.50. Therefore, the total of spatial coefficient has been assumed to be 1.5, however, this will need to be verified at the SPA stage once building locations are known.

Minimum Supply of Water and Flow Rate

Using the values derived above, the minimum supply of water has been calculated as follows:

$Q = KVS_{tot}$
Q = (17) x (9,120 m^3) x (1.5)
Q = 232,560 L

From OBC *Table 2*, the required minimum water supply flow rate for a minimum water supply between 190,000 L and 270,000 L is 6300 L/min. Following the procedure outlined in *Appendix J,* a water supply flow rate below 9000 L/min does not require special evaluation and further calculations using FUS and NFPA 1142 methods are not required. Since the water supply flow rate exceeds 4500 L/min, the site does not qualify for a reduction in the required storage volume. A final review would then be completed by Ottawa Fire Services and Development Review to determine appropriate water storage requirements for the site.

If the building volume is increased, the required water storage and flow rate will also increase. If the future buildings were constructed to maximum dimensions permitted by zoning the minimum water supply could exceed 670,000 L on the smallest block. If a future developer

wants to reduce the minimum water supply requirements, the following measures could be considered:

- Reduce the overall building area and height.
- Implementation of a site use which conforms to low hazard industrial occupancy (i.e. F3) thus reducing the water supply coefficient (K).
- Implementation of an automatic sprinkler system. Additional analysis would be required in accordance with NFPA 13.
- Implementation of fire walls within the proposed building to reduce the effective fire area.

Sample required water storage calculations for the individual blocks have been shown in **Table D1** provided under **Appendix D**. However, detailed fire flow calculations will need to be completed for each block at the SPA stage once future building plans are known. The approximate footprint for a series of interconnected precast underground water storage tanks (41,000 L x 6 units) with a capacity of 246,000 L has been shown on **Figure 3** (provided under **Appendix B**) to demonstrate a reasonable amount of space which may need to be allocated for fire protection. Note that the minimum storage tank volume permitted for fire fighting purposes, regardless of building dimensions, is 38,000 L.

6.0 SANITARY SERVICING

6.1 Existing System

There are no municipal sanitary sewer systems available in proximity to the subject site. Existing developments in the area utilize private septic systems to discharge sanitary flows.

6.2 Proposed Septic Systems

Sanitary flows generated by the individual blocks within the Carroll Subdivision will be conveyed to on-site private septic systems. It has been assumed that advanced treatment is being proposed for this development. Advanced treatment is capable of treating effluent to a notable degree prior to the effluent being disposed to a Class IV leaching bed (Type A or Type B).

GEMTEC completed an impact assessment in accordance with MECP Guideline D-5-4 to assess the potential impact on groundwater and surface water resources due to wastewater treatment and disposal by individual septic systems on the subject site. The impact assessment was completed on a lot-by-lot basis to determine the nitrate concentrations at the boundaries of each block. The maximum allowable concentration of nitrate in the groundwater at the lot boundaries is 10 milligrams per litre as per MECP Guideline D-5-4. The allowable daily design sanitary sewage flow (DDSSF) for the proposed blocks ranges from 531 L/day to 2,455 L/day for conventional systems, and 1,593 L/day to 7,366 L/day for advanced treatment systems (based on 40% hard surface coverage). Calculations have also been completed for 50% and 60% hard surface coverage scenarios since the future development plans are undetermined. Refer to the supporting calculations (prepared by GEMTEC) under **Appendix C**.

GEMTEC has provided the following septic system recommendations for the subject site:

- The proposed blocks will be serviced by either conventional or advanced treatment septic sewage disposal systems that achieve a minimum of 50% reduction in nitrogen, approved under the Ontario Building Code, prior to the effluent being disposed to a Class IV leaching bed (Type A or Type B).

- A site-specific investigation should be conducted on each block for the design of the septic system.
- It is required that the property owners enter a maintenance agreement with authorized agents of the advanced treatment septic system manufacturer for the service life of the system.
- If advanced treatment systems are utilized, the City of Ottawa requires that they be NSF/ANSI 245 and/or CAN/BNQ 3680-600 certified. For 50% nitrate reduction.
- In review of the percolation time of the native soils, a sand mantle and partially to fully raised leaching beds should be allowed for some the proposed blocks. The suitability of the native soils should be assessed on a lot-by-lot basis by a qualified septic designer.
- It should be noted that when determining hard surface coverage for the future blocks, that gravel surfaces are included. Gravel surface are considered impermeable, as they are likely to be compacted over time.
- The maximum allowable daily design sanitary sewage flow (DDSF) for the proposed commercial blocks ranges depends on the total hard surface coverage and type of septic system.
- If during the site plan approval process, the proposed septic system design flow exceeds the preliminary septic flow recommendation for a specific block, then it is recommended that a detailed groundwater impact assessment be conducted. If the detailed groundwater impact assessment demonstrates that additional septic flow can be accommodated on the block, then the preliminary septic flow recommendation for that block should be amended accordingly.
- If the proposed septic flow for a site development application is less than the preliminary septic flow recommendation, then no additional groundwater impact assessment work is required for that block.

All septic systems shall be designed on a lot-by-lot basis at the SPA stage for the individual blocks. As recommended by GEMTEC, test holes should be advanced during the block development to identify the subsurface conditions at the location of the proposed septic system. In all cases, the septic system design must conform to the OBC requirements. GEMTEC has prepared a *Conceptual Lot Development Plan* which provides recommended locations for the future drilled wells and septic systems (refer to *Figure 10* under **Appendix C**). The general placement should be maintained to ensure that future systems do not conflict with the neighbouring blocks. If adjustments to well or septic locations are required at the SPA stage, a Qualified Professional should review the revised placements to confirm that they will not cause interference

7.0 GRADING & DRAINAGE

The overall grading and drainage approach for the Carroll Subdivision is discussed in the sections below. Supporting discussions and calculations from a stormwater quantity and quality control perspective are provided under **Section 8.0**.

7.1 Municipal Right-of-Way

Stormwater runoff from the proposed municipal right-of-way (i.e. Street A) will be captured and conveyed by roadside ditches. The roadside ditches have been designed with a 1.0 m flat bottom and 3H:1V side slopes (refer to the typical road cross section on DWG. 24104-GR1 under **Appendix B**). The roadside ditches will discharge to the proposed stormwater management (SWM) facility contained within Block 4. Refer also to the Street A Plan and Profile drawings (DWG. 24104-P1-P4) provided under **Appendix B**.

7.2 Stormwater Management (SWM) Facility

The proposed stormwater management (SWM) facility will be contained within Block 4 and is intended to be municipally owned and operated. The proposed SWM facility will be designed as a dry pond and will provide both stormwater quantity and quality controls (refer to **Section 8.0** for more details). All stormwater runoff from the individual blocks and municipal right-of-way will be conveyed to the SWM facility where it will be attenuated before discharging to the new outlet ditch (refer to **Section 7.3**). The bottom of the SWM facility has been designed with minimal slopes to maximize the available storage volume. A 5.0 metre wide reinforced grass service road is proposed around the perimeter of the facility for operation and maintenance. Conceptual grading and typical sections for SWM facility are provided on the Grading and Drainage Plan (DWG. 24104-GR2) under **Appendix B**.

7.3 Outlet Ditch

In order to convey stormwater from the Carroll Subdivision to a suitable and legal outlet, a new drainage ditch must be constructed within the easement on the adjacent landlocked property. The proposed outlet ditch has been designed with a 1.0 metre flat bottom, 3H:1V side slopes, and a 3.0 metre wide access platform for operation and maintenance (refer to **Section 7.7** for easement requirements). The alignment of the outlet ditch will follow the northern boundary of the adjacent property before crossing the unopened Oak Creek Road road allowance and discharging into an existing tributary, approximately 220 metres upstream of the Carp River. Refer to **Section 8.4** for supporting discussion and calculations on the capacity of the outlet ditch.

7.4 Rear Yard Ditches

Two rear yard ditch systems have been designed to convey stormwater runoff from the individual blocks to the proposed SWM facility. A rear yard ditch system will be located along the northern boundary of Blocks 1-3 (herein referred to as the north rear yard ditch) and a secondary rear yard ditch system will be located along the eastern boundary of Blocks 5-9 (herein referred to as the east rear yard ditch). The rear yard ditch systems have been designed with 1.0 metre flat bottoms, 3H:1V side slopes, and a 3.0 metre wide access platform for operation and maintenance (refer to **Section 7.7** for easement requirements). Since the rear yard ditch systems form part of the overall drainage system for the subdivision, they will need to be constructed at the onset of the project, prior to the individual blocks being developed. Refer to **Section 8.6** for supporting discussion and calculations on the capacity of the rear yard ditch systems.

7.5 Individual Blocks

Based on topography, stormwater runoff from the individual blocks will be discharged to the municipal right-of-way and/or the rear yard drainage ditches. Stormwater runoff from the individual blocks will need to be attenuated in accordance with the overall stormwater management design for the Carroll Subdivision (refer to **Section 8.0**). Proposed grades for the block corners and drainage slopes along the shared lot lines have been provided on the Grading and Drainage Plans (DWG. 24104-GR1-GR3) to demonstrate the proposed drainage patterns for the subject site. Detailed grading and drainage plans will be required for each individual block at the SPA stage as they become developed.

7.6 External Drainage

Under pre-development conditions, runoff from external lands is conveyed into the subject site. To not cause adverse impacts to the abutting properties, all external drainage patterns have been accommodated in the overall grading and drainage design for the Carroll Subdivision.

Runoff from the external lands located south of Block 9 (denoted as EXT-1) will be captured by an interceptor ditch located inside the property line. The interceptor ditch will capture and convey the external drainage directly to the existing watercourse, bypassing the proposed SWM facility. A small portion of Block 9, which by natural topography, will be conveyed to the interceptor ditch and existing watercourse has also been included in the EXT-1 drainage boundary. Since the interceptor ditch forms part of the overall drainage system for the subdivision, it will need to be constructed at the onset of the project, prior to the individual blocks being developed.

Runoff from the external lands located south of Block 10 (denoted as EXT-2) will be captured by drainage swales and conveyed to the municipal roadside ditch system before discharging to the SWM facility within Block 4.

Runoff from the external lands located between Blocks 13-14 and Carp Road (denoted as EXT-3) will be captured by drainage swales and conveyed to the municipal roadside ditch system before discharging to the SWM facility within Block 4.

Runoff from the external lands located between Block 1 and Carp Road (denoted as EXT-4, legally known as 3160 Carp Road) will be captured by the municipal roadside ditch system and conveyed to the SWM facility within Block 4. A *Servicing and Stormwater Management Brief*, prepared by Novatech for the 3160 Carp Road property, indicates that the post-development stormwater outlet will be to the roadside ditch on Carp Road. Any stormwater conveyed from the 3160 Carp Road property into the Carroll Subdivision will need to be controlled to the allocated pre-development flow rates from area EXT-4.

7.7 Easements

As identified on the Draft Plan of Subdivision, the site is subject to an existing 10 metre wide drainage easement (instrument No. NS215961) located along the northern property boundary. The drainage easement spans from the Carp Road right-of-way in a northeast direction across the newly created parcel (i.e. 3160 Carp Road), across the subject site (i.e. 3112 Carp Road), and across the adjacent landlocked property, before terminating at the unopened Oak Creek Road road allowance. The limits of the easement are shown on registered Plan 5R-7272, provided under **Appendix A** for reference. The purpose of the existing easement is to provide drainage for the adjacent lands and to allow access to the landlocked property as detailed in the deed of land, provided under **Appendix A**.

Although intended for drainage, the lands covered by the existing easement contain no drainage features such as swales or ditches within the limits of the subject site. In order to convey stormwater from the Carroll Subdivision to a suitable and legal outlet, a new drainage ditch must be constructed within the easement on the adjacent landlocked property. To accommodate the new ditch section and an adjacent access platform for operation and maintenance, the existing easement will need to be widened by an additional 5 metres up to 15 metres. Discussions with the adjacent landowner are ongoing and it is acknowledged that written authorization for the easement widening will be required.

The proposed outlet ditch will discharge to an existing tributary on the east side of the unopened Oak Creek Road road allowance. The existing tributary is located within a 39.4 hectare privately owned landlocked parcel. Preliminary discussions with the landowner have been initiated regarding easement requirements over the existing tributary (i.e. site outlet) between the Oak Creek Road and the Carp River. It is acknowledged that written authorization for an easement creation will be required.

The proposed north rear yard drainage ditch system will be contained within the limits of the existing 10 metre easement (refer to typical section on DWG. 24104-GR1) and therefore there will be no additional easement requirements. The proposed east rear yard drainage ditch system will require the creation of a new 15 metre wide easement along the eastern property boundary, spanning Lot 9 to Lot 6 (refer to typical section on DWG. 24104-GR2).

7.8 Block 5

The Draft Plan of Subdivision has provided a 26.0 metre wide block (i.e. Block 5) which spans from the Street A right-of-way to the eastern property boundary. In accordance with the provisions of the deed of land (provided under **Appendix A**), the registration of a Plan of Subdivision on the subject site shall allow for a roadway connection, giving access to the lands (i.e. adjacent landlocked property). The overall grading and drainage plan for the Carroll Subdivision has allowed for Block 5 to be developed with a typical rural road cross section, however, the roadway within Block 5 will not be constructed until such a time that the adjacent landowner proceeds with development plans on their property. In the interim, access to the landlocked property will continue to be provided by the existing easement along the northern property boundary.

7.9 On-Site Drainage Areas

Stormwater runoff from the frontages of Blocks 1-3 (denoted as STM1) and frontages of Blocks 6-9 and Block 10 (denoted as STM3) will outlet to the municipal roadside ditch system and be conveyed to the proposed SWM facility.

Stormwater runoff from Blocks 11-14 (denoted as STM2) and the adjacent external lands (denoted as EXT-3) will outlet to the municipal roadside ditch system and be conveyed by a road crossing culvert to the proposed SWM facility.

Stormwater runoff from the rears of Blocks 1-3 (denoted as area STM4) will outlet to the north rear yard drainage ditch and be conveyed to the proposed SWM facility.

Stormwater runoff from the rears of Blocks 6-9 (denoted as area STM5) will outlet to the east rear yard drainage ditch and be conveyed to the proposed SWM facility. Refer to the Post-Development Drainage Area Plan (DWG. 24104-STM1) under **Appendix B** for more details.

7.10 Culverts

New road crossing culverts will be required within the municipal right-of-way to convey roadside drainage to the proposed SWM facility. Culverts will also be required where drainage ditches cross below the proposed access roads for the SWM facility. Entrance culverts will also be required as the individual blocks become developed. Two new entrance culverts will need to be provided to maintain access to the 3108 Carp Road property following construction of the municipal right-of-way. The culverts will be sized at the detailed design stage using the following design criteria in accordance with current City of Ottawa guidelines:

- Minimum Culvert Diameter 500 mm
- Design Event for Road Crossing Culverts 10 Years
- Design Event for Entrance Culverts 5-Year

Minimum entrance culvert sizes will be assessed based on the level of service for the roadside ditches (i.e. 5-year event). Proposed culvert locations (excluding driveway culverts) are shown on the design drawings provided under **Appendix B**. The culvert sizes indicated on the design

drawings are based on preliminary assumptions in the developed stormwater model and will be refined at the detailed design stage for optimal performance.

7.11 Headwater Drainage Features

Under pre-development conditions, runoff from the subject site and portions of the abutting external lands are conveyed by overland flow in west-to-east direction. Some of the runoff is intercepted by existing drainage features located within the limits of subject site. Based on topographic survey data, the existing on-site drainage features do not have positive draining outlets and do not have direct connectivity to the existing watercourse located at the easternmost property corner. The on-site drainage features have been identified as headwater drainage features (HDFs) in the EIS. As recommended in the EIS, the HDFs will be relocated to the perimeter drainage ditches/swales to maintain feature functions. The relocation of the HDFs is anticipated to improve connectivity with the existing watercourse. The location of the HDFs is shown on *Figure A4* from the EIS (provided under **Appendix C**).

7.12 Grade Raise Restrictions

The Geotechnical Investigation prepared by GEMTEC has indicated that the soil conditions across the site generally consists of silty sand over discontinuous deposits of weathered silty clay crust, over glacial till. Based on the results of the subsurface investigation, a maximum grade raise restriction of 1.5 metres above original ground is recommended. Higher grade raises may be considered but should be reviewed by GEMTEC. The grading plans should be reviewed from a geotechnical perspective to determine if any additional measures are warranted.

8.0 STORMWATER MANAGEMENT

8.1 Design Criteria

In accordance with current City of Ottawa guidelines and overarching studies and reports, the following stormwater management design criteria are proposed for the subject site:

- Control post-development stormwater peak flows to pre-development levels for the 2-year through 100-year design events.
- Minor system (i.e. roadside ditches) shall be designed for a 5-year level of service.
- Major system (i.e. municipal right-of-way and outlet ditch) shall be designed for a 100-year level of service.
- Control the 90th percentile storm event or if conventional methods are necessary then provide enhanced level (70% TSS removal) quality control of stormwater runoff.
- Achieve a post-development infiltration target of 73 to 104 mm/year.
- Incorporate low impact development (LID) measures where possible to do so.

As per *Section 6.4* of the OSDG, open channel systems (i.e. ditches and swales) are to be designed to convey the same design storm as the minor system (i.e. typically 2 to 5-year event). *Table 6.4* from the OSDG, lists the level of service for the minor system (i.e. roadside ditches) of a local road (urban and rural) to be the 5-year event. To optimize the use of available storage in the proposed SWM facility and to lessen quantity controls on the individual blocks, a 5-year level of service for the minor system is considered appropriate for this development. The sections below will provide detailed discussions and calculations to demonstrate how the above design criteria will be achieved for the Carroll Subdivision.

8.2 Pre-Development Flows

Under pre-development conditions, stormwater runoff from most of the subject site and portions of the abutting external lands (denoted as PRE1) is conveyed by overland flow in a west-to-east direction towards the existing agricultural lands to the east.

Stormwater runoff from a portion of the subject site (denoted as area PRE2) is conveyed by overland sheet flow through the adjacent agricultural lands before being intercepted by an existing watercourse further downstream.

Stormwater runoff from a smaller area to the south (denoted as area PRE3) is conveyed by overland sheet flow directly to the existing watercourse located adjacent to the easternmost property corner of the subject site.

Stormwater runoff from the pre-development drainage areas is generally conveyed in a northeast direction where it is intercepted by existing tributaries and ultimately discharges into the Carp River, approximately 1550 metres downstream of the subject site.

A pre-development stormwater model has been developed using PCSWMM. The model takes into consideration the pre-development land use, land cover, and subsurface conditions from the Hydrogeological Investigation. The model has been used to determine the peak flows which discharge from the subject site under pre-development conditions. Pre-development peak flows for the 2-year, 5-year, and 100-year design events have been summarized in the table below.

Table 8.1: Pre-Development Peak Flows

Drainage Area ID	Area (ha)	Pre-Development Peak Flow[*1,2] (L/s)		
		2-Year	5-Year	100-Year
PRE-1	28.32	172	307	809
PRE-2	3.60	205	331	742
PRE-3	2.44	23	46	134
Total	**34.36**	**400**	**684**	**1685**

Notes:
1. Peak flows calculated using PCSWMM.

As demonstrated in the table above, the pre-development peak flows range from 400 L/s during the 2-year design event up to 1685 L/s during the 100-year design event. Refer to the Pre-Development Drainage Area Plan (DWG. 24104-PRE1) provided under **Appendix B**.

8.3 Quantity Control

Under post-development conditions, stormwater runoff will be captured by a system of ditches/swales and conveyed to the proposed SWM facility before discharging to the new outlet ditch along the northern boundary of the adjacent property. As outlined under **Section 8.1**, post-development runoff must be controlled to pre-development levels for the 2-year through 100-year design events. A post-development stormwater model has been developed using PCSWMM. The model has been developed using the following design parameters:

- CN values as per soil groups identified in the Hydrogeological Investigation (refer to *Figure 6* under **Appendix C**).
- Each block will have an imperviousness of 60% (C=0.62).

- Each block will have to provide stormwater attenuation to control the 100-year design event to the 5-year peak flow calculated using the Rational Method (based on an assumed runoff coefficient of 0.62 and City of Ottawa IDF curve equations).
- Roadside ditches will have the capacity to convey the 5-year design event.
- The proposed SWM facility will provide stormwater attenuation to less than pre-development levels for the 2-year through 100-year design events.

8.3.1 Lot Level Quantity Controls

The post-development stormwater model assumes that each block will attenuate the 100-year design storm event to the allocated allowable release rate. The allowable release rate corresponds to the 5-year peak flow rate calculated using the Rational Method, City of Ottawa IDF curve equations (using T_c=10 min.), and an assumed site imperviousness level of 60% (equating to a runoff coefficient of 0.62). Based on topography, some blocks have been assumed to have split lot drainage where a portion of stormwater runoff will be directed to the municipal roadside ditches, and a portion will be directed to the rear yard ditch systems. At the SPA stage, if more runoff is being conveyed to an outlet than what has been allocated for then those drainage areas will need to be overcontrolled to not exceed the allowable release rates. Attenuating the 100-year storm event will require on-site storage to control the outflow to the prescribed release rate and prevent any overflow from the site during this event. Required storage volumes have been estimated for each block based on attenuating the 100-year design event to the 5-year peak flow. The allowable release rates and corresponding required 100-year storage volumes for each block are summarized in the table below.

Table 8.2: Lot Level Quantity Controls

Block No.	Outlet Location	Allowable Release Rate[*1] (L/s)	Outlet Location	Allowable Release Rate[*1] (L/s)	Required Storage Volume[*2] (m^3)
1	Street A	141	North Ditch	38	86
2	Street A	125	North Ditch	55	87
3	Street A	47	North Ditch	133	89
6	Street A	23	East Ditch	196	175
7	Street A	22	East Ditch	193	172
8	Street A	17	East Ditch	209	183
9	Street A	53	East Ditch	559	494
10	Street A	173	-	-	82
11	Street A	204	-	-	97
12	Street A	205	-	-	97
13	Street A	207	-	-	98
14	Street A	261	-	-	124

Notes:
1. Allowable release rates are based on 5-year peak flow calculated using the Rational Method.
2. Required storage volume to attenuate 100-year design storm event to 5-year peak flow.

The required storage volumes provided in the table above are based on each block having an imperviousness of 60%. If the blocks are developed with more impervious area than what has been allocated, additional on-site storage will be required. Likewise, if the blocks are developed with less impervious area, on-site storage requirements will be reduced. Required storage

volumes will need to be calculated for each block at the SPA stage once development plans are finalized.

8.3.2 Subdivision Level Quantity Controls

Stormwater runoff from the proposed municipal right-of-way will discharge to the proposed SWM facility. As outlined in **Section 8.3.1**, stormwater runoff from the individual blocks will be controlled to the allocated allowable release rates before being discharged into the ditch systems and conveyed to the SWM facility. The proposed SWM facility must provide stormwater attenuation to pre-development levels accounting for controlled flows from the individual blocks and uncontrolled flows from the municipal right-of-way and external drainage areas. The downstream end of the SWM facility will incorporate a control structure with multiple stage controls to attenuate the 2-year through 100-year design events to pre-development levels before discharging to the outlet ditch. The allowable release rate for the SWM facility has excluded peak flows from drainage area PRE3 since pre-development conditions will be maintained and the flows will bypass the SWM facility. The table below summarizes the simulation results for the SWM facility.

Table 8.3: Quantity Controls for SWM Facility

Design Event	Allowable Release Rate[*1,2] (L/s)	Required Storage Volume (m^3)	Ponding Elevation (m)	Release Rate[*3] (L/s)
2-Year	227	2,525	108.83	165
5-Year	379	3,819	108.93	344
100-Year	906	7,972	109.24	872
100-Year + 20%	1205	10,545	109.43	967

Notes:
1. Allowable release rate corresponds to pre-development peak flows from drainage areas PRE1 and PRE2. The allowable release rate excludes peak flows from drainage area PRE3 since pre-development conditions will be maintained and the flows will bypass the SWM facility.
2. Total pre-development flow is a summation of flows from the pre-development areas taken at the first time to peak. These flows are not coincidental (i.e. peaks do not occur simultaneously) and therefore the individual peak flows cannot be directly summed.
3. Release rate corresponds to controlled peak flows from the SWM facility. Details on the outlet control structure to be provided at the detailed design stage.

As shown in the table above, the proposed SWM facility has been designed with adequate storage volume to detain flows exceeding pre-development levels for up to and including the 100-year design event. During the detailed design stage, the SWM facility outlet control structure will need to be properly sized to optimize the use of the available pond storage. Refer to **Table E1: SWM Facility Stage-Storage** under **Appendix E** for more details.

8.4 Outlet Ditch Assessment

The proposed SWM facility will discharge to the new outlet ditch on the adjacent landlocked property before ultimately discharging to the Carp River further downstream. The proposed outlet ditch has been designed with a 1.0 metre flat bottom, 3H:1V side slopes and a channel depth of 0.80 m. Using the developed PCSWMM model, the hydraulics of the outlet ditch have been assessed to verify that there is sufficient capacity to convey attenuated peak flows from the SWM facility. The results of the outlet ditch assessment have been summarized in the table below.

Table 8.4: Outlet Ditch Assessment

Design Event	Peak Flow Rate *1 (L/s)	Flow Depth*2 (m)	Flow Velocity*2 (m/s)
2-Year	165	0.20	0.65
5-Year	344	0.25	0.71
100-Year	872	0.39	0.92
100-Year + 20%	967	0.41	0.95

Notes:
1. Attenuated peak flow rate from SWM facility.
2. Output from PCSWMM model.

As shown in the table above, the flow depth required to convey the attenuated 100-year peak flow can be accommodated within the outlet channel. It has also been shown that the peak flow from the stress test event (i.e. 100-year + 20%) can be conveyed without overtopping of the channel side slopes. *Appendix 6-C* of the OSDG notes that the permissible velocity for a grass lined channel is 1.5 m/s. Since the flow velocity during the 100-year design event is below 1.5 m/s, measures for erosion control will not be warranted.

8.5 Roadside Ditch Assessment

Stormwater runoff from the municipal right-of-way and portions of the individual blocks will be captured and conveyed by roadside ditches before discharging to the SWM facility. The roadside ditches have been designed with a 1.0 metre flat bottom, 3H:1V side slopes and a typical channel depth of 1.08 m. Using the developed PCSWMM model, the hydraulics of the roadside ditches have been assessed to verify that there is sufficient capacity to convey peak flows under various design events. As discussed under **Section 8.1**, the roadside ditches have been designed for a 5-year level of service. The results of the drainage ditch assessment have been summarized in the table below.

Table 8.5: Roadside Ditch Assessment

Design Event	Peak Flow Rate *1,2 (L/s)	Flow Depth*1 (m)
2-Year	1300	0.33
5-Year	1866	0.39
100-Year	3394	0.74
100-Year + 20%	4282	0.85

Notes:
1. Output from PCSWMM model.
2. Peak flow modelled at downstream ditch section with largest contributing drainage area.

As shown in the table above, the flow depth required to convey the 100-year peak flow can be accommodated within the roadside ditches. It has also been shown that the peak flow from the stress test event (i.e. 100-year + 20%) can be conveyed without overtopping the channel side slopes.

8.6 Rear Yard/ Interceptor Ditch Assessment

Stormwater runoff from the individual blocks and external drainage areas (where applicable) will be captured and conveyed by rear yard ditch systems (i.e. north and east ditches) before discharging to the SWM facility. An interceptor ditch on Block 9 will also be utilized to convey external drainage to the existing watercourse at the easternmost property corner. The north rear yard ditch system has been designed with a 1.0 metre flat bottom, 3H:1V side slopes and typical channel depth of 0.60 m. The east rear yard ditch system has been designed with a 1.0 metre flat bottom, 3H:1V side slopes and typical channel depth of 1.0 m. The interceptor ditch has been designed with a V-shaped bottom, 3H:1V side slopes, and a typical depth of 0.60 m. Using the developed PCSWMM model, the hydraulics of the ditch systems have been assessed to verify that there is sufficient capacity to convey the 100-year peak flow. The results of the ditch assessments have been summarized in the table below.

Table 8.6: Rear Yard/ Interceptor Ditch Assessment

Ditch Location	Channel Depth (m)	100-Year Peak Flow Rate [*1] (L/s)	Flow Depth[*1] (m)	100-Year + 20% Peak Flow Rate[*1] (L/s)	Flow Depth[*1] (m)
North Ditch	0.60	359	0.21	531	0.26
East Ditch	1.00	1161	0.85	1769	1.08
Interceptor Ditch	0.60	133	0.28	186	0.30

Notes:
1. Output from PCSWMM model.

As shown in the table above, the flow depth required to convey the 100-year peak flow can be accommodated within the ditch systems. It has also been shown that the peak flow from the stress test event (i.e. 100-year + 20%) can be conveyed without overtopping the channel side slopes for both the north ditch and interceptor ditch. For the east ditch system, the ponding elevation for the stress test event will marginally exceed the top of slope elevation at the downstream reaches, however, there will be no encroachment onto permanent structures. At the SPA stage, the individual grading plans for each block will need to demonstrate adequate freeboard in accordance with the current OSDG.

8.7 Quality Control

Designs for water quality should follow the performance criteria outlined in *Appendix A* of the CLI-ECA SWM Criteria (provided under **Appendix E** for reference). Water quality for the subject site is characterized by the overarching Carp River Watershed Subwatershed Study (CRWSS) which recommends normal level (70% TSS removal) quality control of stormwater runoff. For development scenarios (such as the Carroll Subdivision), *Appendix A* of CLI-ECA SWM Criteria recommends control of the 90th percentile storm event as the first means of meeting suspended solids targets. If control of the 90th percentile storm event is demonstrated to not be feasible then conventional methods, such as enhanced or normal level protection (80% or 70% TSS removal respectively) for suspended solids removal are necessary. The level of protection shall be based on the receiver, which for the Carp River, is normal level (70% TSS removal) protection. Control is in the following hierarchical order:

1. Retention (i.e. infiltration, reuse, or evapotranspiration)
2. Low Impact Development (LID) Filtration

3. Conventional Stormwater Management

Quality control for the Carroll Subdivision will be provided by a combination of lot controls (i.e. privately owned measures implemented on the individual blocks) and subdivision controls (i.e. municipally owned measures implemented within the right-of-way and SWM block). Stormwater runoff from rural road cross sections is not commonly treated with extensive quality control measures since the roadside ditches themselves provide a reasonable level of quality treatment. Most retention and filtration based measures are intended for smaller drainage areas (< 2 ha to 5 ha) and as such are more appropriate to be implemented at the lot level rather than the subdivision level.

8.7.1 90th Percentile Event

The 90th percentile rainfall event (also known as the runoff volume control target) represents the rainfall depth for which 90% of all rainfall events are of equal depth or less on an annual average. Since rainfall depths vary geographically, the 90th percentile target shall be interpolated from *Figure 3.67* of the Aquafor Beech Report (provided under **Appendix E** for reference). For the subject site, the 90th percentile target has been interpolated to be 26mm to 27mm. The 90th percentile target volumes have been calculated for each block based on their respective areas and summarized in the table below.

Table 8.7: 90th Percentile Target Volumes

Block ID	Area (m^2)	90th Percentile Target Volume (m^3)	
		Min.[*1]	Max.[*2]
1	10,012	260	270
2	10,011	260	270
3	10,011	260	270
4	20,751	540	560
5	3,335	87	90
6	12,210	317	330
7	12,030	313	325
8	12,623	328	341
9	38,243	994	1,033
10	9,642	251	260
11	11,370	296	307
12	11,420	297	308
13	11,548	300	312
14	14,544	378	393
Street A	24,726	643	668
Total	**212,475**	**5,524**	**5,737**

Notes:
1. 90th percentile minimum target is 26mm as interpolated from *Figure 3.67*.
2. 90th percentile maximum target is 27mm as interpolated from *Figure 3.67*.

As shown in the table above, the 90th percentile target volume for the total site area ranges from 5,524 m^3 up to 5,737 m^3.

Section 4.3.1.5 of the Aquafor Beech Report acknowledges that infiltration of runoff generated from the 90th percentile rainfall event may not be feasible for every site as a result of site specific constraints. Property constraints which may result in the permitting of alternatives include (but are not limited to):

- Shallow bedrock
- High groundwater
- Swelling clays or unstable sub-soils

Two alternatives are identified for sites with constraints. Alternative 1 is a reduced runoff volume control target which must comply with the following conditions:

a. Achieve at least 75% volume control from all impervious surfaces for the runoff generated by the geographically specific 90th percentile rainfall event (*Figure 3.67*).
b. Options considered and presented shall examine the merits of relocating project elements to address, varying soil conditions and other constraints across the site.
c. Not applicable for sites which directly discharge to a watercourse less than 500 m from the site boundaries.

Alternative 2 is to the maximum extent possible and must comply with the following conditions:

a. Achieve volume control to the maximum extent possible. The maximum extent possible shall be defined as the maximum achievable volume control, using all known, available and reasonable methods, given the site restriction.
b. Options considered and presented shall examine the merits of relocating project elements to address, varying soil conditions and other constraints across the site.
c. Not applicable for sites which are directly discharge to a watercourse less than 500 m from the site boundaries.

If it is demonstrated that any of the blocks are constrained by the site conditions listed above, reduced target volumes could be considered.

8.7.2 Stormwater Retention

The first step in the hierarchical order is to control the 90th percentile volume via stormwater retention (i.e. infiltration, reuse, or evapotranspiration).

Infiltration

Stormwater retention via infiltration is typically achieved using engineered systems to temporarily store runoff, allowing it to infiltrate into the underlying native soils. *Appendix 10* (formerly TB IWSTB-2024-04) of the OSDG provides screening criteria for the use of infiltration type LIDs in development applications. As per the guidelines, infiltration/exfiltration systems will not be permitted in any of the following conditions:

1. *Clay and silt soils:* Due to the poor hydraulic properties of silts and clay, infiltration type LID practices are not permitted in clay or silt soils.
2. *Bedrock:* The invert of infiltration type LID practices must be at least one metre above the native (pre-development) elevation of the bedrock surface. Infiltration type LIDs will not be permitted in blasted rock areas nor in bowls of the bedrock elevation.

3. *Engineered fill:* Infiltration type LIDs will not be permitted in engineered fill. Engineered fill may consist of Granular A or Granular B Type II.
4. *Groundwater:* The invert of infiltration type LID practices must normally be at least one metre above the seasonally high (pre-development) groundwater elevation, based on testing results. If there is less than one metre separation to the seasonally high groundwater elevation, extended monitoring programs and thorough hydrogeological assessments will be required, including groundwater mounding analyses.

Hydrogeological testing for the subject site has inferred that the composition of the native soils is approximately 42% silty sand and sandy silt and approximately 58% silty clay and clayey silt. The inferred surficial geology is shown on *Figure 6* of the Hydrogeological Investigation (provided under **Appendix C** for reference). Based on hydrogeological testing, approximately 58% of the total site area is likely not suitable for infiltration/exfiltration systems.

Hydrogeological testing for the subject site has inferred bedrock depths based on practical auger refusal depths. The depths to refusal within the boreholes and test wells ranged from 2.6 metres up to 9.2 metres below the original ground surface. It should be noted that refusal may occur on cobbles or boulders and may not necessarily represent the bedrock surface. Assuming a 1.0 metre deep infiltration practice and a bedrock surface 2.6 metres below original ground, a minimum 1.0 metre separation to bedrock is achievable. Overall, the finished grade of the developed blocks will be above original ground and therefore it is unlikely that bedrock will constrain any infiltration type systems. However, caution should be exercised on blocks with shallower refusal depths due to the potential for bedrock. Further field testing to verify bedrock depths at proposed LID locations or implementation of shallow LID measures could be explored at the SPA stage for impacted blocks. Refer to refusal/bedrock testing results provided under **Appendix C** for more details.

Engineered fill is not anticipated to be required for the site development, therefore, there should be no associated constraints.

Hydrogeological testing for the subject site has inferred groundwater depths based on measured groundwater levels within the monitoring and test wells. Based on groundwater levels measured on April 23rd, 2023, the depth to groundwater ranged from 2.8 metres up to 4.6 metres below the original ground surface. Readings from August 8th, 2019 indicated a groundwater depth of 1.5 metres in a single test well. It should be noted that groundwater levels may be higher during wet periods of the year or following periods of precipitation. Assuming a 1.0 metre deep infiltration practice and a groundwater table 2.8 metres below original ground, a minimum 1.0 metre separation to groundwater is achievable. Overall, the finished grade of the developed blocks will be above original ground and therefore it is unlikely that groundwater will constrain any infiltration type systems. Groundwater monitoring is ongoing to provide a better assessment of groundwater levels at the subject site. However, based on the groundwater levels recorded to date, much of the site should not be constrained by the seasonally high groundwater table.

Based on the results of the hydrogeological testing, the suitability of infiltration systems has been assessed for each block and summarized in the table below. Using *Figure 6* of the Hydrogeological Investigation, soil conditions have been inferred for each block. In the table below, an (H) indicates high suitability - the block area is largely comprised of soils which are favourable for infiltration, an (M) indicates moderate suitability – a reasonable portion of the block area is comprised of soils which are favourable for infiltration, and an (L) indicates low suitability – limited to no areas of the block are comprised of soils which are favourable for infiltration.

Table 8.8: Suitability of Infiltration Systems

Block ID	Soils	Bedrock	Groundwater
1	H	-	-
2	M	-	-
3	L	-	See Note 4
4	L	-	See Note 4
5	L	-	See Note 4
6	L	-	See Note 4
7	L	-	-
8	L	-	-
9	M	See Note 2	-
10	H	See Note 2	-
11	L	-	-
12	L	-	See Note 3
13	M	-	-
14	H	-	-
Street A	M	-	See Note 3

Notes:
1. For soils: (H) indicates high suitability, (M) indicates moderate suitability, and (L) represents low suitability.
2. Blocks are in proximity to borehole (i.e. BH23-14) with refusal depth within 2.6 m of original ground.
3. Blocks are in proximity to borehole (i.e. BH23-07) with groundwater depth within 2.8 m of original ground.
4. Blocks are in proximity to test well (i.e. TW 19-2) with groundwater depth within 1.5 m of original ground.

As shown in the table above, the suitability for infiltration systems varies from block to block. Blocks with high to moderate suitability are strongly encouraged to explore infiltration systems, whereas blocks with low suitability will need to explore other stormwater alternatives. It should be noted that the conditions above are based on inferred hydrogeological testing results, which could vary between test locations. Further on-site investigations would be warranted at the SPA stage for each block to verify site conditions. The following infiltration based systems could be considered at the lot level for blocks with high to moderate suitability:

- Infiltration trenches
- Soakaway pits
- Dry swales (with perforated pipes)
- Bioretention
- Porous pavement

Since the proposed stormwater management facility (i.e. Block 4) and much of the municipal right-of-way is founded on soils with low suitability for infiltration, the implementation of infiltration based systems on municipal property will be limited. The municipal right-of-way (i.e. Street A) will contain approximately 1725 metres of roadside ditches, 790 metres of which is anticipated to be founded on soils with high to moderate suitability for infiltration. The suitability

for infiltration is highest near Carp Road and decreases towards the east. The following measures which will promote infiltration could be considered within the roadside ditches at the subdivision level where high to moderate suitability exists:

- Perched culverts
- Rip-rap check dams

Perched culverts and rip-rap check dams provide stormwater retention which slows runoff and promotes infiltration into the underlying native soils. At the detailed design stage, the exact location of perched culverts and/or rip-rap check dams will need to be identified on the design drawings and available storage volumes upstream of the measures will need to be quantified.

Reuse

Stormwater reuse is the practice of capturing, storing, and repurposing rainwater for beneficial uses. Typical reuse practices can include landscape irrigation, toilet flushing, or other site processes that require the use of water. Rainwater reuse may be feasible at a lot level but the feasibility of such measures may be dependent on the individual development plans for each block. Rainwater reuse at a lot level is encouraged where practical to implement.

Evapotranspiration

Evapotranspiration is the combined process of water moving from land to the atmosphere through evaporation and transpiration. The volume of stormwater which can be retained via evapotranspiration will be influenced by the vegetation coverage which is anticipated to vary from block to block. When the intensity of a rainfall event exceeds the ground's infiltration capacity, the excess runoff fills the small depressions on the ground surface which is known as depression storage. Runoff which is captured by the small depressions on the surface is either infiltrated (when capacity exists) or evaporated. In the Ottawa area, typical values for depression storage are 1.57mm for impervious areas and 4.67mm for pervious grassed areas (OSDG *S5.4.5.4*). While evaporation only accounts for a portion of the total evapotranspiration process, it can conservatively estimate the runoff volume which can be assumed to naturally be retained via depression storage. Depression storage volumes have been estimated for each block based on an assumed percent impervious of 60% and summarized in the table below.

Table 8.9: Depression Storage Volumes

Block ID	Pervious Area[*1] (m^2)	Impervious Area[*2] (m^2)	Pervious Depression Storage (m^3)	Impervious Depression Storage (m^3)	Total Depression Storage (m^3)
1	4,005	6,007	19	9	28
2	4,004	6,007	19	9	28
3	4,005	6,007	19	9	28
4	8,301	12,451	39	20	58
5	1,334	2,001	6	3	9
6	4,884	7,326	23	12	34
7	4,812	7,218	22	11	34
8	5,049	7,574	24	12	35
9	15,297	22,946	71	36	107

10	3,857	5,785	18	9	27
11	4,548	6,822	21	11	32
12	4,568	6,852	21	11	32
13	4,619	6,929	22	11	32
14	5,817	8,726	27	14	41
Street A	9,890	14,835	46	23	69
Total	**84,990**	**127,485**	**397**	**200**	**597**

Notes:
1. Depression storage for pervious areas assumed to be 4.67 mm.
2. Depression storage for impervious areas assumed to be 1.57 mm.

The depression storage volumes provided in the table above can be deducted from the 90th percentile target volumes (**Table 8.7**). At the SPA stage, depression storage volumes should be calculated on a lot-by-lot basis once the proposed surface coverages are known.

8.7.3 Stormwater Filtration

The second step in the hierarchical order is to control the 90th percentile volume via stormwater filtration. Filtration systems utilize a specified media to filter pollutants out of runoff before it is discharged to a storm sewer system or surface outlet. Typical filtration systems may include layers of sand or bioretention media. Since the treatment is provided by the filter media, the functionality of the system is not dependent on the native soil conditions as is the case with infiltration systems. Filtration systems can also incorporate impermeable liners if the site is constrained by high groundwater levels or if groundwater contamination is of concern (i.e. site use). *Table 4.1* from the MECP Manual (provided under **Appendix E** for reference) recommends a 0.50 m separation between the seasonally high groundwater table and sand filters which is a reduction from the 1.0 m separation recommended for infiltration systems. It should be noted that the inclusion of an impermeable liner would prevent any water balance benefits that may be achievable during periods of the year when groundwater levels are lower and therefore is only recommended where deemed necessary. Filtration systems would be encouraged on blocks with poor soil or high groundwater conditions. *Table 4.10* from the MECP SWM Manual (provided under **Appendix E** for reference) provides design guidance for filtration systems. Some of the key design guidelines include:

- Maximum Drainage Area — 5.0 ha
- Storage Depth (head on filter) — 0.50 m for subsurface (i.e. sand)
  0.15 m for surface filters (i.e. bioretention)
- Filter Media Depth — 0.50 m for sand
  1.0 m for bioretention (can be reduced to 0.50 m in constrained sites)

Equation 4.12 from the MECP SWM Manual can be used to calculate the required surface area of a filtration system based on the following:

$$A = \frac{1000\mathrm{Vd}}{\mathrm{k(h+d)t}}$$

Where:

A = surface area of the filter in (m²)
V = design volume (m³)
d = depth of the controlling filter medium (m)

k = coefficient of permeability of the controlling filter media (mm/hr)
h = operating head of water on the filter (m)
t = design drawdown time (hrs)

Using the above equation, the required surface area of a filtration system to control the 90th percentile rainfall event has been calculated for each block and summarized in the table below.

Table 8.10: Required Surface Area for Filtration Systems

Block ID	Design Volume (m^3)	Required Surface Area of Filter System (m^2)
1	270	125
2	270	125
3	270	125
6	330	153
7	325	150
8	341	158
9	1,033	478
10	260	121
11	307	142
12	308	143
13	312	144
14	393	182

Notes:
1. Design volume equates to 90th percentile rainfall event.
2. Depth of controlling filter media assumed to be 0.50m.
3. Coefficient of permeability for filter media assumed to be 45 mm/hr as per MECP SWM Manual for sand filter.
4. Operating head on filter media assumed to be 0.50m.
5. Drawdown time assumed to be 24 hours.

As shown in the table above, the surface area required for a filtration system which can control the 90th percentile rainfall event is very small in comparison to the total block area. The required surface area accounts for only 1.3% of the total lot coverage and therefore is considered a feasible alternative at the lot level where constraints exist. It should be noted that the calculations above are based on the conceptual design of a sand filter and that the required surface areas will be influenced by the input parameters used on a lot-by-lot basis. At the subdivision level, the drainage area tributary to the downstream SWM facility will far exceed the maximum recommended area for a filtration system and therefore incorporating filtration measures into the SWM facility is not practical.

8.7.4 Conventional Stormwater Management

The third and final step in the hierarchical order is conventional stormwater management such as enhanced or normal level protection (80% and 70% TSS removal respectively). Conventional stormwater management should only be considered once the maximum extent possible has been attained for Steps 1 (retention) and Step 2 (filtration). At the lot level, conventional stormwater management measures may be implemented to provide additional quality control, however, the required level of treatment should be achieved using retention or

filtration measures. At the subdivision level, conventional stormwater management will be used to design the SWM facility since retention and filtration are not practical as discussed in the sections above. Refer to **Section 8.7.6** for more details.

8.7.5 Lot Level Control Summary

Each privately owned block within the Carroll Subdivision will need to provide control of the 90th percentile rainfall event via retention or filtration. Based on the constraints discussed in the sections above, the recommended stormwater quality control for each block has been summarized in the table below.

Table 8.11: Recommended Lot Level Quality Control

Block ID	Primary Type of Quality Control for 90th Percentile Rainfall Event
1	Retention*1
2	Retention*1
3	Filtration*2
6	Filtration*2
7	Filtration*2
8	Filtration*2
9	Retention*1
10	Retention*1
11	Filtration*2
12	Filtration*2
13	Retention*1
14	Retention*1

Notes:
1. The 90th percentile rainfall event to be controlled using retention measures such as infiltration, reuse or evapotranspiration.
2. The 90th percentile rainfall event to be controlled using filtration measures. Retention via reuse or evapotranspiration is encouraged where practical to do so.

Table 4.1 from the MECP SWM Manual (provided under **Appendix E** for reference) summarizes the physical constraints associated with various stormwater management practices and can be used, in addition to the recommendations provided herein, to select the appropriate quality control measure(s) for each block at the SPA stage.

8.7.6 Subdivision Level Quality Controls

Quality control at the subdivision level will be provided as part of an overall treatment train approach. Stormwater runoff from the municipal right-of-way will receive quality control from the vegetated roadside ditches. The low longitudinal slopes and 1.0 m wide flat bottom design will reduce flow velocities, promoting infiltration (where suitable soils exist), evapotranspiration, and filtration through the surface vegetation. The implementation of perched culverts and/or rip-rap check dams (refer to **Section 8.7.2**) will provide additional quality control for the upstream reaches where the native soils are favourable for infiltration.

Although the primary purpose of the SWM facility is to provide quantity control, a degree of quality control will also be achievable. The required water quality storage volume to achieve basic level protection (60% TSS removal) with a dry pond SWMP has been calculated using *Table 3.2* from the MECP Manual and summarized in the table below.

Table 8.12: Water Quality Storage Volume for SWM Facility

Drainage Area[*1] (ha)	Imp. Level[*2] (%)	Storage Volume for Imp. Level[*3] (m^3/ha)	Required Storage Volume (m^3)
32.09	42.1	111	3562

Notes:
1. Drainage area includes total area tributary to SWM facility including external lands.
2. Based on tributary area land cover and assuming 60% impervious on blocks.
3. Interpolated using *Table 3.2* from the MECP SWM Manual.

As shown in the table above, a total water quality storage volume of 3562 m^3 will be required within the SWM facility to provide basic level protection (60% TSS removal). Based on **Table E1** (provided under **Appendix E**), the water quality storage volume can be achieved within the dry pond at approximate ponding elevation of 108.91 m.

In accordance with the MECP SWM Manual, the water quality storage volume should have an extended detention time of 24 to 48 hours. Due to the proximity of the subject site to the Carp Airport, standing water is undesirable as it may attract birds which poses a safety risk to air traffic. Therefore, a 24-hour detention time will be targeted. An orifice control which can provide the desired detention time for the quality storage volume will be appropriately sized during detailed design.

To provide additional pre-treatment upstream of the SWM facility, a sediment forebay can be incorporated into the facility design. The sediment forebay facilitates maintenance and improves pollutant removal by trapping larger particles near the inlet of the pond. The forebay should include a permanent pool (>1m depth) to minimize the potential for scour and re-suspension. The forebay can be appropriately sized based on settling length and dispersion length equations from the MECP SWM Manual at the detailed design stage.

The total length of the outlet ditch between the proposed SWM facility and the Carp River is approximately 1150 metres. The low longitudinal slopes and 1.0 m wide flat bottom design will reduce flow velocities, promoting infiltration (where suitable soils exist), evapotranspiration, and filtration through the surface vegetation.

As discussed in the sections above, each block will need to provide independent quality controls, therefore any quality cleansing achieved from the downstream ditches and SWM facility will be above and beyond the required level of protection.

The combination of roadside ditches, the SWM facility, and outlet ditch will provide a reasonable amount of stormwater quality control for the municipal right-of-way prior to discharging into the Carp River.

8.8 SWM Facility Design

As discussed under **Section 8.3.2** and **Section 8.7.6**, the proposed SWM facility will be designed as a dry pond to provide stormwater quantity and quality controls. In addition to providing the required quantity and quality storage volumes, other design parameters must be considered. In review of *Table 4.1* from the MECP SWM Manual, there are no physical

constraints associated with a dry pond SWMP and therefore it can be considered suitable for the subject site. *Table 4.8* from the MECP SWM Manual summarizes the design guidelines recommended for the implementation of dry ponds. The recommended and provided design criteria have been summarized in the table below.

Table 8.13: Dry Pond Design Criteria

Design Element	Recommended Criteria	Provided Criteria
Drainage Area	>5 ha	31.2 ha
Treatment Volume	Table 3.2	Table 3.2
Detention Time	24 hrs	24 hrs[*2]
Pre-Treatment	Forebay	Forebay / ditches
Length-to-Width Ratio	3:1	1.3:1
Depth	3 m Max.	1.27 m
Side Slopes	4:1	3:1
Inlet	Min. 450 mm	1050 mm[*2]
Outlet	Min. 450 mm	600 mm[*2]
Maintenance Access	Per Municipality Approval	5.0 m Access Road
Buffer	3 m beyond max. water level	7+ m

Notes:
1. Recommended criteria as per *Table 4.8* from the MECP SWM Manual.
2. Design details to be determined at detailed design stage.

As shown in the table above, the proposed SWM facility design generally meets or exceeds the recommended criteria from the MECP SWM Manual. The upstream ditches and forebay will provide a reasonable degree of pre-treatment. The side slopes of the facility have been designed at a 3H:1V slope to maximize the available storage volume and to minimize the footprint of the facility. Since the facility will be located within a rural industrial/commercial subdivision, the side slopes are considered satisfactory from a safety perspective. A 5.0 m wide reinforced grass access road is proposed around the perimeter of the SWM facility for operation and maintenance.

The SWM facility will incorporate an emergency overflow. In the event that the outlet is blocked or the system is over capacity, the emergency overflow will discharge stormwater directly to the outlet ditch before impacting the adjacent blocks or neighbouring properties. At the detailed design stage, the dimensions of the emergency overflow will need to be optimized to ensure adequate freeboard (0.30 m minimum) between the maximum ponding elevation and the top of pond is achieved.

At the detailed design stage, the subsurface conditions of the SWM facility block shall be reviewed by the hydrogeological consultant to verify if an impermeable liner is warranted to provide protection against groundwater contamination.

8.9 Low Impact Development (LID)

As outlined under **Section 8.1**, low impact development (LID) measures should be implemented where possible to do so. LID is a stormwater management strategy that seeks to mitigate the impacts of increased runoff and stormwater pollution by managing runoff as

close to its source as possible. Through the processes of infiltration, evapotranspiration, harvesting, filtration and detention of stormwater, LID practices can effectively remove nutrients, pathogens and metals from runoff, and reduce the volume and intensity of stormwater flows.

As discussed under **Section 8.7.5**, retention or filtration based LID measures will be implemented on the individual blocks as the primary means of achieving the required quality control. Due to site constraints such as bedrock, high groundwater, and low permeability soils, the implementation of infiltration based LID measures may not be suitable or may be limited on some blocks (refer to **Table 8.8**). The performance of alternative LID measures such as enhanced grassed swales and vegetated filter strips is not heavily impacted by site constraints and could be implemented at the lot level as part of a treatment train approach to provide additional quality control.

8.10 Water Balance/ Infiltration Target

Designs for water balance should follow the performance criteria outlined in *Appendix A* of the CLI-ECA SWM Criteria (provided under **Appendix E** for reference). Control for water balance assessments shall be in accordance with overarching assessment studies if available. For the subject site, the recommendations from CRWSS should be referenced. As per *Section 8.3.2.1* of the CRWSS, the water balance on a smaller scale (site plan or secondary plan) within the subwatershed must be calculated in a manner that establishes a target value of pre-development total infiltration. Through prior pre-consultation with the City, a post-development water balance target which achieves 85% of the pre-development groundwater recharge is recommended.

The Hydrogeological Investigation prepared by GEMTEC has provided water balance calculations for the subject site. The water balance has established pre-development infiltration rates for each block and has assessed the anticipated infiltration reduction due to the addition of hard surfaces under post-development conditions. Post-development infiltration rates have been provided for 40%, 50%, and 60% hard surface coverage scenarios since the future development plans for each block are undetermined. The water balance calculations include an infiltration target for each block which represents the infiltration rate required to achieve 85% of the pre-development rate under post-development conditions.

As discussed under **Section 8.7.2**, approximately 58% of the total site area is likely not suitable for infiltration/exfiltration systems due to low permeability soils. At the subdivision level, infiltration based measures will not be suitable within the proposed SWM facility block or within significant portions of the municipal right-of-way due to native soil conditions. Therefore, water balance measures will be implemented at the lot level. However, it will not be feasible to implement infiltration systems on blocks which are underlaid by low permeability soils.

To mitigate the post-development infiltration rate reduction, blocks which contain soils with high to moderate infiltration potential shall implement infiltration-based measures. Infiltration targets, based on 60% hard surface coverage, have been calculated for each block and summarized in the table below.

Table 8.14: Water Balance / Infiltration Targets

Block ID	Soils*1	Infiltration Target*3 (mm/yr)
1	H	135
2	M	114
3	L	n/a
6	L	n/a
7	L	n/a
8	L	n/a
9	M	114
10	H	135
11	L	n/a
12	L	n/a
13	M	114
14	H	135

Notes:
1. For soils: (H) indicates high suitability, (M) indicates moderate suitability, and (L) represents low suitability.
2. Infiltration is not recommended on blocks with low suitability (L).
3. Infiltration target is based on 60% hard surface coverage. Refer to water balance tables under **Appendix C** for 40% and 50% hard surface scenarios.

9.0 EROSION AND SEDIMENT CONTROL

Prior to construction and until vegetation has been re-established in disturbed areas, erosion and sediment control measures must be implemented to mitigate the impact on receiving watercourses. The following erosion and sediment control (ESC) measures are recommended for the subject site:

- Limit the extent of exposed soils at any given time.
- Erosion and sediment control measures shall be maintained until vegetation has been re-established in all disturbed areas. Re-vegetate disturbed areas as soon as possible.
- Stockpile soil away (15 metres or greater) from watercourses, drainage features and top of steep slopes.
- Silt fence and straw bales to be installed and maintained where indicated on the erosion and sediment control plans.
- For dry weather periods (active and/or inactive construction phases) inspections of ESC measures shall be undertaken on a weekly basis.
- Inspection of ESC measures shall be undertaken immediately after major storm events (>25mm of rain in 24 hour period), significant snowmelt events (melting of snow at a rate which adversely affects the performance and function of the system), and extreme weather events.
- Visual inspections shall also be undertaken in anticipation of large storm events (or a series of rainfall and/or snowmelt days) that could potentially yield significant runoff volumes.
- Identify and rectify any deficiencies and undertake necessary maintenance measures as soon as possible.

- Inspections and maintenance of temporary ESC measures shall continue until they are no longer required.
- The Contractor shall ensure that records of inspection are taken, including at a minimum:
  - the inspector's name;
  - date of inspection;
  - visual observations;
  - any necessary remedial measures taken to maintain the interim ESC measures.
- Care shall be taken to prevent damage to ESC during construction operations.
- In some cases, barriers may be removed temporarily to accommodate construction operations. The affected barriers shall be reinstated immediately after construction operations are completed.
- ESC should be adjusted during construction to adapt to site features as the site becomes developed.
- ESC shall be cleaned of accumulated sedimentation as required and replaced as necessary.
- During the course of construction, if the Engineer believes that additional prevention methods are required to control erosion and sedimentation, the Contractor shall implement additional measures, as required, to the satisfaction of the Engineer.
- Construction and maintenance requirements for erosion and sediment controls are to comply with Ontario Provincial Standard Specification (OPSS) 805.

Refer to the Erosion and Sediment Control Plan (DWG. 24104-ESC1) provided under **Appendix B** for more details.

10.0 CONCLUSIONS

It has been demonstrated that the proposed rural industrial/commercial subdivision (i.e. Carroll Subdivision) located at 3112 Carp Road can be developed in accordance with current City of Ottawa guidelines and overarching studies. Specifically, the proposed development will include the following key design features:

- New municipal roadway with a rural cross-section contained within a 26 metre right-of-way with two connections to Carp Road.
- Roadside ditches designed for a 5-year level of service.
- Water supply for domestic use via individual drilled wells located on the future development blocks.
- Water supply for fire protection via individual storage tanks located on the future development blocks.
- Wastewater will be conveyed to individual septic systems located on the future development blocks.
- Stormwater attenuation to pre-development levels for the 2-year through 100-year design events via an outlet control structure within the proposed SWM facility.
- On-site stormwater quantity control to the allocated release rates (i.e. 5-year peak flow) for the future development blocks.
- Control of the 90th percentile storm event via retention or filtration measures on the future development blocks for stormwater quality control.
- Quality control of stormwater runoff from the municipal right-of-way by conventional measures and treatment train approach.

- Implementation of infiltration based measures on blocks with suitable soils to achieve a post-development water balance equal to 85% of the pre-development rate.
- Implementation of LID measures on the future development blocks where possible to do so.
- Erosion and sediment control measures will be implemented prior to construction and maintained until vegetation has been re-established in disturbed areas.

Report Prepared By:

Brandon MacKechnie, P.Eng.
Project Engineer

Stormwater Modelling Prepared By:

Ivan Dzeparoski, P.Eng.
Senior Water Resource Engineer

Appendix A

Pre-Consultation Meeting Notes

Draft Plan of Subdivision
(prepared by Callon Dietz Inc.)

Registered Plan 5R-7272
(prepared by Fairhall & Moffatt Ltd.)

Deed of Land

Pre-Application Consultation Meeting Notes

Property Address: 3160 Carp Road
PC2022-0214
September 9, 2022, Microsoft Teams Meeting

Attendees:
Erica Ogden, Planner II, City of Ottawa
Sean Harrigan, Planner I, City of Ottawa
Stephan Kukkonen, Planner I, City of Ottawa
Derek Kulyk, Project Manager, City of Ottawa
Josiane Gervais, Transportation, City of Ottawa
Ann O'Connor, Urban Design, City of Ottawa
Adiva Saadat, Student Planner, City of Ottawa
Mercedes Liedtke, Environmental Planner, Mississippi Valley Conservation Authority
Claire Milloy, Hydrogeologist, Rideau Valley Conservation Authority

Bridgette Alchawa, McIntosh Perry
Adam O'Connor, Keeper Co. Ltd.
Alex Testa
Lois Carroll, TG Carroll Cartage Ltd.
Thomas Carroll, TG Carroll Cartage Ltd.

Regrets:
Anissa McAlpine, Parks Planner, City of Ottawa
Tessa Di Iorio, Hydrogeologist, City of Ottawa
Sami Rehman, Environmental Planner, City of Ottawa

Subject: 3160 Carp Road

Meeting notes:

Overview of Proposal

- The proposal includes the severance of one (1) commercial/industrial lot and a plan of subdivision for a commercial/industrial subdivision with eleven (11) lots.
- Undecided at this time which lot would be created through a severance application, likely considering Lot 1, 11 or 12, as shown on the concept plan provided.

Preliminary comments and questions from staff and agencies, including follow-up actions:

<u>Planning</u>

- Official Plan
  - The property is designated Rural Employment Area on Schedule A of the current City of Ottawa Official Plan
  - The Rural Employment area permits heavy and light industrial uses, transportation, warehouse and storage operations, uses that are noxious by virtue and new commercial uses that primarily provide services to employees of the rural business park or the travelling public.
  - Development will be subject to Site Plan Control and all new development must be supportable on individual well and septic systems.

- Carp Road Corridor Community Design Plan
  - The property is designated as Highway Commercial Area within the Carp Road Corridor Community Design Plan.
  - Highway commercial uses are generally oriented to attract and serve passing traffic and require direct access to arterial roads. Carp Road is an arterial road that provides easy access to Highway 417 and the Carp Airport.
  - The Carp Road Corridor CDP encourages industrial development primarily in industrial/business parks
  - The following Design Guidelines from Section 7.3 of the CDP apply to Industrial/Business Park/ Subdivisions:
    1. Limit access to Carp Road. Internal roads to the subdivision should provide access to Carp Road.
    2. Locate parking at the rear or side of buildings. Where this is not possible and parking is required at the front or side of the building a greater setback from the property line should be required to permit planting to mitigate the effects of the parking area (e.g. parking screened from view).
    3. Locate storage and service areas at the rear of buildings except on sites where the property backs onto Carp Road or the main entry road.
    4. Site buildings fronting on Carp Road to face, front and feature the road corridor (entry roads and all local roads).
    5. Preserve as many trees as possible on the site.
    6. Compensate for removal of existing trees by extensive planting in the open space corridor, entry features "gateways" and on-site landscape areas.
    7. Plant trees along the corridor - an informal mix of trees and shrubs is preferable, with more coniferous than deciduous species.
    8. Provide landscaping at the front of buildings.
    9. Use landscaping, decorative fences to screen unsightly uses.
    10. Create entry feature ("gateways") for new subdivisions/parks. This should include a sign and landscaping with the name of the development and the park occupants and enhanced lighting for visibility at night.
    11. Provide for turning lanes where warranted.
  - The proposed subdivision is adjacent to residential uses, the CDP includes the following policies related to appropriate transition between existing and future uses:
    1. Locate all unsightly and noise-generating elements, such as service lanes, loading zones, dumpsters and outdoor storage, away from adjacent residential properties;
    2. Separate existing residential and institutional areas which back onto "Carp Road Corridor Rural Employment Area" with a landscaped buffer, located on development lands, designed to mitigate unsightly and noise-generating elements. Construction and maintenance of the landscaped buffer may be required as a condition of subdivision/site plan approval;
    3. The buffer should be formed by a 6m wide, 1.5 to 2 metres high aesthetic berm, predominantly planted with evergreen trees that retain their lower limbs with age. The planting should create a continuous and dense visual screen; and
    4. Where the noise generated by future uses is of concern, the setbacks from residential uses should be increased to allow for densely landscaped buffers.
- New Official Plan
  - The property is designated Rural Industrial and Logistics on Schedule B9 of the Council adopted Official Plan, which is awaiting approval from the Ministry of Municipal Affairs and Housing.

- City Council has approved transition policies for the New Official Plan, which state that in the period between Council approval of the New Official Plan and the Minister's approval of the New Official Plan, City staff will apply whichever provision, as between the Current and New Official Plan, is more restrictive.
- The property is subject to the Area Specific Policies for the Carp Road Corridor which designate the lands Corridor Commercial Area on Schedule 8.A within Volume 2C of the New Official Plan
- Permitted uses include light industrial uses, automotive, recreational and heavy vehicle sales and service. Convenience commercial uses are not permitted.

- Zoning By-law
  - The property is zoned Rural Commercial subzone 9 (RC9), which permits a variety of commercial and industrial uses.
  - The provisions for lots zoned RC9 include:
    - Minimum lot area 4000 sq.m.
    - Minimum lot width 30 m
    - Maximum lot coverage 25%

- Plan of Subdivision Application - Erica Ogden, erica.ogden@ottawa.ca
  - The policies of the Carp Road Corridor CDP, discourages lots fronting on to Carp Road. The internal access road should be the access for the proposed lots.
  - Consideration for existing easements to the neighbouring property 3108 Carp Road for the existing access, as well as access to the landlocked agricultural parcel to the rear, which appears to be accessed through the subject property.
  - The property is within the Airport Area of Influence, see the engineering section below for additional required studies.
  - The site has been identified to have Archaeological Potential and will require an Archaeological Resources Assessment.
  - Many of the proposed uses within the Rural Commercial zone require Site Plan Control approval.
  - Appropriate buffering to any existing residential uses and the proposed new lots will be required.

- Severance Application – Sean Harrigan, sean.harrigan@ottawa.ca
  - The severance application must be reviewed independently from the subdivision application but must also have consideration for the future development.
  - Both the proposed severed and retained lots require appropriate frontages, lot sizes and servicing, regardless of the future subdivision application.
  - Lots 11 or 12, shown on the concept plan provided, likely would not be supported through a severance application as they are located behind existing lots and do not have frontage on to Carp Road.
  - Severing Lot 1 may not maintain the required lot frontage for the retained parcel. The lot frontage is not considered cumulative across the various access points. A minor variance application could be considered for the retained lands. It is the applicant's decision whether to pursue a lot configuration that is zoning complaint or to submit a minor variance application and this decision should be rationalized in accordance with applicable policies and consideration for future development potential. However, when determining an appropriate lot configuration (i.e. whether to leave 20m for the future laneway south of Lot 1 or 30+m such that it is zoning compliant, or any other lot configuration), please consider how much space is required for the future subdivision

lane for engineering and traffic requirements (i.e. will 20m be sufficient for industrial related traffic such as freight?).

- The retained and severed lot must be sufficient sized, primarily related to servicing requirements, to adequately accommodate the uses permitted within the RC9 zone, or other mechanisms must be considered in the interim prior to the plan of subdivision application. This is a requirement of the Official Plan and should be discussed in the Planning Rationale/Cover Letter and accounted for in the Hydrogeological Report which will be required as a condition of approval.
- A Planning Justification will be required with the initial severance application and should include an analysis of current permitted uses, and rationale that the severed and retained lots are sufficiently sized.
- Road widening, if required, will be required as a condition of approval for the severance application. A survey is required to confirm.
- Parkland dedication will be required for the severance, see the comments provided below.
- A Hydrogeological and Terrain Analysis will be required and must demonstrate that both the severed and retain can be serviced, see the comments provided below.
- A condition of approval may require a notice on title related to well water quality, if required.
- Consideration should be given to future access from the internal road of the subdivision to Lot 1, as the CDP discourages direct access from Carp Road. Easements across the retained lands and a 30 cm reserve along the Carp Road frontage of Lot 1 may be required.
- Existing access to the farmlands to the rear of the subject property must be considered, as the existing access is located within the area of Lot 1. There more than likely will be a condition of approval that requires a formal easement agreement for the farmlands. Where exactly the easement should be placed is unknown at this time, but it is suspected the best location is over the retained lands through the proposed future lane (potential 30cm reserve would prevent an easement over the severed lot)
- Please note that other conditions of approval not listed above may be requested for the severance applications. The exact list of conditions will be determined based on the final proposal and after a comprehensive review is completed for a formal application submission.

Urban Design - Ann O'Connor, Ann.OConnor@ottawa.ca

- For a Plan of Subdivision application alone, no Design Brief is required. If a Zoning By-law Amendment application is going to be applied for concurrently with the Plan of Subdivision, a Design Brief may be required. A Terms of Reference can be provided by Design staff if this is considered.
- As the design of the lots move forward, consider retaining as much of the tree canopy/wooded area identified on the perimeter of the site.
- All policies in the Carp Road Corridor Community Design Plan should be adhered to, where possible. In particular, consider:
  - For Lot 1, with frontage on Carp Road, note that:
    - Section 2.1 of the CDP identifies that the properties fronting on the Carp Road are most appropriate for highway commercial and industrial use
    - Section 7 addresses how to enhance the visual appearance of the corridor and maintain the rural landscape.
  - For the Lot 8 and Lot 7, with lot lines that abut residential lots, note that:
    - Section 8 addresses land use compatibility with residences.

- Schedules:
  - Schedule 1 – Land Use Designations identifies the subject site as “Highway Commercial Area”
  - Schedule 2 – Environmental Features identifies portions of the site as having “moderate recharge’

Engineering - Derek Kulyk, derek.kulyk@ottawa.ca

Severance

Groundwater and Water Service

Please see the Hydrogeological comments provided below. While confirming quantity and quality it is important to be aware that the site is situated within 220 m of Highland Park Cemetery to the north-east, within 30 m of Presbyterian Cemetery to the south and Mineral Extraction pits (sand and gravel) are approximately 500 m to the south and approximately 375 m to the south-west.

The site is within Mississippi Rideau Source Water Protection Area. The site has been identified to be within a significant groundwater recharge area and contains a highly vulnerable aquifer. The location is within the area covered by the Carp River Watershed/Subwatershed Study (CRWSS).

If the accepted report recommends specific mitigation measures or design requirements, the Owners shall enter into a Development Agreement with the City, at the expense of the Owners, which is to be registered on the title of the property, which includes those recommendations. In instances where the subject site has sensitive soils, the drilling of a well or the conveyance of a 30-centimetre reserve may be required and also for access to the lot from the proposed road, not driveway from Carp Road. Both the report and any required Development Agreement shall be prepared to the satisfaction of Development Review Manager of the Relevant Branch within Planning, Infrastructure and Economic Development Department, or his/her designate.

Sanitary Service

There are no municipal sanitary sewers adjacent the proposed expansion. An Impact Risk Assessment will be required (as part of Hydrogeological and Terrain Analysis). Please see the Hydrogeology comments below.

Stormwater

There are no municipal storm sewers adjacent the proposed lot and also road ROW ditches with downstream outlets were not identified. Consequently, Stormwater investigation (NOT a report) should be provided to the City, as there is a concern of surface run-off conveyance and legal outlet from the proposed lot.

Site Geotechnical Conditions

Please note that sensitive marine clays are anticipated in the area of the proposed severance and potentially thin soils. Also slope of the site is unknown (Slope Stability study might be required).

In the severance application, if the City identifies any adverse soils conditions such as sensitive marine clays, a notice on title will need to be registered that advises of the potential site specific detailed engineering solutions that may be required to allow for development:

“The City of Ottawa has identified that there are potential sensitive marine clay soils and thin soils within the area that may require site specific detailed geotechnical engineering solutions to allow for development, the City of Ottawa bears no responsibility, financial or otherwise, to provide solutions to the deficiency, such solutions being the sole responsibility of the homeowner.”

Carp Airport Proximity

The proposed land severance is direct proximity to Carp airport, 650 m from the end of runway 28, consequently and landing/taking off aircraft might generate excessive noise and vibration. The proposed severance is also directly adjacent to Carp Road (arterial road), which is also identified as a “full load truck route”.

Noise and Vibration Attenuation Study**,** as per City of Ottawa Environmental Noise Control Guidelines will be required to address these two sources (airport & Carp Road) of noise and vibration and potential impacts and mitigation to the future development proposal. The Owner might have to enter into an agreement with the City that requires the Owner to implement any noise control (and vibration if applicable) attenuation measures recommended in the approved study. The Noise Warning Clauses might need to be registered on title.

Transport Canada, Carp Airport Authority, Navigation Canada, or other aviation authorities, as required, need to be contacted regarding ponds and lighting or other specific considerations and limitations associated with proposed development in direct proximity to Carp Airport. The City Engineering needs to be copied on the communication (the findings resulting from the communication might need to be registered on title). Airport area zoning restrictions imposed by the Airport Vicinity Development Zone need to be considered, as per new OP section 10.2.2.11 (Schedule C14) and current OP, Section 4.8.6.

Easements/ROW

Easements and rights-of-ways must be shown on the plans and information on any existing easements or ROWs, must be provided with the application. 0.3 m reserve along Carp Road might be required (preferred access is from the road proposed as subdivision road not directly from Carp Road). There is a concern of access to the agricultural property to the north. It appears that access to that property is along the north-west side of the severed property. The proposed severance will remove access to the mentioned property. Solution must be presented to the City for review, prior to approval of the severance.

Roads

Carp Road in Rural Road Network is an Arterial Road and ROW protection of 30.0 m is required, as per new Official plan, Schedule C16 (15 m from the road centre line to the property limit).
It appears that the ROW width is sufficient and road widening will not be required.
Please refer to the City of Ottawa Private Approach By-Law (Private Approach (By-law No. 2003-447) | City of Ottawa) The driveway setback needs to be, as minimum 3.0 m from the property line, however, as the proposed severed parcel is part of the proposed commercial/industrial subdivision, access to the lot should be provided along its east property limit, which will become in the future the subdivision access road. 0.3 m reserve along Carp Road might be required. Please refer to Transportation Department comments for more information.

Subdivision

Topographic Plan of Survey

A topographic survey needs to identify all representative elevation points, currently existing features, including all property lines, bodies of water, vegetation, easements etc. It needs to provide a note that references the horizontal and vertical datums that were used and tied into to complete the project, including the local benchmarks. The survey should show the municipal road ROW which is identified as an arterial road with 30m ROW protection.

Groundwater and Water Service

It is understood that there are no municipal water pipes near the application. Please see the Hydrogeological comments provided below. While confirming quantity and quality it is important to be aware that the site is situated within 220 m of Highland Park Cemetery to the north-east, within 30 m of Presbyterian Cemetery to the south and Mineral Extraction pits (sand and gravel) are approximately 500 m to the south and approximately 375 m to the south-west. Proximity and potential impact of the aforementioned facilities should be analyzed.

The site is within Mississippi Rideau Source Water Protection Area. The site has been identified to be within a significant groundwater recharge area and contains a highly vulnerable aquifer. The location is within the area covered by the Carp River Watershed/Subwatershed Study (CRWSS).

The Consultant undertaking the hydrogeological and terrain study needs to refer for more details to Hydrogeological and Terrain Analysis Guidelines (March 2021)and should clearly demonstrate integration with other studies such as, but not limited to, Geotechnical Study, ESA, EIS, etc. Also, all surface features of interest or concern need to be addressed. There is an existing watercourse at the NE corner of the property – Fluvial Geomorphological report will be required.

If a SWM pond or similar stormwater management infrastructure is proposed, it will also need to be included in the Hydrogeological Report and Terrain Analysis.

It is the responsibility of the owner to ensure that adequate water supply for firefighting is provided for each lot by the FUS method and please note that a recently revised FUS exists.

As a condition of approval of plan of subdivision, the developer will be required to dedicate a monitoring well, at no cost, to the City.

Sanitary Service

There are no municipal sanitary sewers adjacent the proposed subdivision. Please see the comments below regarding hydrogeology. An Impact Risk Assessment will be required (as part of Hydrogeological and Terrain Analysis).

Minimum Septic Field Setback from property lines is 3 metres & 5 metres from buildings. Note: if the septic fields are raised beds then these separations distances increase (they increase by 2x the grade raise) – please see Ottawa Septic System Office guidelines for details.

Servicing Study (water/sanitary)
A Subdivision Servicing Study (and Plans) will need to be submitted to the City for review and it needs to demonstrate that all lots can be adequately serviced. It should comprehensively address the available water quality and quantity. It should identify the required projected water demand and the expected well capacities (sustainably to be in excess of demand). It should also address sanitary servicing needs of all individual lots.

The report needs to provide all pertinent calculations and justifications to support any claims made in the report. References to other relevant studies need to be made and clearly stated in order to adequately address the servicing needs and underlying ground conditions.

Proposed septic bed sizing needs to be provided, to demonstrate that each bed will be able to accommodate the generated flows and there is an adequate lot area to accommodate the proposed septic beds and water wells on each of the lots. Since there is a watercourse identified on site, required setbacks, as per City official plan need to be observed- they can be significant.

The study should also contain comprehensive rationale that will allow to conclude that the existing hydrogeological and geotechnical conditions were considered, in order to protect the groundwater, as per latest guidelines and legal requirements.

Fire-fighting considerations should also be included in the report to determine potential surface area requirements if water storage tanks need to be implemented in the future, for each lot. As per the clarification provided in Technical Bulletin ISTB-2021-03 the FUS fire-fighting methodology is to be used in Rural Areas in all cases.

All SWM systems need to be identified on the Servicing Plan (i.e. common SWM pond, multiple ponds, swales, ditches, CB's, underground pipes, etc.), as this will impact future space allocation for individual site designs and septic systems.

Storm Sewers
There are no municipal storm sewers adjacent the proposed subdivision and also road ROW ditches with downstream outlets were not identified. Consequently, the retained consultant will need to review the existing terrain and demonstrate that there is Legal and sufficient storm outlet from site for both release rate and volume and prepare a SWM Report and Plan, as per City of Ottawa Sewer Design Guidelines (Second edition, October 2012, plus bulletins) that will ensure that the post development surface run-off will not adversely affect the downstream drainage system, including culverts, point of proposed site storm sewer system outlet location and the adjacent properties, during construction and in the post-construction condition. SWM pond might be required.

Storm Water Management
SWM Report will be required, as per above-mentioned guidelines. LID is required as per the memo from the former MOECC (now MECP). Any existing stormwater runoff from adjacent site(s) that crosses the property must be accommodated by the proposed stormwater

management design. No adverse effect can be created to the surrounding properties. Since it is a commercial/industrial subdivision proposal, on-site SWM measures need to be applied to minimize impact to downstream storm control systems.

Any stormwater outlet to a watercourse will require treatment and, as such, if there are any new stormwater outlets proposed to the watercourse, as part of the SWM plan, or proposed stormwater systems servicing multiple lots, they will require a direct submission Environmental Compliance Approval (ECA) application to the Ministry of the Environment, Conservation and Parks (MECP). The turnaround time for a direct submission ECA from the MECP can be up to one year.

Please note: Once the development application has been submitted, a request can be made to the City to consider a Transfer of Review (ToR) ECA for SWM works (ponds, ditches, culverts, etc.) for a private property, instead of the direct submission ECA. This is subject to approval by the City and MECP. Note that the ECA requirements are currently in flux. It is recommended to check with the City when the development application is submitted to confirm the ECA process at that time.

Stormwater management quality criteria is provided by Mississippi Valley Conservation Authority below.

Note that oil/grit separators, if used, require Environmental Technology Verification (ETV) protocol for ECA approval.

Capacity of the downstream systems needs to be investigated in detail and concurrence with any existing Drainage Studies or Watershed/Subwatershed Studies needs to be demonstrated. All stormwater management determinations shall have supporting rationale.

The site is located within the area covered by the Carp River Watershed/Subwatershed Study, and it suggests methods promoting infiltration (following sufficient/satisfactory treatment). The Stormwater Management Report must address the applicable requirements of the Carp River Watershed/Subwatershed Study and if such pertains, Master Drainage Plan.

A water budget will need to be developed for the proposal to maintain recharge, as the site is within significant groundwater recharge area. It should provide a 15% reduction in the difference from pre-development to post-development.

The SWM report needs to reference soil hydrogeological and geotechnical conditions and its infiltration capacity clearly and what surface run-off water treatment measures are being applied to protect the highly vulnerable aquifer that was identified on the site.

The stormwater management quantity criteria for the development is that the 100-year post-development stormwater runoff must be controlled to the 2-year pre-development runoff, as per section 8.3.7.3 of the Ottawa Sewer Design Guidelines (SDG).

All stormwater management determinations shall have supporting rationale.

All SWM systems need to be identified on the SWM Plan (i.e. common SWM pond, multiple ponds, swales, ditches, CB's, underground pipes, etc.), to support the analysis and recommendations provided in the SWM Report. All these considerations need to be shown on the SWM Plan. Any SWM ponds will need a sediment drying area.

Geotechnical Investigation

A Geotechnical Investigation Report is required. Please note that sensitive marine clays are anticipated in the area of the proposed subdivision and, therefore, enhanced geotechnical investigation and exhaustive analysis will be necessary. Investigation of clays should be undertaken with vane shear testing, Atterberg limits testing (from a number of depths in each column), shrinkage, grain size, grade raise restriction, consolidation, compaction sensitivity, remolded strength and liquefaction analysis- amongst others. For geotechnical investigation, please refer to "Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa"

It should also include exhaustive infiltration/percolation testing for SWM & septic field design, as a highly vulnerable aquifer is present on the site. Extensive analysis and discussion is required to address LID requirements of the MECP bulletin and the Carp River subwatershed study (CRWSS). The area is within Mississippi-Rideau source water protection area and also within significant groundwater recharge area. Infiltration is required here but also might be of concern (septic systems)

The groundwater level is to be investigated and the level is to be derived from spring-time investigation (there are mineral extraction sites to the south, and their presence might need to be considered in the investigation). Water table level needs to be determined for the proposed design and foundation drainage need to be addressed. The above mentioned CRWSS concerns, and its recommendations need to be considered in the Geotechnical Report. In sensitive marine clays, trees in proximity to foundations can cause foundation damage. The requirements of the City's Tree Planting in Sensitive Marine Clay Soils – 2017 Guidelines should be contemplated.

Earthquake analysis and potential for seismic liquefaction analysis are also required to be undertaken and details provided in the report.

As current site grading is unknown, Slope stability Study may also be required, and potential "Hazard Lands" will need to be identified and safe setbacks are to be specified as per Section 4.8 of the Official Plan, in accordance with the "City Slope Stability Guidelines in the City of Ottawa (Original by Golder Associates, 2004; updated by City of Ottawa, 2012)".

Environmental Site Assessment (ESA).

A Phase 1 Environmental Site Assessment (ESA) is required, completed in accordance with Ontario Regulation (O.Reg.) 153/04.
A Phase 2 ESA may be required, depending on the outcome of the Phase 1 ESA.
A Record of Site Condition, if applicable, will be required as a condition of the Plan of Subdivision approval.

Noise Control Feasibility Study
A study will be required due to the potential of the proposed development to generate noise (Stationary Noise) and close proximity of the proposed commercial/industrial subdivision to the existing buildings nearby (offices/potentially residential)

Noise and Vibration Study
A study will be required, in order to address the noise and vibration generated by the Carp Airport activities, adjacent to the proposed development and also the noise and vibration component of the adjacent Carp Road (arterial road), which is also identified as a “full load truck route”, and how, if required, the noise and vibration should be mitigated.

Carp Airport Proximity
Transport Canada, Carp Airport Authority, Navigation Canada, or other aviation authorities, as required, need to be contacted regarding ponds and lighting or other specific considerations and limitations associated with proposed development in direct proximity to Carp Airport. The City Engineering needs to be copied on the communication. Airport area zoning restrictions imposed by the Airport Vicinity Development Zone need to be considered, as per new OP section 10.2.2.11 (Schedule C14) and current OP, Section 4.8.6.

- Noise-sensitive development is not permitted within the 30 NEF/NEP contour lines at the Carp airport.
- Proposed development in the vicinity of Carp airport shall comply with current Transport Canada guidelines.
- Proposed development in the vicinity of Carp airport will comply with TP 312 Aerodrome Standards, and within runway approach surfaces will be subject to the overall building height provisions of the Federal Airport Zoning Regulations and Recommended Practices affecting building heights.
- Prior to Draft Plan of Subdivision approval, exterior lighting specifications need to be defined by a qualified Professional Engineer. Confirmation that the defined criteria comply with the requirements, set by the governing airport authority, will need to be presented to the City prior to the Draft Plan approval.

Easements/ROW
Easements and rights-of-ways must be shown on the plans and information on any existing easements or ROWs, must be provided with the application. There is a concern of access to the agricultural property to the north. It appears that access to that property is along the north-west side of proposed subdivision Lot #1, which is also considered presently as subject to severance. The proposed development will remove access to the mentioned property. Solution needs to be provided.

Roads
Carp Road in Rural Road Network is an Arterial Road and ROW protection of 30.0 m is required, as per new Official plan, Schedule C16 (15 m from the road centre line to the property limit).
Topographic survey needs to confirm the ROW width. If distance between property line and Carp Road centre line is not 15 m, road widening will be required.
Sight line triangles need to be added at the subdivision road intersections with Carp Rad.

As per the Safer Roads initiative (adopted by Council, late 2019), roads must be designed to limit vehicle speeds to 30 km/h (by design, not by signage). Please refer to Transportation Department comments for more information.

Energy conservation
Energy conservation is required to be demonstrated throughout design as per section 4.9 of the Official Plan (reduction of urban heat, renewable energy, mitigation of climate change impacts and others).

Permits and Approvals
The property is within the regulation limit of Mississippi Valley Conservation Authority.

Please contact the Mississippi Valley Conservation Authority (MVCA), amongst other federal and provincial departments/agencies, to identify all the necessary permits and approvals required to facilitate the development. Responsibility rests with the developer and their consultant for determining which approvals are needed and for obtaining all external agency approvals. The address shall be in good standing with all approval agencies. Copies of confirmation of correspondence will be required by the City of Ottawa from all approval agencies that a form of assent is given.
Please note that a stormwater program for multiple lots is understood to be the expanded type of Environmental Compliance Approval (ECA) application with the MECP; please speak with your engineering consultant to understand the impact this has on the application. Note that oil/grit separators require Environmental Technology Verification (ETV) protocol for ECA approval.

If required, an MECP ECA application is not submitted until after City of Ottawa Engineering is satisfied that components directly or indirectly aligned with the ECA process concur with standards, directives, and guidelines of the MECP. No construction shall commence until after a commence work notification is given by Development Review

Hydrogeology
General
Submissions are to be in accordance with the following.

- The City of Ottawa Hydrogeological and Terrain Analysis Guidelines (March, 2021)
- The Carp Road Corridor – Nitrate Impact Assessment Recommendations (City of Ottawa Memorandum, September 2016)
- Ontario's Procedures D-5-4 and D-5-5
- The City of Ottawa Official Plan Section 4.4
- Section 1.6.6.4 of the Provincial Policy Statement

Severance
The hydrogeological and terrain information required to support the proposed single lot severance will be reviewed by City of Ottawa hydrogeological geoscience and other staff. The required information is as follows.

- A hydrogeological and terrain analysis (HGTA) report is required to support the private servicing (well and septic).

- HGTA report must meet the requirement of the City's Hydrogeological and Terrain Analysis Guideline Guidelines (March, 2021); requirements related to severance applications are listed in Section 4.0. Also note that there are special considerations for the septic impact assessment for lots within the Carp Road Corridor (memo dated September 27, 2016), please contact the City planner or hydrogeologist if your hydrogeological consultant does not have a copy of the memo.
- Water quantity and quality: A well must be tested to support the water quantity and water quality. It is recommended that a well be installed onsite, which can be used as the future supply well, however the City Guidelines allow that a near-by technically representative well be used to support severance applications. Note that the supply well must be installed and tested to support an future site plan approval.
    - Support must be provided for the pump test rate; should use the maximum day rate. The rate should consider the actual use (if known), or potential uses permitted through zoning.
    - Must meet the water quality testing requirements outlined in the City Guidelines – i.e. sample for subdivision suite parameters, metals and VOCs. Also consider local existing and historic land use and determine if any additional parameters need to be included (i.e. cemetery, industries, etc.)
- A septic impact assessment is required, as per City Guidelines and the 2016 City memo related to special considerations within the Carp Road Corridor, which includes the use of advance septic treatment (up to 50% nitrate reduction with certified systems). For the severance application, if the use is unknown, then the assessment must be conducted using a proposed reasonable impermeable surface coverage and septic flow, which will be verified at Site Plan Control.
- Note that if the total septic flows for the site will be greater than 10,000 L/day, then an ECA from the MECP will be required for the septic system at Site Plan. If the septic flows are less than 10,000 L/day then a septic assessment is required to ensure that the septic does not impact the local aquifer; the required methodology for the assessment is outlined in the City Guidelines – refer to the predictive assessment for commercial/industrial developments.
- The HGTA report must include a water budget; since the site lies within an area identified as moderate recharge in the Carp Road Corridor CDP; the water budget should show how recharge will be maintained onsite (compared to pre-development conditions).
- The HGTA report should also outline potential onsite activities and risks to existing groundwater users and identify measures that should be implemented to protect the aquifer in the long-term, if needed, to be confirmed at Site Plan.
- The report recommendations section must include clear development recommendations which will be verified at Site Plan Approval, including:
    - Maximum permitted well yield, based on pump test results.
    - Well construction details (if supply well not installed onsite)
    - Maximum septic flow (or maximum employment), maximum impermeable surface and proposed septic system type (if advanced septic treatment is recommended) – based on septic impact assessment calculations
    - Infiltration targets to meet recharge requirements, based on the site-specific water budget
    - Mitigative measures recommended for protection of the aquifer
- At Site Plan Control, additional hydrogeological analyses may be considered if the proposed use exceeds the recommendations. Any additional analyses must meet the requirements of the HGTA Guidelines, to the satisfaction of the City.
- Technical consultation with the hydrogeological reviewer of the severance application is encouraged with the hydrogeological consultant prior to starting field work to help scope report

requirements. Please contact the City hydrogeologist, Tessa Di Iorio (Tessa.diiorio@ottawa.ca) to schedule a technical pre-consultation.

Subdivision

The hydrogeological and terrain information required to support the proposed 11 or 12 lot subdivision will be reviewed by the conservation authority's hydrogeological geoscientist on behalf of the City of Ottawa, as per a formal service agreement. In this way, conservation authority staff are acting on behalf of the City and are not referencing any conservation authority requirements.

High level considerations about the natural hydrogeological and terrain conditions that might impact the proposed subdivision servicing plan and / or scope of investigation include the following.

- The uppermost underlying aquifer is mapped as the Verulam Formation, which is generally considered to be only an inconsistent or marginal producer. Well yield and the acceptability of interference with existing and proposed wells will be especially important to demonstrate.
- There are known issues here and there along the Carp Road Corridor with elevated nitrate and problematic aesthetic parameters. There are also multiple land uses adjacent to the site that should trigger additional chemical analysis of all groundwater samples. The ESA and / or the equivalent work should dictate what additional chemical analyses are needed. If water quality considerations arise, consultation in advance of a formal application is recommended.
- Industrial and commercial development tends to create significant impervious areas, which conflict with the need for rainwater to be able to infiltrate into each lot to dilute septic effluent to acceptable standards. This is to be fully addressed in any submission.
- A water budget assessment will be required to support not only lot sizes, via the nitrate dilution calculations, but also to demonstrate that groundwater recharge is maintained as part of the stormwater management plan. These should be aligned.
- Service locations and design may not be sustainable if only the minimum regulatory requirements from the Wells Regulation and OBC are implemented. The studies that are undertaken to address municipal and provincial planning and development policies should identify what other measures are required to ensure sustainability. In some cases, service location should take precedence over building locations and special well design is needed.

The required investigation and report submission must be respectively supervised and authored by an experienced hydrogeological geoscientist or equivalent engineer. Full information about the required submission is detailed in the City's guideline, to which the link is provided above. In addition, an equivalent summary is provided above in the severance discussion. Note that the severance investigation can be designed to be relevant for and included in the subdivision investigation and submission.

Rather than re-summarizing those requirements then, the following is advised.

Given that there may be well yield and groundwater chemistry / quality issues that arise during the hydrogeological and terrain investigation, it is recommended that the hydrogeological work is phased, and that technical consultation occurs between phases. Technical consultation for the subdivision will be with the designated technical reviewer from the conservation authority. It is recommended that the work proceed as follows.

- A detailed background review and site reconnaissance should be undertaken prior to finalizing the work plan.
- The results of the hydrogeological and terrain work for the severance and the ESA should be used to refine the work plan for the subdivision and integrated into any submission for the subdivision.

- The results of water sample analysis from existing adjacent wells (for all relevant parameters) may be done prior to the main field program as to help gauge the likelihood of existing problems. Otherwise, sampling of adjacent existing water wells would be included in the main field program.
- A work plan should be established which is based on a detailed review of all available background data, rather than generically. It should provide the rationale for test-well and test-pit locations and design and list all methods. Some items that tend to pose issues are elaborated on next.
    - The representative terrain unit investigation should be aligned with any geotechnical work, but the hydrogeologist must be a full participant to all sediment and rock logging work. Further, sediment structure and not just texture and colour should be documented. Photographs are very useful.
    - The work plan should consider if there are existing constraints on service locations, which may dictate testing locations from,
        - non-hydrogeological considerations, such as setbacks from the creek, easements, roads etc.,
        - hydrogeological considerations, such as setbacks from existing services, sources of contamination, outcrops, etc.
    - The work plan should ensure that observation well data can be collected during aquifer tests. Some representative observation well data should be representative of typical separation distances between proposed wells and to existing services from the closest proposed well.
    - Continuous background water level data should be collected prior to and following all aquifer tests to eliminate uncertainties in well recovery datasets and aquifer parameter analysis and to document the baseline interference from existing groundwater users and natural groundwater level fluctuations.
    - Test well construction, purging, disinfection and lithological logging should be fully supervised and documented, and all additional chlorination episodes fully documented, as applicable.
    - Test well design must be representative of future water wells, as to suitably investigate groundwater quality and yield.
    - Well testing must be representative of the greatest water taking (rate and duration) which is permissible by existing zoning, so extended aquifer testing may be required.
    - Residual chlorine measurements must address the level of accuracy and precision needed to ascertain if a groundwater sample is free of chlorine to a level where it is not only undetectable but also non-disinfecting.
    - Sampling plans should be provided, which explain methods:
        - for how required field parameters will be measured, the equipment previously calibrated, the results of calibration and field testing documented to specific levels of accuracy, and what uncertainty is expected
        - Photos of samples and equipment readouts are very useful for considering colour, turbidity, chlorine residual, etc.
        - for filtering and preserving
        - for determining if hydrogen sulphide requires on-site measurement
        - for deciding if and how methane should be measured

- Results should be discussed with the technical reviewer if issues are encountered, prior to application submission.

Please note that following acceptance of the subdivision, each lot will be subject to Site Plan Control. Therefore, the final hydrogeological and terrain analysis, which is submitted with the subdivision application, should provide precise recommendations on a lot-by-lot basis related to the following:

- The types of land use included in the current zoning, which cannot be supported, if applicable.
- The maximum allowable impervious surface area and septic flows, as assessed via the D-5-4 procedure.
- The type of septic treatment that is to be used and that was assessed via the D-5-4 procedure considering the Carp Road Corridor memorandum (i.e., conventional vs. advanced treatment).
- The sustainable and safe water well design
- The maximum sustainable well yield (rate and duration)
- The most suitable service locations to minimize interference but preserve access

These recommendations will become the accepted limitations for private servicing on each lot and will be upheld for each lot at Site Plan Control. Nevertheless, there may be flexibility to amend these limitations if additional investigation is undertaken for the individual lot and that work indicates that a new more intensive private servicing plan is sustainable. The review of such an amended plan would be subject to City review and approval.

Please contact Claire Milloy for questions regarding the subdivision hydrogeological requirements. claire.milloy@rvca.ca

Transportation - Josiane Gervais, josiane.gervais@ottawa.ca

- Follow Traffic Impact Assessment Guidelines
  - Update Screening Form to indicate the anticipated amount of industrial/commercial development. This is required to determine what the impacts will be to Carp Road and should there be any roadway modifications required to support the subdivision.
  - Please submit the revised Screening Form at your earliest convenience to Josiane.gervais@ottawa.ca. The Screening Form will be reviewed to determine if a TIA is required.
  - Start this process asap.
  - The application will not be deemed complete until the submission of the draft step 1-4, including the functional draft RMA package (if applicable), draft functional plans (if applicable) and/or monitoring report (if applicable).
  - Request base mapping asap if RMA is required. Contact Engineering Services (https://ottawa.ca/en/city-hall/planning-and-development/engineering-services)
- Local roadways are to be designed for a 30km/hr operating speed.
- Local roads and collector roads in the rural area must have a 20m and 26m ROW, respectively.
- Geometric Road Design Drawings (GRDD) will be required with the first submission of underground infrastructure and grading drawings. These drawings should include such items as, but are not limited to:
  - Road signage and pavement markings;
  - Location of depressed curbs and tactile walking surface indicators (TWSI);
  - Traffic calming measures aimed at reducing vehicle speed and enhancing pedestrian safety. Measures may include either vertical or horizontal features, however such measures shall not interfere with stormwater management and overland flow routing. Traffic calming measures shall reference best management practices from the Canadian Guide to Neighbourhood Traffic Calming, published by the Transportation Association of Canada, and/or Ontario Traffic Manual, and/or the City of Ottawa's Traffic Calming Design Guidelines;

    - Intersection control measures at new internal intersections;
    - Consideration should be made to include mini roundabouts where feasible throughout the subdivision.
- ROW protection on Carp Road between March and Richardson Side is 30m even.

Environmental - Sami Rehman, Sami.Rehman@ottawa.ca

- It is assumed that lot 1 identified in the draft concept plan for TLC Holdings will be the proposed severance. If so, there are little environmental concern for the single severance. It has been identified as moderate recharge are and may require a groundwater impact assessment (Carp Rd Corridor CDP, Section 3, policy 3).
- For the proposed plan of subdivision, our data indicates a watercourse in the eastern corner of the property. As such, an Environmental Impact Study (EIS) will be required to determine the minimum watercourse setbacks (see OP 4.9). The EIS should also investigate potential significant habitat for threatened or endangered species on or adjacent to the subject property.
- The plan of subdivision will also require a Tree Conservation Report (TCR). This can be combined with the EIS to avoid duplications.
- Here are the links to the Environmental Impact Statement Guidelines and the Tree Conservation Report Guidelines.

Parks

- Severance for commercial or Industrial purposes: As a condition of severance, the General Manager shall require cash-in-lieu of parkland, as well as the fee for appraisal services. Commercial and Industrial uses are expected to convey parkland at a rate of 2 % of the gross land area.
- Industrial Subdivision: Upon subdivision registration, the General Manager shall require cash-in-lieu of parkland, as well as the fee for appraisal services. Commercial and Industrial uses are expected to convey parkland at a rate of 2 % of the gross land area.
- Please address parkland dedication in the planning rationale for each application.
- A property survey will be required to confirm the gross land area being developed with each application.
- Please note that Parks and Facilities Planning has recently undertaken a legislated replacement of the Parkland Dedication By-law, with the new by-law approved by City Council on August 31, 2022. To ensure you are aware of parkland dedication requirements for your proposed development, we encourage you to familiarize yourself with the staff report and By-Law that were approved by Council on August 31, 2022.
- Please contact the Parks and Faculties Planner anissa.mcalpine@ottawa.ca if you have any questions.

City Surveyor

- The determination of property boundaries, minimum setbacks and other regulatory constraints are a critical component of development. An Ontario Land Surveyor (O.L.S.) needs to be consulted at the outset of a project to ensure properties are properly defined and can be used as the geospatial framework for the development.
- Topographic details may also be required for a project and should be either carried out by the O.L.S. that has provided the Legal Survey or done in consultation with the O.L.S. to ensure that the project is integrated to the appropriate control network.

Questions regarding the above requirements can be directed to the City's Surveyor, Bill Harper, at Bill.Harper@ottawa.ca

Conservation Authority - Mercedes Liedtke mliedtke@mvc.on.ca

Severance (Lot 1, 11, or 12)

- The subject property is not regulated by MVCA under Ontario Regulation 153/06.
- If stormwater management is required, MVCA would review the proposal for water quantity and quality impacts on the receiving watercourse.

Subdivision:

- The watercourse on the property is regulated by the Mississippi Valley Conservation Authority (MVCA) under Ontario Regulation 153/06, *Development, Interference with Wetlands and Alterations to Shorelines and Watercourses.* Under Ontario Regulation 153/06, written permission is required from the MVCA prior to the initiation of development (which includes construction, site grading and the placement or removal of fill) within an area regulated by the Conservation Authority as well as straightening, changing, diverting or interfering in any way with the existing channel or the shoreline of a watercourse.
- MVCA recommends that a headwater drainage feature assessment be completed for the identified watercourse on proposed lot 7.
- A stormwater management report will be required with the subdivision submission:
    a. 80% TSS removal, or enhanced level of protection is recommended, but 70%, or normal level of protection is required as per the Carp River Watershed Subwatershed Study.
- The property is within the Carp River Watershed Subwatershed Study area, and was outlined in the Carp Road Corridor Community Design Plan which has an annual infiltration target outlined below. Existing infiltration rates on site should be assessed and maintained post development.
    a. Moderate groundwater recharge area 104 mm/year infiltration

Submission requirements and fees

- Severance
    - Planning Rationale/Cover Letter
    - Hydrogeological and Terrain analysis and report
    - Storm water investigation
        - brief analysis - please see comments above
    - Geotechnical Investigation and Slope Stability Report
        - might be required (please see comments above)
- Subdivision
    - Draft Plan of Subdivision
    - Planning Rationale
    - Archaeological Assessment
    - Private Servicing Plan
    - Preliminary Grading Plan
        - (Provisional Grading Plan can be submitted with application submission and then Grade Control and Drainage Plan as a condition of draft approval)
    - Drainage Plan (SWM Plan to be included)
    - Erosion and Sediment Control Plan
    - Lighting Plan
        - (proximity to Carp Airport – lighting constraints to be defined)
    - Hydrogeological and Terrain analysis and report
    - Baseline Well Water Quality Sampling report
    - Geotechnical Investigation and report
        - (The geotechnical consultant will need to provide full copies of any published and peer reviewed papers relied on, to determine results and conclusions; Earthquake analysis and potential for Seismic liquefaction analysis are also

required to be undertaken and details provided in the report; Slope Stability Study might also be required – grading dependent)
    - Subdivision Servicing Study and Report (Water & Sanitary Private servicing)
    - Storm Water Management Report
    - Noise Control Feasibility Study
        - (to control stationary noise produced by industrial component of the proposed subdivision)
    - Noise and Vibration Study (due to proximity to Carp airport and Carp Road)
    - Phase 1 Environmental Site Assessment (ESA)
    - Phase 2 Environmental Site Assessment (ESA)
        - if required based on outcome of Phase 1 (refer to Environmental Site Assessment comments above)
    - Fluvial Geomorphology Report
        - may be required (identified watercourse on site – NE corner)
    - Environmental Impact Study
    - Transportation Impact Assessment (depending on Screening Form)
- Additional information regarding fees related to planning applications can be found here.
- Guide to preparing City of Ottawa Studies and Plans
- To request City of Ottawa plan(s) or report information please contact the ISD Information Centre: Information Centre (informationcentre@ottawa.ca): (613) 580-2424 ext. 44455
- Plans are to be standard A1 size (594 mm x 841 mm) or Arch D size (609.6 mm x 914.4 mm) sheets, dimensioned in metric and utilizing an appropriate Metric scale (1:200, 1:250, 1:300, 1:400 or 1:500).
- All PDF submitted documents are to be unlocked and flattened.

Next steps

- You are encouraged to discuss the proposal with Councillor, community groups and neighbours.

DRAFT PLAN OF SUBDIVISION

PART OF LOTS 11 AND 12
CONCESSION 2
GEOGRAPHIC TOWNSHIP
OF HUNTLEY
CITY OF OTTAWA

BLOCKS 1–3 and 6–14 for commercial/industrial use
BLOCK 4 for stormwater management
BLOCK 5 for other
STREET A – 26 metres wide

APPLICANT AND PROPERTY OWNER

T & L CARROLL HOLDINGS INC.
1380 HOWE ROAD
CARP, ON, K0A 1L0

I HEREBY AUTHORIZE THE PREPARATION AND SUBMISSION OF THIS PLAN TO THE COUNCIL OF THE CITY OF OTTAWA.

DATED ON NOVEMBER 25, 2025.

T & L CARROLL HOLDINGS INC.
I HAVE THE AUTHORITY TO BIND THIS CORPORATION

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED AS SHOWN ON THIS PLAN AND THEIR RELATIONSHIP TO THE ADJOINING LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

NOVEMBER 25, 2025
DATE

JOHN GAUTHIER
ONTARIO LAND SURVEYOR

SUBJECT TO THE CONDITIONS, IF ANY, SET FORTH IN OUR LETTER DATED _____, THIS DRAFT PLAN IS APPROVED BY THE CITY OF OTTAWA UNDER SECTION 51 OF THE PLANNING ACT THIS ___ DAY OF _____, 20__

ADAM BROWN, MANAGER
DEVELOPMENT REVIEW–RURAL
PLANNING, DEVELOPMENT AND BUILDING SERVICES
DEPARTMENT, CITY OF OTTAWA

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

A. AS SHOWN ON DRAFT PLAN
B. AS SHOWN ON DRAFT PLAN
C. AS SHOWN ON DRAFT PLAN
D. AS DESCRIBED ON THE TITLE BLOCK
E. AS SHOWN ON DRAFT PLAN
F. AS SHOWN ON DRAFT PLAN
F.1 NOT APPLICABLE
G. AS SHOWN ON DRAFT PLAN
H. INDIVIDUAL PRIVATE WELLS
I. REFER TO SOILS REPORT
J. AS SHOWN ON DRAFT PLAN
K. INDIVIDUAL PRIVATE SEPTIC SYSTEMS
L. AS SHOWN ON DRAFT PLAN

SCHEDULE OF AREAS

LOT/BLOCK	AREA (Ha)	TYPE
BLOCK 1	1.00	COMMERCIAL/INDUSTRIAL USE
BLOCK 2	1.00	COMMERCIAL/INDUSTRIAL USE
BLOCK 3	1.00	COMMERCIAL/INDUSTRIAL USE
BLOCK 4	2.08	STORMWATER MANAGEMENT
BLOCK 5	0.33	OTHER
BLOCK 6	1.22	COMMERCIAL/INDUSTRIAL USE
BLOCK 7	1.20	COMMERCIAL/INDUSTRIAL USE
BLOCK 8	1.26	COMMERCIAL/INDUSTRIAL USE
BLOCK 9	3.83	COMMERCIAL/INDUSTRIAL USE
BLOCK 10	0.96	COMMERCIAL/INDUSTRIAL USE
BLOCK 11	1.14	COMMERCIAL/INDUSTRIAL USE
BLOCK 12	1.14	COMMERCIAL/INDUSTRIAL USE
BLOCK 13	1.15	COMMERCIAL/INDUSTRIAL USE
BLOCK 14	1.46	COMMERCIAL/INDUSTRIAL USE
TOTAL LOT/BLOCK AREA (Ha)		18.78

STREET	AREA (Ha)	LENGTH (m)
STREET A	2.47	918.97
TOTAL SUBDIVISION AREA (Ha)		21.25

LEGEND:

○ B	DENOTES	BELL UTILITY POLE
○ H	DENOTES	HYDRO UTILITY POLE
○ B&H	DENOTES	BELL & HYDRO UTILITY POLE
AN	DENOTES	ANCHOR
□ BP	DENOTES	BELL UTILITY PEDESTAL
OHW	DENOTES	OVERHEAD WIRES
BF	DENOTES	BOARD FENCE
PWF	DENOTES	POST & WIRE FENCE
PVC	DENOTES	POLYVINYL CHLORIDE (PLASTIC)
MW	DENOTES	MONITORING WELL
~~	DENOTES	TREE LINE
⊙	DENOTES	SIGN

DISTANCES:
DISTANCES SHOWN ON THIS PLAN ARE GROUND DISTANCES AND CAN BE USED TO COMPUTE GRID DISTANCES BY MULTIPLYING BY A COMBINED SCALE FACTOR OF 0.999905.

BEARINGS:
BEARINGS ARE MTM GRID BEARINGS, DERIVED BY REAL TIME NETWORK GNSS OBSERVATIONS ON OBSERVED REFERENCE POINTS "A" AND "B" SHOWN HEREON, AND ARE REFERRED TO THE NAD83 (ORIGINAL) MTM ZONE 9 COORDINATE SYSTEM.

ELEVATIONS:
ELEVATIONS AND EXISTING TOPOGRAPHIC FEATURES SHOWN ON THIS PLAN WERE PROVIDED BY A SKETCH TO ILLUSTRATE TOPOGRAPHY BY MCINTOSH PERRY SURVEYING INC, FILE 23–1883.

HORIZONTAL DATUM :
HORIZONTAL DATUM IS NAD83 (ORIG) MTM ZONE 9 AND HAS BEEN DERIVED FROM REAL TIME NETWORK GNSS OBSERVATIONS.

VERTICAL DATUM :
VERTICAL DATUM IS CGVD28/78 DERIVED FROM REAL TIME NETWORK GNSS OBSERVATIONS REFERENCED TO THE CANADA HT_2 GEOID MODEL.

SCALE 1 : 750
0 15 30 45 60 75 Metres

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

REVISIONS

No.	DESCRIPTION	DATE	BY
1	REMOVED SEVERANCE ALREADY COMPLETED, REDUCED ROW TO 20M, ADDED NEW BLOCKS	2025–02–06	MP
2	BLOCKS AND STREET REVISED	2025–11–24	MP
3	ROAD RADIUS UPDATED, BLOCKS REVISED	2025–12–08	MP
4	DAYLIGHTING TRIANGLE ON BLOCK 5	2026–01–09	MP

Callon Dietz INCORPORATED
ONTARIO LAND SURVEYORS
CARLETON PLACE LONDON NORTH BAY
info@callondietz.com callondietz.com

ISO 9001:2015

SURVEY BY: | DRAWN BY: MP | FILE No: 23–1833 | PLAN No:

PLAN OF SURVEY OF

PART OF LOT 12 and PART OF THE NORTH HALF OF LOT 11
CONCESSION 2
TOWNSHIP OF HUNTLEY
NOW IN THE TOWNSHIP OF WEST CARLETON

REGIONAL MUNICIPALITY OF OTTAWA - CARLETON

SCALE 1 : 2500

0 50 100 200 300 400

METRES

CHARLES D. ROGERS O.L.S.

1983

I REQUIRE THIS PLAN TO BE DEPOSITED UNDER THE REGISTRY ACT.

DATE JUNE 23, 1983

Charles D. Rogers

CHARLES D. ROGERS

PLAN 5R-7272

RECEIVED AND DEPOSITED

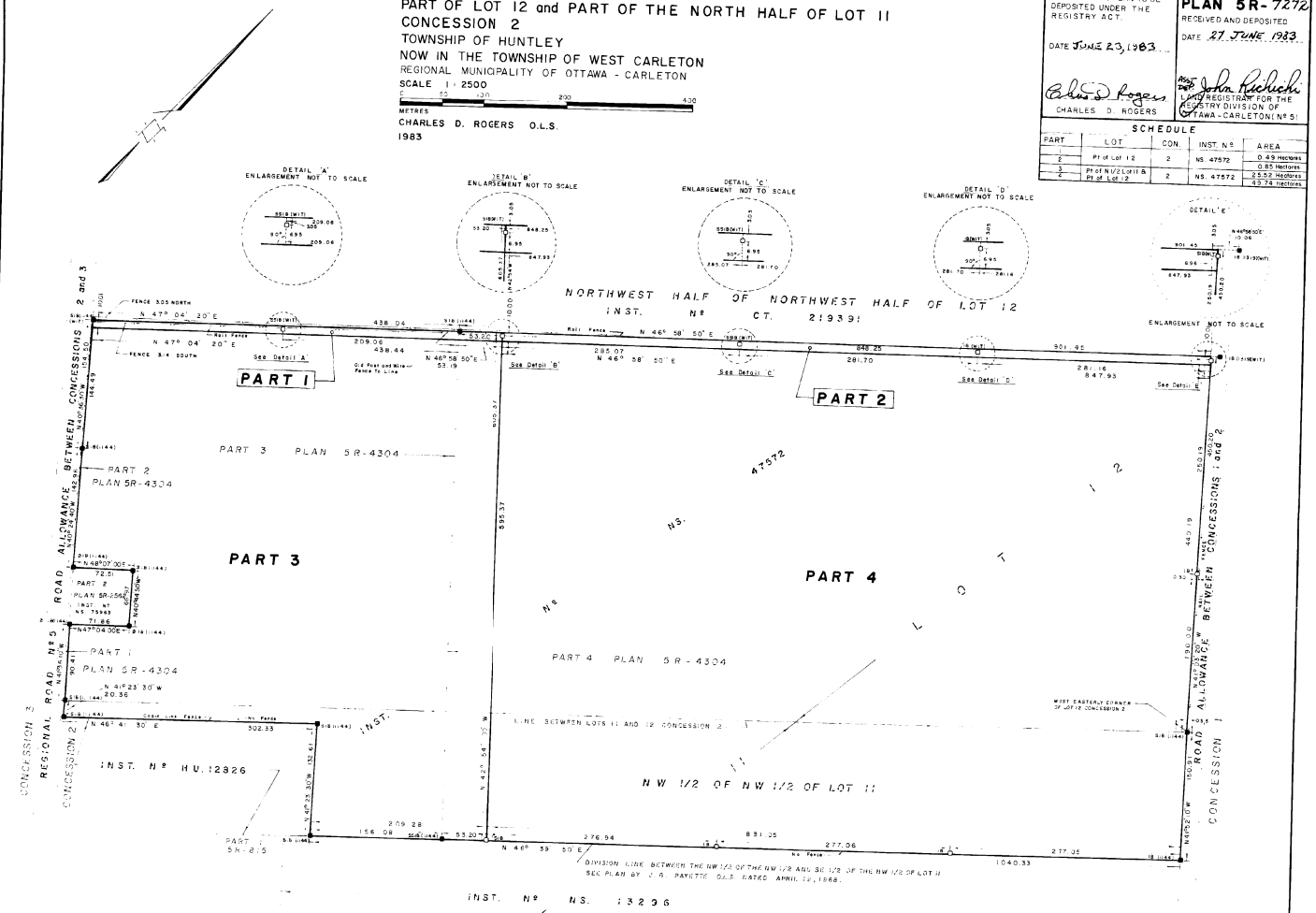
DATE 27 JUNE 1983

John Richichi

LAND REGISTRAR FOR THE REGISTRY DIVISION OF OTTAWA-CARLETON (No 5)

SCHEDULE

PART	LOT	CON.	INST. No	AREA
2	Pt of Lot 12	2	NS. 47572	0.49 Hectares
3	Pt of N1/2 Lot 11 & Pt of Lot 12	2	NS. 47572	0.85 Hectares
4		2	NS. 47572	25.52 Hectares
				26.74 Hectares



SURVEYOR'S CERTIFICATE

I CERTIFY THAT

1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT AND THE REGISTRY ACT AND THE REGULATIONS MADE THEREUNDER
2. THE SURVEY WAS COMPLETED ON THE 2nd DAY OF JUNE 1983

June 23, 1983
DATE

Charles D. Rogers
CHARLES D. ROGERS
ONTARIO LAND SURVEYOR

NOTES

1. BEARINGS HEREON ARE ASTRONOMIC, AND ARE REFERRED TO THE SOUTHERLY LIMIT OF PART 4, PLAN 5R-4304 BEING N 46° 39' 50" E.

LEGEND

S.I.B. — DENOTES STANDARD IRON BAR
S.S.I.B — DENOTES SHORT STANDARD IRON BAR
I.B. — DENOTES IRON BAR
R. — DENOTES ROUND
D — DENOTES SURVEY MONUMENT SET
■ — DENOTES SURVEY MONUMENT FOUND
WIT. — DENOTES WITNESS
(1819) — DENOTES W.J. WEBSTER O.L.S.

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

CAUTION THIS PLAN IS NOT A PLAN OF SUBDIVISION WITHIN THE MEANING OF THE PLANNING ACT.

FAIRHALL & MOFFATT LIMITED
ONTARIO LAND SURVEYORS

FILE	JOB №	PS	REF. №
F-8-4	8940	PS	59-2-HUNTLEY

AFFIDAVIT OF SUBSCRIBING WITNESS

I,

of the

in the

make oath and say:

I am a subscribing witness to the attached instrument and I was present and saw it executed

at by

*See footnote

*See footnote

I verily believe that each person whose signature I witnessed is the party of the same name referred to in the instrument.

SWORN before me at the

this day of 19

A COMMISSIONER FOR TAKING AFFIDAVITS, ETC.

* Where a party is unable to read the instrument or where a party signs by making his mark or in foreign characters add "after the instrument had been read to him and he appeared fully to understand it". Where executed under a power of attorney insert "(name of attorney) as attorney for (name of party)"; and for next clause substitute "I verily believe that the person whose signature I witnessed was authorized to execute the instrument as attorney for (name)".

Dated October 6 1983

NS215961

ALAN ALBERT GALE IN TRUST

TO

APPAULO FARMS LTD.

Address: R.R. #2, Carp, Ontario

Deed of Land

SITUATE

DYE & DURHAM CO. LIMITED

ASSESSMENT ROLL NO:

ADDRESS OF PROPERTY

SP/jd 694-3 Paul

SOLOWAY, WRIGHT, HOUSTON
GREENBERG, O'GRADY, MORIN
BARRISTERS & SOLICITORS
170 METCALFE STREET
OTTAWA, ONTARIO
K2P 1P3

215961

PROPERTY OF THE
LAND REGISTRY OFFICE

8

NS215961

IN THE LAND REGISTRY OFFICE AT
OTTAWA, ONTARIO

LAND REGISTRAR

83 OCT 28 P4:18

I CERTIFY THAT THIS INSTRUMENT
IS LEGISTERED AS OF
IN THE CARLETON (NO.5)
OF OTTAWA CIVIC DIV.

LAND REGISTRY #5

REGISTRATION FEE

LAND TRANSFER TAX

RETAIL SALES TAX

OCT 28 83 0387 RORD 0.01700

OCT 28 83 0388 RETAX 0.66800

THIS SPACE TO BE RESERVED FOR CERTIFICATE OF REGISTRATION

Deed — *Without* Spousal Consent

215961

DYE & DURHAM CO. LIMITED
FORM NO. 1.3

This Indenture

made in duplicate the 6th day of September, one thousand nine hundred and eighty-three.

In Pursuance of the Short Forms of Conveyances Act:

Between

ALAN ALBERT GALE, Real Estate Agent, of the City of Kanata, in the Regional Municipality of Ottawa-Carleton, In Trust,

hereinafter called the GRANTOR

OF THE FIRST PART

AND:

APPAULO FARMS LTD., a body corporate and politic under the laws of the Province of Ontario,

hereinafter called the GRANTEE

OF THE SECOND PART

Witnesseth that in consideration of ----------ONE HUNDRED AND SIX THOUSAND----------

----------($106,000.00)----------

now paid by the said Grantee to the said Grantor, the receipt whereof is hereby by him acknowledged, he the said Grantor DOTH GRANT unto the said Grantee in fee simple

THOSE lands and premises located in the following municipality, namely, in the Township of West Carleton (formerly the Township of Huntley), in the Regional Municipality of Ottawa-Carleton, and being composed of Part of Lot 12 and Part of the north half of Lot 11, Concession 2, Township of Huntley, now in the Township of West Carleton, and which parts are designated as Parts 2 and 4 as shown on a certain Reference Plan deposited in the Land Registry Division of Ottawa-Carleton No. 5 as Number 5R-7272 together with and subject to the easements described in Schedule "A" annexed hereto.

CERTIFICATE OF SECRETARY - TREASURER
Pursuant to Subsection 52(21) of The Planning Act 1983, I certify that the consent of the Land Division Committee of the Regional Municipality of Ottawa Carleton was given on March 30th 1983 to the transaction to which this instrument relates.
Dated this 5th day of October 1983
Secretary - Treasurer

SCHEDULE "A" 215961

TOGETHER WITH AND SUBJECT TO, as hereinafter set out, the following Easements:

A. SUBJECT to the free, uninterrupted and unobstructed right and easement, in perpetuity, upon, over, under, along and across Parts of Lot 12 and of the North half of Lot 11, Concession 2, Township of Huntley, now in the Township of West Carleton and which parts are described as Part 2 on a certain plan deposited as Number 5R-7272 and Part 1 on a certain plan deposited as Number 5R-7363 for the following purposes:

(i) To provide drainage for each and every part of the Grantor's lands being Part of the said Lot 12 and the North half of Lot 11, and being Parts 1 and 3 on said Plan 5R-7272; and

(ii) Together with the right of free and uninterrupted access to the Grantor his heirs, executors, administrators, successors and assigns, his and their workmen, vehicles, suppliers and equipment at all times and for all purposes necessary for or incidental to the exercise of the rights hereby retained by the Transferor to enter onto said Part 2 on said Plan 5R-7272 and Part 1 on Plan 5R-7363 as well as lands adjoining (to a width of 10 feet) Parts 1 and 2 on Plans 5R-7363 and 5R-7272 respectively for the purpose of construction, installation, replacement and repair of the drainage course or drainage works on said Parts 1 and 2.

The Grantor shall bear the cost of establishing such drainage easements and works for the use of the Grantor, on the lands hereby conveyed, which are additional to those required by the Grantee for his use, it being further agreed that this shall not limit or restrict the Grantor with respect to any of the easements hereby reserved.

The Grantor further agrees that he shall, after construction of the said drainage works, repair all damage to the lands adjoining such easements caused by the installation of such works by the Grantor.

CERTIFICATE OF SECRETARY - TREASURER
Pursuant to Subsection 52(21) of The Planning Act 1983, I certify that the consent of the Land Division Committee of the Regional Municipality of Ottawa Carleton was given on MARCH 30th 1983 to the transaction to which this instrument relates.
Dated this 26th day of OCTOBER 1983
Secretary - Treasurer

215961

B. TOGETHER WITH (subject to the provisions of expiry hereinafter set out) of a right-of-way in favour of the Grantee, his heirs, executors, administrators, successors and assigns over Part of said Lot 12, being Part 1 on said Plan 5R-7272 for the purpose only of the transportation of farm machinery to and from the lands herein transferred to the Grantee being Parts 2 and 4 on said Plan 5R-7272. IT IS AGREED that the Grantor shall be entitled from time to time to redesignate the portion of his lands which shall be subject to the said right-of-way for the transportation of farm machinery. Upon the execution by the Grantor or by the heirs, executors, administrators, successors or assigns of the Grantor of a grant of right-of-way having a width of at least sixty-six (66) feet over part of those lands presently shown as Parts 1 and 3 on said Plan 5R-7272 (although the same may be wholly within said Part 3) and provided such grant of right-of-way complies with all applicable requirements for severance pursuant to Section 49 of The Planning Act, 1983 and amendments thereto, and upon the tender of such grant of right-of-way upon the Grantee or the Grantee's heirs, executors, administrators, successors or assigns, the right-of-way previously granted, whether as originally granted over Part 1 on Plan 5R-7272 or as substituted from time-to-time, pursuant hereto, shall absolutely cease to exist. In lieu of redesignation by grant of a further right-of-way, if the Grantor shall register a plan of subdivision against the whole or a portion of his remaining lands and shall show thereon a street or roadway having a width of at least 66 feet and giving access to the lands granted to the Grantee, the right-of-way previously granted, whether as originally granted over Part 1 on Plan 5R-7272 or as substituted from time to time, pursuant hereto, shall absolutely cease to exist. Without restricting the generality of the foregoing the Grantee does hereby agree to execute such Transfers or Releases and to consent to the registration of such plan or plans of subdivision as may be requested by the Grantor to give full effect to the foregoing provisions. The Grantor hereby covenants that no plan of subdivision within the meaning of the Planning Act shall be registered against the said Parts 1 and 3 on Plan 5R-7272 without the inclusion on the said subdivision plan of a street or roadway of at least 66 feet in width and providing access to the above mentioned Parts 2 and 4 on Plan 5R-7272. The said access shall be free and uninterupted and shall not be limited in any way., save as requested by any municipality.

CERTIFICATE OF SECRETARY - TREASURER
Pursuant to Subsection 29(21) of the Planning Act, 1983
I certify that the consent of the Land Division Committee of the [illegible] Municipality of Ottawa Carleton was given on the [illegible] day of [illegible], 19[illegible] to the transaction to which this

215961

The Grantee, does hereby consent to such application as the Grantor may bring pursuant to Section 49 of The Planning Act, 1983 and amendments thereto and does hereby appoint the Grantor as his agent and attorney for the purpose of bringing or consenting to such applications. Without restricting the generality of the foregoing, the Grantee does hereby covenant that he shall execute such further consents and/or Powers of Attorney as may be necessary to permit such application by the Grantor, failing which the right-of-way previously granted over Part 1 Plan 5R-7272 or as substituted from time to time shall absolutely cease to exist.

C. The Grantor agrees that the Grantee shall not be responsible for any of the survey costs incurred by the Grantor with respect to the establishment or re-establishment by the Grantor of the easements set out above.

D. The provisions herein shall be binding upon and enure to the benefit of the parties hereto, their heirs, executors, administrators, successors and assigns.

CERTIFICATE OF SECRETARY - TREASURER
Pursuant to Subsection 50(21) of The Planning Act, 1983, I certify that the consent of the Land Division Committee of the Regional Municipality of Ottawa Carleton was given on the 30th day of March 1983 to the transaction to which this instrument relates.
Dated this 24th day of October 1983
Secretary - Treasurer

215961

DYE & DURHAM CO. LIMITED
FORM NO. 2

TO HAVE AND TO HOLD unto the said Grantee, his heirs, executors, administrators, successors and assigns to and for their sole and only use forever;
SUBJECT NEVERTHELESS to the reservations, limitations, provisoes and conditions expressed in the original grant thereof from the Crown.

The said Grantor COVENANTS with the said Grantee that he has the right to convey the said lands to the said Grantee notwithstanding any act of the said Grantor.

AND that the said Grantee shall have quiet possession of the said lands free from all encumbrances.

AND the said Grantor COVENANTS with the said Grantee that he will execute such further assurances of the said lands as may be requisite.

AND the said Grantor COVENANTS with the said Grantee that he has done no act to encumber the said lands.

AND the said Grantor RELEASES to the said Grantee ALL his claims upon the said lands.

PROVIDED that in construing these presents the words "Grantor" and "Grantee" and the pronouns "he", "his" or "him" relating thereto and used therewith shall be read and construed as "Grantor" or "Grantors", "Grantee" or "Grantees", and "he", "she", "it" or "they", "his", "her", "its" or "their", or "him", "her", "it" or "them", respectively, as the number and gender of the party or parties referred to in each case require, and the number of the verb agreeing therewith shall be construed as agreeing with the said word or pronoun so substituted.

IN WITNESS WHEREOF the said parties hereto have hereunto set their hands and seals.

SIGNED, SEALED AND DELIVERED
In the Presence of

ALAN ALBERT GATE IN TRUST

APPAULO FARMS LTD.

per: _____
President

Refer to all Instructions on Reverse Side

DYE & DURHAM CO. LIMITED
FORM NO. 505
Amended (1) 1983

Form 1 - Land Transfer Tax Act

AFFIDAVIT OF RESIDENCE AND OF VALUE OF THE CONSIDERATION

IN THE MATTER OF THE CONVEYANCE OF *(insert brief description of land)*
Part of Lot 12 and Part of the north half of Lot 11, Concession 2, Township of Huntley, now in the Township of West Carleton being

BY *(print names of all transferors in full)* ALAN ALBERT GALE IN TRUST Parts 2 and 4 Plan 5R-7272

TO *(see instruction 1 and print names of all transferees in full)* APPAULO FARMS LTD.

I, *(see instruction 2 and print name(s) in full)* KENNETH PAUL 215961

MAKE OATH AND SAY THAT:

1. I am *(place a clear mark within the square opposite that one of the following paragraphs that describes the capacity of the deponent(s))*: *(see instruction 2)*
   - ☐ (a) A person in trust for whom the land conveyed in the above-described conveyance is being conveyed;
   - ☐ (b) A trustee named in the above-described conveyance to whom the land is being conveyed;
   - ☐ (c) A transferee named in the above-described conveyance;
   - ☐ (d) The authorized agent or solicitor acting in this transaction for *(insert name(s) of principal(s))* ..... described in paragraph(s) (a), (b), (c) above; *(strike out references to inapplicable paragraphs)*
   - ☒ (e) The President, ~~Vice-President, Manager, Secretary, Director, or Treasurer~~ authorized to act for *(insert name(s) of corporation(s))* APPAULO FARMS LTD. described in paragraph(s) (~~a~~), (~~b~~) (c) above; *(strike out references to inapplicable paragraphs)*
   - ☐ (f) A transferee described in paragraph ( ) *(insert only one of paragraph (a), (b) or (c) above, as applicable)* and am making this affidavit on my own behalf and on behalf of *(insert name of spouse)* ..... who is my spouse described in paragraph ( ). *(insert only one of paragraph (a), (b) or (c) above, as applicable)*

   and as such, I have personal knowledge of the facts herein deposed to.
2. I have read and considered the definitions of "non-resident corporation" and "non-resident person" set out respectively in clauses 1 (1)(f) and (g) of the Act. *(see instruction 3)*.
3. The following persons to whom or in trust for whom the land conveyed in the above-described conveyance is being conveyed are non-resident persons within the meaning of the Act. *(see instruction 4)* none
4. **THE TOTAL CONSIDERATION FOR THIS TRANSACTION IS ALLOCATED AS FOLLOWS:**

(a) Monies paid or to be paid in cash	$ 26,000.00	
(b) Mortgages (i) Assumed *(show principal and interest to be credited against purchase price)*	$ nil	
(ii) Given back to vendor	$ 80,000.00	
(c) Property transferred in exchange *(detail below)*	$ nil	
(d) Securities transferred to the value of *(detail below)*	$ nil	
(e) Liens, legacies, annuities and maintenance charges to which transfer is subject	$ nil	
(f) Other valuable consideration subject to land transfer tax *(detail below)*	$ nil	
(g) VALUE OF LAND, BUILDING, FIXTURES AND GOODWILL SUBJECT TO LAND TRANSFER TAX *(TOTAL OF (a) to (f))*	$ 106,000.00	$ 106,000.00
(h) VALUE OF ALL CHATTELS - items of tangible personal property *(Retail Sales Tax is payable on the value of all chattels unless exempt under the provisions of the "Retail Sales Tax Act", R.S.O. 1980, c.454, as amended)*		$ nil
(i) Other consideration for transaction not included in (g) or (h) above		$ nil
(j) TOTAL CONSIDERATION		$ 106,000.00

ALL BLANKS MUST BE FILLED IN. INSERT "NIL" WHERE APPLICABLE.

5. If consideration is nominal, describe relationship between transferor and transferee and state purpose of conveyance. *(see instruction 5)* n/a
6. If the consideration is nominal, is the land subject to any encumbrance? n/a
7. Other remarks and explanations, if necessary n/a

SWORN before me at the City of Ottawa
in the Reg. Mun. of Ottawa-Carleton
this 16th day of October 19 83

A Commissioner for taking Affidavits, etc.

KENNETH PAUL *signature(s)*

PROPERTY INFORMATION RECORD

A. Describe nature of instrument: Deed

B. (i) Address of property being conveyed *(if available)* not available

(ii) Assessment Roll No. *(if available)* not available

C. Mailing address(es) for future Notices of Assessment under the Assessment Act for property being conveyed *(see instruction 6)* R.R. #2 Carp, Ontario

D. (i) Registration number for last conveyance of property being conveyed *(if available)* not available

(ii) Legal description of property conveyed: Same as in D.(i) above. Yes ☐ No ☐ Not Known ☒

E. Name(s) and address(es) of each transferee's solicitor

Soloway, Wright
170 Metcalfe St.
Ottawa, Ontario

For Land Registry Office use only
REGISTRATION NO.
Land Registry Office No.
Registration Date

DYE & DURHAM CO. LIMITED

AFFIDAVIT OF SUBSCRIBING WITNESS

I, BERNARD PEARL

of the City of Ottawa

in the Regional Municipality of Ottawa-Carleton

make oath and say:

215961

I am a subscribing witness to the attached instrument and I was present and saw it executed

at Ottawa by Alan Albert Gale

*See footnote

*See footnote

I verily believe that each person whose signature I witnessed is the party of the same name referred to in the instrument.

SWORN before me at the
City of Ottawa in the Regional
Municipality of Ottawa-Carleton

this 24 day of October 1983

A COMMISSIONER FOR TAKING AFFIDAVITS, ETC.

[redacted]

* Where a party is unable to read the instrument or where a party signs by making his mark or in foreign characters add "after the instrument had been read to him and he appeared fully to understand it". Where executed under a power of attorney insert "(name of attorney) as attorney for (name of party)", and for last clause substitute "I verily believe that the person whose signature I witnessed was authorized to execute the instrument as attorney for (name)".

MAY, 1982

AFFIDAVIT AS TO AGE AND SPOUSAL STATUS

I / ~~We~~ Alan Albert Gale

of the City of Kanata

in the Regional Municipality of Ottawa-Carleton

(severally) make oath and say: When I / ~~We~~ executed the attached instrument,

*If attorney see footnote

I WAS / ~~WERE BOTH~~ at least eighteen years old;

and within the meaning of clause 1 (f) of the Family Law Reform Act,

Strike out inapplicable clauses.

(a) I WAS / ~~WERE NOT~~ a spouse.

(b) ~~was my spouse~~.

(c) ~~We were spouses of one another~~.

**Not a Matrimonial Home, etc see footnote

The within property is not and never has been occupied as a matrimonial home.

Resident of Canada, etc.

~~SEVERALLY~~ SWORN before me at the
City of Ottawa in the Regional
Municipality of Ottawa-Carleton

this 24 day of October 1983

A COMMISSIONER FOR TAKING AFFIDAVITS, ETC.

* Where affidavit is made by an attorney substitute: "When I executed the attached instrument as attorney for (name of principal) he was not a spouse within the meaning of Clause 1 (f) of the Family Law Reform Act (and if applicable, insert name of spouse). At the time of execution of the Power of Attorney (name of principal) was at least eighteen years of age. The Power of Attorney is in full force and effect and has not been revoked".

** Where spouse does not join in or consent, see Subsection 42(3) of the Family Law Reform Act, (or complete separate affidavit).

Appendix B

Figure 3: Conceptual Lot Development Plan

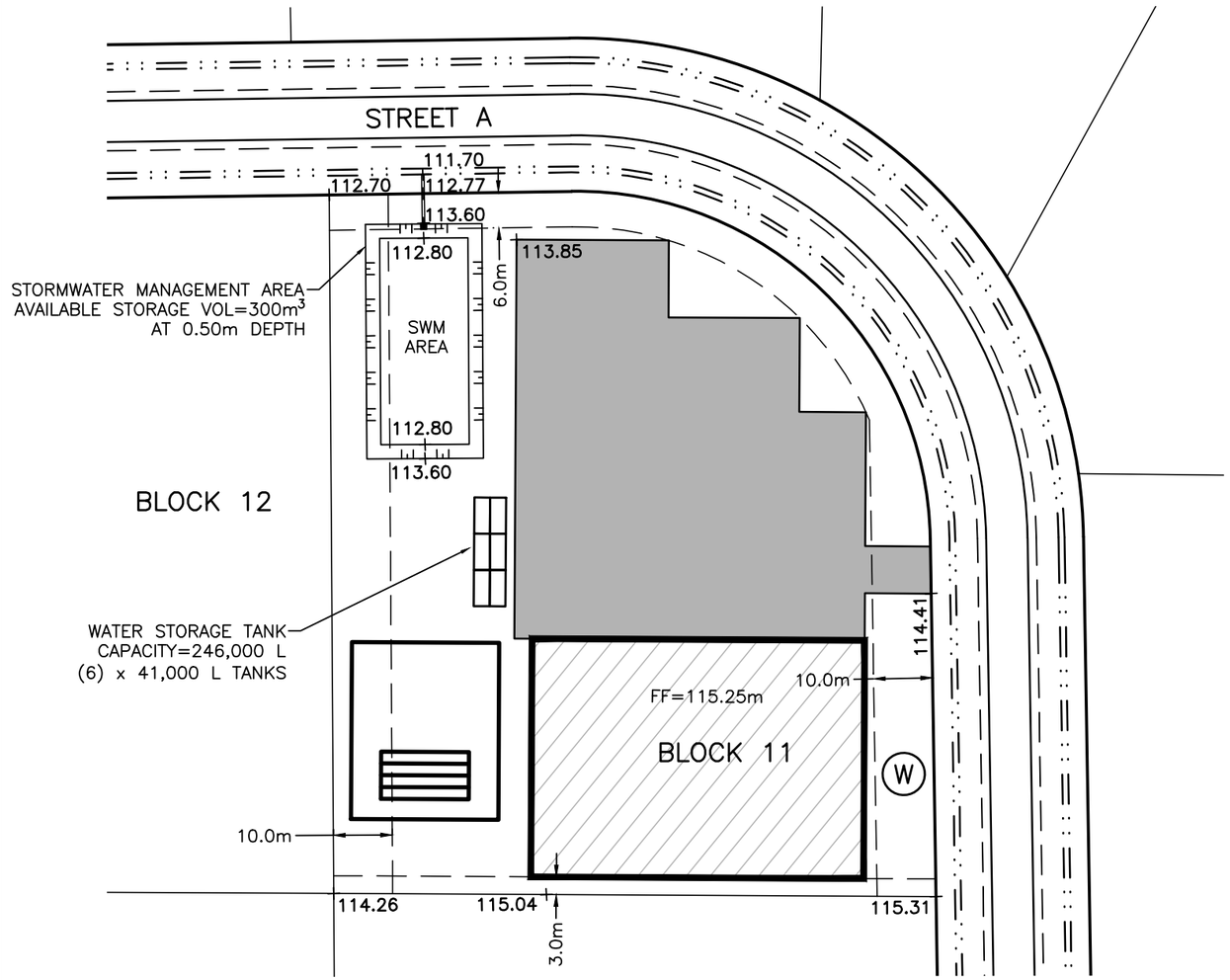
Grading and Drainage Plans (DWG. 24104-GR1-GR3)

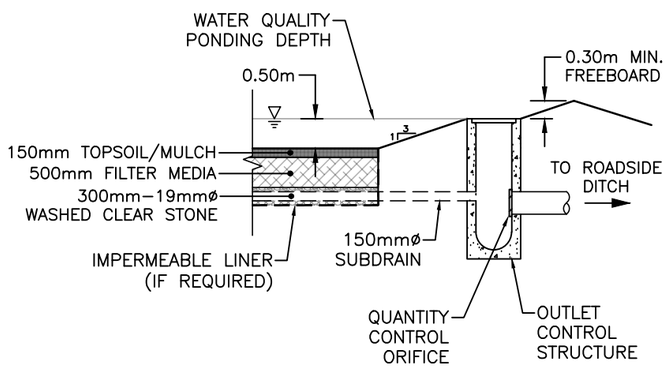
Plan and Profiles (DWG. 24104-P1-P10)

Pre-Development Drainage Area Plan (DWG. 24104-PRE1)

Post-Development Drainage Area Plan (DWG. 24104-STM1)

Erosion and Sediment Control Plan (DWG. 24104-ESC1)





FILTRATION SYSTEM DETAIL (TYP.)
N.T.S.

LEGEND

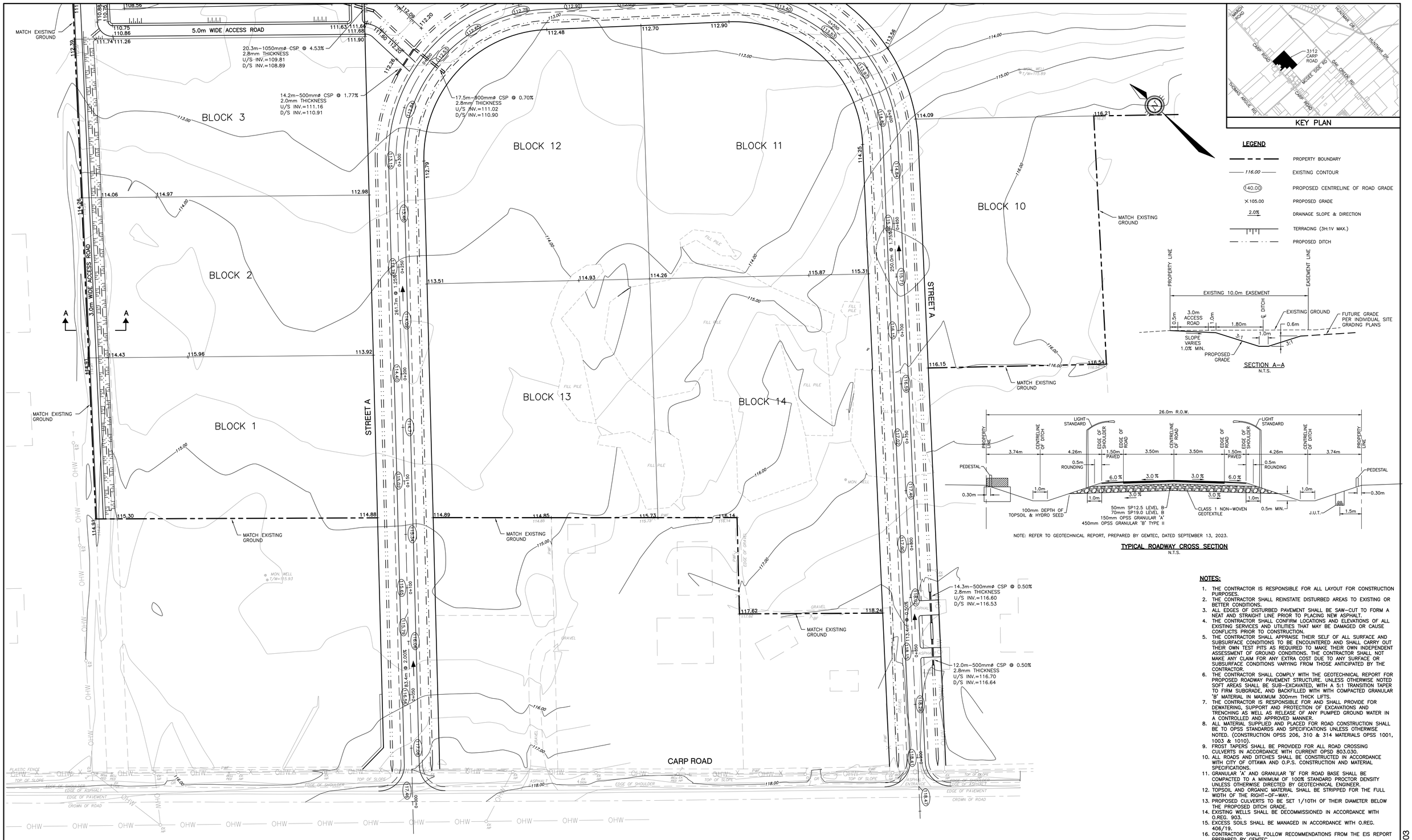
- ZONING SETBACK
- 113.60 — CONCEPTUAL FINISHED GRADE
- W — WELL
- BUILDING FOOTPRINT
- IMPERVIOUS AREA
- SEPTIC FOOTPRINT

BLOCK 11 STATISTICS

BLOCK AREA = 1.14 ha
MAX. BUILDING AREA = 0.285 ha (25% COVERAGE)
BUILDING AREA PROVIDED = 0.228 m² (20% COVERAGE)
IMPERVIOUS AREA = 0.58 ha (INCLUDES BUILDING)
IMPERVIOUS AREA COVERAGE = 51%

Robinson
Land Development

scale 1:1000	CARROLL SUBDIVISION	project no. 24104
date 27/03/26		
drawn by BLM	CONCEPTUAL LOT DEVELOPMENT PLAN	FIG. 3



NOTE: REFER TO GEOTECHNICAL REPORT, PREPARED BY GEMTEC, DATED SEPTEMBER 13, 2023.

NOTES:

1. THE CONTRACTOR IS RESPONSIBLE FOR ALL LAYOUT FOR CONSTRUCTION PURPOSES.
2. THE CONTRACTOR SHALL REINSTATE DISTURBED AREAS TO EXISTING OR BETTER CONDITIONS.
3. ALL EDGES OF DISTURBED PAVEMENT SHALL BE SAW–CUT TO FORM A NEAT AND STRAIGHT LINE PRIOR TO PLACING NEW ASPHALT.
4. THE CONTRACTOR SHALL CONFIRM LOCATIONS AND ELEVATIONS OF ALL EXISTING SERVICES AND UTILITIES THAT MAY BE DAMAGED OR CAUSE CONFLICTS PRIOR TO CONSTRUCTION.
5. THE CONTRACTOR SHALL APPRAISE THEIR SELF OF ALL SURFACE AND SUBSURFACE CONDITIONS TO BE ENCOUNTERED AND SHALL CARRY OUT THEIR OWN TEST PITS AS REQUIRED TO MAKE THEIR OWN INDEPENDENT ASSESSMENT OF GROUND CONDITIONS. THE CONTRACTOR SHALL NOT MAKE ANY CLAIM FOR ANY EXTRA COST DUE TO ANY SURFACE OR SUBSURFACE CONDITIONS VARYING FROM THOSE ANTICIPATED BY THE CONTRACTOR.
6. THE CONTRACTOR SHALL COMPLY WITH THE GEOTECHNICAL REPORT FOR PROPOSED ROADWAY PAVEMENT STRUCTURE. UNLESS OTHERWISE NOTED SOFT AREAS SHALL BE SUB–EXCAVATED, WITH A 5:1 TRANSITION TAPER TO FIRM SUBGRADE, AND BACKFILLED WITH WITH COMPACTED GRANULAR 'B' MATERIAL IN MAXIMUM 300mm THICK LIFTS.
7. THE CONTRACTOR IS RESPONSIBLE FOR AND SHALL PROVIDE FOR DEWATERING, SUPPORT AND PROTECTION OF EXCAVATIONS AND TRENCHING AS WELL AS RELEASE OF ANY PUMPED GROUND WATER IN A CONTROLLED AND APPROVED MANNER.
8. ALL MATERIAL SUPPLIED AND PLACED FOR ROAD CONSTRUCTION SHALL BE TO OPSS STANDARDS AND SPECIFICATIONS UNLESS OTHERWISE NOTED. (CONSTRUCTION OPSS 206, 310 & 314 MATERIALS OPSS 1001, 1003 & 1010).
9. FROST TAPERS SHALL BE PROVIDED FOR ALL ROAD CROSSING CULVERTS IN ACCORDANCE WITH CURRENT OPSD 803.030.
10. ALL ROADS AND DITCHES SHALL BE CONSTRUCTED IN ACCORDANCE WITH CITY OF OTTAWA AND O.P.S. CONSTRUCTION AND MATERIAL SPECIFICATIONS.
11. GRANULAR 'A' AND GRANULAR 'B' FOR ROAD BASE SHALL BE COMPACTED TO A MINIMUM OF 100% STANDARD PROCTOR DENSITY UNLESS OTHERWISE DIRECTED BY GEOTECHNICAL ENGINEER.
12. TOPSOIL AND ORGANIC MATERIAL SHALL BE STRIPPED FOR THE FULL WIDTH OF THE RIGHT–OF–WAY.
13. PROPOSED CULVERTS TO BE SET 1/10TH OF THEIR DIAMETER BELOW THE PROPOSED DITCH GRADE.
14. EXISTING WELLS SHALL BE DECOMMISSIONED IN ACCORDANCE WITH O.REG. 903.
15. EXCESS SOILS SHALL BE MANAGED IN ACCORDANCE WITH O.REG. 406/19.
16. CONTRACTOR SHALL FOLLOW RECOMMENDATIONS FROM THE EIS REPORT PREPARED BY GEMTEC.

NOTES

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PROPERTY BOUNDARIES DERIVED FROM DRAFT PLAN OF SUBDIVISION, PART OF LOTS 11 AND 12, CONCESSION 2, GEOGRAPHIC TOWNSHIP OF HUNTLEY, CITY OF OTTAWA, DATED FEBRUARY 2, 2025, PREPARED BY EGIS SURVEYING INC. NAD83 (ORIGINAL) MTM ZONE 9 COORDINATE SYSTEM.

NO.	REVISION DESCRIPTION	DATE	BY
2	REISSUED FOR REVIEW	27/03/26	BLM
1	ISSUED FOR REVIEW	06/03/25	BLM

SCALE
0 5m 10m 30m
HORIZONTAL 1:750

LICENSED PROFESSIONAL ENGINEER
B. L. MACKECHNIE
100199554
27 Mar. '26
PROVINCE OF ONTARIO

Robinson Land Development
2936 Baseline Road, Suite 200, Ottawa, ON K2H 1B3
(613) 592-6060 rcii.com

DESIGN	JHB
CHECKED	BLM
DRAWN	JHB
CHECKED	CC
APPROVED	BLM

T & L CARROLL HOLDINGS INC.

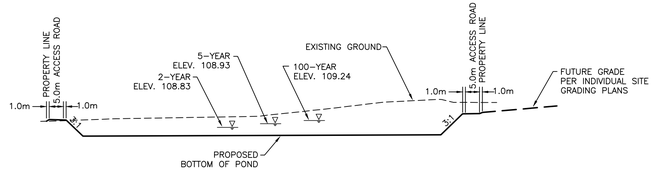
CARROLL INDUSTRIAL SUBDIVISION
3112 CARP ROAD
CITY OF OTTAWA

GRADING AND DRAINAGE PLAN

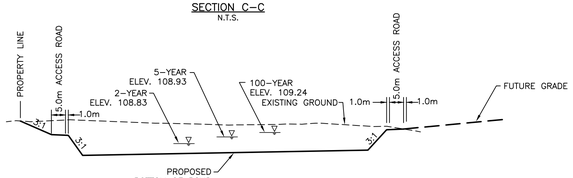
PROJECT No.	24104
SURVEY	LIDAR
DATED	MARCH 2026
DWG. No:	24104-GR1

FILE No. D07-16-25-0003

SECTION G-G
N.T.S.



SECTION C-C
N.T.S.



SECTION B-B
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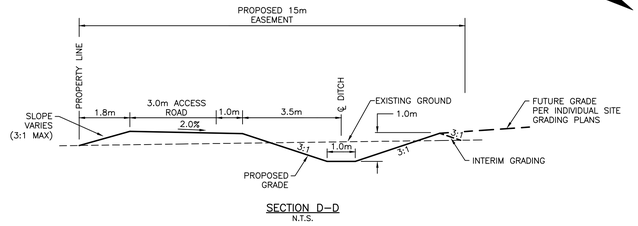

SECTION D-D
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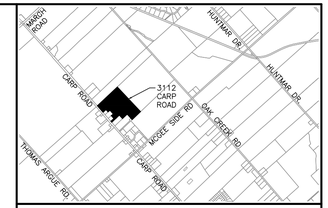
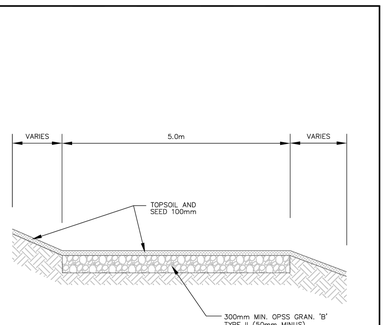


KEY PLAN

LEGEND

- PROPERTY BOUNDARY
- 116.00 — EXISTING CONTOUR
- (140.00) — PROPOSED CENTRELINE OF ROAD GRADE
- ×105.00 — PROPOSED GRADE
- 2.0% — DRAINAGE SLOPE & DIRECTION
- TERRACING (3H:1V MAX.)
- PROPOSED DITCH



Project Title	STORMWATER MANAGEMENT FACILITY DESIGN GUIDELINES
Drawing Title	TYPICAL REINFORCED GRASS SERVICE ROAD
Dwg No.	FIGURE 7.3
Scale	N.T.S.

NOTES

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SCALE
0 5m 10m 30m
HORIZONTAL 1:750

LICENSED PROFESSIONAL ENGINEER
B.L. MACKECHNIE
100199554
PROVINCE OF ONTARIO

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DESIGN	JHB
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DRAWN	JHB
CHECKED	CC
APPROVED	BLM

T & L CARROLL HOLDINGS INC.

CARROLL INDUSTRIAL SUBDIVISION
3112 CARP ROAD
CITY OF OTTAWA

GRADING AND DRAINAGE PLAN

PROJECT No.	24104
SURVEY	LIDAR
DATED	MARCH 2026
DWG. No:	24104-GR2

FILE No. D07-16-25-0003

NOTES

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SCALE
HORIZONTAL 1:750

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27 Mar '26
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CHECKED	CC
APPROVED	BLM

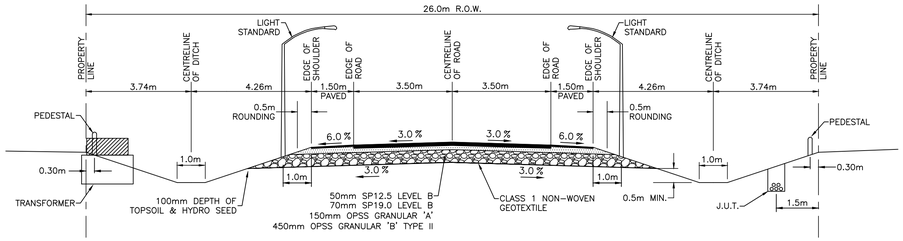
T & L CARROLL HOLDINGS INC.

CARROLL INDUSTRIAL SUBDIVISION
3112 CARP ROAD
CITY OF OTTAWA

GRADING AND DRAINAGE PLAN

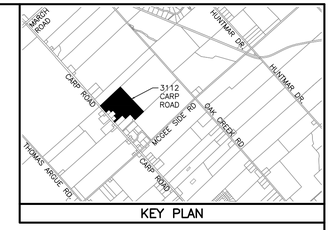
PROJECT No.	24104
SURVEY	LIDAR
DATED	MARCH 2026
DWG. No:	24104-GR3

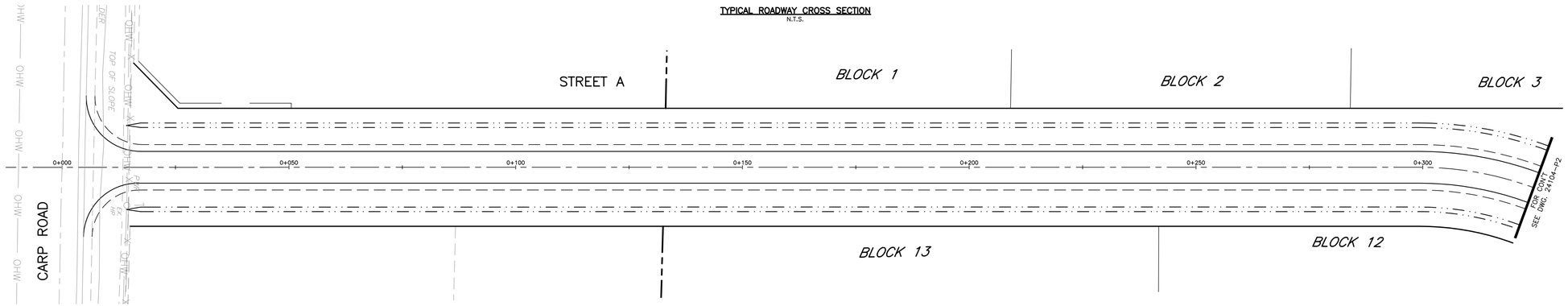
FILE No. D07-16-25-0003

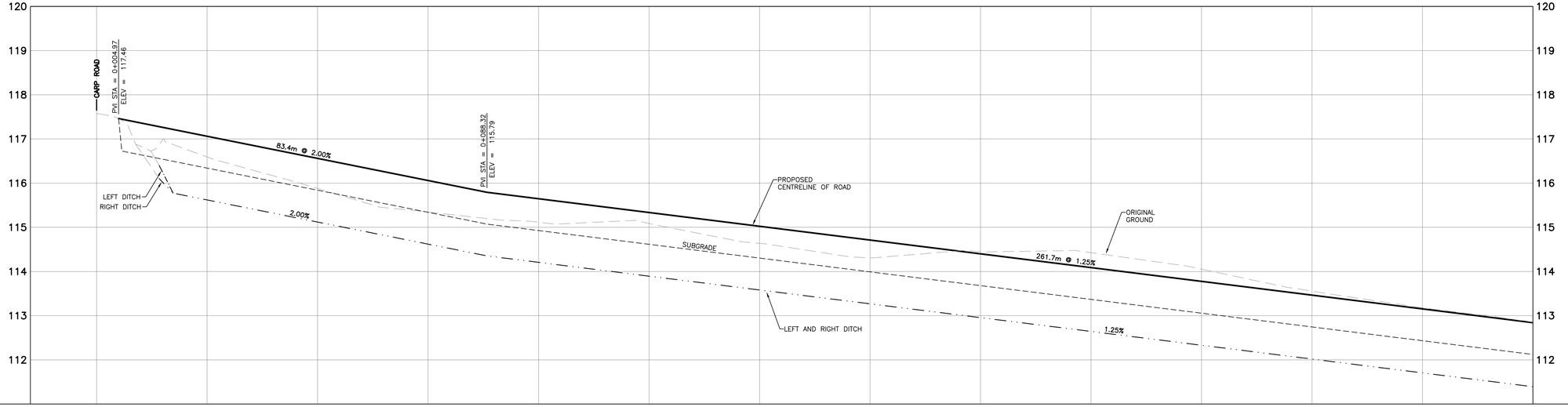


NOTE: REFER TO GEOTECHNICAL REPORT, PREPARED BY GEMTEC, DATED SEPTEMBER 13, 2023.

TYPICAL ROADWAY CROSS SECTION
N.T.S.







CHAINAGE	0+000	0+025	0+050	0+075	0+100	0+125	0+150	0+175	0+200	0+225	0+250	0+275	0+300	0+325
PROPOSED ROAD ℄ ELEVATION		117.06	116.56	116.06	115.65	115.34	115.02	114.71	114.40	114.09	113.78	113.46	113.15	112.84
PROPOSED LEFT DITCH GRADE	116.40	115.77 / 115.62	115.12	114.62	114.35 / 114.21	113.89	113.58	113.27	112.96	112.64	112.33	112.02	111.71	111.39
PROPOSED RIGHT DITCH GRADE	116.10	115.77 / 115.62	115.12	114.62	114.35 / 114.21	113.89	113.58	113.27	112.96	112.64	112.33	112.02	111.71	111.39
EXISTING ℄ R.O.W ELEVATION	*117.58*	*116.59*	*115.88*	*115.35*	*115.11*	*115.09*	*114.64*	*114.31*	*114.45*	*114.43*	*114.05*	*113.55*	*113.18*	*112.85*

NOTES

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1	ISSUED FOR REVIEW	06/03/25	BLM

SCALE
HORIZONTAL 1:500 (0, 5m, 10m, 20m)
VERTICAL 1:50 (0, 0.5m, 1m, 2m)

LICENSED PROFESSIONAL ENGINEER
B. L. MACKECHNIE
100199554
27 Mar. '26
PROVINCE OF ONTARIO

Robinson Land Development
2936 Baseline Road, Suite 200, Ottawa, ON K2H 1B3
(613) 592-6060 rcii.com

DESIGN	JHB
CHECKED	BLM
DRAWN	JHB
CHECKED	CC
APPROVED	BLM

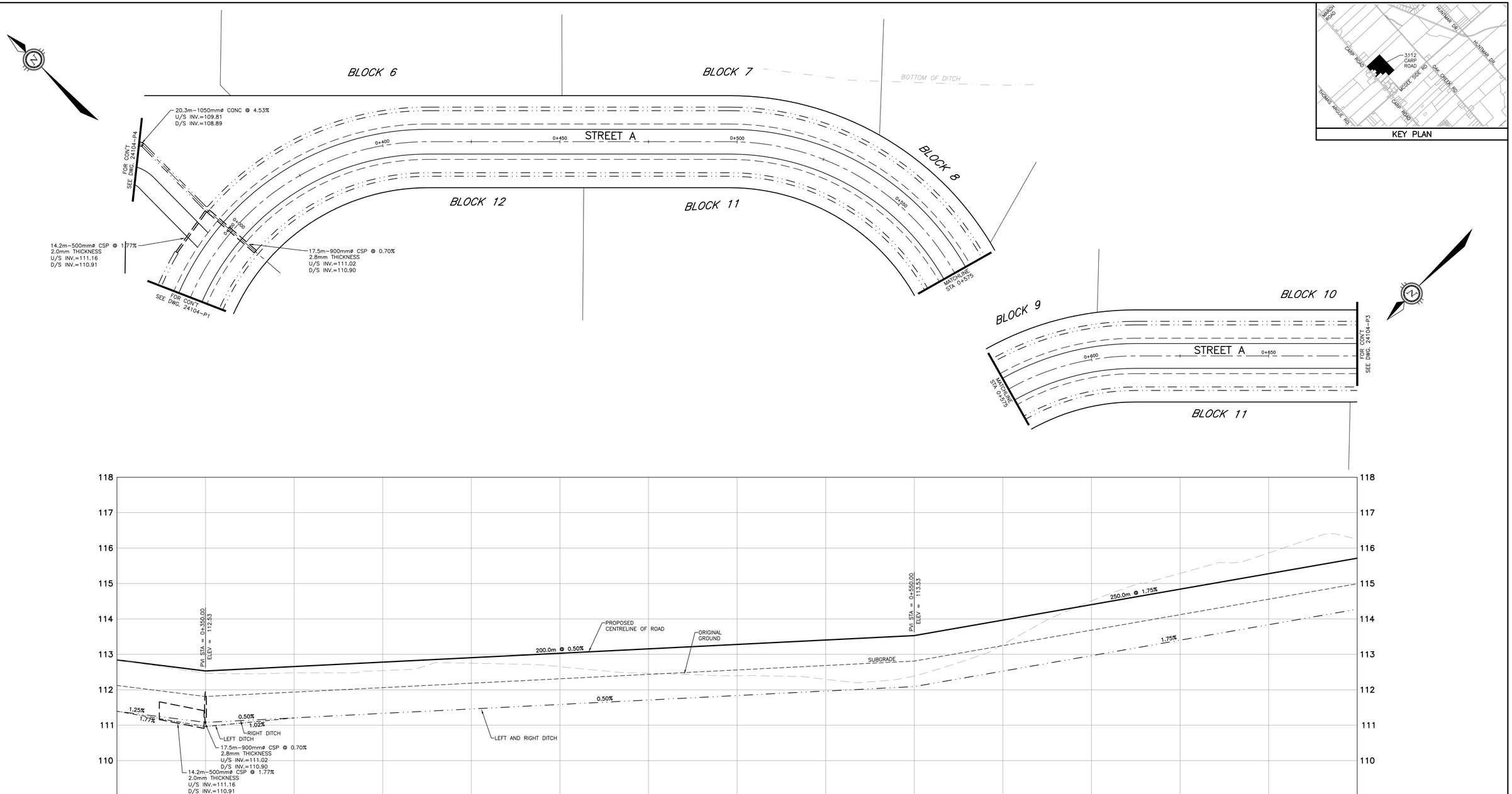
T & L CARROLL HOLDINGS INC.

CARROLL INDUSTRIAL SUBDIVISION
3112 CARP ROAD
CITY OF OTTAWA

STREET A
PLAN AND PROFILE
STA 0+000 TO STA 0+325

PROJECT No.	24104
SURVEY	LIDAR
DATED	MARCH 2026
DWG. No:	24104-P1

FILE No. D07-16-25-0003



PROPOSED ROAD ℄ ELEVATION	112.84	112.53	112.65	112.78	112.90	113.03	113.15	113.28	113.40	113.53	113.97	114.40	114.84	115.28	115.71		PROPOSED ROAD ℄ ELEVATION
PROPOSED LEFT DITCH GRADE	111.39	110.96	111.21	111.33	111.46	111.58	111.71	111.84	111.96	112.09	112.53	112.96	113.40	113.84	114.27		PROPOSED LEFT DITCH GRADE
PROPOSED RIGHT DITCH GRADE	111.39	111.08	111.21	111.33	111.46	111.58	111.71	111.84	111.96	112.09	112.53	112.96	113.40	113.84	114.27		PROPOSED RIGHT DITCH GRADE
EXISTING ℄ R.O.W ELEVATION	*112.85*	*112.47*	*112.48*	*112.54*	*112.75*	*112.65*	*112.46*	*112.40*	*112.29*	*112.39*	*113.28*	*114.51*	*115.29*	*115.86*	*116.25*		EXISTING ℄ R.O.W ELEVATION
CHAINAGE	0+325	0+350	0+375	0+400	0+425	0+450	0+475	0+500	0+525	0+550	0+575	0+600	0+625	0+650	0+675		CHAINAGE

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VERTICAL 1:50 (0, 0.5m, 1m, 2m)

LICENSED PROFESSIONAL ENGINEER
B. L. MACKECHNIE
100199554
27 Mar. 26
PROVINCE OF ONTARIO

Robinson Land Development
2936 Baseline Road, Suite 200, Ottawa, ON K2H 1B3
(613) 592-6060 rcii.com

DESIGN	JHB
CHECKED	BLM
DRAWN	JHB
CHECKED	CC
APPROVED	BLM

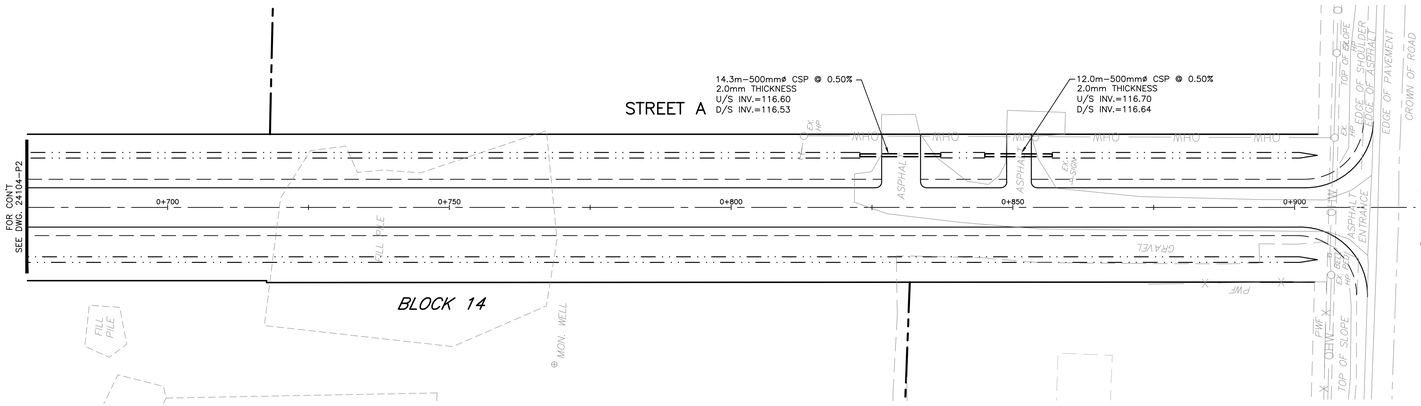
T & L CARROLL HOLDINGS INC.

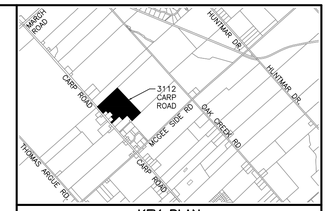
CARROLL INDUSTRIAL SUBDIVISION
3112 CARP ROAD
CITY OF OTTAWA

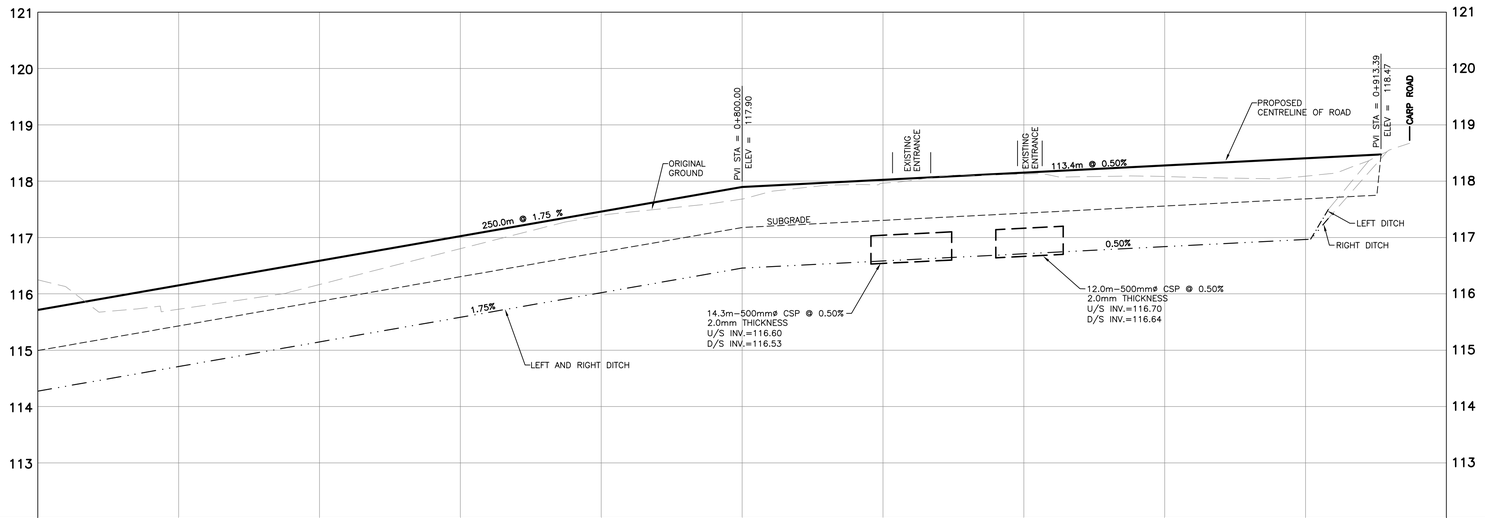
STREET A
PLAN AND PROFILE
STA 0+325 TO STA 0+675

PROJECT No.	24104
SURVEY	LIDAR
DATED	MARCH 2026
DWG. No:	24104-P2

FILE No. D07-16-25-0003







PROPOSED ROAD ℄ ELEVATION	115.71	116.15	116.59	117.02	117.46	117.90	118.02	118.15	118.28	118.41	PROPOSED ROAD ℄ ELEVATION
PROPOSED LEFT DITCH GRADE	114.27	114.71	115.15	115.58	116.02	116.46	116.58	116.71	116.84	116.97 116.97 117.50	PROPOSED LEFT DITCH GRADE
PROPOSED RIGHT DITCH GRADE	114.27	114.71	115.15	115.58	116.02	116.46	116.58	116.71	116.84	116.97 116.97 117.34	PROPOSED RIGHT DITCH GRADE
EXISTING ℄ R.O.W ELEVATION	*116.25*	*115.73*	*116.17*	*116.80*	*117.39*	*117.68*	*117.96*	*118.13*	*118.08*	*118.09*	EXISTING ℄ R.O.W ELEVATION
CHAINAGE	0+675	0+700	0+725	0+750	0+775	0+800	0+825	0+850	0+875	0+900	CHAINAGE

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LICENSED PROFESSIONAL ENGINEER
B.L. MACKECHNIE
100199554
PROVINCE OF ONTARIO
27 Mar '26

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DESIGN	JHB
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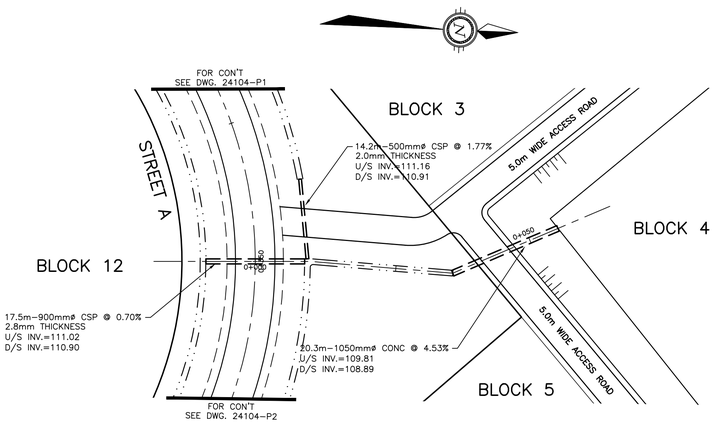
T & L CARROLL HOLDINGS INC.

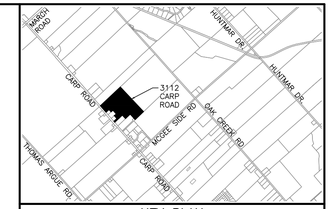
CARROLL INDUSTRIAL SUBDIVISION
3112 CARP ROAD
CITY OF OTTAWA

STREET A
PLAN AND PROFILE
STA 0+675 TO STA 0+915

PROJECT No.	24104
SURVEY	LIDAR
DATED	MARCH 2026
DWG. No:	24104-P3

FILE No. D07-16-25-0003





KEY PLAN

PROPOSED ℄ DITCH ELEVATION	112.53	110.96	110.31	109.87	111.61	111.51	108.95	PROPOSED ROAD ℄ ELEVATION
PROPOSED LEFT DITCH GRADE								PROPOSED LEFT DITCH GRADE
PROPOSED RIGHT DITCH GRADE								PROPOSED RIGHT DITCH GRADE
EXISTING ℄ R.O.W ELEVATION	112.47		112.53			112.63		EXISTING ℄ R.O.W ELEVATION
CHAINAGE	0+000		0+025			0+050	0+075	CHAINAGE

NOTES

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PROPERTY BOUNDARIES DERIVED FROM DRAFT PLAN OF SUBDIVISION, PART OF LOTS 11 AND 12, CONCESSION 2, GEOGRAPHIC TOWNSHIP OF HUNTLEY, CITY OF OTTAWA, DATED FEBRUARY 2, 2025, PREPARED BY EGIS SURVEYING INC. NAD83 (ORIGINAL) MTM ZONE 9 COORDINATE SYSTEM.

NO.	REVISION DESCRIPTION	DATE	BY
2	REISSUED FOR REVIEW	27/03/26	BLM
1	ISSUED FOR REVIEW	06/03/25	BLM

SCALE

HORIZONTAL 1:500 (0, 5m, 10m, 20m)

VERTICAL 1:50 (0, 0.5m, 1m, 2m)

LICENSED PROFESSIONAL ENGINEER
B. L. MACKECHNIE
100199554
27 Mar. '26
PROVINCE OF ONTARIO

Robinson Land Development
2936 Baseline Road,
Suite 200, Ottawa, ON
K2H 1B3
(613) 592-6060 rcii.com

DESIGN	JHB
CHECKED	BLM
DRAWN	JHB
CHECKED	CC
APPROVED	BLM

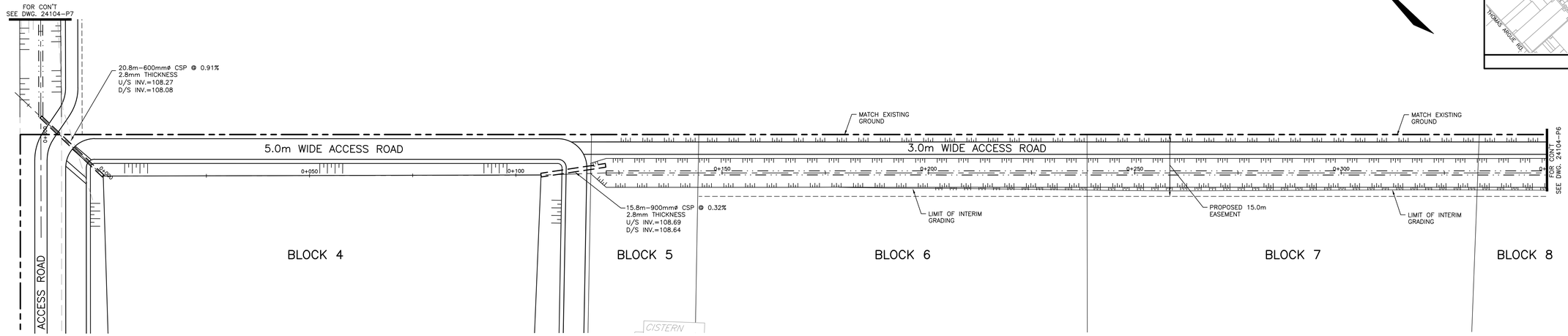
T & L CARROLL HOLDINGS INC.

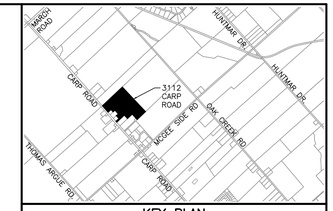
CARROLL INDUSTRIAL SUBDIVISION
3112 CARP ROAD
CITY OF OTTAWA

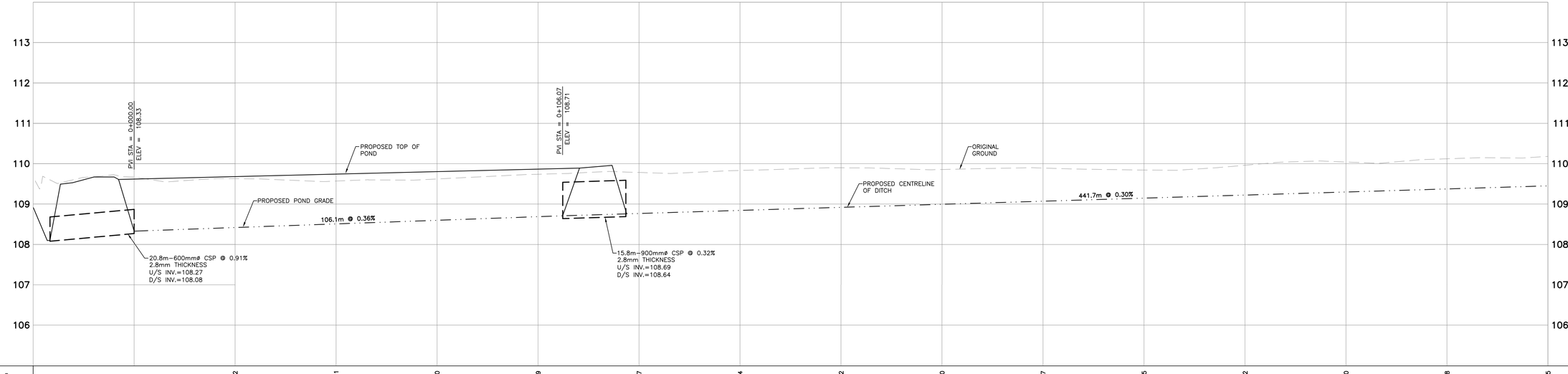
DITCH OUTLET PLAN AND PROFILE STA 0+000 TO STA 0+075

PROJECT No.	24104
SURVEY	LIDAR
DATED	MARCH 2026
DWG. No:	24104-P4

FILE No. D07-16-25-0003







PROPOSED ℄ DITCH ELEVATION			108.42	108.51	108.60	108.69	108.77	108.84	108.92	109.00	109.07	109.15	109.22	109.30	109.38	109.45	PROPOSED ℄ DITCH ELEVATION
PROPOSED LEFT DITCH GRADE																	PROPOSED LEFT DITCH GRADE
PROPOSED RIGHT DITCH GRADE																	PROPOSED RIGHT DITCH GRADE
EXISTING ℄ R.O.W ELEVATION			*109.67*	*109.63*	*109.57*	*109.62*	*109.74*	*109.78*	*109.83*	*109.90*	*109.86*	*109.89*	*109.84*	*109.96*	*110.04*	*110.12*	*110.18*	EXISTING ℄ R.O.W ELEVATION
CHAINAGE			**0+000**	**0+025**	**0+050**	**0+075**	**0+100**	**0+125**	**0+150**	**0+175**	**0+200**	**0+225**	**0+250**	**0+275**	**0+300**	**0+325**	**0+350**	CHAINAGE

NOTES

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NO.	REVISION DESCRIPTION	DATE	BY
2	REISSUED FOR REVIEW	27/03/26	BLM
1	ISSUED FOR REVIEW	06/03/25	BLM

SCALE

HORIZONTAL 1:500 (0, 5m, 10m, 20m)

VERTICAL 1:50 (0, 0.5m, 1m, 2m)

LICENSED PROFESSIONAL ENGINEER
B.L. MACKECHNIE
100199554
24 Mar. '26
PROVINCE OF ONTARIO

Robinson Land Development
2936 Baseline Road, Suite 200, Ottawa, ON K2H 1B3
(613) 592-6060 rcii.com

DESIGN	JHB
CHECKED	BLM
DRAWN	JHB
CHECKED	CC
APPROVED	BLM

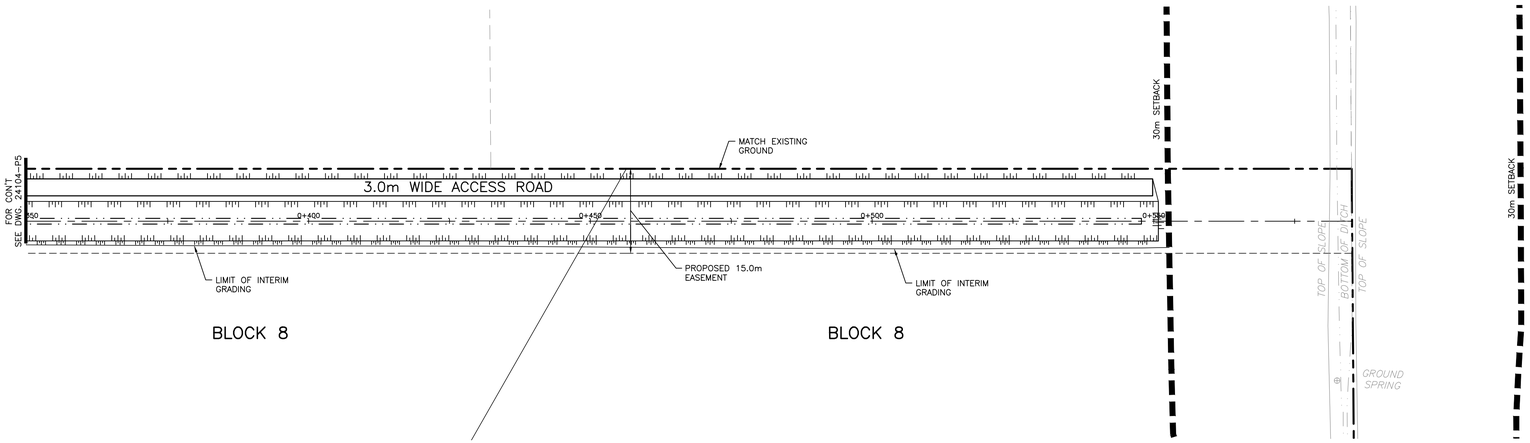
T & L CARROLL HOLDINGS INC.

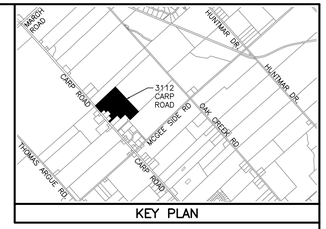
CARROLL INDUSTRIAL SUBDIVISION
3112 CARP ROAD
CITY OF OTTAWA

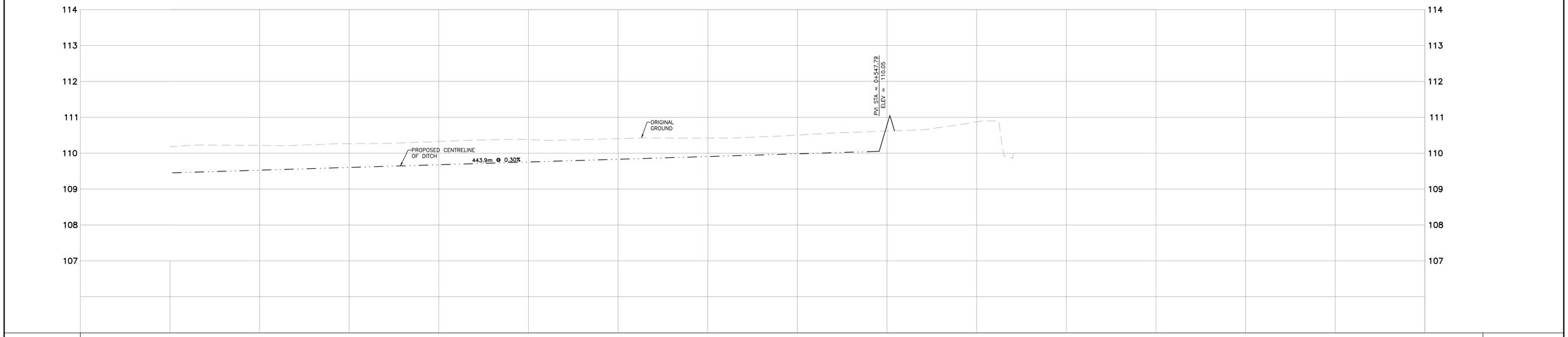
EAST DITCH OUTLET
PLAN AND PROFILE
STA 0-025 TO STA 0+350

PROJECT No.	24104
SURVEY	LIDAR
DATED	MARCH 2026
DWG. No:	24104-P5

FILE No. D07-16-25-0003







PROPOSED ℄ DITCH ELEVATION	109.45	109.53	109.60	109.68	109.75	109.83	109.91	109.98						PROPOSED ℄ DITCH ELEVATION
PROPOSED LEFT DITCH GRADE														PROPOSED LEFT DITCH GRADE
PROPOSED RIGHT DITCH GRADE														PROPOSED RIGHT DITCH GRADE
EXISTING ℄ R.O.W ELEVATION	110.18	110.22	110.26	110.32	110.38	110.41	110.42	110.50	110.62	110.87				EXISTING ℄ R.O.W ELEVATION
CHAINAGE	0+350	0+375	0+400	0+425	0+450	0+475	0+500	0+525	0+550	0+575	0+600			CHAINAGE

NOTES

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PROPERTY BOUNDARIES DERIVED FROM DRAFT PLAN OF SUBDIVISION, PART OF LOTS 11 AND 12, CONCESSION 2, GEOGRAPHIC TOWNSHIP OF HUNTLEY, CITY OF OTTAWA, DATED FEBRUARY 2, 2025, PREPARED BY EGIS SURVEYING INC. NAD83 (ORIGINAL) MTM ZONE 9 COORDINATE SYSTEM.

NO.	REVISION DESCRIPTION	DATE	BY
2	REISSUED FOR REVIEW	27/03/26	BLM
1	ISSUED FOR REVIEW	06/03/25	BLM

SCALE

HORIZONTAL 1:500 (0, 5m, 10m, 20m)

VERTICAL 1:50 (0, 0.5m, 1m, 2m)

LICENSED PROFESSIONAL ENGINEER
B. L. MACKECHNIE
100199554
27 Mar '26
PROVINCE OF ONTARIO

Robinson Land Development
2936 Baseline Road,
Suite 200, Ottawa, ON
K2H 1B3
(613) 592-6060 rcii.com

DESIGN	JHB
CHECKED	BLM
DRAWN	JHB
CHECKED	CC
APPROVED	BLM

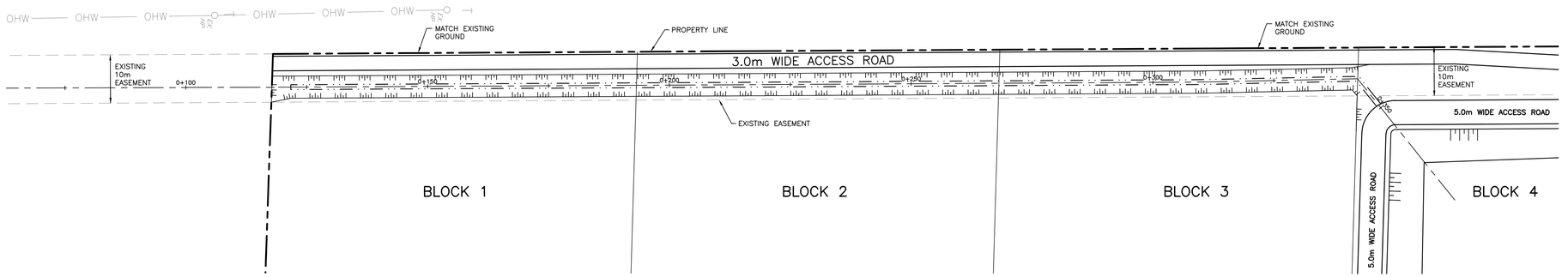
T & L CARROLL HOLDINGS INC.

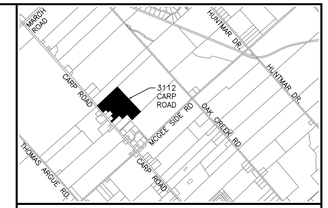
CARROLL INDUSTRIAL SUBDIVISION
3112 CARP ROAD
CITY OF OTTAWA

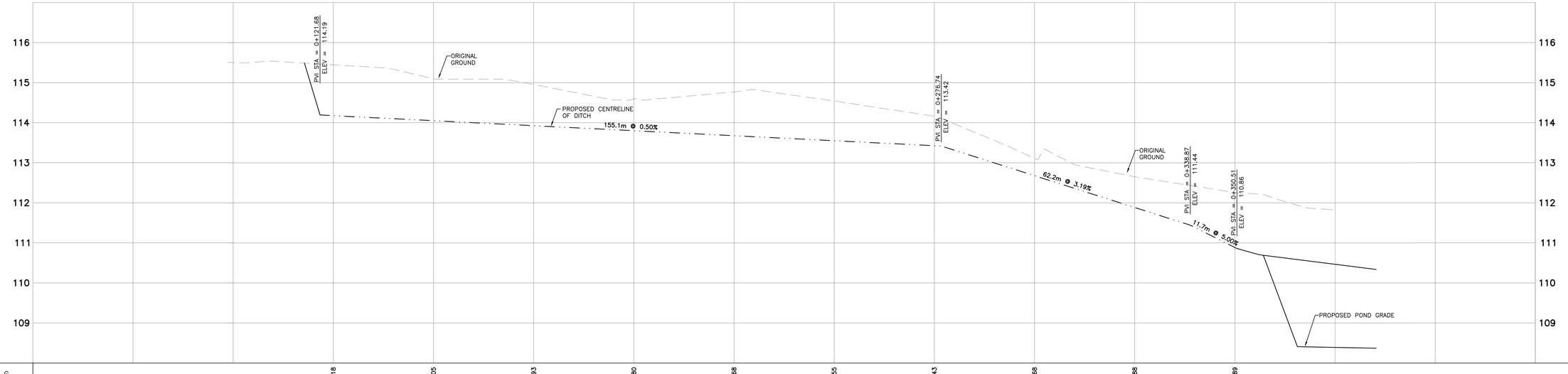
EAST DITCH OUTLET
PLAN AND PROFILE
STA 0+350 TO STA 0+600

PROJECT No.	24104
SURVEY	LIDAR
DATED	MARCH 2026
DWG. No:	24104-P6

FILE No. D07-16-25-0003







PROPOSED ℄ DITCH ELEVATION			114.18	114.05	113.93	113.80	113.68	113.55	113.43	112.68	111.88	110.89					PROPOSED ℄ DITCH ELEVATION
PROPOSED LEFT DITCH GRADE																	PROPOSED LEFT DITCH GRADE
PROPOSED RIGHT DITCH GRADE																	PROPOSED RIGHT DITCH GRADE
EXISTING ℄ R.O.W ELEVATION	115.50	115.45	115.10	114.95	114.59	114.77	114.54	114.16	113.11	112.65	112.25						EXISTING ℄ R.O.W ELEVATION
CHAINAGE	0+100	0+125	0+150	0+175	0+200	0+225	0+250	0+275	0+300	0+325	0+350	0+375					CHAINAGE

NOTES

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NO.	REVISION DESCRIPTION	DATE	BY
2	REISSUED FOR REVIEW	27/03/26	BLM
1	ISSUED FOR REVIEW	06/03/25	BLM

SCALE

HORIZONTAL 1:500 (0, 5m, 10m, 20m)

VERTICAL 1:50 (0, 0.5m, 1m, 2m)

LICENSED PROFESSIONAL ENGINEER
B. L. MACKECHNIE
100199554
14 Mar, 26
PROVINCE OF ONTARIO

Robinson Land Development
2936 Baseline Road, Suite 200, Ottawa, ON K2H 1B3
(613) 592-6060 rcii.com

DESIGN	JHB
CHECKED	BLM
DRAWN	JHB
CHECKED	CC
APPROVED	BLM

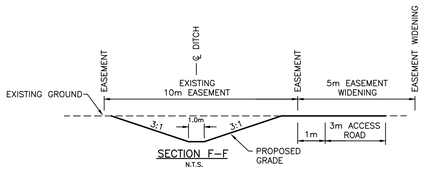
T & L CARROLL HOLDINGS INC.

CARROLL INDUSTRIAL SUBDIVISION
3112 CARP ROAD
CITY OF OTTAWA

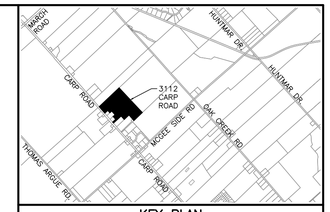
NORTH DITCH OUTLET PLAN AND PROFILE STA 0+100 TO STA 0+375

PROJECT No.	24104
SURVEY	LIDAR
DATED	MARCH 2026
DWG. No:	24104-P7

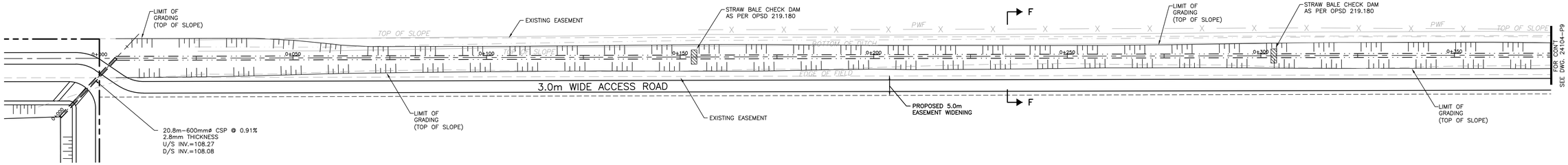
FILE No. D07-16-25-0003

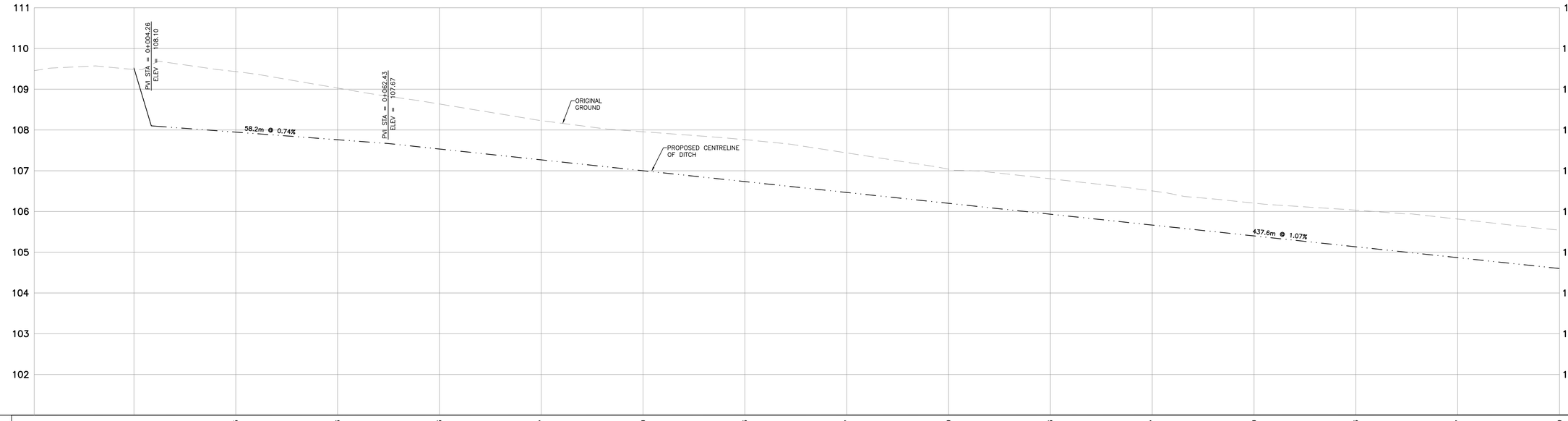


SECTION F–F
N.T.S.



KEY PLAN





PROPOSED ℄ DITCH ELEVATION		107.95		107.76		107.53		107.27		107.00		106.73		106.47		106.20		105.93		105.67		105.40		105.13		104.87		104.60		PROPOSED ℄ DITCH ELEVATION
PROPOSED LEFT DITCH GRADE																														PROPOSED LEFT DITCH GRADE
PROPOSED RIGHT DITCH GRADE																														PROPOSED RIGHT DITCH GRADE
EXISTING ℄ R.O.W ELEVATION	*109.49*		*109.43*		*109.03*		*108.64*		*108.23*		*107.96*		*107.76*		*107.44*		*107.04*		*106.80*		*106.50*		*106.20*		*106.03*		*105.81*		*105.54*	EXISTING ℄ R.O.W ELEVATION
CHAINAGE	**0+000**		**0+025**		**0+050**		**0+075**		**0+100**		**0+125**		**0+150**		**0+175**		**0+200**		**0+225**		**0+250**		**0+275**		**0+300**		**0+325**		**0+350**	CHAINAGE

NOTES

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NO.	REVISION DESCRIPTION	DATE	BY
2	REISSUED FOR REVIEW	27/03/26	BLM
1	ISSUED FOR REVIEW	06/03/25	BLM

SCALE

HORIZONTAL 1:500 (0, 5m, 10m, 20m)

VERTICAL 1:50 (0, 0.5m, 1m, 2m)

LICENSED PROFESSIONAL ENGINEER
B. L. MACKECHNIE
100199554
27-Mar-26
PROVINCE OF ONTARIO

Robinson Land Development
2936 Baseline Road,
Suite 200, Ottawa, ON
K2H 1B3
(613) 592-6060 rcii.com

DESIGN	JHB
CHECKED	BLM
DRAWN	JHB
CHECKED	CC
APPROVED	BLM

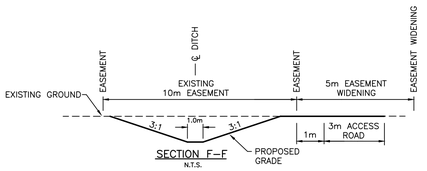
T & L CARROLL HOLDINGS INC.

CARROLL INDUSTRIAL SUBDIVISION
3112 CARP ROAD
CITY OF OTTAWA

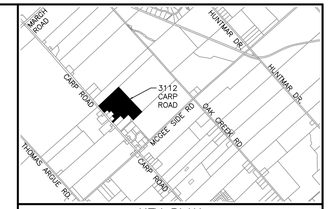
OUTLET DITCH
PLAN AND PROFILE
STA 0+000 TO STA 0+350

PROJECT No.	24104
SURVEY	LIDAR
DATED	MARCH 2026
DWG. No:	24104-P8

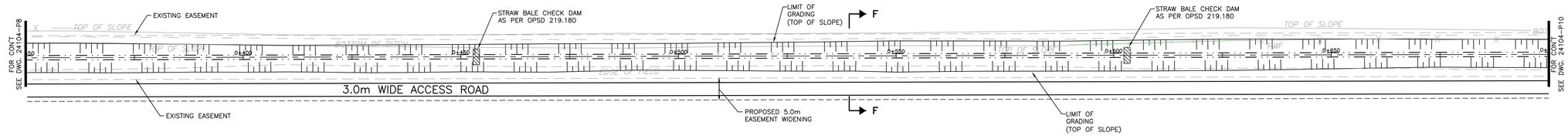
FILE No. D07-16-25-0003

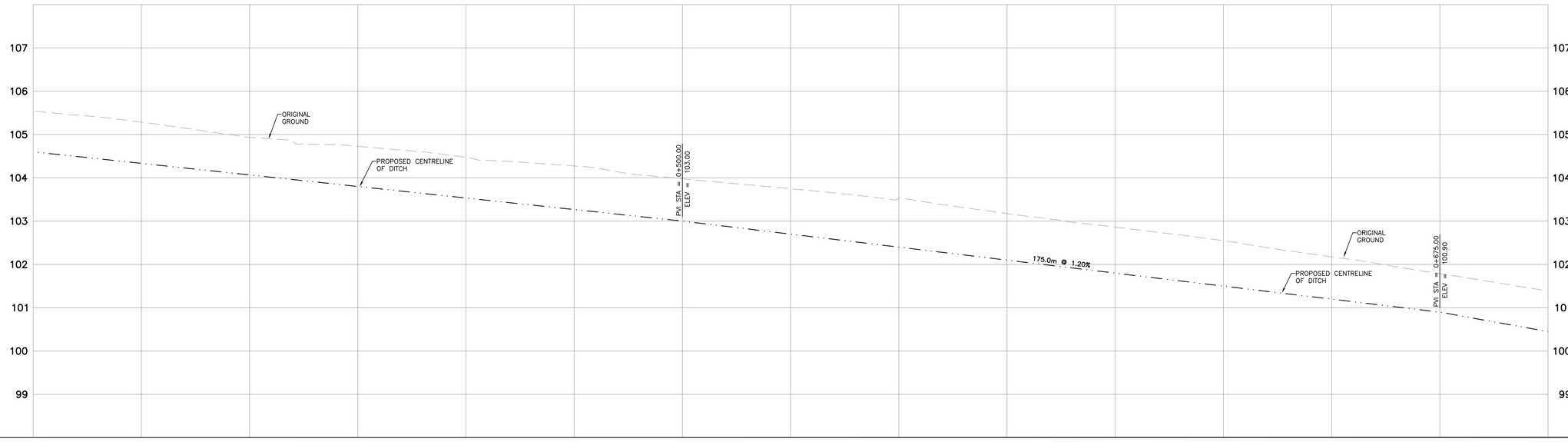


SECTION F–F
N.T.S.



KEY PLAN





PROPOSED ℄ DITCH ELEVATION	104.60	104.33	104.07	103.80	103.53	103.27	103.00	102.70	102.40	102.10	101.80	101.50	101.20	100.90	100.45	PROPOSED ℄ DITCH ELEVATION
PROPOSED LEFT DITCH GRADE																PROPOSED LEFT DITCH GRADE
PROPOSED RIGHT DITCH GRADE																PROPOSED RIGHT DITCH GRADE
EXISTING ℄ R.O.W ELEVATION	105.54	105.29	104.94	104.73	104.48	104.27	103.98	103.75	103.53	103.18	102.86	102.55	102.18	101.79	101.39	EXISTING ℄ R.O.W ELEVATION
CHAINAGE	0+350	0+375	0+400	0+425	0+450	0+475	0+500	0+525	0+550	0+575	0+600	0+625	0+650	0+675	0+700	CHAINAGE

NOTES

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NO.	REVISION DESCRIPTION	DATE	BY
2	REISSUED FOR REVIEW	27/03/26	BLM
1	ISSUED FOR REVIEW	06/03/25	BLM

SCALE

HORIZONTAL 1:500 (0, 5m, 10m, 20m)

VERTICAL 1:50 (0, 0.5m, 1m, 2m)

LICENSED PROFESSIONAL ENGINEER
B.L. MACKECHNIE
100199554
27-Mar-26
PROVINCE OF ONTARIO

Robinson Land Development
2936 Baseline Road, Suite 200, Ottawa, ON K2H 1B3
(613) 592-6060 rcii.com

DESIGN	JHB
CHECKED	BLM
DRAWN	JHB
CHECKED	CC
APPROVED	BLM

T & L CARROLL HOLDINGS INC.

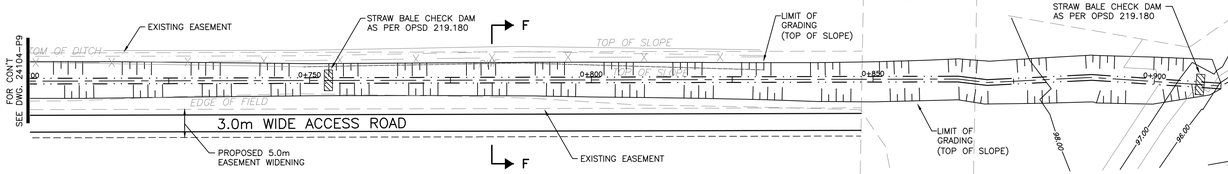
CARROLL INDUSTRIAL SUBDIVISION
3112 CARP ROAD
CITY OF OTTAWA

OUTLET DITCH
PLAN AND PROFILE
STA 0+350 TO STA 0+700

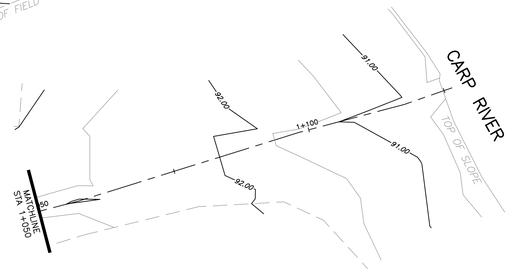
PROJECT No.	24104
SURVEY	LIDAR
DATED	MARCH 2026
DWG. No:	24104-P9

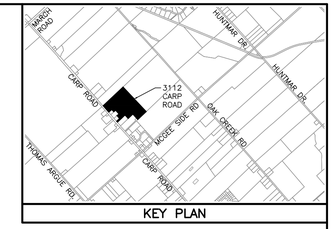
FILE No. D07-16-25-0003

SECTION F–F
N.T.S.

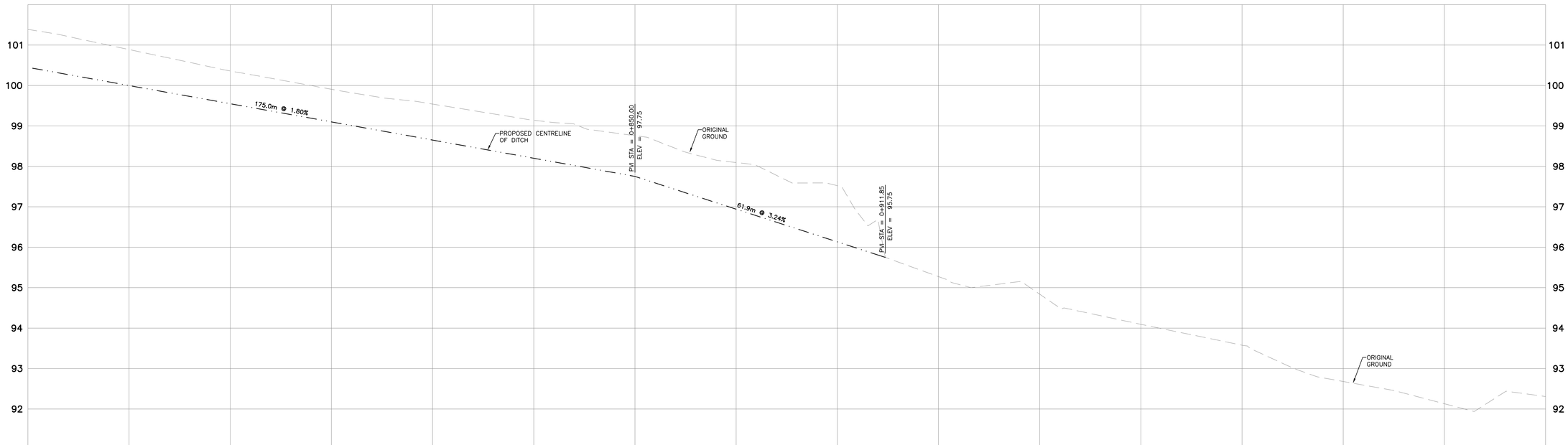


OAK CREEK ROAD
(UNOPENED)





KEY PLAN



PROPOSED ℄ DITCH ELEVATION	100.45	100.00	99.55	99.10	98.65	98.20	97.75	96.94	96.13							PROPOSED ℄ DITCH ELEVATION
PROPOSED LEFT DITCH GRADE																PROPOSED LEFT DITCH GRADE
PROPOSED RIGHT DITCH GRADE																PROPOSED RIGHT DITCH GRADE
EXISTING ℄ R.O.W ELEVATION	*101.39*	*100.89*	*100.36*	*99.91*	*99.54*	*99.14*	*98.76*	*98.10*	*97.52*	*95.27*	*94.84*	*94.09*	*93.58*	*92.68*	*92.13*	*92.31*	EXISTING ℄ R.O.W ELEVATION
CHAINAGE	**0+700**	**0+725**	**0+750**	**0+775**	**0+800**	**0+825**	**0+850**	**0+875**	**0+900**	**0+925**	**0+950**	**0+975**	**1+000**	**1+025**	**1+050**	**1+075**	CHAINAGE

NOTES

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NO.	REVISION DESCRIPTION	DATE	BY
2	REISSUED FOR REVIEW	27/03/26	BLM
1	ISSUED FOR REVIEW	06/03/25	BLM

SCALE
HORIZONTAL 1:500 (0, 5m, 10m, 20m)
VERTICAL 1:50 (0, 0.5m, 1m, 2m)

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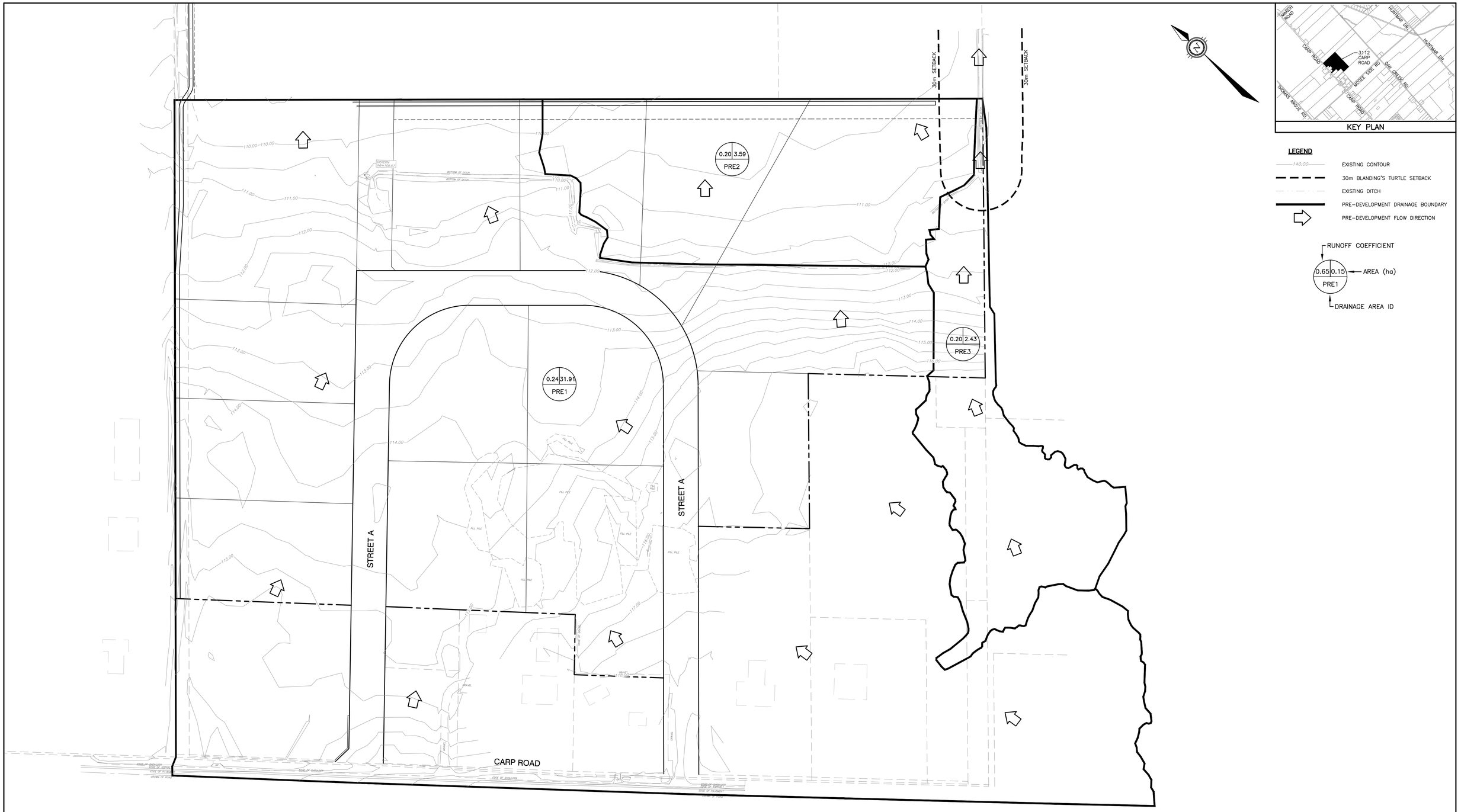
T & L CARROLL HOLDINGS INC.

CARROLL INDUSTRIAL SUBDIVISION
3112 CARP ROAD
CITY OF OTTAWA

OUTLET DITCH
PLAN AND PROFILE
STA 0+700 TO STA 1+075

PROJECT No.	24104
SURVEY	LIDAR
DATED	MARCH 2026
DWG. No:	24104-P10

FILE No. D07-16-25-0003



LEGEND

- EXISTING CONTOUR
- 30m BLANDING'S TURTLE SETBACK
- EXISTING DITCH
- PRE-DEVELOPMENT DRAINAGE BOUNDARY
- PRE-DEVELOPMENT FLOW DIRECTION

RUNOFF COEFFICIENT
0.65 0.15 — AREA (ha)
PRE1
DRAINAGE AREA ID

NOTES

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SCALE
0 10m 20m 50m
HORIZONTAL 1:1250

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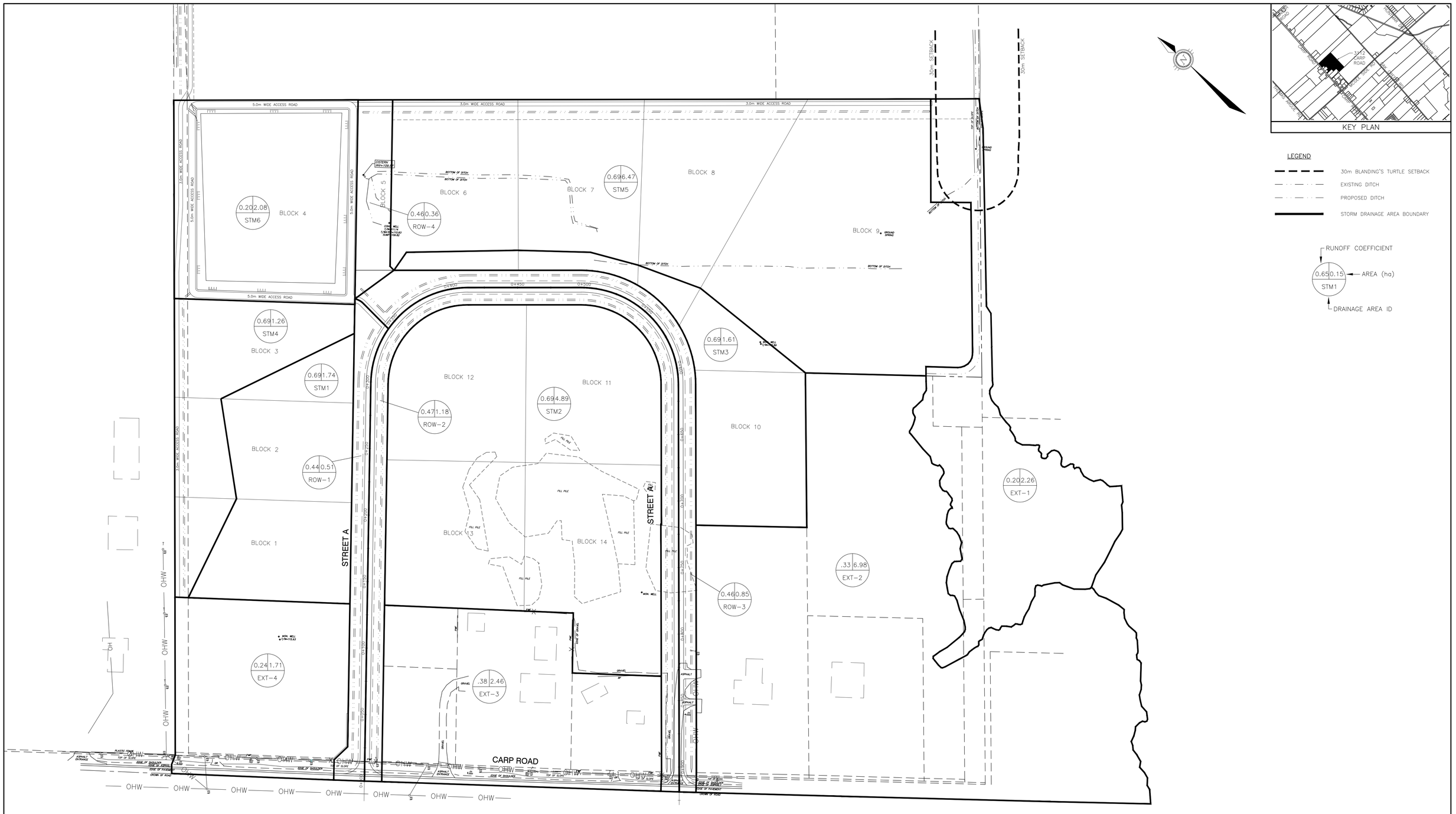
3112 CARP ROAD
CITY OF OTTAWA

PRE-DEVELOPMENT
DRAINAGE AREA PLAN

PROJECT No.	24104
SURVEY	LIDAR
DATED	MARCH 2026
DWG. No:	24104-PRE1

FILE No. D07-16-25-0003



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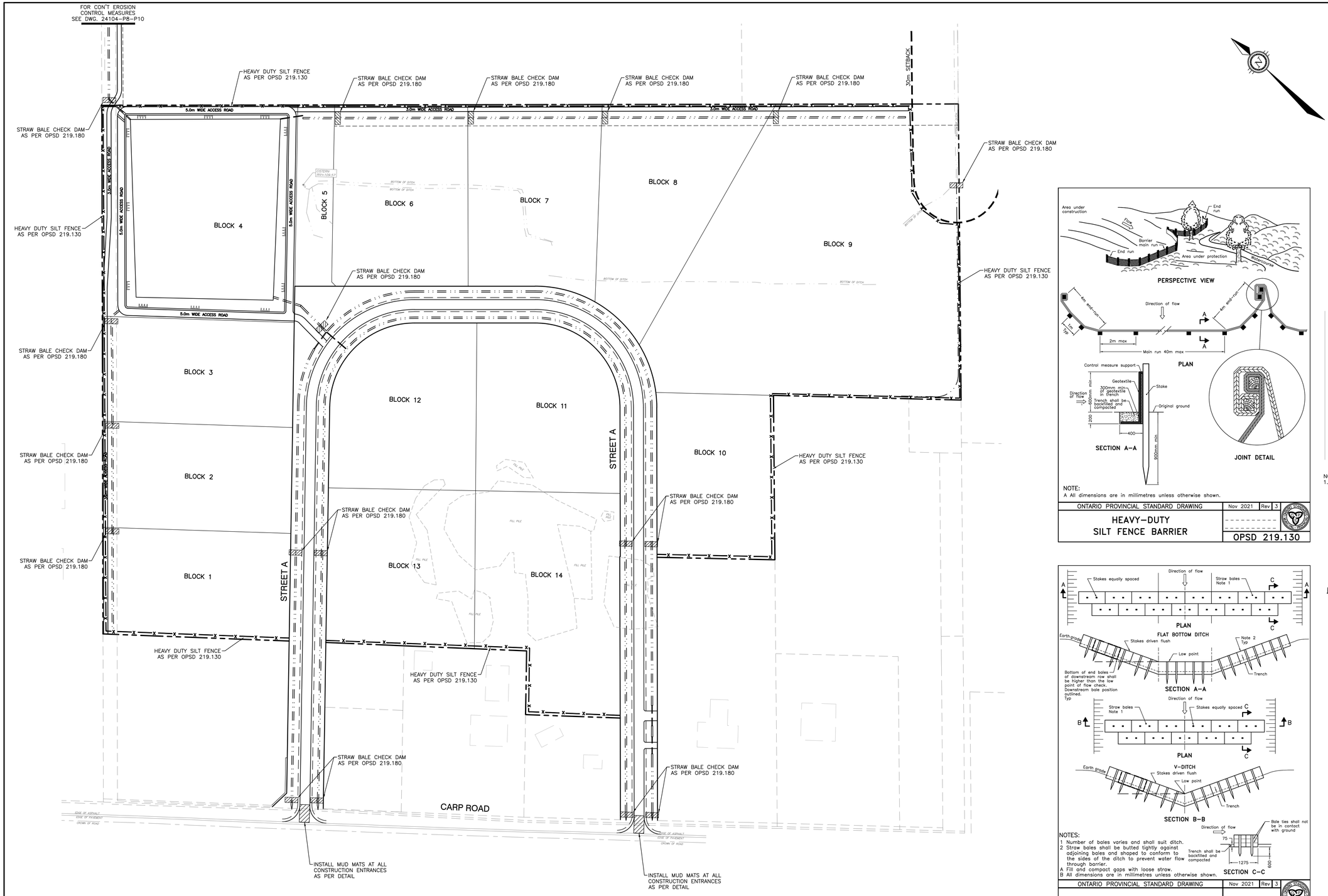
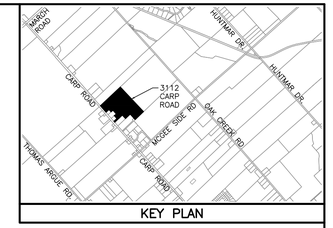
3112 CARP ROAD
CITY OF OTTAWA

POST-DEVELOPMENT DRAINAGE AREA PLAN

PROJECT No.	24104
SURVEY	LIDAR
DATED	MARCH 2026
DWG. No:	24104-STM1

FILE No. D07-16-25-0003





KEY PLAN

LEGEND

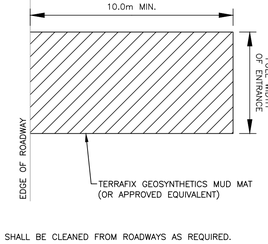
- PROPERTY BOUNDARY
- 30m BLANDING'S TURTLE SETBACK
- EXISTING DITCH
- PROPOSED DITCH
- HEAVY DUTY SILT FENCE
- STRAW BALE CHECK DAM

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

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2021	Rev 3
HEAVY-DUTY SILT FENCE BARRIER		OPSD 219.130

NOTES:
1 Number of bales varies and shall suit ditch.
2 Straw bales shall be butted tightly against adjoining bales and shaped to conform to the sides of the ditch to prevent water flow through barrier.
A Fill and compact gaps with loose straw.
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2021	Rev 3
STRAW BALE FLOW CHECK DAM		OPSD 219.180



NOTES:
1. SEDIMENT SHALL BE CLEANED FROM ROADWAYS AS REQUIRED.

MUD MAT DETAIL
N.T.S.

NOTES:

1. THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE ULTIMATE RECEIVING WATERCOURSE DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.
2. LIMIT THE EXTENT OF EXPOSED SOILS AT ANY GIVEN TIME.
3. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE MAINTAINED UNTIL VEGETATION HAS BEEN RE-ESTABLISHED IN ALL DISTURBED AREAS. RE-VEGETATE DISTURBED AREAS AS SOON AS POSSIBLE.
4. STOCKPILE SOIL AWAY (15 METRES OR GREATER) FROM WATERCOURSES, DRAINAGE FEATURES AND TOP OF STEEP SLOPES.
5. A HEAVY DUTY SILT FENCE BARRIER SHALL BE INSTALLED AS PER OPSD 219.130 WHERE INDICATED AND MAINTAINED AS REQUIRED.
6. STRAW BALE CHECK DAMS TO BE INSTALLED AS PER OPSD 219.180 WHERE INDICATED AND MAINTAINED AS REQUIRED.
7. DURING ACTIVE CONSTRUCTION PERIODS, VISUAL INSPECTIONS SHALL BE UNDERTAKEN ON A WEEKLY BASIS AND AFTER MAJOR STORM EVENTS (>25MM RAIN IN 24 HOUR PERIOD) ON SEDIMENT CONTROL BARRIERS AND ANY DAMAGE REPAIRED IMMEDIATELY.
8. EROSION AND SEDIMENT CONTROL BARRIERS SHALL ALSO BE ASSESSED (AND REPAIRED AS REQUIRED) FOLLOWING SIGNIFICANT SNOWMELT EVENTS.
9. VISUAL INSPECTIONS SHALL ALSO BE UNDERTAKEN IN ANTICIPATION OF LARGE STORM EVENTS (OR A SERIES OF RAINFALL AND/OR SNOWMELT DAYS) THAT COULD POTENTIALLY YIELD SIGNIFICANT RUNOFF VOLUMES.
10. CARE SHALL BE TAKEN TO PREVENT DAMAGE TO EROSION AND SEDIMENT CONTROLS DURING CONSTRUCTION OPERATIONS.
11. IN SOME CASES, BARRIERS MAY BE REMOVED TEMPORARILY TO ACCOMMODATE THE CONSTRUCTION OPERATIONS. THE AFFECTED BARRIERS SHALL BE REINSTATED IMMEDIATELY AFTER CONSTRUCTION OPERATIONS ARE COMPLETED.
12. SEDIMENT CONTROL DEVICES SHALL BE CLEANED OF ACCUMULATED SEDIMENTATION AS REQUIRED AND REPLACED AS NECESSARY.
13. DURING THE COURSE OF CONSTRUCTION, IF THE ENGINEER BELIEVES THAT ADDITIONAL PREVENTION METHODS ARE REQUIRED TO CONTROL EROSION AND SEDIMENTATION, THE CONTRACTOR SHALL IMPLEMENT ADDITIONAL MEASURES, AS REQUIRED, TO THE SATISFACTION OF THE ENGINEER.
14. CONSTRUCTION AND MAINTENANCE REQUIREMENTS FOR EROSION AND SEDIMENT CONTROLS ARE TO COMPLY WITH OPSS 805.
15. CONTRACTOR SHALL FOLLOW RECOMMENDATIONS FROM EIS REPORT DATED JUNE 21, 2024.
16. CONSTRUCTION EQUIPMENT SHALL BE PROPERLY MAINTAINED. MAINTENANCE ON CONSTRUCTION EQUIPMENT WITH RESPECT TO REFUELING, WASHING AND FLUID CHANGES SHOULD NOT TAKE PLACE WITHIN 30 METRES OF ANY SURFACE WATER FEATURES.
17. EMERGENCY SPILL KITS SHALL BE LOCATED ON-SITE AND CONSTRUCTION CREWS SHALL BE FULLY TRAINED ON THE USE OF CLEAN-UP MATERIALS IN ORDER TO MINIMIZE IMPACTS OF ANY ACCIDENTAL SPILLS. THE AREA SHALL BE MONITORED FOR LEAKAGE AND IN THE EVENT OF A MINOR SPILL, ACTIVITY SHOULD BE HALTED AND CORRECTIVE MEASURES SHALL BE IMPLEMENTED. ANY SPILLS SHALL BE IMMEDIATELY REPORTED TO THE MECP SPILLS ACTION CENTRE.

NOTES

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LICENSED PROFESSIONAL ENGINEER
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24 Mar, 26

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T & L CARROLL HOLDINGS INC.

CARROLL INDUSTRIAL SUBDIVISION
3112 CARP ROAD
CITY OF OTTAWA

EROSION AND SEDIMENT CONTROL PLAN

PROJECT No.	24104
SURVEY	LIDAR
DATED	MARCH 2026
DWG. No:	24104-ESC

FILE No. D07-16-25-0003

Appendix C

Hydrogeological Investigation Excerpts

- Bedrock Depths and Elevations
- Groundwater Levels
- Soil Infiltration Testing
- Water Balance
- Summary and Conclusions
- Recommendations
- Figure 1: Detailed Site Plan
- Figure 6: Inferred Surficial Geology
- Figure 10: Conceptual Lot Development Plan
- Borehole Logs
- Guelph Permeameter Infiltration Testing
- Maximum Allowable Septic Flows
- Water Balance Tables

Figure A4: Natural Heritage Features

4.2.7 Auger Refusal and Bedrock

Boreholes 23-06, 23-07, 23-08, 23-10, 23-14, and 23-15, from the GEMTEC 2023 investigations encountered practical auger refusal at depths ranging from about 2.6 to 8.5 metres below the existing ground surface. Boreholes 19-1D, 19-3D, and 19-4S from GEMTEC 2021 investigations encountered practical auger refusal at depths ranging from about 5.6 to 9.1 metres below the existing ground surface. Auger refusal may occur on cobbles and boulders within the glacial till or on the bedrock surface.

Practical refusal to excavating was encountered in test pits 18-2, 18-3, 18-6, 18-9, 18-10, 18-11, 18-12, 18-13, and 18-14 at depths ranging from about 1.8 to 3.1 metres below the existing ground surface.

Bedrock was encountered in the test wells at depths ranging from about 7.0 to 8.2 metres below the existing ground surface. The depth to bedrock at the test well locations was inferred from the drilling resistance and the drill cuttings.

A summary of the refusal depths and elevations from the GEMTEC 2019 and 2023 investigations are summarized in Table 4.4.

Table 4.4 – Summary of Auger Refusal and Bedrock Depths and Elevations

Test hole ID	Ground Surface Elevation (metres)	Depth to Refusal (metres)	Refusal/Bedrock Elevation (metres)
BH 23-06	110.3	8.5[1]	101.8[1]
BH 23-07	112.8	3.3	109.6
BH 23-08	110.3	4.4	105.8
BH 23-10	114.1	4.2	109.9
BH 23-13	111.7	4.0[2]	107.6[2]
BH 23-14	116.3	2.6	113.8
BH 23-15	111.5	5.0	106.4
BH 19-1D	115.8	9.2	106.6
BH 19-3D	115.2	6.5	108.7
BH 19-4S	117.1	5.6	111.5
TW-1	115.8	7.9[3]	107.9[3]
TW-2	112.8	7.6[3]	105.2[3]
TW-3	115.3	7.0[3]	108.3[3]
TW-4	117.3	8.2[3]	109.1[3]
TP 18-2	114.7	2.9	111.8

Test hole ID	Ground Surface Elevation (metres)	Depth to Refusal (metres)	Refusal/Bedrock Elevation (metres)
TP 18-3	113.1	2.4	110.7
TP 18-6	114.5	2.9[4]	111.6[4]
TP 18-9	116.2	3.1[4]	113.2[4]
TP 18-10	114.1	3.1[4]	111.0[4]
TP 18-11	111.6	2.3[4]	109.4[4]
TP 18-12	116.3	2.9[4]	113.4[4]
TP 18-13	111.8	3.1[4]	108.8[4]
TP 18-14	115.5	1.8	113.6

Notes:

1. Practical auger refusal was encountered in borehole 23-06 at a depth of about 8.5 metres below the ground surface, however, an SPT advanced past auger refusal to a depth of about 9.0 metres below the existing ground surface.
2. Borehole 23-13 encountered SPT refusal (not auger refusal). SPT refusal likely represents cobbles and boulders, rather than the bedrock surface.
3. The depth to bedrock in the test wells is inferred from the drilling resistance and the drill cuttings.
4. Refusal to excavator advancement was encountered in test pits 18-6 and 18-9 to 18-13 on possible cobbles and boulders within the glacial till.

4.3 Groundwater Levels

Monitoring wells were installed in borehole 23-07 from the GEMTEC (2023) investigations, borehole 24-9 from the GEMTEC (2024) investigation and boreholes 19-1D, 19-1S, 19-3D, 19-3S, and 19-4S from the GEMTEC (2019) investigations to measure the groundwater levels. Four test wells were advanced at the Site for pumping testing and groundwater level measurements during the previous investigation.

The measured groundwater levels in the monitoring wells and test wells installed in the boreholes are presented in Appendix D and the highest recorded groundwater levels in each monitoring well are summarized in Table 4.5. The groundwater levels may be higher during wet periods of the year such as the early spring or following periods of precipitation.

Table 4.5 – Summary of Groundwater Levels

Borehole ID	Ground Surface Elevation (metres)	Groundwater Depth (metres below ground surface)	Groundwater Level Elevation (metres)	Date
TW 19-1 (bedrock)	115.8	4.2	111.6	Aug 8, 2019

Borehole ID	Ground Surface Elevation (metres)	Groundwater Depth (metres below ground surface)	Groundwater Level Elevation (metres)	Date
TW 19-2 (bedrock)	112.8	1.5	111.3	Aug 8, 2019
TW 19-3 (bedrock)	115.3	3.0	112.3	Apr 27, 2023
TW 19-4 (bedrock)	117.3	3.9	113.4	Apr 27, 2023
BH 23-07	112.8	2.8	110.0	Apr 27, 2023
BH 19-1D	115.8	4.6	111.2	Aug 8, 2019
BH 19-1S	115.8	Dry (3.05)	Dry (112.8)	Aug 6, 2019
BH 19-3D	115.2	2.9	112.3	Apr 27, 2023
BH 19-3S	115.3	3.0	112.3	Apr 27, 2023
BH 19-4S	117.1	4.6	112.5	Apr 27, 2023
BH24-9	117.5	Dry (3.35)	Dry (114.1)	Feb 28, 2024

4.4 Soil Infiltration Testing

As part of GEMTEC (2023a) field infiltration tests were carried out at seven (7) locations across the Site in order to estimate infiltration rates. Shallow hand-auger holes were advanced 0.4 to 1.2 metres below ground surface (mbgs) in the immediate vicinity of test pits 18-1, 18-3, 18-5, 18-9, 18-10 and 18-14. The soils conditions above the depth of infiltration testing consists of grey to brown sands with varying amounts of silt/clay and gravel. The hand auger and infiltration testing depths are summarized in Appendix F.

A Guelph Permeameter was used to estimate the saturated hydraulic conductivity in the vadose zone (ASTM D5126 – 90: Standard Guide for Comparison of Field Methods for Determining Hydraulic Conductivity in the Vadose Zone). The field saturated hydraulic conductivity (K_{fs}) was calculated using the single head method, following Soil Moisture's K_{fs} calculation (refer to Appendix F). The single head method was conducted using hydraulic head heights of 5 to 15 cm.

The field measurements of saturated hydraulic conductivity were converted to infiltration rates based on the relationship between field saturated hydraulic conductivity and infiltration rates presented in "Ontario Ministry of Municipal Affairs and Housing (OMMAH), 1997, Supplementary Guidelines to Ontario Building Code 1997, SG-6 Percolation Times and Soil Descriptions, Toronto, Ontario".

The calculated saturated field hydraulic conductivities range from 1.1 x 10^{-2} to 1.1 x 10^{-5} cm/s. The corresponding estimated infiltration rates, based on K_{fs}, ranged from 26 to 163 mm/hour.

Soil samples were collected from the bottom 15 cm of each hand auger hole and submitted for grain size analyses (Appendix E). Soil classifications are variable ranging from sand with a trace of silt and clay to sandy clayey silt.

Calculated saturated field hydraulic conductivities were also estimated based on grain size analysis and soil texture classification of samples from the hand auger holes, which ranged from 5.3 x 10^{-6} to 3.6 x 10^{-2} cm/s. The infiltration rates based on the soil texture classification for the hand auger samples are presented in Appendix F.

5.0 IMPACT ASSESSMENT

The potential impact on groundwater and surface water resources due to wastewater treatment and disposal by individual on-site sewage disposal systems on the Site are assessed in the following sections.

5.1 Sewage Disposal Systems

It is understood that the use of advanced technologies for the treatment of septic effluent (advanced treatment) is being proposed for the development. Advanced sewage treatment systems are permitted under the Ontario Building Code (OBC), and these technologies are capable of treating effluent prior to the effluent being disposed to a Class IV leaching bed (Type A or Type B), including a reduction in the nitrate concentration. This section discusses the results of the terrain evaluation as they relate to the feasibility of installing advanced sewage treatment systems on the Site for on-site wastewater treatment and disposal.

CoO (2016) provides additional guidance for the application of MECP Guideline D-5-4 within the Carp Road Corridor. The memo allows proponents to undertake a modified nitrate attenuation predictive assessment using nitrogen reduction treatment systems. Available systems are able to achieve a minimum of 50% reduction in nitrogen; as a result, the modified minimum concentration of nitrate used in the nitrate attenuation assessment can be reduced to 20 mg/L.

It should be noted that the following information is provided for general guidance purposes only. All septic systems installed at the Site should be designed on a lot-by-lot basis. Test holes should be advanced during the lot development to identify the subsurface conditions at the location of the proposed septic system. In all cases, the septic system design must conform to OBC requirements.

5.2 Hydrogeological Sensitivity

Areas of thin soils cover, fractured bedrock exposed at ground surface, and karst environments contribute to the hydrogeological sensitivity of a site, which may not allow for sufficient attenuative

A hydrogeological cross-section (Figure 7) for southwest to northeast alignment across the Site, was prepared based information from available geologic mapping, test pit investigations, on-site test wells, and select neighbouring water well records. Please note that the boundaries between zones indicated on the cross-section have been interpreted based on available information and may differ somewhat from that indicated.

Table 7.1 – Framework of Hydrogeological Conceptual Model

Stratigraphic Unit	Generalized Composition	Thickness (m)
Overburden	sand, silty sand, sandy silt	0.3 to 1.0 metres
	silt and clay / glacial till	0.35 to 8 metres
Bedrock	limestone / dolostone and sandstone	> 54 metres

The bedrock elevation at the test wells ranges from 105.2 to 109.1 metres Above Mean Sea Level (AMSL) and the base of the well casings range from 100.3 to 104.2 metres AMSL. The elevation of the water bearing zones (depth water found) ranges from 58.5 to 96.6 metres AMSL and the elevation of the bottom of test wells ranged from 51.8 to 58.8 metres AMSL.

Conceptual Lot Development Plan

A Conceptual Lot Development Plan (Figure 10) is presented to demonstrate that the proposed lots can be serviced with on-site well and septic meeting applicable setbacks. The well and septic locations shown are conceptual. Their general placement (e.g., front yard versus side yard) should be maintained to ensure that future systems do not conflict with those on neighbouring lots. If adjustments to well or septic locations are required at the Site Plan Control stage, a Qualified Professional should review the revised placements to confirm that they will not interfere with the future well and septic systems of adjacent properties.

8.0 WATER BALANCE

8.1 Water Balance Method

GEMTEC has calculated pre-development and post-development water budgets for the Site to assess the impact of the proposed development on groundwater recharge. The water balance of the Site was assessed using following equation:

Mean Annual Precipitation – Change in Groundwater Storage – Evapotranspiration = Runoff + Infiltration

where:

Mean annual precipitation is based on data provided by Environment Canada, from the Ottawa International weather station for the period of 1939-2020.

Long term changes to groundwater storage are assumed to be negligible. *Short term or seasonal changes to storage* are anticipated to balance out (e.g., increased groundwater recharge following spring freshet, followed by dry conditions in the summer months).

Evapotranspiration is calculated based on the Thornthwaite and Mather (1955) model, run by Environment Canada. The technical documentation provided by Environment Canada is titled "Water Balance Tabulations for Canadian Climate Stations", written by Johnstone and Louie, Hydrometeorology Division, Canadian Climate Centre, Atmospheric Environmental Services (undated).

The hydrologic factors used to estimate *infiltration*, such as topography, soil, cover and water holding capacities are based on the MECP Stormwater Management Planning and Design Manual Section 3.0 (MECP, 2003) and the Ministry of the Environment and Energy (MOEE) Hydrogeological Technical Information Requirements for Land Development Applications (MOEE, 1995). The hydrologic factors are based on site-specific field conditions and have been divided into two distinct terrain units (Figure 6). The terrain units at the Site include:

- Terrain Unit 1: Fine Sandy Loam representative of Silty sand, sand and silt, glacial till (approximately 42% coverage)

- Terrain Unit 2: Clay Loam representative of Silty clay and clayey silt (approximately 58% coverage)

8.1.1 Pre-Development

Based on the Site terrain units and Site characteristics, the weighted average infiltration factor was estimated for each lot (Appendix M), based on the following information:

- Topography factor of 0.19 –Rolling land with an average slope between 2.8 m to 3.8m /km;
- Soil factors ranging from 0.15 to 0.30.
    - Fine Sandy loam = 0.30
    - Clay loam = 0.15
- Cover factor of 0.10 – Cultivated land; and
    - The Site consists of grasses and shrubs. Applies to all lots.
- Water holding capacity based on soil factor and cover factor:
    - Fine Sandy loam, pasture and shrubs: water holding capacity of 150 mm

- Water surplus = 342 mm/year

- Clay loam, pasture and shrubs: water holding capacity of 250 mm
  - Water surplus = 320 mm/year

The estimated soil water holding capacities were selected from Table 3.1 of the MECP Stormwater Management Planning and Design Manual (MECP, 2003) with the pasture and shrubs vegetation type.

8.1.2 Post-Development

The post-development conditions at the Site are expected to consist of commercial/industrial buildings, paved parking lots and landscaped lawns / vegetated areas. The maximum hard surface area per commercial/industrial lot will be variable and three scenarios are presented: 40%, 50%, and 60% hard surface coverage. Impervious surfaces consisting of buildings and paved or gravel parking areas, reducing the infiltration factor to 0.

The post-development water holding capacities are as follows:

- Fine Sandy loam, urban lawns/shallow rooted crops: water holding capacity of 75 mm
  - Water surplus = 383 mm/year
- Clay loam, urban lawns/shallow rooted crops: water holding capacity of 100 mm
  - Water surplus = 367 mm/year

Lots with different soil types (refer to Figure 6) have weighted average water surplus values (only applied to lots where there is notable differences in soil types, considering that the boundaries between the two geologic units are inferred). The surplus was provided by Environment Canada, from the Carleton place – Appleton weather station for the period of 1985-2020.

The post-development conditions and calculations are summarized in Appendix M.

8.1.3 Water Balance Summary

Based on the water balance calculations, the post-development infiltration on a per lot basis reduces by about 33 to 56% depending on the hard surface coverage, assuming 40 to 60% hard surface (refer to water balance calculations in Appendix M.

The western half of the Site is underlain by more permeable soils and capable of infiltration through implementation of Low Impact Development (LID) features. These soils are thought to provide important recharge to natural features and surficial and bedrock water supplies in the area. To maintain the high recharge along the Carp Road Corridor, consideration should be given to maintaining the pre-development infiltration rates for the Site post-development to maintain groundwater levels and protect groundwater users.

It should be noted that Lots 3, 6, 7, 8, 11 and 12 are located within mapped low permeability soils (refer to reclassified surficial geology Figure 6). As per Appendix 10 of the City of Ottawa Sewer Design Guidelines (City of Ottawa, 2025), LID features will not be permitted for lots underlain by clay and silt soils.

Table 8.1 below outlines the post-development infiltration targets for each lot, which is the additional infiltration required through Low Impact Development measures to maintain 85% groundwater recharge compared to pre-development conditions. The technical pre-consultation notes (Appendix B) provided by the City of Ottawa (email from Derek Kulyk) note that there may be a 15% reduction in the difference from pre to post development groundwater recharge.

Table 8.1 – Water Balance Targets

Lot ID	Variable Hard Surface Area	Infiltration Targets[1] (mm/year)		
		40% Hard Surface Area	50% Hard Surface Area	60% Hard Surface Area
1	-	60	98	135
2	-	49	81	114
3[(2)]	-	38	65	92
4 - SWMP	-12[3]	-	-	-
5	0[(4)]	-	-	-
6[(2)]	-	38	65	92
7[(2)]	-	38	65	92
8[(2)]	-	38	65	92
9	-	49	81	114
10	-	60	98	135
11[(2)]	-	38	62	92
12[(2)]	-	38	62	92
13	-	49	81	114
14	-	60	98	135

Lot ID	Variable Hard Surface Area	Infiltration Targets[1] (mm/year)		
		40% Hard Surface Area	50% Hard Surface Area	60% Hard Surface Area
Street A	92	-	-	-

Notes:.
1. Infiltration targets required post-development to maintain 85% pre-development recharge.
2. Lots primarily underlain by low permeability soils that are not suitable for implementation of LID features as per City of Ottawa Sewer Design Guidelines – Appendix 10.
3. Assumes 20% hard surface area for the SWMP area to account for roadways. Post-development infiltration targets negative as the increased post-development water surplus (change from pasture shrubs to urban lawns) sufficiently increases the overall groundwater recharge more than the 20% increased infiltration reduction.
4. Block 5 assumes 0% hard surface area.
5. Street A right of way assumes 50% hard surface area.

9.0 SUMMARY AND CONCLUSIONS

Based on the results of the hydrogeological investigation, the following conclusions and professional opinions are provided:

- The Site geology consists of fine and coarse grained glaciomarine deposits overlying the proposed bedrock water supply aquifer.
  - The overburden at the Site consists of sand, silty sand and sandy silt (0.25 to 3.4 metres thick) and silty clay (0.35 to 3.8 metres thick), underlain by glacial till (1.0 to 9.2 metres thick). The Site overburden thickness ranges from approximately 1.8 to 9.2 metres.
  - Based on the top 1 metre of overburden, three distinct terrain units are present across the Site: 1) sand, 2) silty sand to sandy silt, till and 3) sandy clayey silt.
  - The bedrock water supply aquifer is characterized as Paleozoic bedrock consisting of Shadow Lake Formation limestone, dolostone, shale, and arkose sandstone of the Simcoe Group.
- Fine grained soils ranging in thickness from approximately 1.8 to 9.2 meters, with soils thicknesses thinning towards the southeast of the Site, and Lot 7. Karst was not identified on the Site.
  - The soil conditions encountered at TP18-14 (i.e., Lot 7) is considered to be hydrogeologically sensitive due to thin soil cover to bedrock. Hydrogeological investigations in support of Site Plan Control for Lot 7 should consider the hydrogeological sensitivity with regards to well and septic placements. Given the large lot size, future well and septic systems should not be located in areas of thin soils and/or

additional protective measures should be considered (e.g., increased casing depth, increased separation distance between well and septic, etc.).

- Negative impacts to the bedrock aquifer are not anticipated. The nitrate dilution predictive assessment for industrial/commercial developments, as outlined in MECP Guideline D-5-4 guidelines demonstrates that the Site can support the proposed lot density.
  - The maximum allowable daily design sanitary sewage flow (DDSF) for the proposed commercial lots range from 531 L/day to 2,455 L/day for conventional systems, and 1,593 L/day to 7,366 L/day for advanced systems assuming 40% hard surface coverage. Refer to Appendix H for additional maximum septic flow scenarios based on 50 and 60% hard surface coverage.
  - With the use of best management practices and the recommended protective measures, the impact to the receiving aquifer will be mitigated.
- The test well construction is typical of future water supply wells in the development.
  - Well casing installed a minimum of 4.57 metres (15 feet) into competent bedrock.
  - Maximum recommended depth of 61 metres below ground surface.
  - Hydro-fracking to increase well yield.
- The water quality available from drilled wells on the Site is safe for consumption based on the absence of health-related exceedances. To note, total coliform exceeded the ODWQS in TW2 with a concentration of 1 count per 100mL; however, the total coliform counts of less than 6 CFU/100mL in all test wells meets MECP Guideline D-5-5 for acceptable drinking water quality. The quality of the groundwater meets the Ontario Drinking Water Quality Standards, Guidelines and Objectives with the exception of hardness, sodium, and sulphide.
  - The levels of hardness are considered to be reasonably treatable using a conventional water softener.
  - The levels of sodium remain well below the 200 mg/L aesthetic objective; however, three of the four test wells exceed the 20 mg/L warning limit for persons on sodium restricted diets.
  - The levels of hydrogen sulphide exceed the ODWS aesthetic objective of 0.05 mg/L. An unofficial addendum to MECP Guideline D-5-5 (July 6, 1995) indicates that sulphide concentrations of up to 2.5 mg/L can be reasonably treated with manganese greensand filters.
  - The water quality results from the previous investigations (GEMTEC, 2020) reported similar groundwater quality with slightly elevated hardness and hydrogen sulphide.

- The water quality from neighbouring private wells (PW1 and PW2) are similar to the water quality found in the proposed subdivision. The ODWQS exceedances in PW1 and PW2 include operational guideline of hardness (PW1 and PW2), maximum acceptable concentration of total coliform (PW2), which is less than 6 CFU/100mL and meets MECP Guideline D-5-5 for acceptable drinking water quality and the warning level for persons on sodium restricted diets (PW1).
- No negative water quality impacts from neighbouring properties have been identified.
    - Potential sources of groundwater contamination from neighbouring cemeteries are associated with toxic chemicals from coffins, embalming fluids and dental fillings. Trace metals associated with cemeteries include manganese, nickel, copper, vanadium, mercury, arsenic, barium, lead, cadmium and chromium. The trace metals tested from TW2 and TW4 reported non-detectable concentrations or concentrations well below the applicable maximum acceptable concentration, aesthetic objective or operational guideline.
        - 3149 Carp Road – approx. 0.66-hectare parcel located upgradient to groundwater flow; and
        - 2037 McGee Side Road – approx. 45-hectare parcel (current cemetery footprint of approx. 17.5 hectares currently) and located cross-gradient to groundwater flow.
- The water quality determined in the course of this investigation is representative of long-term water quality from which future lot owners are likely to obtain from their wells constructed in accordance with the well construction recommendations.
- The quantity of groundwater available from the proposed water supply aquifer is more than sufficient for the proposed development and will sustain repeated pumping at the test rate and duration at 24-hour intervals over the long term. The well yields determined in the course of this investigation are representative of the long-term yields which future lot owners are likely to obtain from their wells constructed in accordance with the well construction recommendations.
- Additional water quantity testing is recommended should future lot owners require groundwater in excess of the maximum allowable septic flows (e.g., processing waters).
    - The current zoning of the Site is Rural Commercial, Subzone 9 (RC9). The permitted uses of the Site should be consulted at Site Plan to confirm that the tested water quantity of approximately 10,000 litres per day is sufficient for the proposed Site usage.
    - Potential Site usages that may require additional water quantity testing include: car wash, hotel, campground, etc.

- Interference between drinking water wells is expected to be acceptable under typical usage for commercial/industrial developments.
    - No significant drawdown was observed in the bedrock monitoring wells during the individual pumping tests, or the muti well pumping test (pumping TW1 and TW4 simultaneously), with a maximum observed drawdown of 0.84 metres in the bedrock monitoring wells.
    - Long term water level monitoring in the bedrock test wells reported drawdown of less than 0.2 metres over a two-week period. Negligible drawdown related to off-site pumping or precipitation events was observed.
    - Background studies along Carp Road that were reviewed as part of the investigation (CoO, 2004 & Dillon, 2004) do not indicate water quantity concerns in the area.
- Based on the water balance calculations, the percentage decrease in infiltration will decrease by approximately 67% % from pre- to post-development conditions on the proposed severance lot, depending on the hard surface coverage after development.
    - Consideration should be given to maintaining the pre-development infiltration volumes for each lot post-development to sustain groundwater levels and protect groundwater users. This can be supported through the placement through the use of Low Impact Development (LID) measures.

10.0 RECOMMENDATIONS

The following provides general recommendations and recommendations regarding well construction specifications, water quality and septic system design:

10.1 General Recommendations

The accepted GEMTEC hydrogeological report entitled “Hydrogeological Assessment and Terrain Analysis, Proposed Commercial/Industrial Subdivision, 3112 Carp Road, Township of Huntley, Ottawa, Ontario”, dated March 26, 2026 shall be made available to lot purchasers as a guide to development.

The well and septic locations shown are conceptual – refer to Figure 10. Their general placement (e.g., front yard versus side yard) should be maintained to ensure that future systems do not conflict with those on neighbouring lots. If adjustments to well or septic locations are required at the Site Plan Control stage, a Qualified Professional should review the revised placements to confirm that they will not interfere with the future well and septic systems of adjacent properties.

10.2 Groundwater Impact Mitigation Recommendations

- Low Impact Development (LID) and stormwater management measures are recommended to maintain at least 85% of pre-development infiltration rates for lots underlain by permeable soils. The infiltration targets for individual lots are provided in Table 8.1.
    - It is noted that Appendix 10 of the City of Ottawa Sewer Design Guidelines (December 2025) do not permit LID features in silt and clay soils, which applies to Lots 3, 6, 7, 8, 11 and 12. Groundwater recharge should be maintained in lots underlain by more preamble soils, being Lots 1, 2, 9, 10, 13 and 14.
- The post-development water balance indicates significant increase in runoff, which will need to be addressed as part of the stormwater for the Site. Potential impacts from the runoff from a contaminant perspective include winter maintenance (road salting) and fuel spills from potential fuel storage / parking lots. It is recommended that BMP for road salting and fuel storage/spills be followed.
    - It is recommended that the best management practices for the application of road salts should follow the City of Ottawa's "Material Application Policy, Revision 3.2, October 31, 2011" Salt Management Plan.
    - It is recommended that the best management practices for fuel storage follow the Liquid Fuels Handling Code and the Ontario Water Resources Act.

10.3 Well Construction Recommendations

- Any original test wells which are not located in suitable locations for future development use and any other existing wells located on the property should be abandoned by a licensed well driller in accordance with MECP regulations following draft plan approval of the subdivision;.
- Wells should be located so that they meet the minimum setback distances from septic systems, property lines and any other sources of contamination, as required in the Ontario Building Code and/or Ontario Reg. 903. If possible, the setback distance for the location of drinking water wells should be maximized.
- All wells shall remain accessible for future inspection and testing and to large equipment for future maintenance, repair, and replacement.
- All wells that are drilled in the subdivision should be constructed in accordance with MECP regulations (Ontario Reg. 903).
- All wells that are drilled in the subdivision should be maintained in accordance with the document entitled 'Water Supply Wells – Requirements and Best Management Practices' (MECP December 2009).

- Well casings should be extended at least 11.6 metres below ground surface. The entire annular space between the steel casing and the overburden/bedrock should be filled with a suitable cement or bentonite grout.
    - In addition to the minimum recommended well casing lengths specified in the preceding recommendation, all well casings should be completed a minimum of 4.57 metres into sound, competent bedrock.
- A well grouting certification inspection should be conducted during the installation and grouting of the well casing for all future wells installed on the Site. The well grouting certification inspection should be conducted under the supervision of a professional engineer or professional geoscientist.
- Hydrofracturing of all four on-site test wells was required to obtain the minimum pumping requirements of MECP Guideline D-5-5. Future lot owners should be aware that additional well development such as hydrofracturing, surging and/or additional pumping may be required to reach the well yields demonstrated in this report.
    - Muti-day well development may be required to reduce turbidity levels in newly drilled wells on the Site. If a newly drilled well is required at the time of Site Plan Control for the Site, a qualified professional should be retained to confirm that turbidity levels are at acceptable levels after well development.
- The test wells completed for this study were completed at depths of 61 metres below ground surface. Future drinking water wells completed on the Site at depths greater than 61 metres may encounter different hydrogeological conditions and the quality and quantity of water available from drilled wells may differ than that presented in this study.

10.4 Septic System Recommendations

- The proposed lots will be serviced by either conventional or advanced treatment septic sewage disposal systems that achieve a minimum of 50% reduction in nitrogen, approved under the Ontario Building Code, prior to the effluent being disposed to a Class IV leaching bed (Type A or Type B). A site-specific investigation should be conducted on each lot for the design of the septic system.
    - It is required that the property owners enter a maintenance agreement with authorized agents of the advanced treatment septic system manufacturer for the service life of the system.
    - If advanced treatment systems are utilized, the City of Ottawa requires that they be NSF/ANSI 245 and/or CAN/BNQ 3680-600 certified. For 50% nitrate reduction.
- In view of the percolation time of the native soils, a sand mantle and partially to fully raised leaching beds should be allowed for on some the proposed lots. The suitability of the native soils should be assessed on a lot-by-lot basis by a qualified septic designer.

- It should be noted that when determining hard surface coverage for the future lots, that gravel surfaces are included. Gravel surfaces are considered impermeable, as they are likely to be compacted over time.
- The maximum allowable daily design sanitary sewage flow (DDSF) for the proposed commercial lots ranges depends on the total hard surface coverage and type of septic system (conventional vs advanced treatment). Refer to Appendix H for the individual lot maximum septic flows based on the hard surface coverage.
    - If during Site Plan Control the proposed septic system design flow exceeds the preliminary septic flow recommendation for a specific lot, then it is recommended that a detailed groundwater impact assessment be conducted. If the detailed groundwater impact assessment demonstrates that additional septic flow can be accommodated on the lot, then the preliminary septic flow recommendation for that lot should be amended accordingly.
    - If the proposed septic flow for a site development application is less than the preliminary septic flow recommendation, then no additional groundwater impact assessment work is required for that lot.

10.5 Drinking Water Supply Recommendations

- It is recommended that the following information be registered on title for the created lots:
    - Background sodium levels in the drinking water wells at the Site may exceed the warning level for persons on sodium restricted diets and should be reported to the Local Medical Officer of Health;
    - The following water quality parameters may not meet the ODWS operational guidelines in drinking water wells completed at the Site:
        - Hardness – Hardness levels in the on-site test wells were greater than the operational guideline for hardness and can be expected in future wells drilled at the property.
    - The following water quality parameters may not meet the ODWQS aesthetic objectives in drinking water wells completed at the Site:
        - Sulphide – Sulphide levels in all four of the on-site test wells exceeded the ODWQS aesthetic objective for sulphide and may be encountered in future wells drilled on the subject site. Although ingestion of large quantities of sulphide can produce toxic effects on humans, it is unlikely that an individual would consume a harmful dose in drinking water because of the associated unpleasant taste and odour. Sulfide, in association with iron, produces black stains on laundered items and black deposits on pipes and fixtures. Hydrogen sulphide can be effectively treated through the use of activated charcoal filters, chlorination, manganese greensand filters and other forms of oxidizing treatment. It is recommended that a water quality treatment specialist be retained to appropriate design and size the treatment systems.

- The maximum groundwater quantity per lot tested as part of this investigation is 10,080 litres per day. Additional pumping tests and well interference assessments are recommended for higher groundwater demands.

11.0 CLOSURE

We trust this report provides sufficient information for your present purposes. If you have any questions concerning this report, please do not hesitate to contact our office.

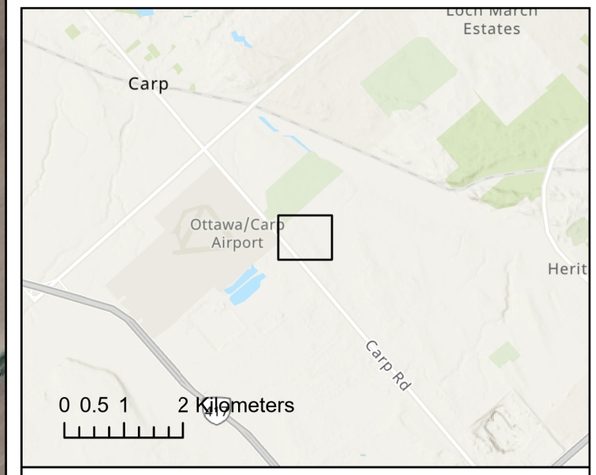
Andrius Paznekas, M.Sc., P.Geo.
Hydrogeologist

SE/DC/BR/JKA/AP

Legend

BH/MW # ← BOREHOLE / MONITORING WELL ID
XX.XX ← GROUND SURFACE ELEVATION, IN METERS
GEODETIC DATUM

- Borehole Location (current investigation)
- Test Pit Location (previous investigation by GEMTEC)
- Borehole/ Test Well Location (previous investigation by GEMTEC)
- Approximate Property Boundary
- Lot Line



Scale
1:3,000
40 20 0 40 80 120 160 m

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ottawa@gemtec.ca

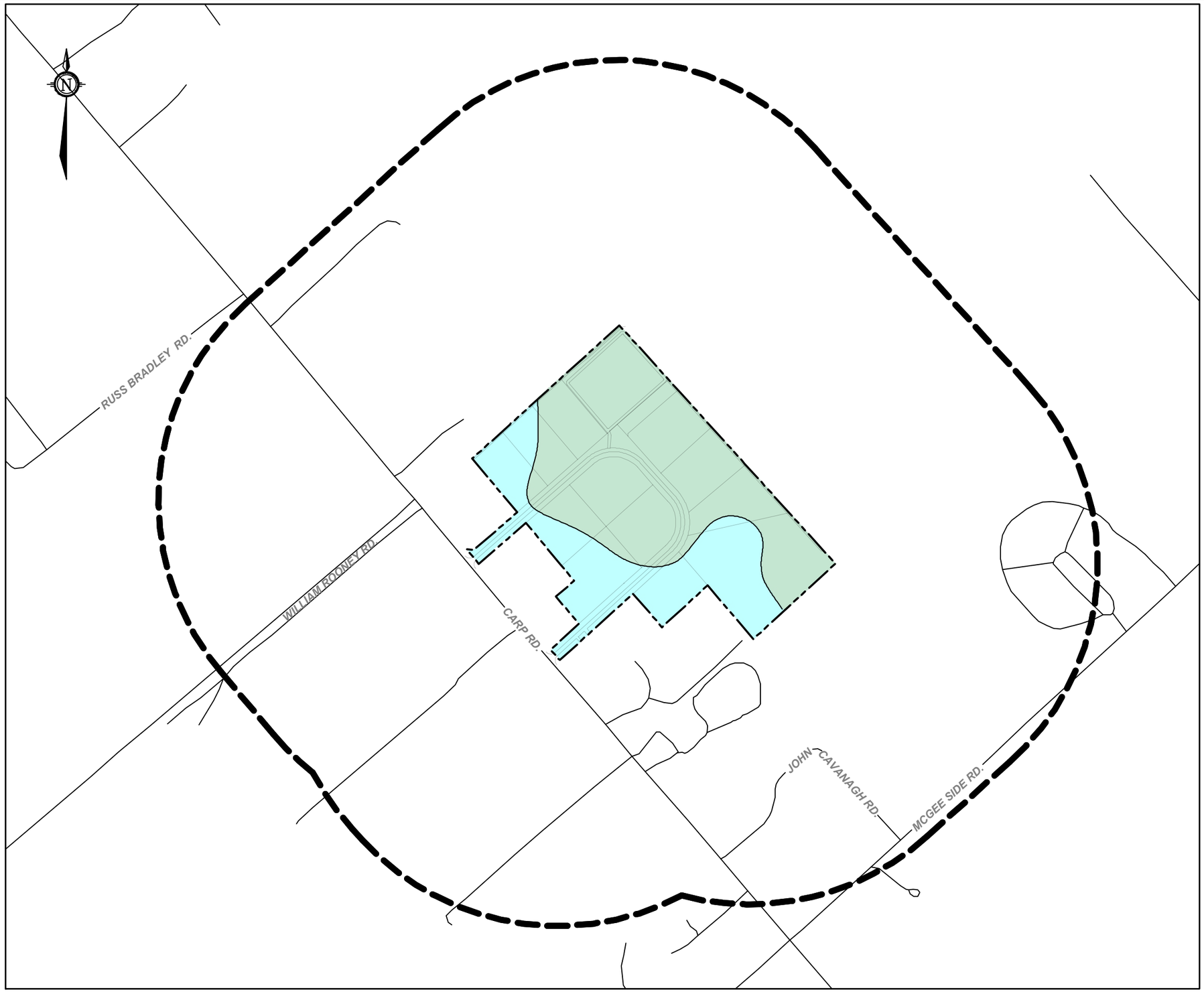
Client:	Project No.:
TLC Holdings LTD.	102151.001

Project
Hydrogeological Investigation & Terrain Analysis
3112 Carp Rd, Ottawa, ON

Drwn By:	Chkd By:	
S.L.	A.P.	Detailed Site Plan

Date: March 2026	Rev.	
	0	Figure: 1

Coordinate System: NAD 1983 UTM Zone 18N
Service Layer Credits: Hybrid Reference Layer: Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community
Google Earth: © OpenStreetMap (and) contributors, CC-BY-SA



Legend

- Subject Site
- Study Area
  500m around Subject Site
- Lot Line
- Silty Sand, Sand and Silt, Till
- Silty Clay, Clayey Silt

Scale 1:7500

0 150 300 450m

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Client: TLC Holdings LTD.

Project No.: 102151.001

Project
Hydrogeological Investigation & Terrain Analysis
3112 Carp Rd, Ottawa, ON

Drwn By: C.Z./S.L.

Chkd By: B.R.

Inferred Surficial Geology

Date: March 2026

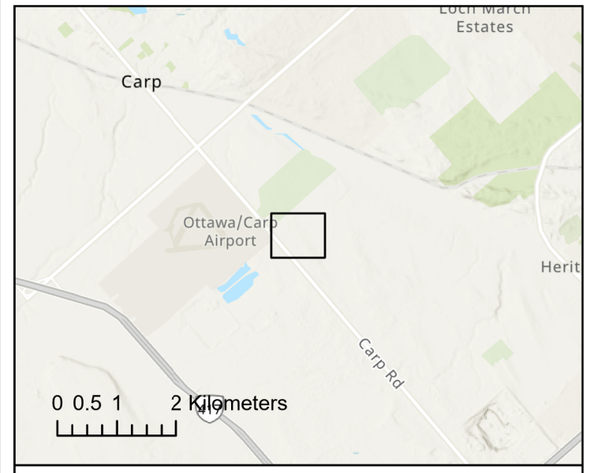
Rev. 0

Figure: 6

Coordinate System: NAD 1983 UTM Zone 18N
Service Layer Credits: Hybrid Reference Layer: Esri Community Maps Contributors, City of Ottawa, Province of Ontario, Esri Canada, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, NRCan, Parks Canada

Legend

- Conceptual Well Location
- Lot Line
- Approximate Property Boundary
- Septic System (30m X 25m)
- 18m Buffer



Scale
1:3,000
40 20 0 40 80 120 160 m

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Client:	Project No.:
TLC Holdings LTD.	102151.001

Project
Hydrogeological Investigation & Terrain Analysis
3112 Carp Rd, Ottawa, ON

Drwn By:	Chkd By:	Conceptual Lot Development Plan
S.L.	A.P.	

Date: March 2026	Rev.	Figure: 10
	0	

Coordinate System: NAD 1983 UTM Zone 18N
Service Layer Credits: Hybrid Reference Layer: Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community
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RECORD OF BOREHOLE 19-1D

CLIENT: Novatech
PROJECT: Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jul 9 2019

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, %	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger, Hollow Stem Auger (210mm OD)	Ground Surface									Above ground protector
		Dark brown silty sand, with organic material (TOPSOIL)		0.20							
		Brown SILTY SAND		0.31	1	SS	533	5			
		Grey brown SILTY CLAY, some sand									
		Brown SILTY SAND, trace clay		0.61	2	SS	610	11			
1		Grey brown SILTY CLAY		0.91							
		Brown SILTY SAND, trace clay		1.04							
		Grey brown SILTY CLAY with silty sand seems		1.22	3	SS	610	10			
		Grey brown silty sand, some gravel, trace to some clay (GLACIAL TILL)		1.65							
2		Grey sandy silt / silty sand, some gravel, cobbles, and boulders (GLACIAL TILL)		1.83	4	SS	610	26			Bentonite
					5	SS	610	33			
3					6	SS	406	89			
					7	SS	200	65			
4					8	SS	100	68			Filter Sand
5					9	SS	279	59			50 mm diameter, 1.52 m length slotted PVC Pipe
					10	SS	483	43			
6					11	SS	381	50			
					12	SS	76	50			
7					13	SS	51	50			
8					14	SS	127	50			Slough
					15	SS	203	90			
9		Auger refusal on inferred bedrock End of borehole		9.17							
10											

GEO - BOREHOLE LOG 64819.03_BOREHOLE LOGS_GNT_V01_2019-07-10.GPJ GEMTEC 2018.GDT 21/8/19

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED:

RECORD OF BOREHOLE 19-1S

CLIENT: Novatech
PROJECT: Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jul 9 2019

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	SOIL PROFILE: STRATA PLOT	SOIL PROFILE: ELEV. DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, mm	SAMPLES: BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m; DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m; SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED); WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger Hollow Stem Auger (210mm OD)	Ground Surface							10 20 30 40 50 60 70 80 90		Above ground protector
		Soil conditions not logged									Bentonite
1											
2											Filter Sand
3				3.05							50 mm diameter, 1.52 m length slotted PVC Pipe
4											
5											
6											
7											
8											
9											
10											

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED:

GEO - BOREHOLE LOG 64819.03_BOREHOLE LOGS_GNT_V01_2019-07-10.GPJ GEMTEC 2018.GDT 21/8/19

RECORD OF BOREHOLE 19-3D

CLIENT: Novatech
PROJECT: Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Borehole Location Plan, Figure 1

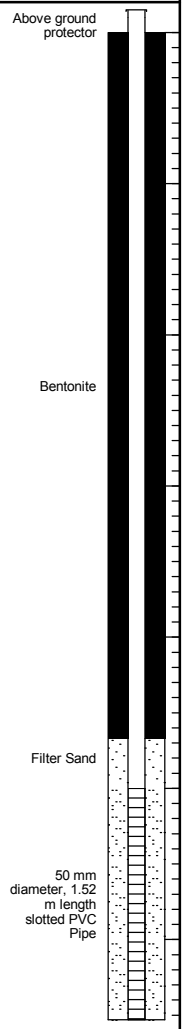
SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jul 10 2019

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
0	Power Auger, Hollow Stem Auger (210mm OD)	Ground Surface						
		Dark brown silty sand, with organic material (TOPSOIL)		0.13	1	SS	330	16
		Grey brown sandy silt / silty sand, some gravel cobbles boulders (GLACIAL TILL)			2	SS	178	103
1					3	SS	229	85
2					4	SS	150	110
3					5	SS	610	58
					6	SS	381	84
4					7	SS	178	66
5					8	SS	310	92
6					9	SS	53	50
		Auger refusal on inferred bedrock End of borehole		6.53				
7								
8								
9								
10								

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA
NATURAL
REMOULDED
WATER CONTENT, %
W_P W W_L
10 20 30 40 50 60 70 80 90

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION



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LOGGED: A.N.
CHECKED:

GEO - BOREHOLE LOG 64819.03_BOREHOLE LOGS_GNT_V01_2019-07-10.GPJ GEMTEC 2018.GDT 21/8/19

RECORD OF BOREHOLE 19-3S

CLIENT: Novatech
PROJECT: Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Borehole Location Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jul 10 2019

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (+ NATURAL, ⊕ REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger / Hollow Stem Auger (210mm OD)	Ground Surface							10 20 30 40 50 60 70 80 90		Above ground protector
		Soil conditions not logged									Bentonite
3											Filter Sand
											50 mm diameter, 1.52 m length slotted PVC Pipe
				4.57							
10											

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Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED:

GEO - BOREHOLE LOG 64819.03_BOREHOLE LOGS_GNT_V01_2019-07-10.GPJ GEMTEC 2018.GDT 21/8/19

RECORD OF BOREHOLE 19-4S

CLIENT: Novatech
PROJECT: Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Borehole Location Plan, Figure 1

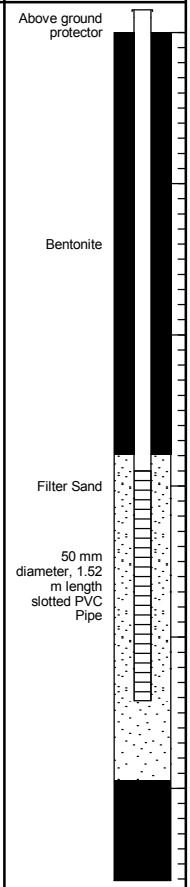
SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Jul 10 2019

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
0	Power Auger Hollow Stem Auger (210mm OD)	Ground Surface						
		Dark brown silty sand, with organic material (TOPSOIL)		0.20	1	SS	406	9
		Reddish brown SILTY SAND, trace gravel		0.41				
1		Grey brown silty sand, some gravel, cobbles and boulders (GLACIAL TILL)			2	SS	254	8
					3	SS	330	43
2					4	SS	559	77
					5	SS	610	76
3								
		Grey brown silty sand / sandy silt, some gravel cobbles and boulders (GLACIAL TILL)		3.10	6	SS	381	92
					7	SS	406	83
4								
					8	SS	356	36
5								
		Auger refusal on boulders End of borehole		5.61				
6								
7								
8								
9								
10								

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION



GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED:

GEO - BOREHOLE LOG 64819.03_BOREHOLE LOGS_GNT_V01_2019-07-10.GPJ GEMTEC 2018.GDT 21/8/19

RECORD OF BOREHOLE 18-1

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

Correction: Record of Test Pit 18-1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m; DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m; SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED); WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface							10 20 30 40 50 60 70 80 90		
		Dark brown silty sand, with organic material (TOPSOIL)			1	GS					Test pit backfilled with excavated material
		Brown, fine to medium grained SAND, trace to some silt		0.23	2	GS					
1	Excavator CASE CX135 sr	Grey brown, fine to coarse grained SAND, trace silt, trace to some gravel, cobbles and boulders, some sandy silt pockets with depth (GLACIAL TILL)		0.91	3	GS					
2											
3					4	GS					
		End of Test Pit		3.05							No groundwater observed upon completion of test pit
4											
5											

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

RECORD OF BOREHOLE 18-2

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

Correction: Record of Test Pit 18-2

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Excavator CASE CX135 sr	Ground Surface								Test pit backfilled with excavated material
		Dark brown silty sand, with organic material (TOPSOIL)								
		Brown SILTY SAND, some roots		0.18	1	GS				
1		Grey brown SILTY SAND		0.61	2	GS				
		Grey SANDY SILT / SILTY SAND, some gravel cobbles and boulders (GLACIAL TILL)		1.14	3	GS				
2					4	GS				
3		Practical shovel refusal on possible bedrock End of Test Pit		2.90						No groundwater observed upon completion of test pit
4										
5										

SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA
+ NATURAL ⊕ REMOULDED
WATER CONTENT, %
W_P W W_L
10 20 30 40 50 60 70 80 90

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

RECORD OF BOREHOLE 18-3

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

Correction: Record of Test Pit 18-3

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
0		Ground Surface						
	Excavator CASE CX135 sr	Dark brown silty sand, with organic material (TOPSOIL)						
		Grey brown SILTY SAND		0.15	1	GS		
		Grey brown SILTY CLAY (WEATHERED CRUST)		0.41	2	GS		
1		Grey brown, silty sand, some gravel, cobbles and boulders (GLACIAL TILL)		0.94	3	GS		
2		Practical shovel refusal at 1.52 m on possible bedrock at two locations within test pit End of Test Pit		2.44				
3								
4								
5								

SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA
+ NATURAL ⊕ REMOULDED
WATER CONTENT, %
W_P W W_L
10 20 30 40 50 60 70 80 90

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

Test pit backfilled with excavated material

No groundwater observed upon completion of test pit

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

RECORD OF BOREHOLE 18-4

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

Correction: Record of Test Pit 18-4

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, mm	SAMPLES BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface								
		Dark brown silty sand, with organic material (TOPSOIL)								Test pit backfilled with excavated material
		Grey brown SILTY CLAY (WEATHERED CRUST)		0.18	1	GS				
1		Grey brown silty sand, trace clay, some gravel, cobbles and boulders (GLACIAL TILL)		0.53	2	GS				
	Excavator CASE CX135 sr	Grey brown silty sand, trace clay, some gravel, cobbles and boulders, with pockets of grey SILTY CLAY on one side of test pit (GLACIAL TILL)		1.17	3	GS				
2					4	GS				
3		End of Test Pit		3.05						Groundwater seepage at 0.91 m below ground surface
4										
5										

SHEAR STRENGTH (Cu), kPA
PENETRATION RESISTANCE (N), BLOWS/0.3m
+ NATURAL ⊕ REMOULDED
DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m
WATER CONTENT, %
W_P W W_L
10 20 30 40 50 60 70 80 90

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LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

RECORD OF BOREHOLE 18-5

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

Correction: Record of Test Pit 18-5

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Excavator CASE CX135 sr	Ground Surface							10 20 30 40 50 60 70 80 90		
		Dark brown silty sand, with organic material (TOPSOIL)									Test pit backfilled with excavated material
		Brown SILTY SAND		0.23							
1		Grey silty sand, some gravel, cobbles, and boulders (GLACIAL TILL)		0.97							
2											
3		End of Test Pit		3.05							No groundwater observed upon completion of test pit
4											
5											

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LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

RECORD OF BOREHOLE 18-6

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

Correction: Record of Test Pit 18-6

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Excavator CASE CX135 sr	Ground Surface								Test pit backfilled with excavated material
		Dark brown silty sand, with organic material (TOPSOIL)								
		Brown SILTY SAND		0.36	1	GS				
		Grey brown SILTY CLAY (WEATHERED CRUST)		0.61	2	GS				
1		Grey silty sand, some gravel, cobbles and boulders (GLACIAL TILL)		1.02	3	GS				
2										
3		Practical shovel refusal within Glacial Till End of Test Pit		2.90						No groundwater observed upon completion of test pit
4										
5										

SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L

10 20 30 40 50 60 70 80 90

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

RECORD OF BOREHOLE 18-7

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

Correction: Record of Test Pit 18-7

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Excavator CASE CX135 sr	Ground Surface							10 20 30 40 50 60 70 80 90		
		Dark brown silty sand, with organic material (TOPSOIL)									Test pit backfilled with excavated material
		Brown SILTY SAND		0.20							
1		Grey silty sand, some gravel, cobbles and boulders (GLACIAL TILL)		0.76							
2											
3		End of Test Pit		3.05							No groundwater observed upon completion of test pit
4											
5											

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

RECORD OF BOREHOLE 18-8

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

Correction: Record of Test Pit 18-8

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, mm	SAMPLES BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Excavator CASE CX135 sr	Ground Surface								Test pit backfilled with excavated material
		Dark brown clayey silt, with organic material (TOPSOIL)								
		Grey brown SILTY CLAY, trace sand (WEATHERED CRUST)		0.23						
1		Grey brown SILTY SAND, trace clay		1.70	1	GS				
2		Boulder encountered underlain by grey SILTY CLAY Note: Unable to determine depth of SILTY CLAY due to side wall shearing		1.98	2	GS				Groundwater seepage at 1.52 metres below ground surface
3		Test pit lost due to side wall shearing End of Test Pit		3.05						
4										
5										

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA
NATURAL REMOULDED
WATER CONTENT, %
W_P W W_L
10 20 30 40 50 60 70 80 90

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

RECORD OF BOREHOLE 18-9

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

Correction: Record of Test Pit 18-9

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Excavator CASE CX135 sr	Ground Surface								
		Dark brown silty sand, with organic material (TOPSOIL)								Test pit backfilled with excavated material
		Grey brown SILTY SAND		0.20						
1		Grey brown silty sand, some gravel, cobbles, and boulders (GLACIAL TILL)		0.48						
2										
3		Practical shovel refusal within Glacial Till End of Test Pit		3.05						No groundwater observed upon completion of test pit
4										
5										

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

RECORD OF BOREHOLE 18-10

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

Correction: Record of Test Pit 18-10

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (+ NATURAL, ⊕ REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Excavator CASE CX135 sr	Ground Surface							10 20 30 40 50 60 70 80 90		
		Dark brown silty sand, with organic material (TOPSOIL)									Test pit backfilled with excavated material
		Grey brown SILTY CLAY (WEATHERED CRUST)		0.15							
1		Grey brown silty sand, trace clay, some gravel, cobbles and boulders (GLACIAL TILL)		0.94							
2											
3		Practical shovel refusal within Glacial Till End of Test Pit		3.05							No groundwater observed upon completion of test pit
4											
5											

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

RECORD OF BOREHOLE 18-11

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

Correction: Record of Test Pit 18-11

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, %	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface									
		Dark brown clayey silt, with organic material (TOPSOIL)									Test pit backfilled with excavated material
				0.23							
1	Excavator CASE CX135 sr	Grey brown SILTY CLAY (WEATHERED CRUST)									
				1.32							
2		Grey silty sand, some gravel, cobbles and boulders (GLACIAL TILL)									
		Practical shovel refusal within Glacial Till		2.29							No groundwater observed upon completion of test pit
		End of Test Pit									
3											
4											
5											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL, ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

RECORD OF BOREHOLE 18-12

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

Correction: Record of Test Pit 18-12

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Excavator CASE CX135 sr	Ground Surface									
		Dark brown silty sand, with organic material (TOPSOIL)									
		Brown SILTY SAND		0.23							
1		Grey brown, silty sand, some gravel cobbles and boulders (GLACIAL TILL)		0.76							Test pit backfilled with excavated material
2											
3		Practical shovel refusal within Glacial Till End of Test Pit		2.90							No groundwater observed upon completion of test pit
4											
5											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL, ⊕ REMOULDED
WATER CONTENT, %: W_P, W, W_L
10 20 30 40 50 60 70 80 90

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

RECORD OF BOREHOLE 18-13

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

Correction: Record of Test Pit 18-13

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)
0		Ground Surface		
		Dark brown clayey silt, with organic material (TOPSOIL)		
		Grey brown SILTY SAND, some gravel and cobbles		0.31
1		Grey brown SILTY CLAY (WEATHERED CRUST)		1.14
				1.27
	Excavator CASE CX135 sr	Grey brown SILTY SAND		1.32
		Grey brown SILTY CLAY (WEATHERED CRUST)		
2				
		Grey silty sand, some gravel, cobbles and boulders (GLACIAL TILL)		2.59
3		Practical shovel refusal within Glacial Till End of Test Pit		3.05
4				
5				

SAMPLES: NUMBER | TYPE | RECOVERY, mm | BLOWS/0.3m

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

Test pit backfilled with excavated material

Groundwater seepage at 1.27 metres below ground surface

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

RECORD OF BOREHOLE 18-14

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

Correction: Record of Test Pit 18-14

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Excavator CASE CX135 sr	Ground Surface								
		Dark brown silty sand, with organic material (TOPSOIL)			1	GS				Test pit backfilled with excavated material
		Brown SANDY SILT		0.23	2	GS				
1		Grey brown sandy silt, trace to some gravel, cobbles and boulders (GLACIAL TILL)		0.79	3	GS				
2		Practical shovel refusal on possible bedrock End of Test Pit		1.83						No groundwater observed upon completion of test pit
3										
4										
5										

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

RECORD OF BOREHOLE 18-15

CLIENT: Novatech
PROJECT: Industrial Subdivision Hydrogeological Investigation
JOB#: 64819.03
LOCATION: See Test Pit Location Plan, Figure 2

Correction: Record of Test Pit 18-15

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 22 2018

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m; DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m; SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED); WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface							10 20 30 40 50 60 70 80 90		
		Dark brown clayey silt, with organic material (TOPSOIL)									Test pit backfilled with excavated material
		Grey brown SILTY CLAY, some sand (WEATHERED CRUST)		0.53							
1		Grey brown SILTY SAND		1.07							
2	Excavator CASE CX135 sr										
		Grey SILTY CLAY		2.57							
3											
		Grey silty clay, some gravel cobbles and boulders (GLACIAL TILL)		3.66							
4											Groundwater seepage at about 2.57 metres below ground surface
		Test pit lost due to side walls shearing End of Test Pit		4.27							
5											

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED: A.P.

GEO - BOREHOLE LOG 64819.03_TEST PIT LOGS_GNT_V01_2018-11-26.GPJ GEMTEC 2018.GDT 10/12/18

RECORD OF BOREHOLE 23-01

CLIENT: TLC Holdings Ltd.
PROJECT: Geotechnical Investigation, Proposed Plan of Subdivision, 3112 Carp Road, Ottawa, Ontario
JOB#: 102151.001
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 18 2023

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
		Ground Surface		115.75				
0	Power Auger / Hollow Stem Auger (210mm OD)	TOPSOIL		115.50				
		Loose, brown SILTY SAND, with rootlets		0.25	1	SS	405	7
				114.99				
		Grey brown SILTY SAND, trace to some clay		0.76				
1				114.79				
		Stiff to very stiff, grey brown SILTY CLAY, with sand seams (WEATHERED CRUST)		0.96	2	SS	535	7
				114.23				
		Compact to very dense, grey brown SILTY SAND, some gravel, with cobbles and boulders (GLACIAL TILL)		1.52	3	SS	155	27
2					4	SS	430	26
3					5	SS	155	87
				111.94				
		Dense, grey SILTY SAND, some gravel, with cobbles and boulders (GLACIAL TILL)		3.81	6	SS	405	46
4				111.33				
		End of Borehole		4.42				
5								
6								
7								
8								
9								
10								

SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA + NATURAL ⊕ REMOULDED
WATER CONTENT, % W_P W W_L
10 20 30 40 50 60 70 80 90

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

Auger Cuttings

GEMTEC
Consulting Engineers and Scientists

LOGGED: CC
CHECKED: TM

GEO - BOREHOLE LOG 102151.001 BH LOGS 2023-04-24.GPJ GEMTEC 2018.GDT 3/20/26

RECORD OF BOREHOLE 23-03

CLIENT: TLC Holdings Ltd.
PROJECT: Geotechnical Investigation, Proposed Plan of Subdivision, 3112 Carp Road, Ottawa, Ontario
JOB#: 102151.001
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 18 2023

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		112.76						
0	Power Auger / Hollow Stem Auger (210mm OD)	TOPSOIL		112.61						
		Very loose, grey brown SILTY SAND, trace to some clay		0.15	1	SS	380	WH		
				112.00						
1		Compact, grey brown SILTY SAND, some clay		0.76	2	SS	585	21		
				111.24						
		Stiff to very stiff, grey brown SILTY CLAY, trace sand (WEATHERED CRUST)		1.52	3	SS	610	8		
2				110.48						Auger Cuttings
		Loose to compact, grey brown SILTY SAND to SANDY SILT, some gravel, with cobbles and boulders (GLACIAL TILL)		2.28	4	SS	380	8		
3					5	SS	535	20		
				109.11						
		End of Borehole		3.65						
4										
5										
6										
7										
8										
9										
10										

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: NATURAL, REMOULDED
WATER CONTENT, %: W_P, W, W_L
10 20 30 40 50 60 70 80 90

GEMTEC
Consulting Engineers and Scientists

LOGGED: CC
CHECKED: TM

GEO - BOREHOLE LOG 102151.001 BH LOGS 2023-04-24.GPJ GEMTEC 2018.GDT 3/20/26

RECORD OF BOREHOLE 23-04

CLIENT: TLC Holdings Ltd.
PROJECT: Geotechnical Investigation, Proposed Plan of Subdivision, 3112 Carp Road, Ottawa, Ontario
JOB#: 102151.001
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 18 2023

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		110.49						
0	Power Auger / Hollow Stem Auger (210mm OD)	TOPSOIL		110.29						
		Loose, grey brown SILTY SAND, with rootlets		0.20	1	SS	510	4		
				109.73						
1		Loose to compact, grey brown SAND, some silt, with silty clay seams		0.76	2	SS	510	9		
					3	SS	460	12	MH	Auger Cuttings
2				108.21						
		Dense to very dense, grey brown SILTY SAND, some gravel, with cobbles and boulders (GLACIAL TILL)		2.28	4	SS	405	51		
3					5	SS	430	57		
4					6	SS	205	49		
				106.07						
		End of Borehole		4.42						
5										
6										
7										
8										
9										
10										

SOIL PROFILE / SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

GEMTEC
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LOGGED: CC
CHECKED: TM

GEO - BOREHOLE LOG 102151.001 BH LOGS 2023-04-24.GPJ GEMTEC 2018.GDT 3/20/26

RECORD OF BOREHOLE 23-06

CLIENT: TLC Holdings Ltd.
PROJECT: Geotechnical Investigation, Proposed Plan of Subdivision, 3112 Carp Road, Ottawa, Ontario
JOB#: 102151.001
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 20 2023

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
		Ground Surface		110.29				
0	Power Auger / Hollow Stem Auger (210mm OD)	TOPSOIL		109.99	1	SS	355	5
		Grey brown SILTY SAND, trace clay, with rootlets		0.30				
				109.53				
1		Loose to very dense, grey brown SILTY SAND, some gravel, with cobbles and boulders (GLACIAL TILL)		0.76	2	SS	560	6
2					3	SS	305	46
					4	SS	610	41
3					5	SS	305	50
4					6	SS	405	>50
5					7	SS	510	72
					8	SS	305	62
6					9	SS	480	36
7					10	SS	480	82
8					11	SS	330	77
					12	SS	330	59
9		End of Borehole Note: Auger refusal occured at 8.53 metres depth		101.30 8.99				
10								

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

ADDITIONAL LAB. TESTING: MH

PIEZOMETER OR STANDPIPE INSTALLATION: Auger Cuttings

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LOGGED: CC
CHECKED: TM

GEO - BOREHOLE LOG 102151.001 BH LOGS 2023-04-24.GPJ GEMTEC 2018.GDT 3/20/26

RECORD OF BOREHOLE 23-07

CLIENT: TLC Holdings Ltd.
PROJECT: Geotechnical Investigation, Proposed Plan of Subdivision, 3112 Carp Road, Ottawa, Ontario
JOB#: 102151.001
LOCATION: See Site Plan, Figure 1

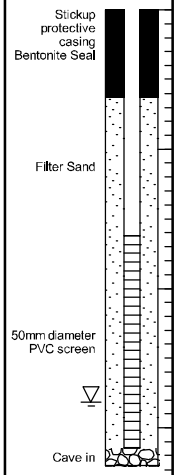
SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 20 2023

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
		Ground Surface		112.82				
0	Power Auger / Hollow Stem Auger (210mm OD)	TOPSOIL		112.52	1	SS	355	1
		Brown SILTY SAND, with rootlets		0.30				
				112.06				
1		Loose, grey brown SILTY SAND, some gravel, trace clay		0.76	2	SS	405	7
				111.30				
		Dense, grey brown SILTY SAND, trace to some gravel, with cobbles and boulders (GLACIAL TILL)		1.52	3	SS	460	43
2					4	SS	330	>50
3					5	SS	50	> 50
				109.55				
		End of Borehole Auger Refusal		3.27				
4								
5								
6								
7								
8								
9								
10								

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: NATURAL, REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION



GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
23/04/27	2.82 ▽	110.0

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LOGGED: CC
CHECKED: TM

GEO - BOREHOLE LOG 102151.001 BH LOGS 2023-04-24.GPJ GEMTEC 2018.GDT 3/20/26

RECORD OF BOREHOLE 23-08

CLIENT: TLC Holdings Ltd.
PROJECT: Geotechnical Investigation, Proposed Plan of Subdivision, 3112 Carp Road, Ottawa, Ontario
JOB#: 102151.001
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 18 2023

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger / Hollow Stem Auger (210mm OD)	Ground Surface		110.28						Auger Cuttings
		TOPSOIL		110.08						
		Brown SILTY SAND, trace clay, with rootlets		0.20	1	SS	430	7		
				109.52						
1		Stiff to very stiff, grey brown SILTY CLAY (WEATHERED CRUST)		0.76	2	SS	610	5	MH	
2					3	SS	610	3		
		Very loose, grey SILT and SAND		2.13						
					4	SS	175	WH		
				107.39						
3		Very loose, grey sandy SILT and CLAY, with cobbles and boulders (GLACIAL TILL)		2.89						
					5	SS	380	WH	MH	
4				105.84						
		End of Borehole Auger Refusal		4.44						
5										
6										
7										
8										
9										
10										

SOIL PROFILE / SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: NATURAL, REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

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LOGGED: CC
CHECKED: TM

GEO - BOREHOLE LOG 102151.001 BH LOGS 2023-04-24.GPJ GEMTEC 2018.GDT 3/20/26

RECORD OF BOREHOLE 23-10

CLIENT: TLC Holdings Ltd.
PROJECT: Geotechnical Investigation, Proposed Plan of Subdivision, 3112 Carp Road, Ottawa, Ontario
JOB#: 102151.001
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 19 2023

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger; Hollow Stem Auger (210mm OD)	Ground Surface		114.14						
		TOPSOIL		113.99						
		Grey SAND and GRAVEL, with cobbles and boulders (GLACIAL TILL)		0.15	1	SS	205	17		
				113.38						
1		Loose, grey brown, SILTY SAND, trace gravel (GLACIAL TILL)		0.76	2	SS	405	4		
				112.62						
		Very dense, grey brown, SILTY SAND, some gravel, with cobbles and boulders (GLACIAL TILL)		1.52	3	SS	75	>50		
2					4	SS	180	>50		
3					5	SS	0	>50		
4					6	SS	355	>50		
				109.90						
		End of Borehole Auger Refusal		4.24						
5										
6										
7										
8										
9										
10										

SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA + NATURAL ⊕ REMOULDED
WATER CONTENT, % W_P W W_L
10 20 30 40 50 60 70 80 90

GEMTEC
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LOGGED: CC
CHECKED: TM

GEO - BOREHOLE LOG 102151.001 BH LOGS 2023-04-24.GPJ GEMTEC 2018.GDT 3/20/26

RECORD OF BOREHOLE 23-11

CLIENT: TLC Holdings Ltd.
PROJECT: Geotechnical Investigation, Proposed Plan of Subdivision, 3112 Carp Road, Ottawa, Ontario
JOB#: 102151.001
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 18 2023

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		111.49						
0		TOPSOIL		111.29						
	Power Auger / Hollow Stem Auger (210mm OD)	Loose to compact, grey brown SILTY SAND, trace to some clay		0.20	1	SS	510	11		
1					2	SS	510	11		
2					3	SS	610	5		Auger Cuttings
				109.21						
		Dense to very dense, grey brown SILTY SAND and GRAVEL, with cobbles and boulders (GLACIAL TILL)		2.28	4	SS	205	32		
3					5	SS	510	72		
4					6	SS	305	102		
				107.07						
		End of Borehole		4.42						
5										
6										
7										
8										
9										
10										

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: NATURAL, REMOULDED
WATER CONTENT, %: W_P, W, W_L
10 20 30 40 50 60 70 80 90

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LOGGED: CC
CHECKED: TM

GEO - BOREHOLE LOG 102151.001 BH LOGS 2023-04-24.GPJ GEMTEC 2018.GDT 3/20/26

RECORD OF BOREHOLE 23-13

CLIENT: TLC Holdings Ltd.
PROJECT: Geotechnical Investigation, Proposed Plan of Subdivision, 3112 Carp Road, Ottawa, Ontario
JOB#: 102151.001
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 19 2023

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger / Hollow Stem Auger (210mm OD)	Ground Surface		111.69							
		TOPSOIL		111.41							
		Loose to compact, grey brown SILTY SAND, trace to some gravel		0.28	1	SS	405	4			
1					2	SS	330	10			
		Still to very stiff, grey brown SILTY CLAY, with silty sand seams (WEATHERED CRUST)		110.17 1.52	3	SS	610	2			
2											Auger Cuttings
		Very dense, grey SILTY SAND and GRAVEL, with cobbles and boulders (GLACIAL TILL)		109.41 2.28	4	SS	50	>50			
3					5	SS	405	100			
					6	SS	205	>50			
4		End of Borehole Spoon Refusal		107.63 4.06							
5											
6											
7											
8											
9											
10											

GEMTEC
Consulting Engineers and Scientists

LOGGED: CC
CHECKED: TM

GEO - BOREHOLE LOG 102151.001 BH LOGS 2023-04-24.GPJ GEMTEC 2018.GDT 3/20/26

RECORD OF BOREHOLE 23-14

CLIENT: TLC Holdings Ltd.
PROJECT: Geotechnical Investigation, Proposed Plan of Subdivision, 3112 Carp Road, Ottawa, Ontario
JOB#: 102151.001
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 19 2023

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		116.33						
0	Power Auger Hollow Stem Auger (210mm OD)	TOPSOIL		116.05						
		Loose, grey brown SILTY SAND		0.28	1	SS	50	6		
1					2	SS	380	7		Auger Cuttings
		Very dense, grey brown SILTY SAND, some gravel, with cobbles and boulders (GLACIAL TILL)		114.96 1.37	3	SS	25	>50		
2					4	SS	180	>50		
		End of Borehole Auger Refusal		113.77 2.56						
3										
4										
5										
6										
7										
8										
9										
10										

SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA + NATURAL ⊕ REMOULDED
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
WATER CONTENT, % W_P W W_L
10 20 30 40 50 60 70 80 90

GEMTEC
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LOGGED: CC
CHECKED: TM

GEO - BOREHOLE LOG 102151.001 BH LOGS 2023-04-24.GPJ GEMTEC 2018.GDT 3/20/26

RECORD OF BOREHOLE 23-15

CLIENT: TLC Holdings Ltd.
PROJECT: Geotechnical Investigation, Proposed Plan of Subdivision, 3112 Carp Road, Ottawa, Ontario
JOB#: 102151.001
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Apr 19 2023

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		111.47						
0	Power Auger / Hollow Stem Auger (210mm OD)	TOPSOIL		111.27						
		Loose, brown SILTY SAND, with rootlets		0.20	1	SS	330	7		
				110.71						
1		Compact, grey brown SILTY SAND, trace clay		0.76	2	SS	460	11		
				109.95						
		Compact, brown SILTY SAND		1.52	3	SS	355	17		
2				109.19						
		Very loose, grey SANDY SILT		2.28	4	SS	560	1		Auger Cuttings
				108.42						
3		Grey brown SAND, some silt		3.05						
				108.12	5	SS	430	20		
		Grey brown SILTY CLAY with sand seams (WEATHERED CRUST)		3.35						
				107.66						
4		Dense to very dense, grey brown SILTY SAND and GRAVEL, trace clay, with cobbles and boulders (GLACIAL TILL)		3.81	6	SS	330	38		
					7	SS	230	>50		
5				106.44						
		End of Borehole Auger Refusal		5.03						
6										
7										
8										
9										
10										

SOIL PROFILE / SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

GEMTEC
Consulting Engineers and Scientists

LOGGED: CC
CHECKED: TM

GEO - BOREHOLE LOG 102151.001 BH LOGS 2023-04-24.GPJ GEMTEC 2018.GDT 3/20/26

RECORD OF BOREHOLE 24-1

CLIENT: T & L Carroll Holdings Inc.
PROJECT: Phase Two Environmental Site Assessment
JOB#: 102151.001
LOCATION: 3160 Carp Road, Ottawa, Ontario

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Feb 14 2024

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	SOIL PROFILE: STRATA PLOT	SOIL PROFILE: ELEV. / DEPTH (m)	SAMPLE DATA: NUMBER	SAMPLE DATA: TYPE	SAMPLE DATA: RECOVERY (mm)	SAMPLE DATA: BLOWS/0.3m	SAMPLE DATA: LABORATORY ANALYSES	COMBUSTIBLE VAPOUR CONCENTRATION (ppm)	ODOUR	TPH (mg/kg)	MONITORING WELL INSTALLATION AND NOTES
		Ground Surface		114.70									
0	Direct Push	Topsoil		114.50									
		Brown silty sand with trace clay and some organics - Wet		0.20	1	SS	406		OC Pesticides, Metals	HEX: 40; IBL: 0	None		Native backfill
				113.94									
		End of borehole (No refusal)		0.76									

GEMTEC
Consulting Engineers and Scientists

LOGGED: M.B.
CHECKED: M.K.

ENV - BOREHOLE LOG 102151.001_LOGS_2024-03-16.GPJ GEMTEC 2018.GDT 4/10/24

RECORD OF BOREHOLE 24-2

CLIENT: T & L Carroll Holdings Inc.
PROJECT: Phase Two Environmental Site Assessment
JOB#: 102151.001
LOCATION: 3160 Carp Road, Ottawa, Ontario

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Feb 14 2024

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLE DATA: NUMBER	TYPE	RECOVERY (mm)	BLOWS/0.3m	LABORATORY ANALYSES	COMBUSTIBLE VAPOUR CONCENTRATION (ppm)	ODOUR	TPH (mg/kg)	MONITORING WELL INSTALLATION AND NOTES
		Ground Surface		114.20									
0	Direct Push	Topsoil		113.97									
		Brown silty sand with trace clay and some organics - Wet		0.23	1	SS	609		OC Pesticides, Metals	HEX: 15; IBL: 1	None		Native backfill
				113.44									
		End of borehole (No refusal)		0.76									

GEMTEC
Consulting Engineers and Scientists

LOGGED: M.B.
CHECKED: M.K.

ENV - BOREHOLE LOG 102151.001_LOGS_2024-03-16.GPJ GEMTEC 2018.GDT 4/10/24

RECORD OF BOREHOLE 24-3

CLIENT: T & L Carroll Holdings Inc.
PROJECT: Phase Two Environmental Site Assessment
JOB#: 102151.001
LOCATION: 3160 Carp Road, Ottawa, Ontario

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Feb 14 2024

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLE DATA: NUMBER	TYPE	RECOVERY (mm)	BLOWS/0.3m	LABORATORY ANALYSES	COMBUSTIBLE VAPOUR CONCENTRATION (ppm)	ODOUR	TPH (mg/kg)	MONITORING WELL INSTALLATION AND NOTES
		Ground Surface		112.34									
0	Direct Push	Topsoil		112.13									
		Brown silty sand with trace gravel and clay - Wet		0.21	1	SS	305		PHC F1-F4/BTEX, PAHs, M&Is	HEX: 10; IBL: 0	None		Native backfill
1					2	SS	305			HEX: 10; IBL: 0	None		
		End of borehole (No refusal)		110.82 1.52									

GEMTEC
Consulting Engineers and Scientists

LOGGED: M.B.
CHECKED: M.K.

ENV - BOREHOLE LOG 102151.001_LOGS_2024-03-16.GPJ GEMTEC 2018.GDT 4/10/24

RECORD OF BOREHOLE 24-4

CLIENT: T & L Carroll Holdings Inc.
PROJECT: Phase Two Environmental Site Assessment
JOB#: 102151.001
LOCATION: 3160 Carp Road, Ottawa, Ontario

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Feb 14 2024

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLE DATA: NUMBER	TYPE	RECOVERY (mm)	BLOWS/0.3m	LABORATORY ANALYSES	COMBUSTIBLE VAPOUR CONCENTRATION (ppm)	ODOUR	TPH (mg/kg)	MONITORING WELL INSTALLATION AND NOTES
		Ground Surface		110.56									
0	Direct Push	Topsoil		110.29									
		Brown silty sand with trace clay and some organics - Wet		0.27	1	SS	762		OC Pesticides, Metals	HEX: 5; IBL: 0	None		Native backfill
				109.80									
		End of borehole (No refusal)		0.76									

GEMTEC
Consulting Engineers and Scientists

LOGGED: M.B.
CHECKED: M.K.

ENV - BOREHOLE LOG 102151.001_LOGS_2024-03-16.GPJ GEMTEC 2018.GDT 4/10/24

RECORD OF BOREHOLE 24-5

CLIENT: T & L Carroll Holdings Inc.
PROJECT: Phase Two Environmental Site Assessment
JOB#: 102151.001
LOCATION: 3160 Carp Road, Ottawa, Ontario

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Feb 14 2024

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLE DATA: NUMBER	TYPE	RECOVERY (mm)	BLOWS/0.3m	LABORATORY ANALYSES	COMBUSTIBLE VAPOUR CONCENTRATION (ppm)	ODOUR	TPH (mg/kg)	MONITORING WELL INSTALLATION AND NOTES
		Ground Surface		110.79									
0	Direct Push	Topsoil		110.59									
		Brown silty sand with trace gravel and clay - Wet		0.20	1	SS	203			HEX: 5; IBL: 0	None		Native backfill
1					2	SS	406		PHC F1-F4/BTEX, PAHs, M&Is	HEX: 10; IBL: 2	None		
		End of borehole (No refusal)		109.27 1.52									

GEMTEC
Consulting Engineers and Scientists

LOGGED: M.B.
CHECKED: M.K.

ENV - BOREHOLE LOG 102151.001_LOGS_2024-03-16.GPJ GEMTEC 2018.GDT 4/10/24

RECORD OF BOREHOLE 24-6

CLIENT: T & L Carroll Holdings Inc.
PROJECT: Phase Two Environmental Site Assessment
JOB#: 102151.001
LOCATION: 3160 Carp Road, Ottawa, Ontario

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Feb 14 2024

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLE DATA: NUMBER	TYPE	RECOVERY (mm)	BLOWS/0.3m	LABORATORY ANALYSES	COMBUSTIBLE VAPOUR CONCENTRATION (ppm)	ODOUR	TPH (mg/kg)	MONITORING WELL INSTALLATION AND NOTES
		Ground Surface		113.67									
0	Direct Push	Topsoil		113.42									
		Brown silty sand with trace gravel and clay - Wet		0.25	1	SS	304			HEX: 45; IBL: 3	None		
1					2	SS	508		PHC F1-F4/BTEX, PAHs	HEX: 20; IBL: 2	None		Native backfill
		End of Borehole (No refusal)		112.15 1.52									

GEMTEC
Consulting Engineers and Scientists

LOGGED: M.B.
CHECKED: M.K.

ENV - BOREHOLE LOG 102151.001_LOGS_2024-03-16.GPJ GEMTEC 2018.GDT 4/10/24

RECORD OF BOREHOLE 24-7

CLIENT: T & L Carroll Holdings Inc.
PROJECT: Phase Two Environmental Site Assessment
JOB#: 102151.001
LOCATION: 3160 Carp Road, Ottawa, Ontario

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Feb 14 2024

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLE DATA: NUMBER	TYPE	RECOVERY (mm)	BLOWS/0.3m	LABORATORY ANALYSES	COMBUSTIBLE VAPOUR CONCENTRATION (ppm)	ODOUR	TPH (mg/kg)	MONITORING WELL INSTALLATION AND NOTES
		Ground Surface		114.32									
0	Direct Push	Topsoil		114.07									
		Brown silty sand with trace gravel and clay- Wet		0.25	1	SS	406		PHC F1-F4/BTEX, PAHs, M&Is	HEX: 10; IBL: 2	None		Native backfill
1					2	SS	305			HEX: 0; IBL: 3	None		
		End of Borehole (No refusal)		112.80 1.52									

GEMTEC
Consulting Engineers and Scientists

LOGGED: M.B.
CHECKED: M.K.

ENV - BOREHOLE LOG 102151.001_LOGS_2024-03-16.GPJ GEMTEC 2018.GDT 4/10/24

RECORD OF BOREHOLE 24-8

CLIENT: T & L Carroll Holdings Inc.
PROJECT: Phase Two Environmental Site Assessment
JOB#: 102151.001
LOCATION: 3160 Carp Road, Ottawa, Ontario

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Feb 14 2024

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLE DATA: NUMBER	TYPE	RECOVERY (mm)	BLOWS/0.3m	LABORATORY ANALYSES	COMBUSTIBLE VAPOUR CONCENTRATION (ppm)	ODOUR	TPH (mg/kg)	MONITORING WELL INSTALLATION AND NOTES
		Ground Surface		115.93									
0	Direct Push	Topsoil		115.72									
		Brown silty sand with trace gravel and clay - Wet		0.21	1	SS	406			HEX: 10; IBL: 1	None		
1					2	SS	406		PHC F1-F4/BTEX, PAHs	HEX: 10; IBL: 3	None		Native backfill
		End of Borehole (No refusal)		114.41 1.52									

GEMTEC
Consulting Engineers and Scientists

LOGGED: M.B.
CHECKED: M.K.

ENV - BOREHOLE LOG 102151.001_LOGS_2024-03-16.GPJ GEMTEC 2018.GDT 4/10/24

RECORD OF BOREHOLE 24-9

CLIENT: T & L Carroll Holdings Inc.
PROJECT: Phase Two Environmental Site Assessment
JOB#: 102151.001
LOCATION: 3160 Carp Road, Ottawa, Ontario

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Feb 14 2024

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLE DATA: NUMBER	TYPE	RECOVERY (mm)	BLOWS/0.3m	LABORATORY ANALYSES	COMBUSTIBLE VAPOUR CONCENTRATION (ppm)	ODOUR	TPH (mg/kg)	MONITORING WELL INSTALLATION AND NOTES
		Ground Surface		117.49									
0	Direct Push	Gravel		116.73	1	SS	406		PHC F1-F4/BTEX	HEX: 5; IBL: 2	None		Bentonite Seal
1		Brown silty sand with trace gravel and clay		0.76 / 115.97	2	SS	210			HEX: 35; IBL: 1	None		Filter Sand
2		Silty sand with some gravel, rocks - Wet		1.52	3	SS	430			HEX: 0 ; IBL: 1	None		51 mm diameter 3.05 metre long well screen
					4	SS	365			HEX: 5; IBL: 1	None		
3					5	SS	150			HEX: 5; IBL: 1	None		
		End of Borehole - Auger Refusal at Inferred Bedrock		114.14 / 3.35									

GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEVATION (m)
Feb. 14/24	3.35 ▽	114.14
Feb. 23/24	3.35 ▼	114.14
Feb. 28/24	3.35 ▽	114.14

GEMTEC
Consulting Engineers and Scientists

LOGGED: M.B.
CHECKED: M.K.

ENV - BOREHOLE LOG 102151.001_LOGS_2024-03-16.GPJ GEMTEC 2018.GDT 4/10/24

Table E1: Comparison of infiltration rates based on field saturated hydraulic conductivity (using Guelph Permeameter) and soil texture / grain size analysis (lab testing). Refer to Figure 1 for infiltration test locations.

		Field Testing		Infiltration Rates[2] (mm/hr)		
Test ID	**Depth m bgs**	**Guelph Permeameter K_{fs} (cm/s)**	**Soil Class. (GSA)**	**Guelph Permeameter *K_{fs}**	**Soil Texture**	**Hazen Method *K_{fs}**
GP 18-1S	0.30 – 0.45	1.3×10^{-3}	4.0×10^{-4}	92	61.2	197
GP 18-1D	1.00 – 1.15	1.1×10^{-2}	3.6×10^{-2}	163	210	230
GP 18-3S	0.50 – 0.65	1.1×10^{-5}	-	26	-	-
GP 18-5S	0.25 – 0.40	5.0×10^{-5}	-	38	-	-
GP 18-9S	0.25 - 0.40	8.5×10^{-4}	-	82	-	-
GP 18-10S	0.40 - 0.55	1.1×10^{-5}	-	26	-	-
GP 18-14S	0.30 – 0.45	2.1×10^{-4}	5.3×10^{-6}	56	13.2	20

Notes:
1. Appendix C – Site Evaluation and Soil Testing Protocol for Stormwater Infiltration (Low Impact Development Stormwater Management Planning and Design Guide, Credit Valley Conservation Authority, Version 1.0, 2011)
2. The estimated infiltration rates do not include a safety factor and do not represent design infiltration rates.

Abbreviations:
K_{fs} = Field saturated hydraulic conductivity;
GSA = Grain Size Analysis, Hazen D_{10}; **Soil Texture** = US Maryland Stormwater Design Manual – Table D.13.1 Hydrologic Soil Properties Classified by Soil Texture (revised May 2009);
***K_{fs}** converted to infiltration rate based on K_{fs}-infiltration relationship found in OMMAH;
OMMAH = Ontario Ministry of Municipal Affairs and Housing (OMMAH). 1997. Supplementary Guidelines to Ontario Building Code 1997. SG-6 Percolation Times and Soil Descriptions, Toronto, Ontario

Maximum Allowable Septic Flows (40% Hard Surface)
3112 Carp Road, Ottawa, ON

Lot	Available Infiltration [1] (litres per day)	Maximum Septic Flow-Conventional[2] (litres per day)	Maximum Number of Users[3]	Maximum Septic Flow-Advanced[2] (litres per day)	Maximum Number of Users[3]
Lot 1	2229	743	10	2229	30
Lot 2	1923	641	9	1923	26
Lot 3	1593	531	7	1593	21
Lot 6	1943	648	9	1943	26
Lot 7	1911	637	8	1911	25
Lot 8	2007	669	9	2007	27
Lot 9	7366	2455	33	7366	98
Lot 10	2140	713	10	2140	29
Lot 11	1816	605	8	1816	24
Lot 12	1816	605	8	1816	24
Lot 13	2212	737	10	2212	29
Lot 14	3254	1085	14	3254	43

Notes:

1. Available infiltration (litres per day) = Infiltration volume (m3/year) x (1000 litres/m3) / (365 days/year) x (1 - hard surface area) x Infiltration Factor. Assumes a hard surface coverage of 40%.
2. Incorporates a value of 20 mg/L nitrate in the discharged effluent from the tertiary treatment system. The calculated maximum allowable flow is based on a simplification of the formula provided in Section 5.6.3, utilizing a concentration of 20 mg/L of Nitrate in the effluent discharging from the tertiary treatment unit.
3. Assumes 75 litres per day per person.

Maximum Allowable Septic Flows (50% Hard Surface)
3112 Carp Road, Ottawa, ON

Lot	Available Infiltration [1] (litres per day)	Maximum Septic Flow-Conventional[2] (litres per day)	Maximum Number of Users[3]	Maximum Septic Flow-Advanced[2] (litres per day)	Maximum Number of Users[3]
Lot 1	1857	619	8	1857	25
Lot 2	1603	534	7	1603	21
Lot 3	1327	442	6	1327	18
Lot 6	1619	540	7	1619	22
Lot 7	1593	531	7	1593	21
Lot 8	1672	557	7	1672	22
Lot 9	6139	2046	27	6139	82
Lot 10	1783	594	8	1783	24
Lot 11	1513	504	7	1513	20
Lot 12	1513	504	7	1513	20
Lot 13	1843	614	8	1843	25
Lot 14	2712	904	12	2712	36

Notes:

1. Available infiltration (litres per day) = Infiltration volume (m3/year) x (1000 litres/m3) / (365 days/year) x (1 - hard surface area) x Infiltration Factor. Assumes a hard surface coverage of 50%.
2. Incorporates a value of 20 mg/L nitrate in the discharged effluent from the tertiary treatment system. The calculated maximum allowable flow is based on a simplification of the formula provided in Section 5.6.3, utilizing a concentration of 20 mg/L of Nitrate in the effluent discharging from the tertiary treatment unit.
3. Assumes 75 litres per day per person.

Maximum Allowable Septic Flows (60% Hard Surface)
3112 Carp Road, Ottawa, ON

Lot	Available Infiltration [1] (litres per day)	Maximum Septic Flow-Conventional[2] (litres per day)	Maximum Number of Users[3]	Maximum Septic Flow-Advanced[2] (litres per day)	Maximum Number of Users[3]
Lot 1	1486	495	7	1486	20
Lot 2	1282	427	6	1282	17
Lot 3	1062	354	5	1062	14
Lot 6	1295	432	6	1295	17
Lot 7	1274	425	6	1274	17
Lot 8	1338	446	6	1338	18
Lot 9	4911	1637	22	4911	65
Lot 10	1426	475	6	1426	19
Lot 11	1210	403	5	1210	16
Lot 12	1210	403	5	1210	16
Lot 13	1475	492	7	1475	20
Lot 14	2169	723	10	2169	29

Notes:

1. Available infiltration (litres per day) = Infiltration volume (m3/year) x (1000 litres/m3) / (365 days/year) x (1 - hard surface area) x Infiltration Factor. Assumes a hard surface coverage of 60%.
2. Incorporates a value of 20 mg/L nitrate in the discharged effluent from the tertiary treatment system. The calculated maximum allowable flow is based on a simplification of the formula provided in Section 5.6.3, utilizing a concentration of 20 mg/L of Nitrate in the effluent discharging from the tertiary treatment unit.
3. Assumes 75 litres per day per person.

Water Balance - 3112 Carp Road

Pre-Development Conditions

Block	Land Use[1]	Water Holding Capacity (mm) [3]	Hard Surface Percentage	Area (m^2)	Water Surplus (mm/yr)[2]	Topography Factor	Soil Factor	Vegetation Factor	Infiltration Coefficient	Runoff Coefficient	Infiltration (mm/yr)	Runoff (mm/yr)	Infiltration Volume (m^3/yr)	Runoff Volume (m^3/yr)
1	Pasture and Shrubs	150	0%	10000	342	0.19	0.3	0.1	0.59	0.41	202	140	2018	1402
2	Pasture and Shrubs	150 / 250	0%	10000	331	0.19	0.23	0.1	0.52	0.48	172	159	1721	1589
3	Pasture and Shrubs	250	0%	10000	320	0.19	0.15	0.1	0.44	0.56	141	179	1408	1792
4	Pasture and Shrubs	250	0%	20800	320	0.19	0.15	0.1	0.44	0.56	141	179	2929	3727
5	Pasture and Shrubs	250	0%	33000	320	0.19	0.15	0.1	0.44	0.56	141	179	4646	5914
6	Pasture and Shrubs	250	0%	12200	320	0.19	0.15	0.1	0.44	0.56	141	179	1718	2186
7	Pasture and Shrubs	250	0%	12000	320	0.19	0.15	0.1	0.44	0.56	141	179	1690	2150
8	Pasture and Shrubs	250	0%	12600	320	0.19	0.15	0.1	0.44	0.56	141	179	1774	2258
9	Pasture and Shrubs	150 / 250	0%	38300	331	0.19	0.23	0.1	0.52	0.48	172	159	6592	6085
10	Pasture and Shrubs	150	0%	9600	342	0.19	0.3	0.1	0.59	0.41	202	140	1937	1346
11	Pasture and Shrubs	250	0%	11400	320	0.19	0.15	0.1	0.44	0.56	141	179	1605	2043
12	Pasture and Shrubs	250	0%	11400	320	0.19	0.15	0.1	0.44	0.56	141	179	1605	2043
13	Pasture and Shrubs	150 / 250	0%	11500	331	0.19	0.23	0.1	0.52	0.48	172	159	1979	1827
14	Pasture and Shrubs	150	0%	14600	342	0.19	0.3	0.1	0.59	0.41	202	140	2946	2047
Street A	Pasture and Shrubs	150 / 250	0%	24700	331	0.19	0.3	0.1	0.59	0.41	195	136	4824	3352

Post-Development Conditions: Blocks 4, 5 and Street A

Block	Land Use[1]	Water Holding Capacity (mm) [3]	Hard Surface Percentage	Area (m^2)	Water Surplus (mm/yr)[2]	Topography Factor	Soil Factor	Vegetation Factor	Infiltration Coefficient	Runoff Coefficient	Infiltration (mm/yr)	Runoff (mm/yr)	Infiltration Volume (m^3/yr)	Runoff Volume (m^3/yr)
4	SWMP - Urban Lawns	100	20%	20800	367	0.19	0.15	0.1	0.44	0.56	161	206	2687	4947
5	Pasture and Shrubs	250	0%	33000	320	0.19	0.15	0.1	0.44	0.56	141	179	4646	5914
Street A	Road and ROW - Urban Lawns	75 / 100	50%	24700	375	0.19	0.3	0.1	0.59	0.41	221	154	2732	6530

Post-Development Conditions: Scenario 1 - 40% Hard Surface

Block	Land Use[1]	Water Holding Capacity (mm) [3]	Hard Surface Percentage	Area (m^2)	Water Surplus (mm/yr)[2]	Topography Factor	Soil Factor	Vegetation Factor	Infiltration Coefficient	Runoff Coefficient	Infiltration (mm/yr)	Runoff (mm/yr)	Infiltration Volume (m^3/yr)	Runoff Volume (m^3/yr)
1	Urban Lawns	75	40%	10000	383	0.19	0.3	0.1	0.59	0.41	226	157	1356	2474
2	Urban Lawns	75 / 100	40%	10000	375	0.19	0.23	0.1	0.52	0.48	195	180	1170	2580
3	Urban Lawns	100	40%	10000	367	0.19	0.15	0.1	0.44	0.56	161	206	969	2701
6	Urban Lawns	100	40%	12200	367	0.19	0.15	0.1	0.44	0.56	161	206	1182	3295
7	Urban Lawns	100	40%	12000	367	0.19	0.15	0.1	0.44	0.56	161	206	1163	3241
8	Urban Lawns	100	40%	12600	367	0.19	0.15	0.1	0.44	0.56	161	206	1221	3403
9	Urban Lawns	75 / 100	40%	38300	375	0.19	0.23	0.1	0.52	0.48	195	180	4481	9881
10	Urban Lawns	75	40%	9600	383	0.19	0.3	0.1	0.59	0.41	226	157	1302	2375
11	Urban Lawns	100	40%	11400	367	0.19	0.15	0.1	0.44	0.56	161	206	1105	3079
12	Urban Lawns	100	40%	11400	367	0.19	0.15	0.1	0.44	0.56	161	206	1105	3079
13	Urban Lawns	75 / 100	40%	11500	375	0.19	0.23	0.1	0.52	0.48	195	180	1346	2967
14	Urban Lawns	75	40%	14600	383	0.19	0.3	0.1	0.59	0.41	226	157	1979	3612

Post-Development Conditions: Scenario 2 - 50% Hard Surface

Block	Land Use[1]	Water Holding Capacity (mm) [3]	Hard Surface Percentage	Area (m^2)	Water Surplus (mm/yr)[2]	Topography Factor	Soil Factor	Vegetation Factor	Infiltration Coefficient	Runoff Coefficient	Infiltration (mm/yr)	Runoff (mm/yr)	Infiltration Volume (m^3/yr)	Runoff Volume (m^3/yr)
1	Urban Lawns	75	50%	10000	383	0.19	0.3	0.1	0.59	0.41	226	157	1130	2700
2	Urban Lawns	75 / 100	50%	10000	375	0.19	0.23	0.1	0.52	0.48	195	180	975	2775
3	Urban Lawns	100	50%	10000	367	0.19	0.15	0.1	0.44	0.56	161	206	807	2863
6	Urban Lawns	100	50%	12200	367	0.19	0.15	0.1	0.44	0.56	161	206	985	3492
7	Urban Lawns	100	50%	12000	367	0.19	0.15	0.1	0.44	0.56	161	206	969	3435
8	Urban Lawns	100	50%	12600	367	0.19	0.15	0.1	0.44	0.56	161	206	1017	3607
9	Urban Lawns	75 / 100	50%	38300	375	0.19	0.23	0.1	0.52	0.48	195	180	3734	10628
10	Urban Lawns	75	50%	9600	383	0.19	0.3	0.1	0.59	0.41	226	157	1085	2592
11	Urban Lawns	100	50%	11400	367	0.19	0.15	0.1	0.44	0.56	161	206	920	3263
12	Urban Lawns	100	50%	11400	367	0.19	0.15	0.1	0.44	0.56	161	206	920	3263
13	Urban Lawns	75 / 100	50%	11500	375	0.19	0.23	0.1	0.52	0.48	195	180	1121	3191
14	Urban Lawns	75	50%	14600	383	0.19	0.3	0.1	0.59	0.41	226	157	1650	3942

Post-Development Conditions: Scenario 3 - 60% Hard Surface

Block	Land Use[1]	Water Holding Capacity (mm) [3]	Hard Surface Percentage	Area (m^2)	Water Surplus (mm/yr)[2]	Topography Factor	Soil Factor	Vegetation Factor	Infiltration Coefficient	Runoff Coefficient	Infiltration (mm/yr)	Runoff (mm/yr)	Infiltration Volume (m^3/yr)	Runoff Volume (m^3/yr)
1	Urban Lawns	75	60%	10000	383	0.19	0.3	0.1	0.59	0.41	226	157	904	2926
2	Urban Lawns	75 / 100	60%	10000	375	0.19	0.23	0.1	0.52	0.48	195	180	780	2970
3	Urban Lawns	100	60%	10000	367	0.19	0.15	0.1	0.44	0.56	161	206	646	3024
6	Urban Lawns	100	60%	12200	367	0.19	0.15	0.1	0.44	0.56	161	206	788	3689
7	Urban Lawns	100	60%	12000	367	0.19	0.15	0.1	0.44	0.56	161	206	775	3629
8	Urban Lawns	100	60%	12600	367	0.19	0.15	0.1	0.44	0.56	161	206	814	3810
9	Urban Lawns	75 / 100	60%	38300	375	0.19	0.23	0.1	0.52	0.48	195	180	2987	11375
10	Urban Lawns	75	60%	9600	383	0.19	0.3	0.1	0.59	0.41	226	157	868	2809
11	Urban Lawns	100	60%	11400	367	0.19	0.15	0.1	0.44	0.56	161	206	736	3447
12	Urban Lawns	100	60%	11400	367	0.19	0.15	0.1	0.44	0.56	161	206	736	3447
13	Urban Lawns	75 / 100	60%	11500	375	0.19	0.23	0.1	0.52	0.48	195	180	897	3416
14	Urban Lawns	75	60%	14600	383	0.19	0.3	0.1	0.59	0.41	226	157	1320	4272

Notes:
1. Table 3.1 MOE SWMP Planning and Design Manual (2003)
2. Surplus data from Environment Canada Water Budget Means for Carleton&Appleton 1985-2020.

GEMTEC
Consulting Engineers and Scientists

Water Balance Summary - 3112Carp Road

Lot	Pre-Development Infiltration Volume (m^3/yr)	Pre-Development Infiltration (mm/yr)	Post-Development Infiltration (Volume m^3/year)							
			Hard Surface[1,2,3]	Water Blance Target (mm/year)[(4)]	40% Hard Surface	40% Water Balance Target (mm/year)[(4)]	50% Hard Surface	50% Water Balance Target (mm/year)[(4)]	60% Hard Surface	60% Water Balance Target (mm/year)[(4)]
1	2018	202	-	-	1356	60	1130	98	904	135
2	1721	172	-	-	1170	49	975	81	780	114
3	1408	141	-	-	969	38	807	65	646	92
4	2929	141	2732[(1)]	-12	-	-	-	-	-	-
5	4646	141	4646[(2)]	0	-	-	-	-	-	-
6	1718	141	-	-	1182	38	985	65	788	92
7	1690	141	-	-	1163	38	969	65	775	92
8	1774	141	-	-	1221	38	1017	65	814	92
9	6592	172	-	-	4481	49	3734	81	2987	114
10	1937	202	-	-	1302	60	1085	98	868	135
11	1605	141	-	-	1105	38	920	65	736	92
12	1605	141	-	-	1105	38	920	65	736	92
13	1979	172	-	-	1346	49	1121	81	897	114
14	2946	202	-	-	1979	60	2732	98	1320	135
Street A	4824	195	2779[(3)]	92	-	-	-	-	-	-

Notes:

1. Block 4 SWMP assumes 20% hard surface coverage for future access roads.
2. Block 5 assumes 0% hard surface
3. Street A assumes 50% hard surfaced area (12.5m of the 25m right of way)
4. Water balance targets assume 85% of groundwater recharge (pre-to-post development) is maintained.

Water Balance Summary - 3112 Carp Road

Lot	Pre-Development Infiltration Volume (m^3/yr)	Reduction in Infiltration (Volume / %)			
		Post-Development (Hard Surface[1])	Post-Development 40% Hard Surface	Post-Development 50% Hard Surface	Post-Development 60% Hard Surface
1	2052	-	34%	45%	56%
2	1754	-	33%	44%	56%
3	1440	-	33%	44%	55%
4	2995	8%	-	-	-
5	4752	0%	-	-	-
6	1757	-	33%	44%	55%
7	1728	-	33%	44%	55%
8	1814	-	33%	44%	55%
9	6719	-	33%	44%	56%
10	1970	-	34%	45%	56%
11	1642	-	33%	44%	55%
12	1642	-	33%	44%	55%
13	2017	-	33%	44%	56%
14	2996	-	34%	45%	56%
Street A	4905	43%	-	-	-

Notes.

1. Lot 4 hard surface 20%, lot 5 hard surface 0% and Street A hard surface 50%.

Legend

- Property Boundary
- Study Area
- Watercourse
- Headwater Drainage Feature
- Candidate Blanding's Turtle Habitat 2 (30 m)
- Candidate Blanding's Turtle Habitat 3 (250 m)

Scale
1:5,250
0 50 100 200 300 400 Meters

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www.gemtec.ca
ottawa@gemtec.ca

Client: TLC Holdings Ltd.

Project: 102151.001

Location: 3160 Carp Road
Ottawa, Ontario

Drwn By: EP | Chkd By: TW | Natural Heritage Features

Date: June 2024

Rev. 0

Figure: A.4

Coordinate System: NAD 1983 UTM Zone 18N
Service Layer Credits: Hybrid Reference Layer: Esri Community Maps Contributors, City of Ottawa, Province of Ontario, Esri Canada, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, NRCan, Parks Canada
World Imagery: Maxar

Appendix D

Rural Fire Flow Calculation Process

Table D1: Required Water Storage for Fire Protection

OBC Table 1: Water Supply Coefficient

OBC Table 2: Minimum Water Supply Flow Rates

OBC Figure 1: Spatial Coefficient vs Exposure Distance

Appendix J RURAL FIRE FLOW CALCULATION PROCESS

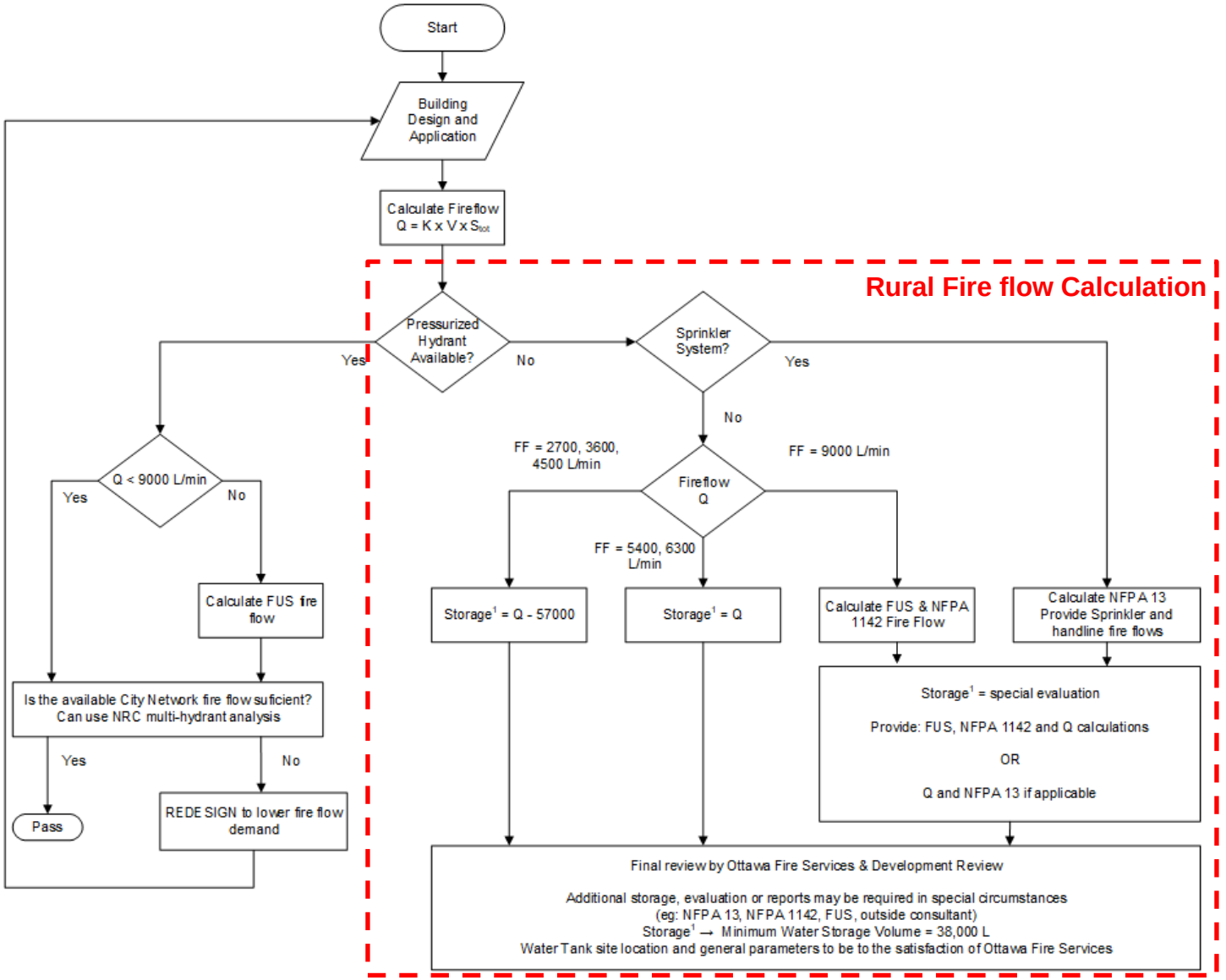

Figure J.1: Rural Fire Flow Calculation Process.

Table D1: Required Water Storage for Fire Protection

Block No.	Block Area (ha)	BLDG Area (m^2)	BLDG Height (m)	BLDG Volume, V (m^3)	Water Supply Coefficient [*1], K	S_{TOT} [*2]	Min. Water Supply [*3], Q (L)	Required Water Supply Flow Rate [*4] (L/min)	Min. Required Water Storage [*5] (L)
1	1.00	2,000	4.0	8,000	17	1.5	204,000	6,300	204,000
2	1.00	2,000	4.0	8,000	17	1.5	204,000	6,300	204,000
3	1.00	2,000	4.0	8,000	17	1.5	204,000	6,300	204,000
6	1.22	2,440	4.0	9,760	17	1.5	248,880	6,300	248,880
7	1.20	2,400	4.0	9,600	17	1.5	244,800	6,300	244,800
8	1.26	2,520	4.0	10,080	17	1.5	257,040	6,300	257,040
9	3.83	7,660	4.0	30,640	17	1.5	781,320	9,000	FUS & NFPA Required
10	0.96	1,920	4.0	7,680	17	1.5	195,840	6,300	195,840
11	1.14	2,280	4.0	9,120	17	1.5	232,560	6,300	232,560
12	1.14	2,280	4.0	9,120	17	1.5	232,560	6,300	232,560
13	1.15	2,300	4.0	9,200	17	1.5	234,600	6,300	234,600
14	1.46	2,920	4.0	11,680	17	1.5	297,840	9,000	FUS & NFPA Required

Parameters

20%	Building Lot Coverage (Max. 25% as per RC9 Zoning)
4.0	Building Height (Max. 11.0 as per RC9 Zoning)
17	Water Supply Coefficient (F2 Occupancy; Non-combustible)

Notes:

1	Water supply coefficient as per OBC Table 1 for F2 occupancy
2	Total spatial coefficient as per OBC Figure 1
3	$Q = K \times V \times S_{TOT}$
4	Required water supply flow rate as per OBC Table 2
5	If Flow Rate = 2700, 3600 or 4500 L/min then Storage = Q - 57000, if Flow Rate = 5400 or 6300 L/min then Storage = Q

Table 1: Water Supply Coefficient - K					
TYPE OF CONSTRUCTION	**Classification by Group or Division in Accordance with Table 3.1.2.1 of the Ontario Building Code**				
	A-2 B-1 B-2 B-3 C D	**A-4 F-3**	**A-1 A-3<**	**E F-2**	**F-1**
Building is of noncombustible construction with fire separations and fire-resistance ratings provided in accordance with Subsection 3.2.2. of the OBC, including loadbearing walls, columns and arches.	10	12	14	17	23
Building is of noncombustible construction or of heavy timber construction conforming to Article 3.1.4.6. of the OBC. 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.	16	19	22	27	37
Building is of combustible construction with fire separations and fire-resistance ratings provided in accordance with Subsection 3.2.2. of the OBC, including loadbearing walls, columns and arches. Noncombustible construction may be used in lieu of fire-resistance rating where permitted in Subsection 3.2.2. of the OBC.	18	22	25	31	41
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.	23	28	32	39	53
Column 1	2	3	4	5	6

Table 2: **Minimum Water Supply Flow Rates**	
Building Code, **Part 3 Buildings**	**Required Minimum Water Supply Flow Rate (L/min.)**
One-storey building with building area not exceeding 600m² (excluding F-1 occupancies)	1800
All other buildings	2700 (If **Q** ≤ 108,000L)[1] 3600 (If **Q** > 108,000L **and** ≤ 135,000L)[1] 4500 (If **Q** > 135,000L **and** ≤ 162,000L)[1] 5400 (If **Q** > 162,000L **and** ≤ 190,000L)[1] 6300 (If **Q** > 190,000L **and** ≤ 270,000L)[1] 9000 (If **Q** > 270,000L)[1]

Note: [1] $\mathbf{Q=KVS_{Tot}}$ as referenced in Section 3(a)

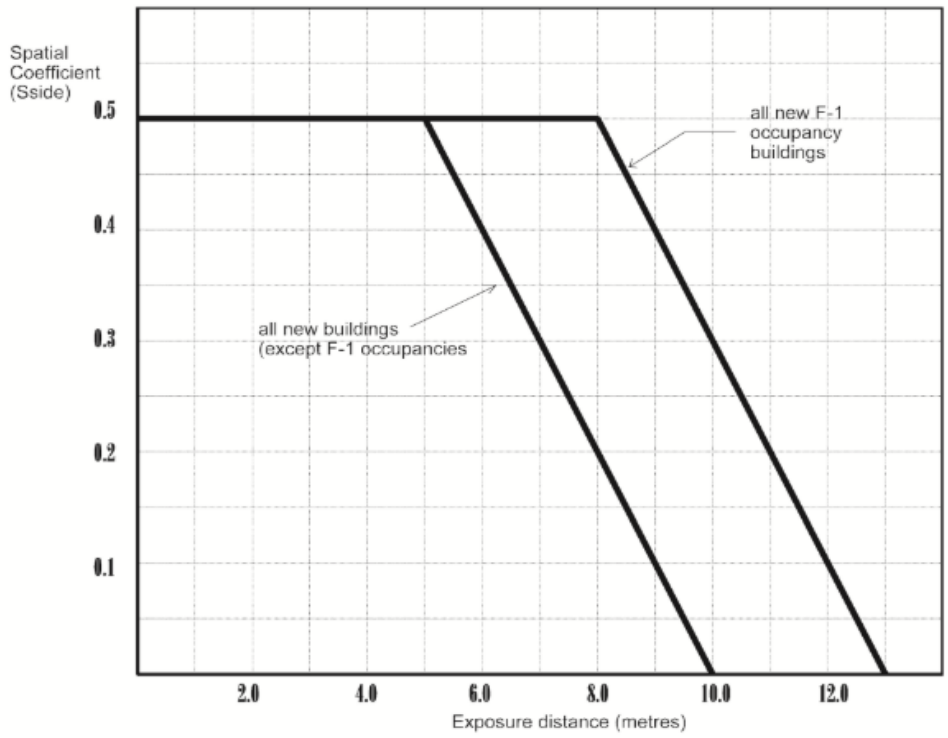

Figure 1
Spatial Coefficient vs Exposure Distance

Appendix E

Table E1: SWM Facility Stage-Storage

CLI-ECA Appendix A

Figure 3.67: Recommended Regional 90% Percentile Volume Targets for Ontario

MECP Table 4.1: Physical Constraints for SWMP Types

MECP Table 4.10: Filters – Summary of Design Guidance

Table E1: SWM Facility Stage-Storage

Ponding Elevation (m)	Ponding Area (m^2)	Available Storage Volume (m^3)
108.40	364	9
108.50	2,147	122
108.60	5,243	485
108.70	8,613	1,177
108.80	11,489	2,193
108.90	13,002	3,429
109.00	13,316	4,750
109.10	13,459	6,089
109.20	13,603	7,442
109.30	13,748	8,810
109.40	13,892	10,192
109.50	14,037	11,588
109.60	14,186	12,999
109.70	14,355	14,424
109.80	14,504	15,864
109.90	14,764	17,319

Notes:

1. Available storage volumes calculated using Civil3D by Autodesk.

Appendix A – Stormwater Management Criteria

1.0 Applicability of Criteria

1.1 The criteria listed under Table A1 of this Appendix applies to all drainage areas greater than 0.1 ha, with the construction erosion and sediment control criteria applying also to sites <0.1 ha;

1.2 Despite condition 1.1 of Appendix A, if some or all of the criteria listed under Table A1 of this Appendix have been assessed for and addressed in other adjacent developed lands to the project site through a sub watershed plan or equivalent study, then those criteria may not be applicable to the project site.

Table A1. Performance Criteria

Water Balance [1]	**FOR DEVELOPMENT SCENARIOS** [2] **Assessment Studies:** i) Control [3] as per the criteria identified in the water balance assessment completed in one or more of the following studies [15], if undertaken: a watershed/sub watershed plan; Source Protection Plan (Assessment Report component); Master Stormwater Management Plan, Master Environmental Servicing Plan; Class EA, or similar approach that transparently considers social, environmental and financial impacts; or local site study including natural heritage, Ecologically significant Groundwater Recharge Areas (EGRA), inflow and infiltration strategies. The assessment should include sufficient detail to be used at a local site level and consistent with the various level of studies; OR **IF Assessment Studies in i) NOT completed:** ii) Control [3] the recharge [4] to meet Pre-development [5] conditions on property; **OR** iii) Control [3] the runoff from the 90th percentile storm event. **Lake Simcoe Watershed Municipalities:** iv) Control [3] as per the evaluation of anticipated changes in water balance between Pre-development and post-development assessed through a Stormwater management plan in support of an application for Major Development [6]. The assessment should include sufficient detail to be used at a local site level. If it is demonstrated, using the approved water balance estimation methods **[7]**, that the site's post to Pre-development water balance cannot be met, and Maximum Extent Possible [8] has been attained, the proponent may use Lake Simcoe and Region Conservation Authority's (LSRCA) Recharge Compensation Program [9]. **FOR RETROFIT SCENARIOS** [10] **Assessment Studies:** i) Control as per criteria identified in the water balance assessment completed in one or more of the following studies: a watershed/sub watershed plan, Source Protection Plan (Assessment Report component), Master Stormwater Management Plan, Master Environmental Servicing Plan,

	Class EA, or local site study including natural heritage, EGRA, inflow and infiltration strategies, if undertaken. The assessment should include sufficient detail to be used at a local site level and consistent with the various level of studies; **OR** ii) If constraints [11] identified in i), then control [3] as per Maximum Extent Possible [8] based on environmental site feasibility studies or address local needs[14]. **IF Assessment Studies in i) NOT completed:** iii) Control [3] the recharge [4] to meet Pre-development [5] conditions on property; **OR** iv) Control [3] the runoff from the 90th percentile storm event.
Water Quality [1]	**FOR DEVELOPMENT SCENARIOS** [2] All of the following criteria must be met for development scenarios: **General:** i) Characterize the water quality to be protected and Stormwater Contaminants (e.g., suspended solids, nutrients, bacteria, water temperature) for potential impact on the Natural Environment, and control as necessary, **OR** ii) As per the watershed/sub watershed plan, similar area-wide Stormwater study, or Stormwater management plan to minimize, or where possible, prevent increases in Contaminant loads and impacts to receiving waters. **Suspended Solids:** i) Control [3] 90th percentile storm event and if conventional methods are necessary, then enhanced, normal, or basic levels of protection (80%, 70%, or 60% respectively) for suspended solids removal (based on the receiver). **Phosphorus:** i) Minimize existing phosphorus loadings to Lake Erie and its tributaries, as compared to 2018 or conditions prior to the proposed development, **OR** ii) Minimize phosphorus loadings to Lake Simcoe and its tributaries. Proponents with development sites located in the Lake Simcoe watershed shall evaluate anticipated changes in phosphorus loadings between Pre-development and post-development through a Stormwater management plan in support of an application for Major Development [6]. The assessment should include sufficient detail to be used at a local site level. If, using the approved phosphorus budget tool [12], it is demonstrated that the site's post to Pre-development phosphorus budget cannot be met, and Maximum Extent Possible [8] has been attained, the proponent may use LSRCA's Phosphorus Offsetting Policy [9]. **FOR RETROFIT SCENARIOS** [10] i) Improve the level of water quality control currently provided on site; **AND** ii) As per the 'Development' criteria for Suspended Solids, **OR** iii) **If 'Development' criteria for Suspended Solids cannot be met**, Works are designed as a multi-year retrofit project, in accordance with a rehabilitation study or similar area-wide Stormwater study, such that the completed treatment train will achieve the 'Development' criteria for Suspended Solids or local needs[14], within ten (10) years; **OR**

	iv) If constraints [11] identified in ii) and iii), then control [3] as per Maximum Extent Possible [8] based on environmental site feasibility studies.
Erosion Control (Watershed) [1]	**FOR DEVELOPMENT SCENARIOS** [8] i) As per erosion assessment completed in watershed/sub watershed plan, Master Stormwater Management Plan, Master Environmental Servicing Plan, Drainage Plan, Class EA, local site study, geomorphologic study, or erosion analysis; **OR** ii) As per the Detailed Design Approach or Simplified Design Approach methods described in the Stormwater Management Planning and Design Manual: a. The Detailed Design Approach may be selected by the proponent for any development regardless of size and location within the watershed provided technical specialists are available for the completion of the technical assessments; or considered more appropriate than the simplified approach given the size and location of the development within the watershed and the sensitivity of the receiving waters in terms of morphology and habitat function. b. The Simplified Design Approach may be adopted for watersheds whose development area is generally less than twenty hectares AND either one of the following two conditions apply: 1) The catchment area of the receiving channel at the point-of-entry of Stormwater drainage from the development is equal to or greater than twenty-five square kilometers; or 2) Meets the following conditions: - The channel bankfull depth is less than three quarters of a meter; - The channel is a headwater stream; - The receiving channel is not designated as an Environmentally Sensitive Area (ESA) or Area of Natural or Scientific Interest (ANSI) and does not provide habitat for a sensitive aquatic species; - The channel is stable to transitional; and - The channel is slightly entrenched; **OR** iii) In the absence of a guiding study, detain at minimum, the runoff volume generated from a 25 mm storm event over 24 to 48 hours. **FOR RETROFIT SCENARIOS** [10] i) If approaches i-iii) under 'Development Scenarios' are not feasible as per identified constraints [11], then improve the level of erosion control [3] currently provided on site to Maximum Extent Possible [8] based on environmental site feasibility studies or address local needs[14].
Water Quantity (Minor and Major System) [1]	**i)** As per municipal standards, Master Stormwater Management Plan, Class EA, Individual EA and/or ECA, as appropriate for the type of project [13]
Flood Control (Watershed Hydrology) [1]	**FOR DEVELOPMENT SCENARIOS** [2] i) Manage peak flow control as per watershed/sub watershed plans, municipal criteria being a minimum 100 year return storm (except for site-specific considerations and proximity to receiving water bodies), municipal guidelines and standards, Individual/Class EA, ECA, Master Plan,

	as appropriate for the type of project [13]. **FOR RETROFIT SCENARIOS** [10] i) If approaches i) under 'Development Scenarios' are not feasible as per identified constraints [11], then improve the level of flood control [3] currently provided on site to Maximum Extent Possible [8] based on environmental site feasibility studies.
Construction Erosion and Sediment Control	i) Manage construction erosion and sediment control through development and implementation of an erosion and sediment control (ESC) plan. The ESC plan shall: a. Have regard to Canadian Standards Association (CSA) W202 Erosion and Sediment Control Inspection and Monitoring Standard (as amended); OR b. Have regard to Erosion and Sediment Control Guideline for Urban Construction 2019 by TRCA (as amended). ii) Be prepared by a QP for sites with drainage areas greater than 5 ha or if specified by the Owner for a drainage lower than 5 ha. iii) Installation and maintenance of the ESC measures specified in the ESC plan shall have regard to CSA W208:20 Erosion and Sediment Control Installation and Maintenance (as amended). iv) For sites with drainage areas greater than 5 ha, a QP shall inspect the construction ESC measures, as specified in the ESC plan.
Footnote	1. Where the opportunity exists on your project site or the same sub watershed, reallocation of development elements may be optimal for management as described in footnote [3]. 2. Development includes new development, redevelopment, infill development, or conversion of a rural cross-section into an urban cross-section. 3. Stormwater volumes generated from the geographically specific 90th percentile rainfall event on an annual average basis from all surfaces on the entire site are targeted for control. Control is in the following hierarchical order, with each step exhausted before proceeding to the next: 1) retention (infiltration, reuse, or evapotranspiration), 2) LID filtration, and 3) conventional Stormwater management. Step 3, conventional Stormwater management, should proceed only once Maximum Extent Possible [8] has been attained for Steps 1 and 2 for retention and filtration. 4. Recharge is the infiltration and movement of surface water into the soil, past the vegetation root zone, to the zone of saturation, or water table. 5. Pre-development is defined as the more stringent of the two following scenarios: 1) a site's existing condition, or 2) as defined by the local municipality. 6. Major Development has the same meaning as in the Lake Simcoe Protection Plan, 2009. 7. Currently, the approved tool by LSRCA for calculating the water balance is the Thornthwaite-Mather Method. Other tools agreed upon by relevant approval agencies (e.g., LSRCA, municipality, or Ministry) may also be acceptable, subject to written acceptance by the Director. 8. Maximum Extent Possible means maximum achievable Stormwater volume control through retention and LID filtration engineered/landscaped/technical Stormwater practices, given the site constraints [11]. 9. Information pertaining to LSRCA's Recharge Compensation Program and Phosphorus Offsetting Policy is available on LSRCA's website (lsrca.on.ca), or in "Water Balance Recharge Policy for the Lake Simcoe Protection Plan", dated July 2021, and prepared by Lake Simcoe

	Region Conservation Authority and “Phosphorus Offsetting Policy”, dated July 2021, and prepared by Lake Simcoe Region Conservation Authority. 10. Retrofit means: 1) a modification to the management of the existing infrastructure, 2) changes to major and minor systems, or 3) adding Stormwater infrastructure, in an existing area on municipal right-of-way, municipal block, or easement. It does not include conversion of a rural cross-section into an urban cross-section. 11. Site constraints must be documented. A list of site constraints can be found in Table A2. 12. Tools for calculating phosphorus budgets may include the Ministry’s Phosphorus Tool, the Low Impact Development Treatment Train Tool developed in partnership by TRCA, LSRCA, and Credit Valley Conservation (CVC), or other tools agreed upon by the LSRCA and other relevant approval agencies including the municipality. 13. Possible to look at combined grey infrastructure and LID system capacity jointly. 14. Local needs include requirements for water quality, erosion, and/or water balance retrofits identified by the owner through ongoing operation and maintenance of the stormwater system, including inspection of local receiving systems and the characterization of issues requiring remediation through retrofit controls. 15. All studies shall conform with Ministry policies. If any conclusions in the studies negate policy, then the project will require a direct submission to the Ministry for review through an application pertaining to a Schedule C Notice.

Table A2. Stormwater Management Practices Site Constraints

Site Constraints	
a)	Shallow bedrock [1], areas of blasted bedrock [2], and Karst;
b)	High groundwater [1] or areas where increased infiltration will result in elevated groundwater levels which can be shown through an appropriate area specific study to impact critical utilities or property (e.g., susceptible to flooding);
c)	Swelling clays [3] or unstable sub-soils;
d)	Contaminated soils (e.g., brownfields);
e)	High Risk Site Activities including spill prone areas;
f)	Prohibitions and or restrictions per the approved Source Protection Plans and where impacts to private drinking water wells and /or Vulnerable Domestic Well Supply Areas cannot be appropriately mitigated;
g)	Flood risk prone areas or structures and/ or areas of high inflow and infiltration (I/I) where wastewater systems (storm and sanitary) have been shown through technical studies to be sensitive to groundwater conditions that contribute to extraneous flow rates that cause property flooding / Sewer back-ups;
h)	For existing municipal rights-of-way infrastructure (e.g., roads, sidewalks, utility corridor, Sewers, LID, and trails) where reconstruction is proposed and where surface and subsurface areas are not available based on a site-specific assessment completed by a QP;
i)	For developments within partially separated wastewater systems where reconstruction is proposed and where, based on a site-specific assessment completed by a

QP, can be shown to: i Increase private property flood risk liabilities that cannot be mitigated through design; ii Impact pumping and treatment cost that cannot be mitigated through design; or iii Increase risks of structural collapse of Sewer and ground systems due to infiltration and the loss of pipe and/or pavement support that cannot be mitigated through design.
j) Surface water dominated or dependent features including but not limited to marshes and/or riparian forest wetlands which derive all or a majority of their water from surface water, including streams, runoff, and overbank flooding. Surface water dominated or dependent features which are identified through approved site specific hydrologic or hydrogeologic studies, and/or Environmental Impact Statements (EIS) may be considered for a reduced volume control target. Pre-consultation with the MECP and local agencies is encouraged;
k) Existing urban areas where risk to water distribution systems has been identified through assessments to meet applicable drinking water requirements, including Procedures F-6 and F-6-1, and substantiated by a QP through an appropriate area specific study and where the risk cannot be reasonably mitigated per the relevant design guidelines;
l) Existing urban areas where risk to life, human health, property, or infrastructure has been is identified and substantiated by a QP through an appropriate area specific study and where the risk cannot be reasonably mitigated per the relevant design guidelines;
m) Water reuse feasibility study has been completed to determine non-potable reuse of Stormwater for onsite or shared use;
n) Economic considerations set by infrastructure feasibility and prioritization studies undertaken at either the local/site or municipal/system level [4].
Footnote: 1. May limit infiltration capabilities if bedrock and groundwater is within 1m of the proposed Facility invert per Table 3.4.1 of the LID Stormwater Planning and Design Guide (2010, V1.0 or most recent by TRCA/CVC). Detailed assessment or studies are required to demonstrate infiltration effects and results may permit relaxation of the minimum 1m offset. 2. Where blasting is more localized, this constraint may not be an issue elsewhere on the property. While infiltration-based practices may be limited in blasted rock areas, other forms of LID, such as filtration, evapotranspiration, etc., are still viable options that should be pursued. 3. Swelling clays are clay soils that is prone to large volume changes (swelling and shrinking) that are directly related to changes in water content. 4. Infrastructure feasibility and prioritization studies should comprehensively assess Stormwater site opportunities and constraints to improve cost effectiveness, environmental performance, and overall benefit to the receivers and the community. The studies include assessing and prioritizing municipal infrastructure for upgrades in a prudent and economically feasible manner.

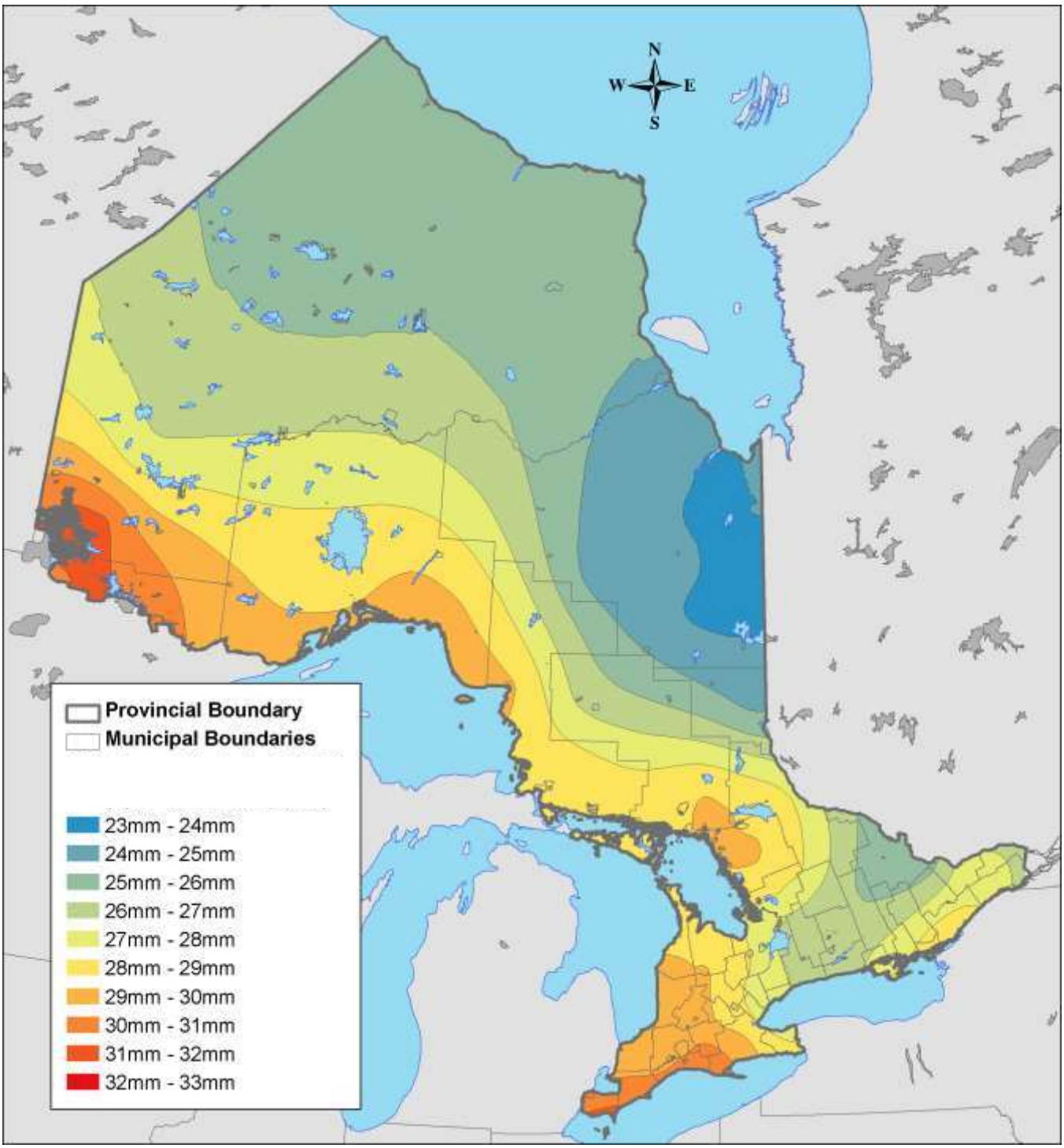

Figure 3.67 – Recommended Regional 90% Percentile Volume Targets for Ontario
(represented by the 95th percentile daily rainfall contours April - October, where daily volume exceeds 2 mm).

- The SWMPs must not affect the fluvial processes in the floodplain; and
- The outlet invert elevation of the SWMP should be higher than the 2 year floodline and the overflow elevation must be above the 25 year floodline.

Table 4.1: Physical Constraints for SWMP Types

SWMP	Topography	Soils	Bedrock	Groundwater	Area
wet pond	none	none	none	none	> 5 ha
dry pond	none	none	none	none	> 5 ha
wetland	none	none	none	none	> 5 ha
infiltration basin	none	loam (min. inf. rate ≥ 60 mm/h)	> 1 m below bottom	> 1 m below bottom	< 5 ha
infiltration trench	none	loam (min. inf. rate ≥ 15 mm/h)	> 1 m below bottom	> 1 m below bottom	< 2 ha
reduced lot grading	< 5%	loam (min. inf. rate ≥ 15 mm/h)	none	none	none
soakaway pit	none	loam (min. inf. rate ≥ 15 mm/h)	> 1 m below bottom	> 1 m below bottom	< 0.5 ha
rear yard ponding	< 2%	loam (min. inf. rate ≥ 15 mm/h)	> 1 m below bottom	> 1 m below bottom	< 0.5 ha
grassed swales	< 5%	none	none	none	< 2 ha
pervious pipes	none	loam (min. inf. rate ≥ 15 mm/h)	> 1 m below bottom	> 1 m below bottom	none
vegetated filter strips	< 10%	none	none	> 0.5 m below bottom	< 2 ha
sand filters	none	none	none	> 0.5 m below bottom	< 5 ha
oil/grit separators	none	none	none	none	< 2 ha

Filtration systems can be incorporated into most parking lot areas or commercial sites. The surface of the biofilter can be landscaped using trees, shrubs and riverstone or turf and integrated as an amenity within the overall landscape for the development. Biofilters can also be located beneath hard surface landscaped areas, such as courtyards, walkways and patios.

Design Guidance

There is limited operational experience with filters in Ontario. A summary of design guidance is provided in Table 4.10, based on experience in other jurisdictions. A more detailed discussion of this guidance is provided in the sections that follow.

Table 4.10: Filters – Summary of Design Guidance

Design Element	Design Objective	Minimum Criteria	Preferred Criteria
Drainage Area		< 5 hectares	
Treatment Volume	Provision of appropriate Level of protection (see Section 3.3)	As per Table 3.2 (infiltration)	
Pre-treatment	Longevity	Pre-treatment provided by sedimentation chamber or forebay, vegetated filter strip, swale or oil/grit separator	Sedimentation Chamber Volume: Winter By-pass: 25% of water quality treatment volume Winter Operation: 50% of water quality treatment volume
Storage Depth (head on filter)	Avoid filter compaction Protect vegetation	Subsurface sand and organic filters: 0.5 m Surface filters and bioretention: 0.15 m	

Table 4.10: Filters – Summary of Design Guidance (cont'd)

Design Element	Design Objective	Minimum Criteria	Preferred Criteria
Filter Media Depth	Filtering	Sand: 0.5 m Organic: 0.15 - 0.3 m peat 0.1 m peat/sand 0.5 m sand Bioretention: 1.0 - 1.2 m of planting soil	
Under-drain	Discharge	Minimum 100 mm perforated pipes bedded in 150 mm - 300 mm of 50 mm gravel	Winter operation: minimum 200 mm perforated pipes bedded in 300 mm of 50 mm gravel

Drainage Area
Filters should be implemented for drainage areas ≤ 5 ha.

Land Use
Filters may be employed for any land use, but because of their need for pre-treatment and ongoing maintenance, and the fact that they are not useful for erosion and quantity control, they are most often employed at commercial and industrial sites which have a high level of imperviousness. They can be designed to be part of the storm sewer system and thus can be combined with measures such as rooftop, parking lot or superpipe storage (for quantity control).

Volumetric Sizing
Water quality volumes to be used in the design are provided in Table 3.2 under the "infiltration" heading. Erosion and quantity control volumes are not applicable to this type of SWMP. The design should be such that at a minimum, the by-pass of flows should not occur below or at the peak runoff from a 4 hour 15 mm design event.

Storage Depth
It is recommended that the storage depth above a sand filter be limited to a maximum of 1 metre to reduce the potential for compaction of the sand layer. Storage depths for surface filters and bioretention areas should be limited to 0.15 m in order to protect the vegetation.

Media Depth
The recommended filter layer depth for most sand filters is 0.5 m. In bioretention filters, the planting soil layer is normally 1.0 to 1.2 m.