

August 25, 2026

Norfolk County
Community Development Division
185 Robinson Street
Simcoe, Ontario N3Y 5L6

Attention: Fabian Serra – Planner, Development Planning
Alisha Cull, BES, MCIP, RPP, Ec.D. – Manager, Planning Services

Reference: HFW Holdings Limited
Site Plan Application Submission 3
395 Queensway West, Simcoe (Northern Parcel)
Our File 22-013

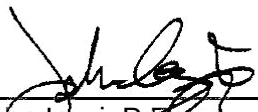
G. Douglas Vallee Limited has reviewed the Submission 2 site plan application comments by Norfolk County for application SPPL2024179. Please find the following items enclosed as part of our 3rd site plan application submission:

- 1) Comment Tracking Matrix, by G. Douglas Vallee Limited, dated 2026-08-20.
- 2) Site Plan Drawings, by G. Douglas Vallee Limited, dated 2025-12-17.
- 3) Civil Engineering Drawings, by G. Douglas Vallee Limited, dated 2026-08-19.
- 4) Functional Servicing Report, by G. Douglas Vallee Limited, dated 2025-12-02.
- 5) Stormwater Management Report, by G. Douglas Vallee Limited, dated 2026-05-01.
- 6) Street Lighting Drawings, by SEI Electrical Engineering, dated 2026-07-13.
- 7) Rev2 - Schedule H Securities Cost Estimate, by G. Douglas Vallee Limited, dated 2026-08-20.
- 8) Landscape Plans, by Adesso, dated 2026-08-24.
- 9) Infiltration Inquiry Email Correspondence with Cambium, dated 2026-04-15.
- 10) Swale Subdrain Email Correspondence with Norfolk County, dated 2026-04-16.
- 11) Cambium – Lake Erie Region Transport Pathway notice, dated 2026-05-12.
- 12) Canada Post Clearance Letter, by Canada Post, dated 2026-08-19.
- 13) Hydro One Design Layout, by Hydro One, dated 2026-08-12.
- 14) Outfall Channel Design Brief, by GeoProcess Research Associates dated 2025-09-25.
- 15) Outfall Channel Design Drawings, by GeoProcess Research Associates dated 2025-09-25.

The submission has been made electronically on August 25, 2026 via Norfolk County's CityView portal.

We trust that this information is complete and sufficient. Should you have any questions or require further information please do not hesitate to contact us.

Respectfully submitted,



John Iezzi, P. Eng.

Associate, Manager of Land Development

G. DOUGLAS VALLEE LIMITED

Consulting Engineers, Architects and Planners

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G. DOUGLAS VALLEE LIMITED
Consulting Engineers, Architects & Planners

22-013 HFW - 395 Queensway - Northern Parcel

Development Application: SPPL2024179

Comment	Department	REF #	Date	Comment	Vallee Response	Task/Owner	Status
2nd SUBMISSION - NORFOLK COMMENTS							
2nd Submissiom	Planning	1	1-May-26	Please revise site plan to illustrate the location of exterior lighting on site plan. Understood shown on photometric plan.	Noted. The light standards have been added to the site plan.	Vallee	Complete
	Planning	2	1-May-26	Please revise the photometric plan to provide exterior lighting along the pathway around the Storm water management pond for Crime Prevention Through Environmental Design purposes (CPTED).	While we appreciate staff’s recommendation, our Client’s position remains that additional lighting along the northern extent of the site is not appropriate nor desirable. It will negatively impact the adjacent landowners and may impact the natural environment that our Client is eager to preserve in accordance with the established EIS. Of note, the Official Plan specifically states that the County “shall encourage” this practice, but it does not expressly require it: m) The County shall encourage development design considering the principles of Crime Prevention Through Environmental Design (CPTED). Specifically, the County shall encourage proponents of new development to use appropriate lighting to deter crime and to situate buildings on lots to maximize natural surveillance. As such, we thank staff for their feedback, however, will proceed without the supplemental lighting on this private site.	Vallee	Complete
	Planning	3	1-May-26	Internal pedestrian circulation through the site is limited, please consider the location of an additional east-west walkway. Currently the sidewalks are proposed around the site on Queensway and Hunt Street. The Sidewalk connections from Hunt street do not extend into the internal road network. The sidewalk only connects at the most northern point of the site, around the storm water management pond and down south. At a minimum there should be sidewalks on one side of the internal road network. Given how the plan indicates that the sidewalk connects to the parking area in the northwest area, there should be a sidewalk connection in front of units 1-12 to ensure a seamless walkway connection. Sidewalks should be provided along units 29-40. Alternatively, Sidewalks can be provided in front of units 17-28 and 29-40 to provide a seamless sidewalk connections.	Per discussion with Norfolk County on May 13, 2026, comment has been deleted.	Vallee	Complete
	Planning	4	1-May-26	If sidewalks are provided in front of the internal units of 17-28 and units 29 to 40 than crosswalk connections should also be provided in an east-west direction between units 16 and 17, and 40 and 41 to improve accessibility and connectivity within the site but also the existing sidewalk connections along Hunt Street. This would also allow for safe pedestrian access for visitors parking in the visitor parking area to access the units as opposed to walking on the road.	Per discussion with Norfolk County on May 13, 2026, comment has been deleted.	Vallee	Complete
	Planning	5	1-May-26	A Draft mutual access agreement and reference plan will be required as a condition of site plan approval. Please note that a registered mutual access agreement will be required prior to occupancy.	Noted.	Vallee	Complete
	Planning	6	1-May-26	Revisions to the security schedule are required. No values are provided for street lighting, line painting demarcation, signage considerations.	Noted. Securities have been updated.	Vallee	Complete
	Planning	7	1-May-26	A utility plan is required as a condition of site plan approval.	Noted. A composite utility plan has been provided.	Vallee	Complete
	Planning	8	1-May-26	Confirming receipt of request for the proposed location of the bus shelter to be in phase 2 Infront of Queensway. Satisfied.	No response required.	Vallee	Complete
	Planning	9	1-May-26	Stop signs and stop bars provided.	No response required.	Vallee	Complete
	Planning	10	1-May-26	Confirming fencing provided.	No response required.	Vallee	Complete
	Planning	11	1-May-26	Relocation of the Canada Post Mailbox appreciated.	No response required.	Vallee	Complete
	Planning	12	1-May-26	Record of Site condition confirmed receipt.	No response required.	Vallee	Complete
	Planning	13	1-May-26	Landscaping plan provided.	No response required.	Vallee	Complete
	Planning	14	1-May-26	Confirming the restoration plan has been addressed through the Geoprocess updates (Outfall channel design update).	No response required.	Vallee	Complete
	Planning	15	1-May-26	Confirmation that the Heli Pad proposed in phase 2 for the apartment site to the south will be covered in the subsequent application.	No response required.	Vallee	Complete
	Planning	16	1-May-26	Satisfied with the appraisal provided.	No response required.	Vallee	Complete
	Planning	17	1-May-26	Insurance information required to be provided amongst other agreement related items (see attached Site Plan Agreement Requirements attachment).	Noted.	Vallee	Complete
2nd Submissiom	Zoning	-	1-May-26	Reviewed. No Comments.	No response required.	Vallee	Complete

2nd Submission	Grand Erie District School Board	-	1-May-26	The proposed development is situated within the boundary area of Lynndale Heights Public School (JK-8) and Simcoe Composite School (9-12). Lynndale Heights Public School is currently operating at capacity with two portables onsite. With the proposed plan to develop 174 residential units, this school may not have space to accommodate all the students generated from this development. As such, we request that the following be included in the conditions of draft approval: That the Owner/Developer must agree in the Site Plan Agreement to notify all purchasers of residential units and/or renters of same, by inserting the following clauses in all offers of Purchase and Sale/Lease: "Despite the best efforts of the Grand Erie District School Board (GEDSB), accommodation in nearby facilities may not be available for all anticipated students. You are hereby notified that students may be accommodated in temporary facilities and/or bussed to a school outside the area, and further, that students may, in future, be transferred to another school." Please note, Student Transportation Services of Brant Haldimand and Norfolk (STSBHN) does not travel on private street networks and bus stops for these students will need to be outside the proposed block on a municipally maintained road.	Noted.	Vallee	Complete
2nd Submission	Fire	-	1-May-26	Ensure adequate access for fire department apparatus, particularly in regard to street width and turning radius – on-street parking is not supported based on the provided site plan	Adequate fire access for fire vehicles is provided. Refer to the fire route shown on Drawing A101, which shows a 6m-wide fire route and 12m center turning radii. Note the proposed road width is 7.3m.	Vallee	Complete
2nd Submission	Fire	-	1-May-26	Hydrant flows to be adequate to support development	Adequate fire flow from the existing water distribution system along Hunt Street is available to service the proposed development. Complete details are described in the functional servicing report.	Vallee	Complete
2nd Submission	Fire	-	1-May-26	If electric-vehicle charging or battery storage (Tesla wall, etc.) infrastructure is being provided please notify NCFD	Noted. No electric-vehicle charging or battery storage (Tesla wall, etc.) infrastructure is proposed at this time.	Vallee	Complete
2nd Submission	LPRCA	-	1-May-26	Reviewed. No further comments or concerns with the application.	Noted. No further response required. A permit application will be submitted upon engineering approval from Norfolk County.	Vallee	Pending
	Agreement Administrator	-	1-May-26	See attached.	Noted.	Vallee	Complete
2nd Submission	Development Engineering General Comments	1	10-Apr-26	Please provide details pertaining to the revisions to the underground parking concept relative to property lines and abutting underground infrastructure.	The proposed mid-rise underground parking structure does not extend beyond the limits of the mid-rise building footprint, and therefore, will not impact the Phase 1 infrastructure.	Vallee	Complete
2nd Submission	Development Engineering General Comments	2	10-Apr-26	Please be advised that in addition to the conveyance of a daylight / sightline triangle at Hunt St. and Queensway, Phase 2 will also require a road widening (~8m) along the frontage along Queensway West. It is recommended that the applicant reviews Norfolk County Official Plan and sidewalk policy with respect to these requirements.	Any potential daylight triangles at the Hunt Street/Queensway intersection, and/or road widening along the frontage of Queensway West shall be reviewed as part of the site plan application for the Phase 2 lands, and not as part of this application.	Vallee	Complete
2nd Submission	Development Engineering General Comments	3	10-Apr-26	Please circulate the LPRCA approval for the SWM Pond outlet to Patterson Creek. Additionally, confirm the waiver of the Rapid Geomorphic Assessment which was a requirement per the 1st submission comments.	Per the LPRCA comments, they've confirmed they have no further comments or concerns with the application. Therefore, no Rapid Geomorphic Assessment is required (which originally requested by Norfolk, not the LPRCA).		Complete
2nd Submission	Development Engineering General Comments	4	10-Apr-26	As a condition of the Site Plan Agreement, provide mutual agreements between the Phase 1 & 2 properties for shared access, shared SWM, shared servicing, and any easement required to accommodate the developments. Please include these in your next submission.	Noted. Mutual agreements/easements registration will be provided as a condition of the site plan agreement.		Complete
2nd Submission	Development Engineering General Comments	5	10-Apr-26	Please revise unit prices for the Security Schedule H to accommodate current industry prices: Road Construction i. 1.5m Sidewalk Construction taken at \$85/sqm ii. Curb and Gutter to be taken at \$75/m	Noted. The securities estimate has been updated accordingly.		Complete
2nd Submission	Development Engineering SWM Report	6	10-Apr-26	Per Design Criteria Section 7.8.01 and 7.8.06, please provide calculations for design flows and time of concentration.	The pre and post-development peak runoff flows for the site were calculated using Visual Otthymo SWM modelling software. Refer to the complete Otthymo output files in Appendix D of the SWM report. As the pre-development and post-development catchments have greater than 20% imperivous coverage, the time of concentration is not required as a catchment parameter. Instead, peak design flows are calculated in Visual Otthymo based on the total catchment area, impervious area percentage, and the directly connected impervious area percentage.		Complete
2nd Submission	Development Engineering SWM Report	7	10-Apr-26	Include updated Post-Development Drainage Area Plans in this report.	An updated Post-Development Drainage Area Plan is included in Appendix E of the SWM Report.		Complete
2nd Submission	Development Engineering SWM Report	8	10-Apr-26	Please confirm the OGS has been sized for both Phase 1 and 2 of the development lands.	The OGS was sized for both the Phase 1 and 2 development lands. Refer to the OGS sizing parameters in Appendix A of the SWM report and the detailed sizing report from Hydroworks in Appendix C of the SWM Report.		Complete

2nd Submission	Development Engineering SWM Report	9	10-Apr-26	Please note that an ECA will be required for the proposed SWM strategy. If the applicant seeks an exemption for the site, please circulate a copy upon receipt from the MOE.	The MECP has confirmed that an EASR will be required for the project, and an exemption is not applicable. An EASR will be completed upon engineering approval from Norfolk County.		Pending
2nd Submission	Development Engineering SWM Report	10	10-Apr-26	Sizing requirements for Infiltration Basin sizing shall adhere to MECP requirements: a. 48h max. drawdown time. Ideally 24h. b. Max. depth of storage within basin = 0.6m c. Seasonal high water table must be at minimum 1m below infiltration basin. d. Typically designed with a bypass for winter freezing to ensure functionality	To address the county's concerns related to the maximum depth of storage above an infiltration basin, we have removed the infiltration stone layer below the pond. However, the pond will remain unlined (no impermeable liner) to allow for some infiltration for water balance purposes. Therefore, infiltration has only been accounted for in the water balance calculations, and not the quantity control SWM modelling/calculations. The seasonally high groundwater is at an elevation of 212.90m (2.10m) below the bottom of pond elevation.		Complete
2nd Submission	Development Engineering SWM Report	11	10-Apr-26	Please confirm that the required storage volumes for 25, 50 & 100-year storm events have not been reduced based on infiltration.	As described in the SWM Report, no infiltration has been accounted for in the minor or major storm events, only in the water balance calculations.		Complete
2nd Submission	Development Engineering SWM Report	12	10-Apr-26	Conditions and permission is to be supplied by Cambium in regard to the proposed infiltration within WHPA B & C as a Highly Vulnerable Aquifer.	Cambium has confirmed that infiltration is permitted within WHPA C (northwest corner of the property where the SWM pond is located. Refer to email correspondence dated April 15, 2026.		Complete
2nd Submission	Development Engineering FSR	13	10-Apr-26	Per 2025 Sanitary modelling Report, peak wastewater flows are 10.9:/s vs 6.82L/s noted in table 2 of the FSR. Please review and confirm.	The modelling completed by RVA (report dated July 17, 2023 but received by Vallee in March 2025) utilized a per capita flow rate of 450 L/cap/day. Since that time, Norfolk has revised their design criteria such that the per capita flow rate is 285 L/cap/day, which results in a total peak sanitary flow of 6.82 L/s. RVA's analysis confirmed that the existing sanitary collection system can accommodate the additional flow from the development (10.9 L/s), which is greater than the peak flow rate of 6.82 L/s (calculated using the updated per capita flow rate). Therefore, the system has sufficient capacity to support the development.		Complete
2nd Submission	TIS Brief	14	10-Apr-26	Please note that for future phases of the development, justification must be demonstrated need for any connection to Queensway West Road.	Noted. Connections to Queensway West shall reviewed as part of the site plan application for the Phase 2 lands, and not as part of this application.		Complete
2nd Submission	Development Engineering C100 - Servicing Plan	15	10-Apr-26	Note all pipe size, slopes and lengths on this plan.	Noted. All sizes, slopes and lengths are shown.		Complete
2nd Submission	Development Engineering C100 - Servicing Plan	16	10-Apr-26	Please add a note, 'The roof water leaders shall be discharged to splash pads in all Townhouse residential developments'.	Noted. Note has been added.		Complete
2nd Submission	Development Engineering C100 - Servicing Plan	17	10-Apr-26	Please add a note, 'Hydrant leads shall be 150mm minimum'.	Noted. Note has been added.		Complete
2nd Submission	Development Engineering C101 - Grading Plan	18	10-Apr-26	Include additional surrounding grades that indicate the site is self-contained and does not accommodate additional external flows from adjacent properties.	Contours from Norfolk's GIS confirm that stormwater runoff from #24 and #26 Hunt Street (located at the north side of the development), flows overland in a northerly direction towards Patterson Creek. A site visit was completed to confirm the area from #415 Queensway West that contributes runoff to the development site. This areahas been added to the SWM model and accounted for in the storm drainage areas and design sheet.		Complete
2nd Submission	Development Engineering C101 - Grading Plan	19	10-Apr-26	Please note that the private pond does not require direct access from the Hunt St. ROW, as it will not be assumed as a municipal asset.	Noted. The pathway to Hunt Street is as a walking path.		Complete
2nd Submission	Development Engineering C101 - Grading Plan	20	10-Apr-26	Illustrate the ponding level of the 100-year storm event within the site area. Per Section 7.4.00, ponding can be accommodated within parking areas to a limit of 0.3 meters in depth.	As illustrated by the grades shown on Drawing C101, the maximum ponding depth within the roadway/parking area are as follows: - CBMH1 ponds to an elevation of 217.31 (0.13m above the CBMH grate elevation) - CBMH2 ponds to an elevation of 217.27 (0.11m above the CBMH grate elevation) - CBMH3 has no ponding (not a low point) - CBMH4 ponds to an elevation of 217.18 (0.12m above the CBMH grate elevation) - CBMH5 ponds to an elevation of 217.16 (0.15m above the CBMH grate elevation) - CBMH6 ponds to an elevation of 217.16 (0.13m above the CBMH grate elevation) Therefore ponding will never exceed 0.3m before spilling towards the SWM Pond.		Complete
2nd Submission	Development Engineering C101 - Grading Plan	21	10-Apr-26	Rear yard swale behind Lot 1-12 flows directly into the SWM Pond without a formal inlet design.	Correct. Runoff from behind lots 1-12 flows directly into the SWM pond via overland flow. As the proposed swale grade is less than the required slope of 2.0%, a swale subdrain will be installed under the swale per the detail on DWG C101 - Grading Plan, which will outlet directly to the SWM pond.		Complete
2nd Submission	Development Engineering C101 - Grading Plan	22	10-Apr-26	Show underside of footing elevation for all townhouse blocks. Include a note, 'A minimum of 0.5m minimum is required between the USF and seasonably high groundwater level'.	Noted. Note have been added.		Complete
2nd Submission	Development Engineering C101 - Grading Plan	23	10-Apr-26	All lot surfaces shall be constructed to a minimum grade of 2%, the maximum lot surface grade for yards shall be 6%. See Lots 1, 16, 28, 29, 41, 43 & 44.	Noted. Grading has been revised such that all rear yard lot surface grades are between 2.0% and 6.0%.		Complete
2nd Submission	Development Engineering C101 - Grading Plan	24	10-Apr-26	Rear and Side yard swales shall have a minimum slope of 2.0%. Maximum depth for all swales shall be 0.5m. Maximum side slope on any swale shall be 3:1.	Noted. Grading has been revised to achieve minimum rear and side yard swale slopes of at least 2.0% where possible. Where swales are less than 2.0%, subdrains shall be installed per the detail provided on DWG C101 - Grading Plan and DWG C100 - Servicing Plan complete with connection to the proposed storm sewer or SWM pond as applicable. All swales are a minimum of 1.0%. Refer to the email correspondence with Norfolk County dated April 15, 2026 which confirms this approach.		Complete

2nd Submission	Development Engineering C101 - Grading Plan	25	10-Apr-26	Please include roadway and curb radii dimensions on this drawing per Section 16.4.02. As noted in the details, the minimum pavement width of a multiple unit development roadway for two-way traffic with no street parking shall be 7.30m.	Noted. Roadway and curb radii dimensions have been added.		Complete
2nd Submission	Development Engineering C101 - Grading Plan	26	10-Apr-26	Per the Geotechnical report, the minimum pavement design shall be: a. 40mm of HL3 b. 60mm of HL8 c. 150mm of Granular A d. 300mm of Granular B	The light-duty and heavy-duty pavement structures specified meet the minimum recommended pavement structures thicknesses outlined in the geotechnical report and adheres to Norfolk County Design Criteria 16.05.02 for new multiple unit development roadways (40mm HL3, 50mm HL8, 150m Gran A and 300mm Gran B).		Complete
2nd Submission	Development Engineering C103 & C104	27	10-Apr-26	Per Design Criteria 7.8.10, 1.0 meters of cover from the top of storm pipe to the finished grade is required. Please include this dimension. Also note where insulation is to be provided where applicable.	Noted. 1.0m of cover on some sections of storm is not feasible, therefore insulation per OPSD 1109.030 shall be provided. The areas where insulation is required has been noted on the profiles on Drawings C103 and C104.		Complete
2nd Submission	Development Engineering C103 & C104	28	10-Apr-26	The minimum drop across storm manholes shall be as follows: e. 0 degrees = 20mm f. 1 degree to 45 degrees = 50mm g. 46 degrees to 90 degrees = 80mm (See CBMH2 & CBMH5)	Noted. The drops are CBMH2 and CBMH5 have been revised.		Complete
2nd Submission	Development Engineering C103 & C104	29	10-Apr-26	Please note and illustrate the future 250mm connections from the trench drain to the storm sewer.	The connections have been noted.		Complete
2nd Submission	Development Engineering C103 & C104	30	10-Apr-26	Per Design Criteria 9.5.03, minimum depth of cover shall be 2.4m for sanitary. Please include this dimension and note where insulation is to be provided where applicable.	Design Criteria 9.5.03 requires 2.4m of cover for sanitary in order to service basement units. However, units 13-44 have no basements, and units 1-12 will be serviced by internal grinder pumps, therefore 2.4m of cover is not required. Insulation is only required where there is frost concerns, as such no insulation is required over the sanitary.		Complete
2nd Submission	Development Engineering C103 & C104	31	10-Apr-26	Please illustrate the limit of excavation and construction notes (ie trench box required?) for the SAMH1 – SAMH6 infrastructure in plan view.	The proposed sanitary sewer from SAMH1 to SAMH6 will be installed before the foundations of units 28 and 29, therefore no trench box shall be required.		Complete
2nd Submission	Development Engineering C103 & C104	32	10-Apr-26	Illustrate the existing property line connection and valve the 400mm WM on Hunt St.	The existing valve on Hunt Street was installed on the 200mm PVC stub towards the development site. This is shown on the Drawing C103.		Complete
2nd Submission	Development Engineering C103 & C104	33	10-Apr-26	A minimum vertical distance of 0.5m between the outside of the watermain and the outside of a sewer shall be provided. Please review the crossing at SAMH4 and include this dimension at all crossing locations.	There is no sewer/watermain crossing at SAMH4. 0.5m of separation is provided and noted at all other watermain crossings.		Complete
2nd Submission	Development Engineering C103 & C104	34	10-Apr-26	Please add a note, 'PVC pipe in sizes 150mm to 300mm shall be minimum DR18 and conform to AWWA C900 and CSA B137.3'.	DR18 pipe is only applicable to watermain pipe. The labels on the profiles have been updated to reflect this, and this has been noted on Drawing C100 Servicing Plan.		Complete
2nd Submission	Development Engineering C103 & C104	35	10-Apr-26	Please illustrate and note the basement floor elevations of all buildings to be constructed.	Underside of footing elevations are noted on Drawing C101 Grading Plan.		Complete
2nd Submission	Development Engineering C103 & C104	36	10-Apr-26	Please illustrate the location of all tees, hydrant and valve connections within the development in profile.	Noted. The tees, hydrant and valve locations have been added to the profile views.		Complete
2nd Submission	Development Engineering C105 - Pond Plan & Profile	37	10-Apr-26	Confirm if detail is to reference CBMH8 instead of CBMH3	Detail reference has been corrected.		Complete
2nd Submission	Development Engineering C105 - Pond Plan & Profile	38	10-Apr-26	Note limit of excavation and other construction details in relation to the 500mm storm pipe that currently exists on the subject lands.	The drawing has been revised to note that the existing 500mm storm pipe shall be cut, capped and grouted where required to avoid excavating too close to the existing neighbouring property. The storm will be removed elsewhere.		Complete
2nd Submission	Development Engineering C105 - Pond Plan & Profile	39	10-Apr-26	Illustrate the flood plain elevation in all sections	The 2 through 100-year ponding elevations, and the 25, 50 and 100-year flood plain elevations are shown on section AA (the 2, 5 and 10-year flood plain elevations are below the proposed SWM pond).		Complete
2nd Submission	Development Engineering SAN - Sanitary Drainage Areas	40	10-Apr-26	Per Design Criteria 7.8.08, minimum and maximum sanitary sewer velocities are 0.75m/s and 4.6m/s, respectively.	The lowest velocity shown on the sanitary design sheet of 0.66 m/s which is minorly lower than the required minimum velocity of 0.75m/s. These runs are at 0.4%, and have greater than 13 units connected, which meets Norfolk Design Criteria 9.3.00. The sanitary sewer slope for these runs cannot be increased any further.		Complete
2nd Submission	Development Engineering SAN - Sanitary Drainage Areas	41	10-Apr-26	Please include SAMH1 – EX.SAMH16 design calculations in the chart.	Noted. SAMH1 to EX SAMH6 is included in the sanitary design sheet.		Complete
2nd Submission	Development Engineering STM - Storm Drainage Areas	42	10-Apr-26	Please provide Storm Sewer Design sheets. Per Design Criteria 7.8.07, storm design flows should not exceed 95% of full capacity, and minimum and maximum storm sewer velocities are 0.75m/s and 4.6m/s, respectively.	Noted. All proposed storm sewers are at less than 95% capacity and all velocities are greater than 0.75 m/s and less than 4.6 m/s.		Complete
2nd Submission	Forestry	-	7-May-26	AND FURTHER THAT prior to final plan approval, the Owner shall provide a restoration plan which illustrates that the proposed development and stormwater management pond will have no negative impacts to the significant woodland, to the satisfaction of Norfolk County;	Noted. A restoration plan has been provided which illustrates that the proposed development and stormwater management pond will have no negative impacts to the significant woodland.		Complete
2nd Submission	Forestry	-	7-May-26	AND FURTHER THAT prior to final plan approval, the Owner shall provide a landscape plan which illustrates existing vegetation to be retained and proposed landscaping, materials and features, to the satisfaction of Norfolk County;	Noted. A landscape plan has been provided which illustrates the existing vegetation to be retained and the proposed landscaping.		Complete
	Building	-	7-May-26	Reviewed. No comments at this time.	Noted.		Complete

	Source Water Protection, Cambium	-	12-May-26	Complete comments in attached document. To summarize: 1) There do not appear to be any Threats proposed, which means that the Source Protection Plan (SPP) does not currently apply, although it may apply once the proposed updates come into effect. 2) A Restricted Land Use (RLU) Notice is not required. 3) Transport Pathways are man-made conditions of land that may increase the vulnerability of a municipal drinking water system’s raw water supply. It appears that the stormwater management infiltration facility associated with the proposed development may create a Transport Pathway. Municipalities must report new (or modified) Transport Pathways pursuant to Section 27 (3)(4) of Ontario Regulation 287/07, which states: - If a person applies to a municipality for approval of a proposal to engage in an activity in a wellhead protection area or a surface water intake protection zone that may result in the creation of a new transport pathway or the modification of an existing transport pathway, the municipality shall give the source protection authority and the source protection committee notice of the proposal and shall include a description of the proposal, the identity of the person responsible for the proposal and a description of the approvals the person requires to engage in the proposed activity. - If a municipality gives a notice described in subsection (3), the municipality shall give a copy of the notice to the person responsible for the proposal. - Please return the enclosed Lake Erie Transport Pathway Notice to the Risk Management Office. Upon receipt of this Notice, a review will be initiated and additional information may be required to identify if any amendments to the SPP may be required.	1) Noted. No response required. 2) Noted. No response required. 3) Noted. Cambium has confirmed that infiltration is permitted within WHPA C (northwest corner of the property where the SWM pond is located. Refer to email correspondence dated April 15, 2026. The Lake Erie Transport Pathway Notice has been completed and provided as part of the 3rd submission package.		Complete
	Brant Halidmand Norfolk Catholic District School Board	-	12-May-26	Comments Pending.	No response required.		Complete
	Paramedic Services	-	12-May-26	Comments Pending.	No response required.		Complete
	Canada Post	-	12-May-26	Comments Pending. Have provided previous comments below. Note that there is an attachment with the Lock Box requirements.	Noted. Lock box requirements will only pertain to phase 2. A clearance letter from Canada Post has been provided as part of the submission package.		Complete

DRAWING LIST SPA

ARCHITECTURAL
A100 COVER SHEET SPA
A101 SITE PLAN
A102 SITE PLAN DETAILS

CONSULTANT LIST

ARCHITECTURAL / STRUCTURAL / CIVIL



Consulting Engineers,
Architects & Planners

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CONTACT:

STEPHEN CAMPBELL, P.GEO
GEOFF BELL, P.GEO

ABBREVIATIONS & SHORT FORMS

GENERAL ABBREVIATIONS

A/F/F & AFF - ABOVE FINISHED FLOOR
AF - ABOVE FINISHED
ADJ. - ADJUSTABLE
ALT. - ALTERNATE
APP. - APPLICATION
ARCH. - ARCHITECTURAL
AODA - ACCESSIBILITY FOR ONTARIANS W/ DISABILITIES ACT
BD - BOARD
BF - BARRIER FREE
BFP - BACK FLOW PREVENTER
B/N/C & BNC - BULL NOSE CORNER
BOL - BOLLARD
BP - BEARING POCKET
BPP - BEARING PLATE POCKET
BR - BICYCLE RACK
CANT. - CANTILEVERED
CBS - CALL BUTTON STATION
CCJ - COMPARTMENT CONTROL JOINT
CHB - CHALK BOARD
CH.TBL. - CHANGE TABLE
CI - CONTINUOUS INSULATION
CJ - CONTROL JOINT
CM - CONTROL MODULE
CH / COH - COAT HOOK
CMD - CARBON MONOXIDE DETECTOR
COMP. - COMPRESSIBLE / COMPRESSOR
CONT. - CONTINUOUS
CONN. - CONNECTION
CP - CONTROL PANEL
CU - CONDENSING UNIT
CV - CONTROL VALVE
C.V. - CENTRAL VAC
GVF - CENTRAL VAC PORT
C/VN - COMPLETE WITH
DBL - DOUBLE
DG - DROPPED CURB
DF - DRINKING FOUNTAIN
DN - DISH WASHER
DWS - DRAWING
DIST. - DISTANCE
DISP. - DISPLAY CASE
DSR - DESIGNATED SUBSTANCE REPORT
EA - EACH
EGS - EMERGENCY CALL SWITCH
EIF - EACH FACE
ELEV. - ELEVATION
ENG.D - ENGINEERED
ENG - ENGINEER
EPB - EMERGENCY PUSH BUTTON
EY - EYE WASH STATION
E.N. - EACH WAY
EX - EXISTING
EXP. - EXPOSED
FB - FIRE BLOCK
FD - FLOOR DRAIN
FDTH - FOUNDATION
FEG - FIRE EXTINGUISHER CABINET
FE - FIRE EXTINGUISHER
FDG - FOLD DOWN GRAB BAR
FLEX. - FLEXIBLE
FLR. - FLOOR
FLRING. - FLOORING
FR - REFRIGERATOR
FRE - FREEZER
F/R/R & FRR - FIRE RESISTANCE RATING
FS - FIRE STOP
FSS - FOLD DOWN SHOWER SEAT
FTG/S - FOOTINGS
F/V - FIELD VERIFY
FN - FOUNDATION WALL
GALV. - GALVANIZED
GAZ. - GAZIEBO
GB & GB# - GRAB BAR
GD - GARBAGE DISPOSAL
GEN. - GENERATOR
GL - GRID LINE
GM - GAS METER
HD - HOSE BED
HD - HAND DRYER
H/D - HEAVY DUTY
HO - HOLD OPEN
HORZ. - HORIZONTAL
HWH - HOT WATER HEATER
INSUL. - INSULATION
ICB - INTEGRAL COVE BASE
KP - KEY PAD
L - LOCK
M / MIRR - MIRROR
MANUF. - MANUFACTURED
MAX. - MAXIMUM
MECH. - MECHANICAL
MIN. - MINIMUM
M/O/L & MOL - MINISTRY OF LABOUR
M/O/T & MOT - MINISTRY OF TRANSPORTATION
MS - MOP SINK
MTP - MOUNTED
MN - MICROWAVE
NADG - NORFOLK ACCESSIBILITY DESIGN GUIDELINES
N/C & NC - NOT IN CONTRACT
NO. - NUMBER
NTS - NOT TO SCALE
OBC - ONTARIO BUILDING CODE
O/D - OUTSIDE DIAMETER
O.H. - OVERHEAD
O/VN - ONE WAY
PER.S - PERMETER / PERIMETERS PER.(S)
PEB - POWER OPERATOR PUSH BUTTON
PDC - POWER DOOR CONTROL BUTTON
PDO - POWER DOOR OPERATOR
POS - PROTECTION OF SOFFITS
PTD/D - PAPER TOWEL DISPENSER/DISPOSAL
P/F/P & PFP - Poured in PLACE
PRE-FIN. - PRE-FINISHED
PROF. ENG. - PROFESSIONAL ENGINEER
P/T - PRESERVATIVE TREATED
RCH - RECESSED CABINET HEATER
REQ.D - REQUIRED
REF - REFLECTED CEILING PLAN
REIN. - REINFORCED
REINF.G - REINFORCING
REF. - REFERENCE
REF. - REFRIGERATOR
REL. - RELOCATED
RD - ROOF DRAIN
RM - ROOM
R/O - ROUGH OPENING
RNL - RAIN WATER LEADER
SA - SMOKE ALARM
SC - SAN CUT
SCD - TOILET SEAT COVER DISPENSER
SCH.S - SCHEDULES
SD - SCUPPER DRAIN
SD - SOAP DISPENSER
SH - SOAP HOLDER
SHH - SHOWER HEAD & MIXING VALVE / HAND
SHF - SHELF
SND - SANITARY NAPKIN DISPOSAL
SNV - SANITARY NAPKIN VENDING DISPENSER
S/O/G & SOG - SLAB ON GRADE
SD - SOAP DISPENSER
SP - SUMP PUMP
SPEC.D - SPECIFIED
SPMDPD - STD. PRECIPITATOR MAX. DRY DENSITY
SR - SHOWER ROD
ST. - STOVE
STRUCT. - STRUCTURAL
TB - TACK BOARD
TBD - TO BE DETERMINED
TC - TEACHER'S CABINET/CLOSET
TH - THERMOSTAT
THERM. - THERMAL
TM - TILTED MIRROR
TOB - TOWEL BAR
TPD - TOILET PAPER DISPENSER
TWF - THRU WALL FLASHING
TYP. - TYPICAL

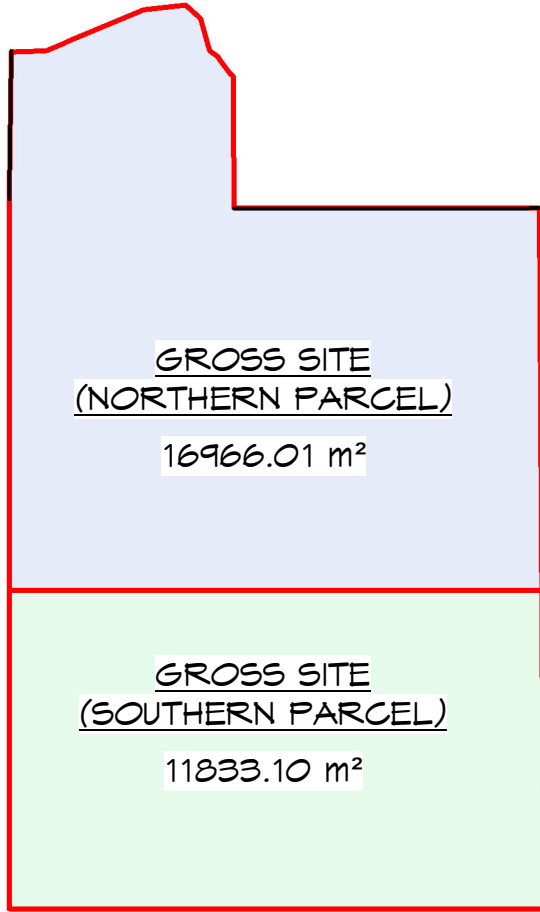
ULC - UNDERWRITERS LABORATORIES OF CANADA
U/C - UNDER CUT
U/S - UNDER SIDE
U/V/O - UNO - UNLESS NOTED OTHERWISE
VAR. - VARIOUS
VAR. - VARIES
VERT. - VERTICAL
W - WITH
WB - WHITE BOARD/MARKER BOARD
W/B - WATER BOTTLE FILL UP STATION
WC - WATER COOLER
WM - WATER METER
WR - WASTE RECEPTACLE
WS - WATER SOFTENER
% - PERCENT
Ø - AT
O/C - ON CENTER

MATERIAL ABBREVIATIONS

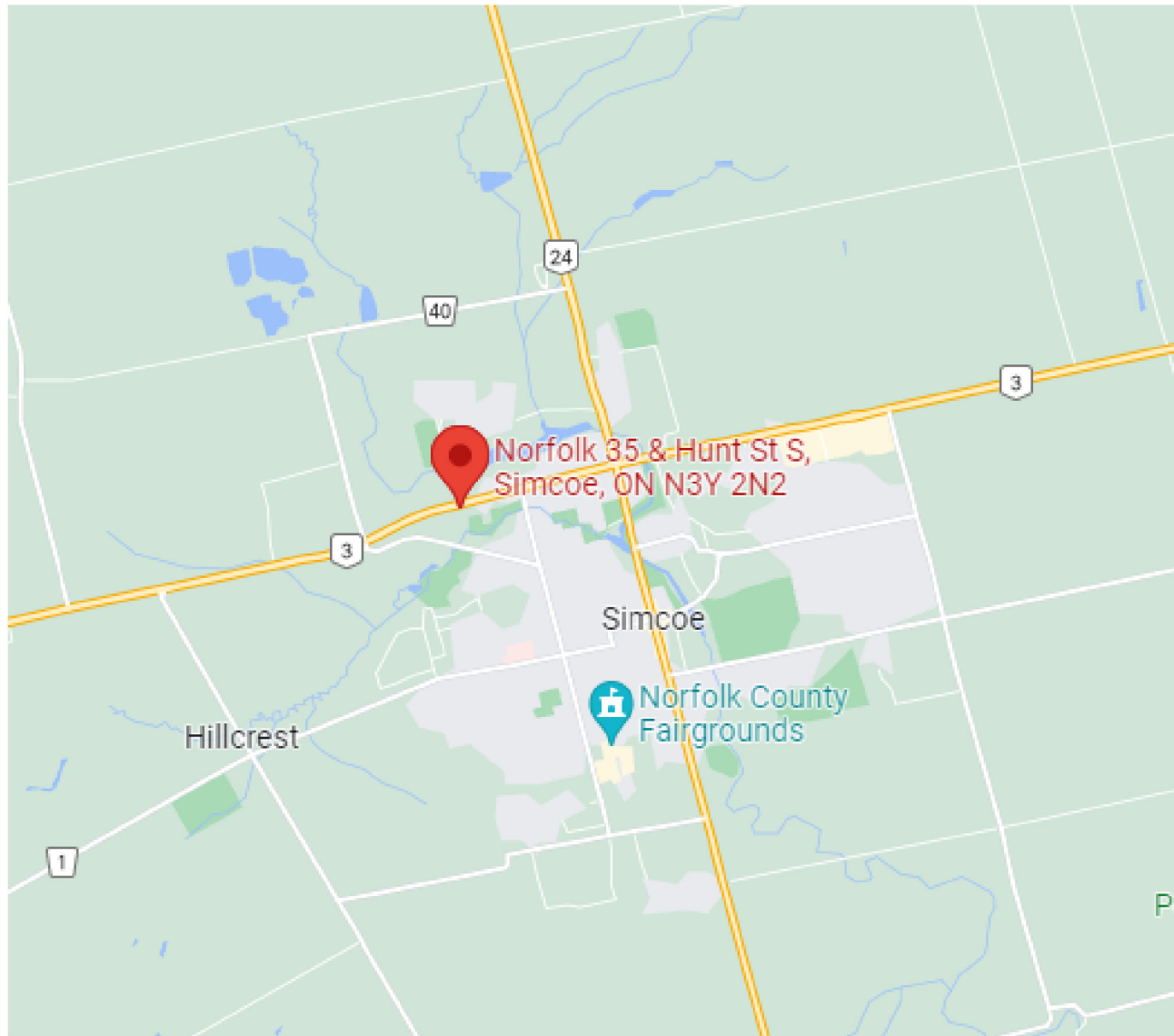
AB - ARCHITECTURAL BLOCK
AGT - ACOUSTIC CEILING TILE
ASPH. - ASPHALT
ANF - ACOUSTIC WALL PANEL
AT - ACOUSTIC TILE
AL - ALUMINUM
AN - ANODIZED
AN(C) - ANODIZED COLOURED
B - BRICK
BIB - BOARD & BATTEN
BPG - BACK PTD. GLASS
CAR - CARPET
CFT - CARPET TILE
CB - CONCRETE BLOCK
CEM - CEMENT BOARD
CT - CERAMIC TILE
CONC. - CONCRETE
C(S) - CONC. SEALED
CTF - CORK TILE FLOORING
EM - EXPANDED METAL
EP - EPOXY PAINT & PRIMER
ESP - EPOXY SEALED FLOORING
ET - EPOXY TERRAZZO
F - FIRELITE GLAZING
FG - FIBREGLASS
FT - FLOCKED TILE (CARPETING)
GB / GBD / GYP BD - GYPSUM BOARD
GLB - GLASS BLOCK
GLBL - GLAZED BLOCK
GL - GLAZING / GLASS
GSG - GEORGIAN WIRE GLAZING
GM - GYM MAT
GMT - GLASS MOSAIC TILE
HM - HOLLOW METAL
HARDWD. - HARDWOOD
H/D/G - HDG - HOT DIPPED GALV.
IMP - INSULATED METAL PANELS
LGG - LEAD COATED COPPER
LNO - LINOLEUM
LSG - LAMINATED SAFETY GLAZING
LVT - LUXURY VINYL TILE
LVP - LUXURY VINYL PLANK
LXG - LEXAN GLAZING
MAR. - MARMOLEUM
MAS - MASONITE
MS - METAL SIDING
MTL - METAL
MN - MOVEABLE WALL SYSTEM
NAT. - NATURAL
PB - PARTICLE BOARD
PG - PRECAST CONG.
P / PTD. - PAINTED
PF / PRE-FIN. - PREFINISHED
PL - PLASTER
PLAM - PLASTIC LAMINATE
PLYND - PLYWOOD
PMP - PREFORMED METAL PANEL
PSP - PIERCED STEEL PLANKING
PT - PORCELAIN TILE
PQG - PARQUET FLOORING
QT - QUARRY TILE
QVT - QUARTZ VINYL TILE
R - RUBBER
RB - RUBBER BASE
RSF - RESILIENT SHEET FLOORING
S - STONE
SAFE - SAFETY FLOORING
SC - SPECIAL COATING
SF - SPORTS FLOORING
SG - LAMINATED SAFETY GLASS
SGL - SPANDREL GLAZING
SHV - SHEET VINYL FLOORING
S.S. - SOLID SURFACE
ST - STUCCO
ST / STL - STEEL
S/S - STAINLESS STEEL
SV - STAINED & VARNISHED
SNG - SOLID WOOD CORE
T - TEMPERED GLAZING / GLASS
TDS - TEMPERED DOUBLE GLAZING / GLASS
TBS - TILE BACKER BOARD
TECTUM - TECTUM ACOUSTIC PANEL
TERR. - TERRAZZO
TURF - ARTIFICIAL TURF
U - POLYURETHANE
V - VINYL
VCSB - VINYL COATED GYPSUM BOARD
VCP - VENEER CORE PLYWOOD
VCT - VINYL COMPOSITE TILE
VFF - VINYL FLANK FLOORING
VR - VENTED RUBBER BASE
WD - WOOD
WP - WATER PROOFING

RM. NAMES

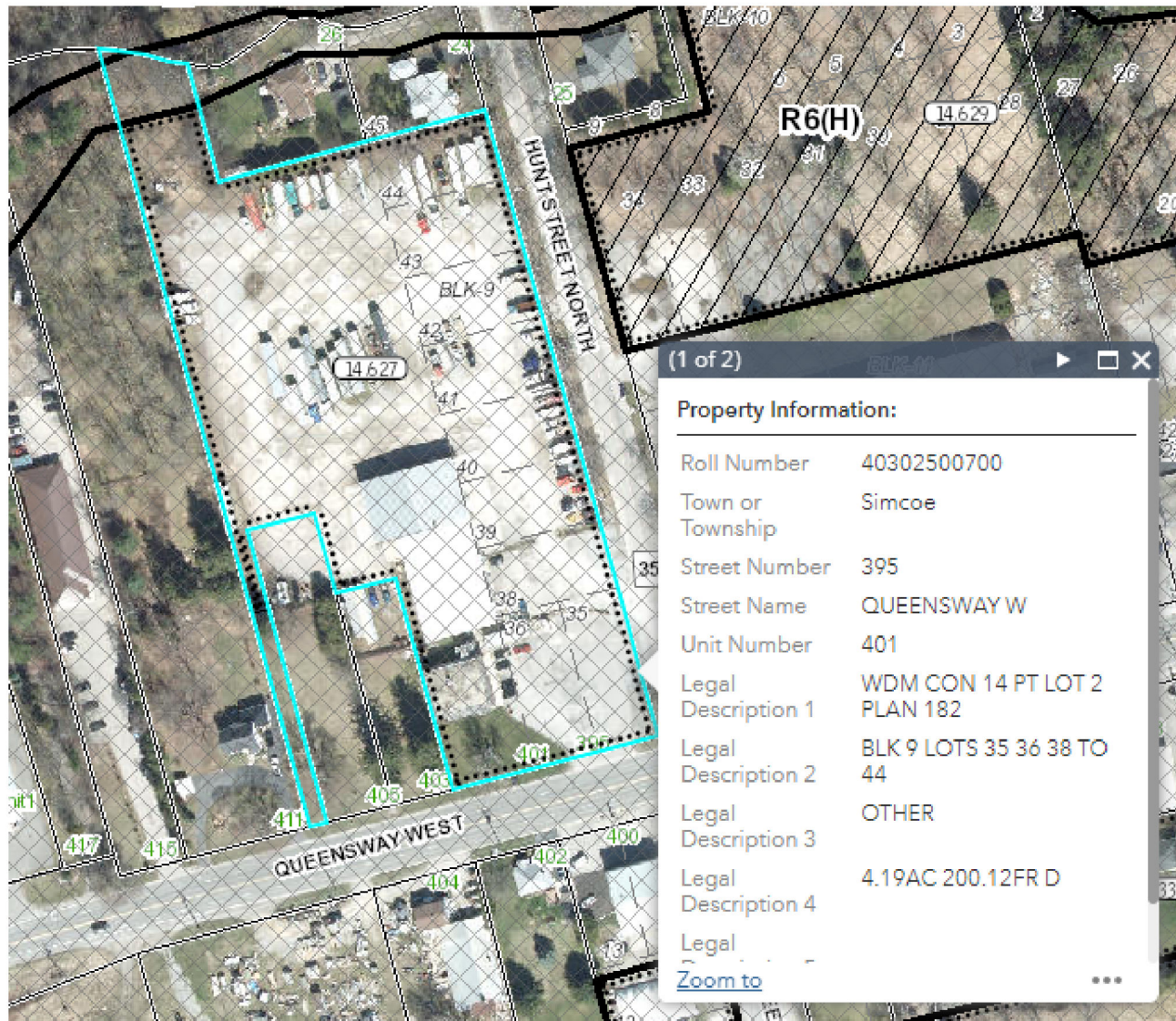
AL - AIR LOCK
CL - CLOSET
CLASSRM. - CLASSROOM
COMM. - COMMUNICATION
CONF. - CONFERENCE
CORR. - CORRIDOR
ELEC. - ELECTRICAL
ELEV. - ELEVATOR
INST. - INSTRUCTOR
LAB - LABORATORY
LAU. - LAUNDRY
PR. - POWDER ROOM
PRINC. - PRINCIPAL
REC. - RECEPTION
RECEIV. - RECEIVING
RM. - ROOM
SHWR. - SHOWER
STOR. - STORAGE
ST. - STATION
SUR. - SURGERY
VEST. - VESTIBULE
VP - VICE PRINCIPAL
WR. - WASHROOM



1
A100
GROSS SITE
SCALE 1:2000



KEY MAP
SCALE 1:100



1
A100
SITE MAP
SCALE 1:100

SITE STATISTIC & ZONING REQ.'S

PROPERTY LEGAL DESCRIPTION:				
345, 401, 402, 405, 411 QUEENSWAY WEST IN THE TOWN OF NORTH SIMCOE, IN THE DISTRICT OF NORFOLK COUNTY				
ZONING:				
IN ACCORDANCE TO THE TOWN OF SIMCOE, ZONING BY-LAW 1-Z-2014 NORFOLK COUNTY - JANUARY-2021-CONSOLIDATION				
PROVISION LAND USE PROPOSED (NORTHERN PORTION)				
5.0 5.4 5.4.1	ZONING AMENDMENT: RESIDENTIAL ZONES URBAN RESIDENTIAL TYPE 4 ZONE (R4) PERMITTED USES In an R4 Zone, no land, building or structure shall be used except in accordance with the following uses: a) group townhouse c) street townhouse d) semi-detached, duplex, tri-plex and four-plex dwellings provided they are located on the same lot with, and in accordance with the Zone provisions of, group townhouse			
PROVISION	SETBACKS (m. - METERS):	REQUIRED IN Street Townhouse (per unit)	REQUIRED IN Group Townhouse (Street Townhouse)	PROVIDED (m)
5.4.2a)	MIN. LOT AREA: I) ATTACHED GARAGE II) CORNER LOT III) DETACHED GARAGE	156m² 264m² 162m²	145m² 145m² 215m²	16.966m² - -
5.4.2b)	MIN. LOT FRONTAGE: I) INTERIOR LOT II) CORNER LOT III) CORNER LOT ACCESSED BY A REAR LANE	6.5 11 6.5	30 30 -	101.2 - -
5.4.2c)	MIN. FRONT YARD: I) ATTACHED GARAGE II) DETACHED GARAGE OR REAR YARD PARKING	6 1.5	6 1.5	MIN. 6 -
5.4.2d)	MIN. EXTERIOR SIDE YARD: I) W/ A 6m FRONT YARD II) W/ A 1.5m FRONT YARD	6 1.5	6 1.5	- -
5.4.2e)	MIN. INTERIOR SIDE YARD	1.2	3	MIN. 6.5
14.1034	MIN. REAR YARD: I) ATTACHED GARAGE	3	3	4.3
5.4.2g)	MIN. SEPARATION BETWEEN TOWNHOUSE DWELLINGS	2	2	3
14.1034	MAX. BLDG. HEIGHT	13	13	MAX. 13
5.4.3	Setback from Mutual Side Lot Line Notwithstanding the required side yard, on a mutual side lot line separating two (2) attached townhouse units, no interior side yard is required where the walls are joined, where the walls are not joined, a 1.2 metre side yard shall be required	1.2	1.2	MIN. 1.2
5.4.4	Maximum Units in a Townhouse Dwelling No more than eight (8) dwelling units shall be located in a townhouse dwelling.	8 UNITS	8 UNITS	6 UNITS

COORD. W/ ZONING BY-LAW FOR ALL OTHER ZONING REQ.'S

PARKING REQ.'D RESIDENTIAL (R4)			
PROVISION	NUMBER OF PARKING SPACES	REQUIRED	PROVIDED
4.9a)	SINGLE DETACHED SEMI-DETACHED, DUPLEX, TRI-PLEX, FOUR-FLEX, TOWNHOUSE DWELLINGS & VACATION HOME (B-Z-2011): 2 SPACES / DWELLING UNIT 2 SPACES x 44 DWELLING UNITS = 88	88 SPACE(S)	88 SPACE(S)
PARKING REQ.'D RESIDENTIAL - VISITOR:			
4.9f)	VISITOR PARKING: 1 SPACE / 3 DWELLING UNITS 1 SPACE x (44 / 3) = 15	15 SPACE(S)	15 SPACE(S)
PARKING REQ.'D RESIDENTIAL - TOTAL:			
TOTAL		103 SPACE(S)	103 SPACE(S)
PARKING REQ.'D RESIDENTIAL - BARRIER FREE (PART OF REQ.'D PARKING)			
4.3.3	BARRIER FREE PARKING REQ.'D: 1-25 PARKING SPACES = TYPE 'A' (3.4m WIDE) PLUS 1.5m AISLE TYPE 'B' (2.4m WIDE) PLUS 1.5m AISLE	1 SPACE(S) 0 SPACE(S)	1 SPACE(S) 0 SPACE(S)

4.0 OFF STREET PARKING PARKING SPACE DIMENSIONS			
4.1 4.1.3a)	PARKING SPACE DIMENSIONS WIDTH OF PARKING SPACE FOR VEHICLES PARKED SIDE BY SIDE	3 MIN.	3
4.1.3b)	FOR VEHICLES PARKED WITH WALL OR FENCE ADJ. DEPTH OF PARKING SPACE FOR 90 DEGREE PARKING FOR PARALLEL PARKING	3.3 MIN. 5.8 MIN. 7 MIN.	3.3 5.8 7
4.1.4 4.1.4a)	PARKING AISLE REQ.'S TWO-WAY TRAFFIC	7.3 MIN.	7.3 MIN.

4.2 LOCATION OF PARKING ON A LOT	
4.2.3	4.2.3 Residential Parking Area For Urban Residential Type 1 to 4 Zones (R1 to R4), the following shall apply: a) within a front yard or exterior side yard, motor vehicles shall only be parked on a driveway, in a parking space or private garage (1-2-2018); b) not more than one (1) required parking space may be located within the required front yard or required exterior side yard (1-2-2018); c) vehicles shall not be parked within any landscaped area (1-2-2018);
4.2.4	4.2.4 Other Provisions a) For tri-plex dwellings, duplex dwellings, four-plex dwellings, street townhouses, stacked townhouses, and boarding or lodging houses, required parking spaces shall be prohibited within the required front yard or required exterior side yard, except where a dwelling unit has a private garage in which case the driveway leading to the private garage may be used as a parking space subject to the size requirements herein; b) For group townhouses and apartment dwellings, no parking lot shall be located closer than 3 metres from any dwelling on the lot or of any interior lot line abutting another residential Zone; c) For group townhouses and apartment dwellings, no parking lot or parking space shall be located between a dwelling and the street line, except for individual or tandem parking spaces leading directly to each townhouse dwelling unit; d) For commercial or industrial properties, no parking lot shall be located closer than 4.5 metres from any interior lot line abutting a residential Zone; e) For accessory residential dwelling units, notwithstanding the foregoing, one (1) parking space dedicated for the use of the accessory residential dwelling unit, may be permitted in the front yard provided a minimum of 50 percent of the required front yard shall be maintained as landscaped open space notwithstanding such dedicated parking space.

LANDSCAPED AREA	
2.51	"LANDSCAPED AREA" shall mean an area of land comprised of trees, shrubs, flowers, grass or other horticultural elements. Landscaping may include pervious paths, patios, walkways, or elements designed to enhance the visual amenity of a property but does not include open storage display areas, parking or loading areas, or areas covered by driveways. (B-2-2018)
4.2.5	4.2.5 Parking and Landscape Area (1-2-2018) Within Urban Residential Type 1 to 4 Zones (R1 to R4), the following shall apply: a) A minimum of 50 percent of the front yard shall be maintained as landscape area. b) In the case of a corner lot, a minimum of 50 percent of each of the front yard and exterior side yard shall be maintained as landscape area.

LOT COVERAGE:	
BLDG. (GROSS / FOOTPRINT) ASPHALT PARKING, PLAY & DRIVEWAY SIDEWALKS & HARD SURFACE AREAS LANDSCAPED OPEN SPACE	PROVIDED (m²) 5180.6m² 3194.1m² 950.2m² 1620.3m²
	30% 14% 6% 45%
BLDG. & OBC CLASSIFICATION: GROUP C, RESIDENTIAL	

NO.	DATE	ISSUANCE
1	2025.12.17	ISSUED FOR SPA SUBMISSION 2
2	2024.06.12	ISSUED FOR SPA (UPDATED)
1	2024.05.17	ISSUED FOR SPA
NO.	DATE	ISSUANCE

PROPERTY LEGAL DESCRIPTION:
PARTS 1, 2, & 3 ON PLAN STR 111133

APPLICANT:
WPH HOLDINGS LIMITED
HERBERT CHIU
3 FERNWOOD COURT
RICHMOND HILL, ONTARIO
L4B 3C2
1.416.919.6768

DO NOT SCALE DRAWINGS. CALL FOR ANY
CLARIFICATIONS THAT ARE REQUIRED. FIELD
VERIFY AT ALL BUILT CONDITIONS
ALL DWG.'S ARE TO BE READ IN COLOUR
ORIGINAL PAGE SIZE ARCH D' - 24" x 36"



G. DOUGLAS VALLEE LIMITED
2 TALBOT STREET NORTH
SIMCOE ONTARIO N3Y 3W4
(519) 426-6270

PROJECT TITLE:
HUNT ST. N. RESIDENTIAL
HUNT STREET NORTH,
SIMCOE, ON N3Y 2M9

DRAWING TITLE:
COVER SHEET SPA

CHECKED BY: JVLHR	DRAWN BY: BM
DRAWING SCALE: As indicated	DRAWING NO.: A100
PROJECT NO.: 22-013	

BLDG. HEIGHT - NORFOLK COUNTY:

shall indicate the vertical distance between the average finished grade of the ground at the front wall of a building and:
a) In the case of a flat roof or a mansard roof, the highest point of the roof surface;
b) In the case of any other roof, the highest point of the ridge. [S-2-2017]

DISCLAIMER:

ALL EXISTING SITE INFORMATION WAS PROVIDED BY JENITT AND DIXON ONTARIO LAND SURVEYORS IN THE FORM OF AN ELECTRONIC FILE PLAN FILE NO. 23-3563 DATED 2023.11.02 CONSISTING OF THE LEGAL SURVEY PLAN.

REFERENCE NOTE:

FOR OTHER SITE CONDITIONS, EXISTING TO REMAIN OR NEW TO BE PROVIDED, THIS DWS. IS TO BE READ IN CONJUNCTION W/ ALL OTHER DWS.'S LISTED ON A100 DWS. LIST.

LIGHTING NOTE:

LIGHTING MUST BE DIRECTED ON SITE AND MUST NOT SPILL OVER TO / ONTO ADJACENT PROPERTIES OR STREETS. PROVIDE HOUSE SHIELDS WHERE NEEDED, TO COMPLETELY ELIMINATE SPILL / GLARE TO ADJACENT PROPERTIES, DARK SKY COMPLIANT (COORD. W/ ELEC. PHOTOMETRIC SITE PLAN)

BEFORE STARTING WORK

• THE **AUTHORITY HAVING JURISDICTION** IS NORFOLK COUNTY.

• THE CONTRACTOR SHALL NOTIFY THE **AUTHORITY HAVING JURISDICTION** ARCHITECT & CONSULTANTS AT LEAST 48 HOURS PRIOR TO COMMENCING ANY CONST. OR DEMOLITION.

• THE POSITION OF THE POLE LINES, CONDUITS, WATER MAINS, SEWERS, & OTHER UTILITIES & STRUCTURES ARE NOT NECESSARILY SHOWN ON THE CONTRACT DWS.'S, WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES & STRUCTURES IS NOT GUARANTEED & ARE TO BE VERIFIED ON SITE.

• ALL POSITIONS OF THE EX. UNDERGROUND UTILITIES WITHIN THE LIMITS OF CONST. SHALL BE LOCATED, MARKED & PROTECTED BY THE CONTRACTOR. ANY UTILITIES DAMAGED OR DISTURBED DURING CONST. SHALL BE REPAIRED OR REPLACED TO THE SATISFACTION OF THE ENGINEER, AT THE CONTRACTOR'S EXPENSE.

• PRIOR TO THE COMMENCEMENT OF CONST., ALL BENCHMARKS, ELEVATIONS, DIMENSIONS, & GRADES MUST BE CHECKED BY THE CONTRACTOR & ANY DISCREPANCIES REPORTED TO THE ENGINEER / ARCHITECT.

BENCHMARKS

TWO DIFFERENT BENCHMARKS MUST BE REFERRED TO @ ALL TIMES; REFER TO CIVIL DRAWING SET.

SITE PLAN NOTES

• ALL WORK INVOLVED IN THE CONST., RELOCATION, REPAIR OF MUNICIPAL SERVICES FOR THE PROJECT SHALL BE TO THE SATISFACTION OF THE **AUTHORITY HAVING JURISDICTION**.
• FIRE ROUTE SIGNS & 3-WAY FIRE HYDRANTS SHALL BE ESTABLISHED TO THE SATISFACTION OF THE LOCAL FIRE DEPARTMENT & AT THE EXPENSE OF THE OWNER.
• MAIN DRIVEWAY DIMENSIONS AT THE PROPERTY LINE BOUNDARIES ARE PLUS OR MINUS 15mm UNO.
• THE APPROVAL OF THIS PLAN DOES NOT EXEMPT THE CONTRACTOR FROM THE REQ.'S TO OBTAIN THE VARIOUS PERMITS/APPROVALS AS MAY BE REQUIRED, SUCH AS, BUT NOT LIMITED TO:

- BUILDING PERMIT
- SANITARY / STORM & WATER PERMITS
- ROAD CUT PERMITS
- RELOCATION OF SERVICES
- APPROACH APPROVAL PERMITS
- ENCROACHMENT AGREEMENTS (IF REQ.'D)
- COMMITTEE OF ADJUSTMENT
- ROAD OCCUPANCY PERMIT
- SITE ALTERATION

GENERAL NOTES:

• FIRE ACCESS ROUTE TO BE POSTED & DESIGNATED UNDER MUNICIPAL BY-LAW (FIRE ACCESS ROUTE TO BE MIN. 6 m WIDE W/ A MIN. 12 m CENTER LINE TURNING RADIUS & MAX. 6% SLOPE)
• COORD. W/ MECH. & ELEC. SITE PLANS FOR ALL EX. & NEW LOCATIONS OF SERVICES & ENTRY OF SERVICES INTO THE BLDG'S ENVELOPE. (ALL MECH. & ELEC. INFORMATION INDICATED ON ARCH. SITE DWS. A101 IS FOR GENERAL REFERENCE & COORD. ONLY)
• COORD. W/ SITE GRADING PLAN FOR PROPOSED FINAL FINISH GRADE ELEV.'S & DRAINAGE SLOPES
• COORD. W/ LANDSCAPE SITE PLAN FOR LOCATIONS OF SEEDING, SODDING, PLANTING & PAVING & OTHER HARD SURFACING. COORD. W/ ARCH. SITE PLAN.
• TYP. DRIVEWAY & PARKING LOT CONC. CURBS AS INDICATED ON DRAWING. COORD. W/ OPSD DETAILS & SPECS. FOR TYPICAL CURB TYPES. SITE DIMENSIONS ARE TO THE FACE OF CURBS
• THE SUB-GRADE SOILS EXPOSED AFTER EXCAVATION SHALL BE INSPECTED & CERTIFIED BY A QUALIFIED REG-STERED PROFESSIONAL SOILS ENGINEER & A COPY OF THE REPORT SHALL BE FORWARDED TO THE **AUTHORITY HAVING JURISDICTION** BUILDING DIVISION. WHERE THE FOOTINGS WILL BE SITUATED ON FILL MATERIAL, THE FOOTINGS SHALL BE DESIGNED & APPROVED BY QUALIFIED REGISTERED PROFESSIONAL ENGINEER
• ALL FILL PLACED ON THE SITE SHALL BE COMPACTED TO A MIN. OF 98% STANDARD PROCTOR DENSITY. A SUFFICIENT NUMBER OF TESTS SHALL BE TAKEN AT VARIOUS LEVELS OF THE SITE SATISFACTORY TO THE ENGINEER. TEST RESULTS SHALL BE SENT TO THE **AUTHORITY HAVING JURISDICTION** W/ A LETTER, SIGNED & STAMPED BY THE SOILS ENGINEER, STATING THAT A SUFFICIENT NUMBER OF TESTS HAVE BEEN TAKEN & THE MIN. DENSIFICATION HAS BEEN REACHED
• APPROVAL OF THIS DWS. IS FOR MATERIAL ACCEPTABILITY & COMPLIANCE W/ MUNICIPAL & PROVINCIAL SPECS.'S & STANDARDS ONLY. APPROVAL & INSPECTION BY THE MUNICIPALITY OF THE WORKS DOES NOT CERTIFY THE LINE & GRADE OF THE WORKS IT IS THE OWNER'S RESPONSIBILITY TO HAVE THEIR ENGINEER CERTIFY THIS ACCORDINGLY
• PROVIDE CONST. GATES / FENCES / BOUNDARIES AS SHOWN / REQ.'D TO THE **AUTHORITY HAVING JURISDICTION** REQ.'S. (SUBMIT SHOP DWS.'S FOR LOCATIONS & EXTENTS).
• A 2.4m HIGH CHAIN LINK FENCE C/W SUPPORTS AS REQ.'D, @ WORK BOUNDARIES TO BE ERECTED BY THE CONTRACTOR PRIOR TO THE COMMENCEMENT OF THE DEMOLITION PROCESS & SHALL REMAIN & BE MAINTAINED IN POSITION INDEFINITELY UNTIL COMPLETION OF NEW CONST. WORK
• CONTRACTOR IS RESPONSIBLE FOR PLANTINGS, SOD, WATERING & MAINTENANCE UNTIL SUBSTANTIAL PERFORMANCE IS ACHIEVED. THE WARRANTY PERIOD WILL COMMENCE UPON SUBSTANTIAL PERFORMANCE OF THIS WORK
• ALL CONCRETE CURBS TO BE 150mm

NOTE:

THIS SITE PLAN APPLICATION APPLIES TO THE NORTHERN PARCEL ONLY (PARTS 1, 2, & 3 ON PLAN STR-11733). A SEPERATE AND SUBSEQUENT SITE PLAN APPLICATION WILL BE SUBMITTED FOR THE SOUTHERN PORTION AT A LATER DATE. (THE INTENDED LAYOUT OF THE SOUTHERN PORTION IS SHOWN FOR COORDINATION PURPOSES ONLY.)

GENERAL NOTES:

- (A) GENERAL CONTRACTOR TO COORDINATE ALL WORK WITHIN THE BOULEVARD W/ THE **AUTHORITY HAVING JURISDICTION** & OBTAIN ALL NECESSARY PERMITS & APPROVALS FROM LOCAL AUTHORITIES. EXECUTE ALL WORK AS PER THE MUNICIPAL REQUIREMENTS.
- (B) GENERAL CONTRACTOR TO EXECUTE WORK TO DRIVEWAY ENTRANCE UNDER SUPERVISION OF THE **AUTHORITY HAVING JURISDICTION**. REFER TO ENTRANCE PERMIT REQUIREMENTS WHERE EXIST. DRIVEWAY ENTRANCE TO BE MODIFIED OR INSTALLATION OF NEW ENTRANCE AS PER MUNICIPAL REQUIREMENTS. PROVIDE NEW CONC. ENTRANCE CURBS TO MATCH EXISTING WHERE INDICATED.
- (L) PLANTING BEDS, TREE PLANTINGS, LANDSCAPE FEATURES & SODDED AREAS
- (SW) CONCRETE SIDEWALK
- (DC) CONCRETE SIDEWALK DROP CURB
- (CP) CANADA POST (COORD. W/ A102)

SIGN LEGEND

- (A) STOP SIGN
- (F) NO PARKING - FIRE ROUTE
- (L) NO PARKING - BY PERMIT ONLY, BARRIER-FREE PARKING, VAN ACCESSIBLE - TYPE 'A'
- (D) VISITOR PARKING ONLY
- (R) PEDESTRIAN CROSSING SIGN

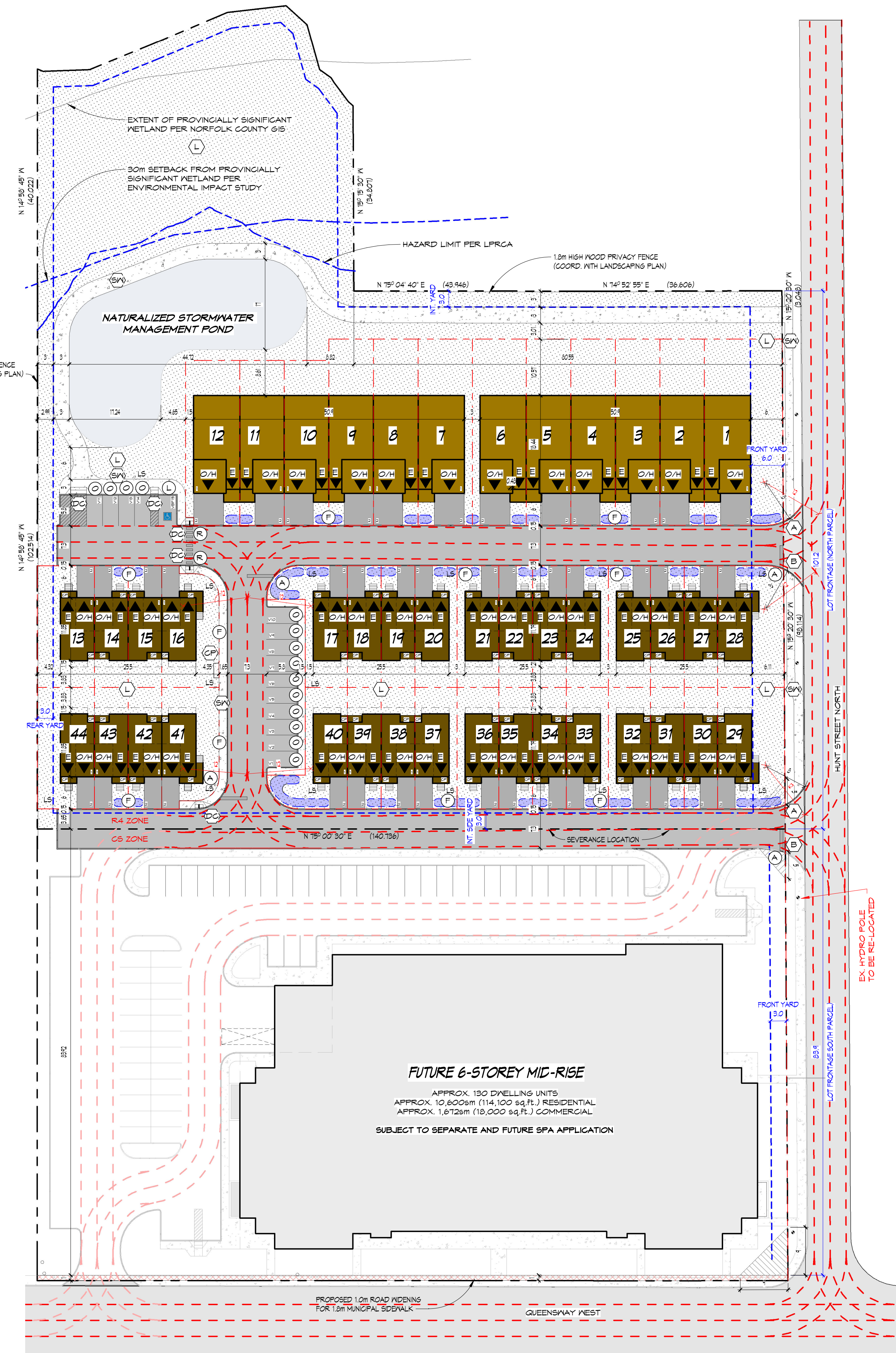
NOTE:

CONFIRM LOCATIONS & CONTENT OF ALL SIGNAGE W/ THE OWNER & **AUTHORITY HAVING JURISDICTION** PRIOR TO FABRICATION & ERECTION. PROPOSED SITE SIGNAGE TO COMPLY W/ SIGNAGE BY-LAWS.

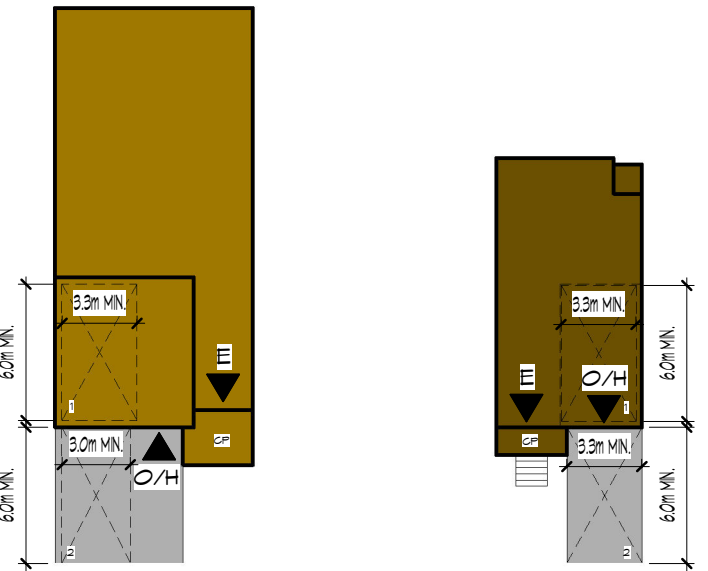
NOTE:

ALL SIGNS TO BE CENTERED ON POSTS TYP.

1 SITE PLAN
A101 SCALE 1:500



TYPICAL PARKING SPACE DIMENSIONS:



TYP. 2-STOREY

TYP. 3-STOREY

NOTE: MINIMUM PARKING SPACE SIZES ARE GOVERNED BY THE NORFOLK COUNTY ZONING BY-LAW, AS FOLLOWS:

- a) width of parking space:
 - for vehicles parked side by side - 3 metres
 - for vehicles parked with wall or fence adjacent - 3.3 metres
- b) depth of parking space:
 - for tandem parking - 6 metres

ALL PARKING SPACES SHALL PROVIDE MINIMUM SIZES AND SHALL NOT INCLUDE ANY ENCROACHMENTS (E. ALL STARS, PROJECTIONS, COLUMNS, ETC. MUST NOT ENCRDACH INTO MINIMUM PARKING SPACE SIZES)

SITE PLAN LEGEND

- ENTRANCE / EXIT DOOR
- ENTRANCE / EXIT DOOR (OVERHEAD DOOR W/ OPERATOR)
- PROPERTY BOUNDARY LINE(S)
- SETBACKS
- SNOW STORAGE (ALL ADDITIONAL SNOW TO BE TAKEN AWAY BY OWNER) (ALL ADDITIONAL SNOW TO BE PILED IN AREAS SHOWN ON SITE PLAN)
- FIRE ROUTE (6m WIDE / 12m CENTER RADIUS)
- COVERED PORCH
- PAINTED GRAPHICS ON ASPHALT / CONC. (COORD. W/ THE CITY / TOWN HAVING JURISDICTION GUIDELINES)
- ACCESSIBLE SIGN ON ASPHALT / CONC. (WHITE & BLUE COLOUR)
- DIRECTIONAL SIGNS ON ASPHALT / CONC. (WHITE COLOUR)
- CROSSWALK / CROSSING (WHITE COLOUR)
- VEHICULAR STALL MARKINGS (YELLOW COLOUR)
 - VBFF - BARRIER FREE / ACCESSIBLE
 - VH - VISITOR
 - SH - SPARE
 - A1 - ONE REQ.'D DWELLING PARKING
 - A2 - TWO REQ.'D DWELLING PARKING (LETTER REPRESENTS UNIT TYPE)
- DIAGONAL MARKINGS (WHITE / YELLOW COLOUR)
- STOP SIGN VEHICULAR MARKINGS (WHITE COLOUR)
- LIGHT STANDARD (COORD. W/ PHOTOMETRICS)
- SIGN (COORD. W/ SIGN LEGEND)
- DROP CURB
- LOCATED ON THE PROPERTY LINES TYP. VISIBILITY TRIANGLES / SIGHT / DAYLIGHT TO BE MAINTAINED (REMAIN CLEAR) @ BOTH SIDES OF ALL LANEWAY / DRIVEWAY & INTERSECTIONS. THE MAX. HEIGHT OF ANY OBJECT OR MATURE VEGETATION WITHIN THE VISIBILITY TRIANGLE IS NOT TO EXCEED REQ.'D HEIGHT ABOVE THE CENTRELINE OF THE CORRESPONDING ADJACENT STREET
- NORFOLK COUNTY 5m x 5m LANEWAY 1m HEIGHT NO PARKING ALLOWED
- TACTILE WARNING SURFACE INDICATORS (800mm LENGTH - TILE) (FOR SITE CONDITIONS ONLY) (COORD. W/ OPSD 310.39)
- ON SITE
 - KNEISK ARMOR-TILE CAST IN PLACE IN NEW SURFACES (COLOUR TO BE VERIFIED BY ARCHITECT)
 - KNEISK ADVANTAGE CAST IRON CAST IN PLACE IN NEW SURFACES (UNCOATED NATURAL PATINA) (COLOUR TO BE VERIFIED BY ARCHITECT)
- HATCH IDENTIFICATION LEGEND
 - CONC. SIDEWALK / PAD / CROSSWALK / SIDEWALK / LANEWAY / STAIRS / ETC.
 - AREA OF NEW SOD ON 150mm TOPSOIL (COORD. W/ CONST. FOR EXTENTS)
 - 2-STOREY, 1 GARAGE (6.4m W x 10.4m D)
 - 3-STOREY, 1 GARAGE (6.4m W x 11.6m D)

GENERAL NOTES:

- SHOP DWS.'S ARE TO BE DIMENSIONED IN METRIC UNITS (IMPERIAL & METRIC BOTH SHOWN IS ACCEPTABLE)
- COORD. W/ EX. SURVEY DWS. FOR LINE WEIGHTS & TYPES AS REVIT IS NOT COMPATIBLE WITH AUTOCAD LINE WEIGHTS & TYPES

NO.	DATE	ISSUANCE
4	2026.05.27	ISSUED FOR SPA SUBMISSION #3
3	2025.12.17	ISSUED FOR SPA SUBMISSION 2
2	2024.06.12	ISSUED FOR SPA (UPDATED)
1	2024.05.17	ISSUED FOR SPA
NO.	DATE	ISSUANCE

PROPERTY LEGAL DESCRIPTION:
PARTS 1, 2, & 3 ON PLAN STR-11733

APPLICANT:

WH HOLDINGS LIMITED
HERBERT CHIU
3 FERNWOOD COURT,
RICHMOND HILL, ONTARIO
L4B 3C2
1.416.919.9768

DO NOT SCALE DRAWINGS. CALL FOR ANY CLARIFICATIONS THAT ARE REQUIRED. FIELD VERIFY AT ALL BUILT CONDITIONS
ALL DWS.'S ARE TO BE READ IN COLOUR
ORIGINAL PAGE SIZE ARCH D' - 24" x 36"



G. DOUGLAS VALLEE LIMITED
2 TALBOT STREET NORTH
SIMCOE ONTARIO N3Y 3W4
(519) 426-6270

PROJECT TITLE:
HUNT ST. N. RESIDENTIAL
HUNT STREET NORTH,
SIMCOE, ON N3Y 2M9

DRAWING TITLE:
SITE PLAN

CHECKED BY:
JVLHR

DRAWING SCALE:
As indicated

PROJECT NO:
22-013

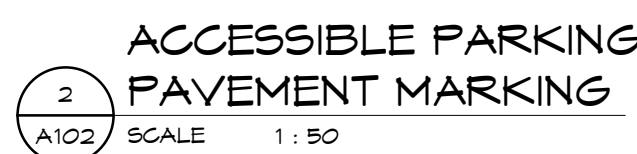
DRAWN BY:
LHR/BM

DRAWING NO.:

A101



1 NORFOLK
A102 SCALE 1:200



APPLICANT:
WFH HOLDINGS LIMITED
HERBERT CHIU
3 FERNWOOD COURT,
RICHMOND HILL, ONTARIO
L4B 3C2
1.416.919.9768

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DRAWING TITLE:
SITE PLAN DETAILS

CHECKED BY:

JI/LHF

DRAWING SCALE:

As indicated

PROJECT NO.:
22-013

DRAWN BY:

BM

DRAWING NO.:

References

A102

HF'W HUNT STREET RESIDENTIAL DEVELOPMENT

SIMCOE

NORFOLK COUNTY



DRAWING LIST

G. DOUGLAS VALLEE LIMITED - CIVIL

- 22-013 C0V - COVER PAGE
- 22-013 C100 - SERVICING PLAN
- 22-013 C101 - GRADING PLAN
- 22-013 C102 - EROSION AND SEDIMENT CONTROL PLAN
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- 22-013 C104 - PLAN & PROFILE STREET C AND D
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- 22-013 GN1 - GENERAL NOTES & DETAILS 1
- 22-013 GN2 - GENERAL NOTES & DETAILS 2
- 22-013 SAN - SANITARY DRAINAGE AREAS
- 22-013 STM - STORM DRAINAGE AREAS
- 22-013 COM - COMPOSITE UTILITY PLAN

G. DOUGLAS VALLEE LIMITED - ARCHITECTURE

22-013 A100 - COVER SHEET SPA
22-013 A101 - SITE PLAN
22-013 A102 - SITE PLAN DETAILS

ADESSO LANDSCAPING

L-1 - TREE PROTECTION PLAN
L-2 - TREE INVENTORY
L-3 - LANDSCAPE PLAN
L-4 - RESTORATION PLANTING PLAN

GEOPROCESS RESEARCH ASSOCIATES

01 - PLAN, PROFILE AND CROSS SECTIONS
02 - CONSTRUCTION DETAILS
03 - ESC, FLOW MANAGEMENT AND NOTES
04 - RESTORATION PLAN AND PLANTING NOTES

SEI ELECTRICAL ENGINEERING

ES001 - ELECTRICAL GENERAL NOTES LEGEND AND SCHEDULES
ES100 - ELECTRICAL SITE PLAN LIGHTING LAYOUT

HYDRO ONE NETWORKS INC.

304200510 - ZSD - HEW HUNT STREET RESIDENTIAL DEVT

SITE BENCHMARKS:

1. SPIKE IN FACE OF WOOD HYDRO POLE AT NORTHWEST CORNER
OF QUEENSWAY WEST AND HUNT STREET.
ELEVATION 217.99m
2. TOP OF LARGE PUMPER NOZZLE OF FIRE HYDRANT AT
NORTHWEST CORNER OF QUEENSWAY WEST AND HUNT STREET.
ELEVATION 218.16m

[illegible]

NOTE:
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ALL WORK, MATERIALS AND PROCESSES TO ABIDE TO NORFOLK COUNTY STANDARDS AND SPECIFICATIONS

LEGAL DESCRIPTION

LOT 35, 36, 38, 39, 40, 41, 42, 43 & 44, BLOCK 9 REGISTERED PLAN 182, TOWN OF SIMCOE AND PART OF LOT 2 CONCESSION 14, TOWNSHIP OF WINDHAM IN NORFOLK COUNTY.

APPLICANT INFORMATION

APPLICANT INFORMATION
 APPLICANT: HFW HOLDINGS LIMITED
 TELEPHONE: 416-919-9768
 ADDRESS: 3 FERNWOOD COURT, RICHMOND HILL,
 ONTARIO, L4B 3C2

PRELIMINARY
NOT TO BE USED
FOR CONSTRUCTION



G. DOUGLAS VALLEE LIMITED
2 TALBOT STREET NORTH
SIMCOE, ONTARIO N3Y 3W4
(519) 426-6270

Stamp



Project Title	
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HFW HUNT STREET
RESIDENTIAL DEVELOPMENT
SIMCOE - NORFOLK COUNTY

Drawing Title

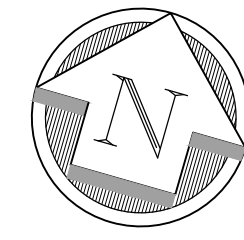
COVER PAGE

Designed by :	Drawn By :
NLO	NLO/NBN

Checked by :	Date Started :
JTI	JAN 2023

Drawing Scale :	Drawing No.
AS NOTED	001

Project No. **22-013**



1. ALL EX. WATER AND SANITARY SERVICES TO THE SUBJECT PROPERTY ARE TO BE DISCONNECTED AND REMOVED AT THE START OF CONSTRUCTION.
2. PARKING AND AISLE PAVEMENT TO ADHERE TO PAVEMENT DESIGNS CONTAINED IN THE GEOTECHNICAL REPORT BY THE CONSULTANT DATED OCTOBER 20, 2022 AND NORFOLK COUNTY DESIGN CRITERIA:

HEAVY DUTY:

40mm HL3
80mm HL8
150mm GRANULAR A
300mm GRANULAR B
3. GENERAL CONTRACTOR TO COORDINATE ALL WORK WITHIN THE SITE WITH THE COUNTY AND OBTAIN ALL NECESSARY PERMITS AND APPROVALS FROM LOCAL AUTHORITIES. EXECUTE ALL WORK AS PER NORFOLK COUNTY REQUIREMENTS.
4. GENERAL CONTRACTOR TO EXECUTE WORK TO CONSTRUCTION SITE ACCESS UNDER SUPERVISION OF THE ENGINEER. REFER TO ENTRANCE PERMIT REQUIREMENTS WHEN APPLICABLE. DRIVEWAY ENTRANCE TO BE MODIFIED OR INSTALLATION OF NEW ENTRANCE AS PER NORFOLK COUNTY REQUIREMENTS. PROVIDE NEW CONC. ENTRANCE CURBS TO MATCH EX. AS REQUIRED.
5. PRIOR TO THE COMMENCEMENT OF CONSTRUCTION, ALL BENCHMARKS, ELEVATIONS, DIMENSIONS AND GRADES MUST BE VERIFIED BY THE CONTRACTOR AND ANY DISCREPANCIES REPORTED TO THE ENGINEER.
6. AT LEAST TWO DIFFERENT BENCHMARKS MUST BE REFERRED TO AT ALL TIMES.
7. COORDINATE WITH SITE GRADING PLAN FOR PROPOSED FINAL FINISH GRADE ELEVATIONS AND DRAINAGE SLOPES.
8. TRAFFIC CONTROL SHALL BE IMPLEMENTED BY THE CONTRACTOR IN ACCORDANCE WITH OTM TEMPORARY CONTROL CHENS BOOK 7. APPROVAL FOR THE TRAFFIC CONTROL WILL BE SOUGHT FROM THE MUNICIPALITY BY THE CONTRACTOR.
9. ALL ROOF WATER LEADERS SHALL BE DISCHARGED TO SPLASH PADS.

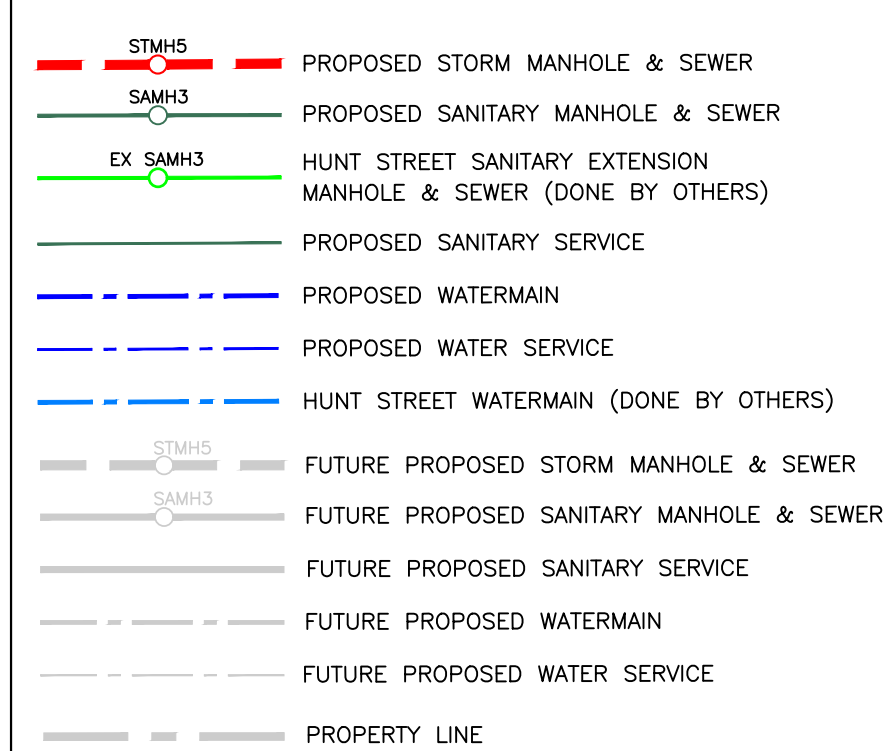
- NOTES:

1. PROPOSED SEWERS TO ADHERE TO THE FOLLOWING OPSD:

1200mm MAINTENANCE HOLE STRUCTURE	OPSD 701.010
1200mm CATCH BASIN MAINTENANCE HOLE GRATE	OPSD 400.010

ALL COMPONENTS OF THE PROPOSED STORM SEWERS ARE TO ADHERE TO DIVISION 700 OF THE OPSD.
2. RESTORE EX. COUNTY INFRASTRUCTURE TO COUNTY STANDARDS:
 - REFER TO TRENCHING RESTORATION DETAIL ON DRAWING GN.
 - CONCRETE CURB TO MATCH EX.
 - CONCRETE SIDEWALK TO MATCH EX. WIDTH.
 - CONSTRUCTION PER OPSD AND OPSD.
4. ALL WATERMAIN TO BE RESTRAINED AT ALL BENDS, TEES, REDUCERS, DEAD-ENDS, AND VALVES AS PER DETAILS ON DWG. GN.
5. ALL WATERMAIN PIPE SHALL PVD DR18 AND CONFORM TO AWWA C900 AND CSA B137.3.
6. ALL HYDRANTS LEADS SHALL BE 150mm MINIMUM.

LEGEND

[illegible]

NOTE:
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ALL WORK, MATERIALS AND PROCESSES TO ABIDE TO NORFOLK COUNTY STANDARDS AND SPECIFICATIONS

LEGAL DESCRIPTION
LOT 35, 36, 38, 39, 40, 41, 42, 43 & 44, BLOCK 9 REGISTERED PLAN
182, TOWN OF SIMCOE AND PART OF LOT 2 CONCESSION 14,
TOWNSHIP OF WINDHAM IN NORFOLK COUNTY.

APPLICANT INFORMATION

APPLICANT: HFW HOLDINGS LIMITED
TELEPHONE: 416-919-9768
ADDRESS: 3 FERNWOOD COURT, RICHMOND HILL,
ONTARIO, L4B 3C2

BENCHMARKS

BM #1: SPIKE IN FACE OF WOOD HYDRO POLE AT NORTHWEST
CORNER OF QUEENSWAY WEST AND HUNT STREET.
ELEV. 217.99m

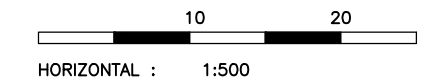
BM #2: TOP OF LARGE PUMPER NOZZLE OF FIRE HYDRANT AT
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STREET.
ELEV. 218.16m

PRELIMINARY
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DRAWING LIST
G. DOUGLAS VALLEE LIMITED DRAWINGS

- 22-013 COV - COVER PAGE
- 22-013 C100 - SERVICING PLAN
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SCALE:



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G. DOUGLAS VALLEE LIMITED
2 TALBOT STREET NORTH
SIMCOE, ONTARIO N3Y 3W4
(519) 426-6270

Stamp



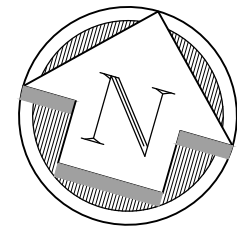
Project Title

**HFV HUNT STREET
RESIDENTIAL DEVELOPMENT**

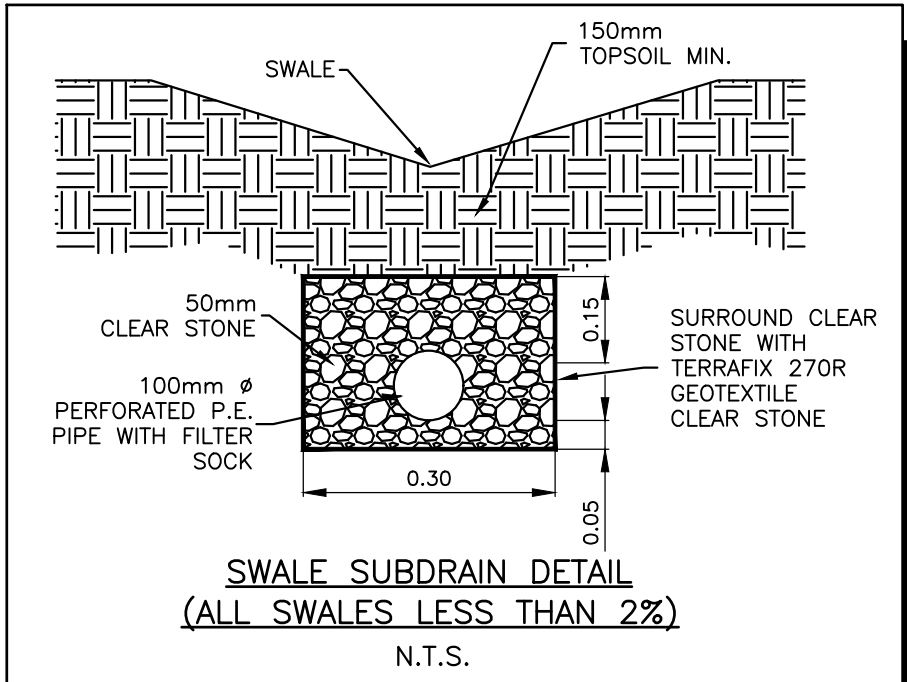
SIMCOE - NORFOLK COUNTY

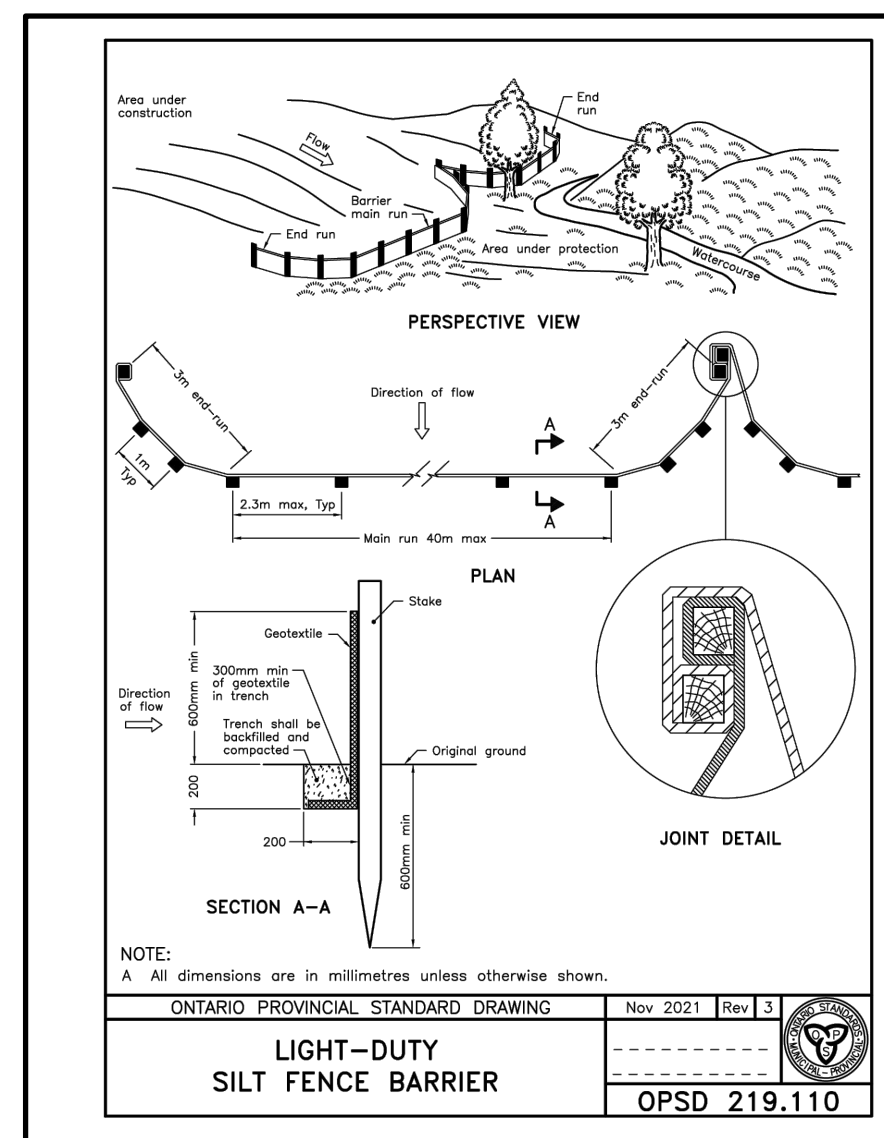
Drawing Title	SERVICING PLAN
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Designed by : NLO	Drawn By : NLO
Checked by : JI	Date Started : JAN 2023
Drawing Scale : 1:500	Drawing No. C100
Project No. 22-013	

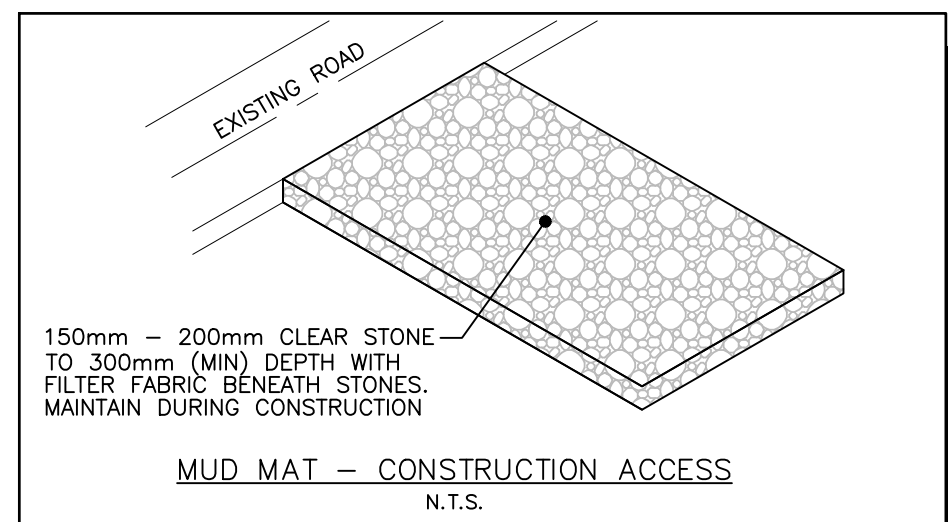


Drawing Scale : 1:500	Drawing No. C101
Project No. 22-013	





CATCHBASIN SEDIMENT PROTECTION DETAIL
N.T.S.



- LEGEND**
- | | |
|---|--|
|  | EXISTING GROUND CONTOUR |
|  | PROPOSED SWALE |
|  | PROPOSED LIGHT DUTY SILT FENCE
AS PER OPSPD 219.110 |
|  | PROPOSED GRADING MATCH LINE |
|  | PROPOSED CATCHBASIN |
|  | PROPOSED CATCHBASIN MANHOLE |

1.	THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR DESIGN AND PROVISION OF ALL SEDIMENT CONTROL MEASURES AS MAY BE REQUIRED TO PROTECT THE WORK SITE OR THE ADJACENT LANDS, REGARDLESS OF THE SOURCE OR ORIGIN OF EROSION OR SEDIMENTS. IF THE ENGINEER IS NOT SATISFIED WITH THE EXTENT OF THE MEASURES TAKEN, THE ENGINEER MAY DIRECT THAT ADDITIONAL CONTROLS BE PUT IN PLACE.	5.	ALL COLLECTED SEDIMENT TO BE DISPOSED OF AT AN APPROVED LOCATION.
		6.	MINIMIZE AREA DISTURBED DURING CONSTRUCTION.
		7.	ALL DEWATERING TO BE DISPOSED OF IN AN APPROVED SEDIMENTATION BASIN.
	THE ENGINEERS REQUIREMENTS FOR SEDIMENT AND EROSION CONTROL SHALL BE CONSIDERED ABSOLUTE MINIMUMS. THE CONTRACTOR IS RESPONSIBLE TO ENSURE THAT THE MEASURES ARE ADEQUATE SHALL LIE SOLELY ON THE CONTRACTOR. ANY DAMAGE RESULTING FROM FAILURE OF THESE MEASURES SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE.	8.	PROTECT ALL CATCH BASINS, MANHOLES AND PIPE ENDS FROM SEDIMENT INTRUSION WITH GEOTEXTILE AND MAINTAIN IN FREE FLOWING STATE (PER AFWA 270R OR APPROVED EQUIVALENT). REFER TO DETAIL THIS PAGE.
		9.	KEEP ALL SUMPS CLEAN DURING CONSTRUCTION INCLUDING OIL GR. SEPARATOR
2.	PROTECT ALL EXPOSED SURFACES AND CONTROL ALL RUNOFF DURING CONSTRUCTION.	10.	PREVENT WIND-BLOWN DUST.
3.	ALL EROSION CONTROL MEASURES TO BE IN PLACE UNTIL RESTORATION IS COMPLETE.	11.	CONTRACTOR TO PROVIDE MUD MAT AT ALL CONSTRUCTION ENTRANCES.
4.	MAINTAIN EROSION CONTROL MEASURES DURING CONSTRUCTION.		

1. STRIP TOPSOIL AND STOCK PILE AS DIRECTED.
2. EXPOSED SURFACES TO BE INSPECTED AND APPROVED BY GEOTECHNICAL ENGINEER PRIOR TO PLACEMENT OF FILL.
3. ENGINEERED FILL SHALL BE PLACED UNDER DIRECT SUPERVISION OF GEOTECHNICAL ENGINEER. NO ENGINEERED FILL SHALL BE PLACED WITHOUT THE GEOTECHNICAL ENGINEER ON SITE.
4. ENGINEERED FILL SHALL BE PLACED IN 300mm LIFTS AND COMPACTED TO 98% SPMD. TO THE ELEVATIONS SPECIFIED.
5. ENGINEERED FILL MATERIAL SHALL BE ON SITE NATIVE MATERIAL OR SELECT SUBGRADE MATERIAL IMPORTED TO SITE. THE SOURCE OF SELECT SUBGRADE MATERIAL MUST BE APPROVED BY THE GEOTECHNICAL CONSULTANT.

- ### CUT/FILL LEGEND
- | | |
|---|------------------------|
|  | FILL IN EXCESS OF 0.5m |
|  | CUT IN EXCESS OF 0.5m |

[illegible]

NOTE: THE CONTRACTOR IS CAUTIONED THAT ALL OF THE EXISTING UTILITY LOCATIONS ARE NOT INDICATED ON THIS DRAWING. THE CONTRACTOR MUST ARRANGE FOR LOCATES FROM EACH AREA UTILITY COMPANY PRIOR TO ANY CONSTRUCTION OR EXCAVATION. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR THE PROTECTION OF ALL UTILITIES INCLUDING THOSE NOT INDICATED ON THIS DRAWING. G. THE CONTRACTOR SHALL BE LIABLE FOR ANY DAMAGE TO OR DAMAGE TO ANY EXISTING UTILITY WHICH MAY OR MAY NOT BE INDICATED ON THIS DRAWING.

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LEGAL DESCRIPTION

LOT 35, 36, 38, 39, 40, 41, 42, 43, 4 & 4, BLOCK 9 REGISTERED PLAN 182, TOWNSHIP OF SIMCOE AND PART OF LOT 2 CONCESSION 14, TOWNSHIP OF WINDHAM IN NORFOLK COUNTY.

APPLICANT INFORMATION

APPLICANT: HRW HOLDINGS LIMITED
TELEPHONE: 416-663-1111
ADDRESS: 3 FERNWOOD COURT, RICHMOND HILL,
ONTARIO, L4B 3C2

BENCHMARKS

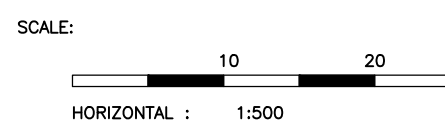
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PRELIMINARY
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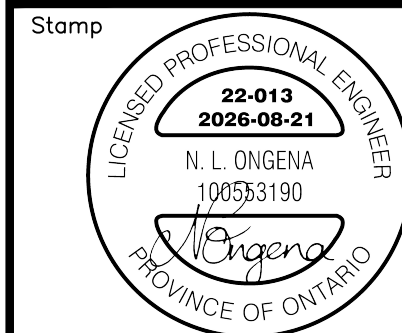


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G. DOUGLAS VALLEE LIMITED
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SIMCOE, ONTARIO N3Y 3W4
(519) 426-6270



Project Title
HFV HUNT STREET RESIDENTIAL DEVELOPMENT SIMCOE - NORFOLK COUNTY

Drawing Title
EROSION AND SEDIMENT CONTROL PLAN

Designed by :	NLO	Drawn By :	NLO/NBN
Checked by :	JTI	Date Started :	JAN 2023
Drawing Scale :	1:500	Drawing No.	C102
Project No.	22-013		

[illegible]

NOTE:
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ALL WORK, MATERIALS AND PROCESSES TO ABIDE TO NORFOLK COUNTY STANDARDS AND SPECIFICATIONS

LEGAL DESCRIPTION

LOT 35, 36, 38, 39, 40, 41, 42, 43 & 44, BLOCK 9 REGISTERED PLAN 182, TOWN OF SIMCOE AND PART OF LOT 2 CONCESSION 14, TOWNSHIP OF WINDHAM IN NORFOLK COUNTY.

APPLICANT INFORMATION

APPLICANT: HFW HOLDINGS LIMITED
TELEPHONE: 416-919-9768
ADDRESS: 3 FERNWOOD COURT, RICHMOND HILL,
ONTARIO, L4B 3C2

BENCHMARKS

BM #1: SPIKE IN FACE OF WOOD HYDRO POLE AT NORTHWEST CORNER OF QUEENSWAY WEST AND HUNT STREET.
ELEV. 217.99m

BM #2: TOP OF LARGE PUMPER NOZZLE OF FIRE HYDRANT AT NORTHWEST CORNER OF QUEENSWAY WEST AND HUNT STREET.
ELEV. 218.16m

PRELIMINARY
NOT TO BE USED
FOR CONSTRUCTION

DRAWING LIST

C. DOUGLAS VALLÉE LIMITED DRAWINGS

- 22-013 COV - COVER PAGE
- 22-013 C100 - SERVING PLAN
- 22-013 C101 - GRADING PLAN
- 22-013 C102 - EROSION AND SEDIMENT CONTROL PLAN
- 22-013 C103 - PLAN & PROFILE STREET A AND B
- 22-013 C104 - PLAN & PROFILE STREET C AND D
- 22-013 C105 - PLAN & PROFILE SWM POND AND OUTLET
- 22-013 C106 - REMOVALS PLAN
- 22-013 G01 - GENERAL NOTES & DETAILS 1
- 22-013 G02 - GENERAL NOTES & DETAILS 2
- 22-013 G03 - SANITARY DRAINAGE AREAS
- 22-013 STM - STORM DRAINAGE AREAS
- 22-013 COM - COMPOSITE UTILITY PLAN

SCALE:



HORIZONTAL : 1 : 500



VERTICAL : 1 : 100

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CLARIFICATIONS THAT ARE REQUIRED. FIELD
VERIFY AT ALL BUILT CONDITIONS

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ORIGINAL PAGE SIZE ARCH 'D' - 24" x 36"



G. DOUGLAS VALLEE LIMITED
2 TALBOT STREET NORTH
SIMCOE, ONTARIO N3Y 3W4
(519) 426-6270



Project	Title
	HFV HUNT STREET RESIDENTIAL DEVELOPMENT SIMCOE - NORFOLK COUNTY

Drawing Title

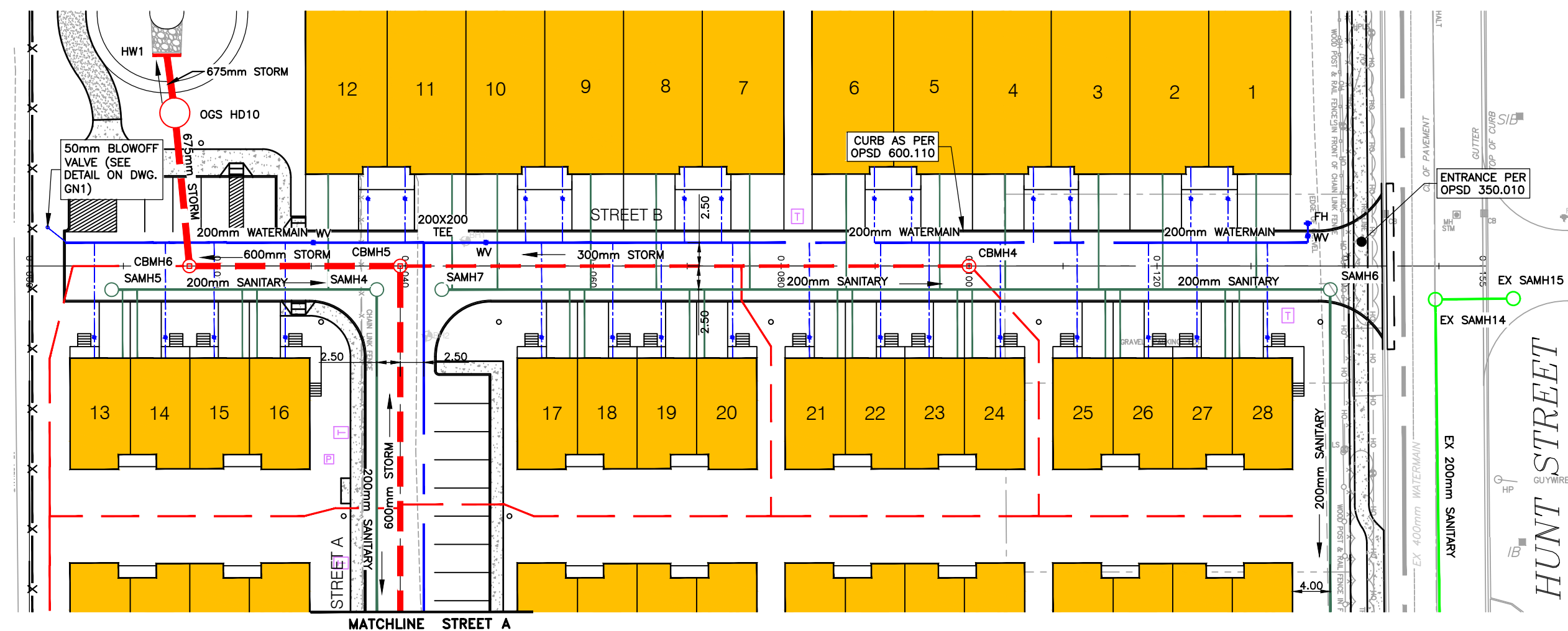
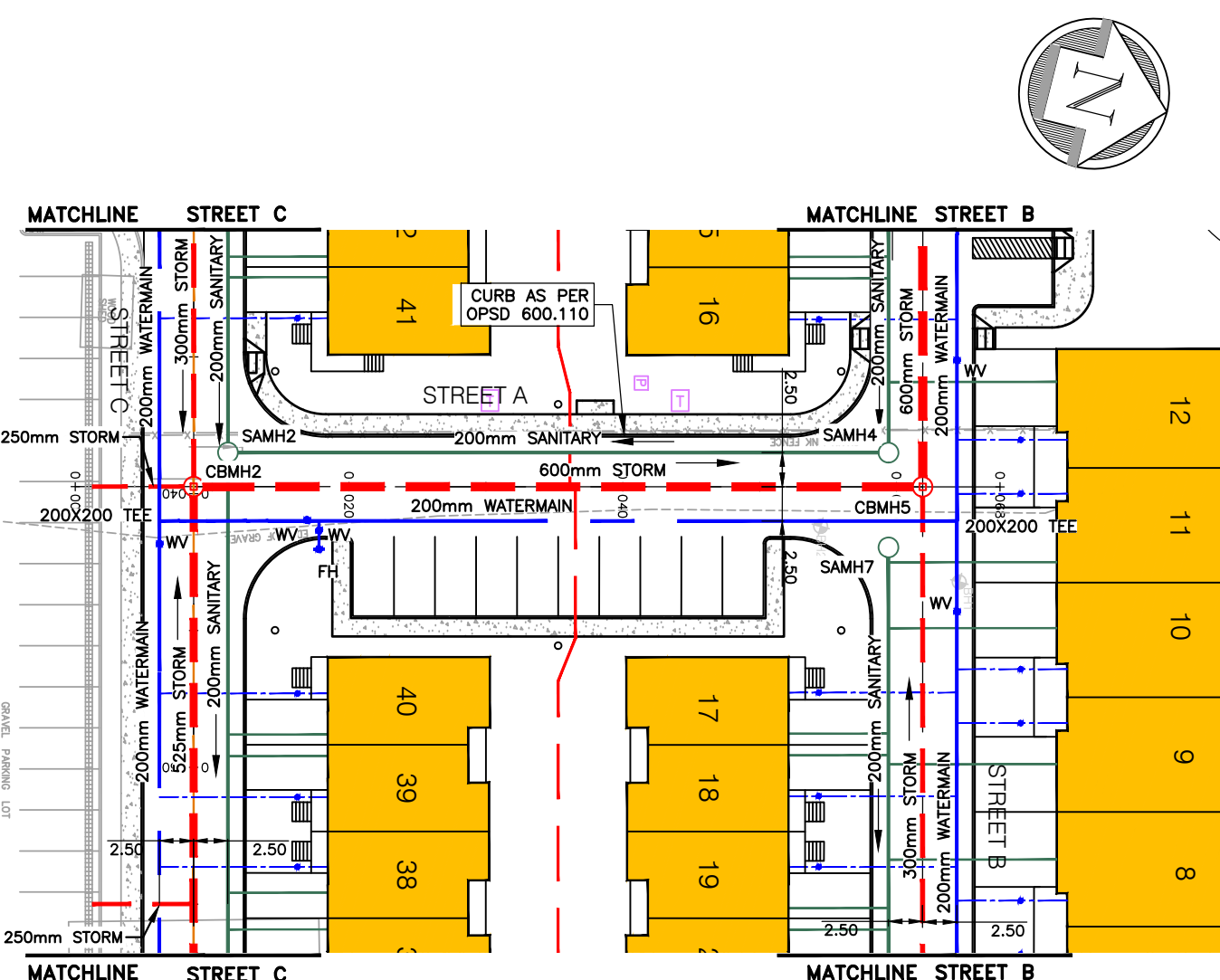
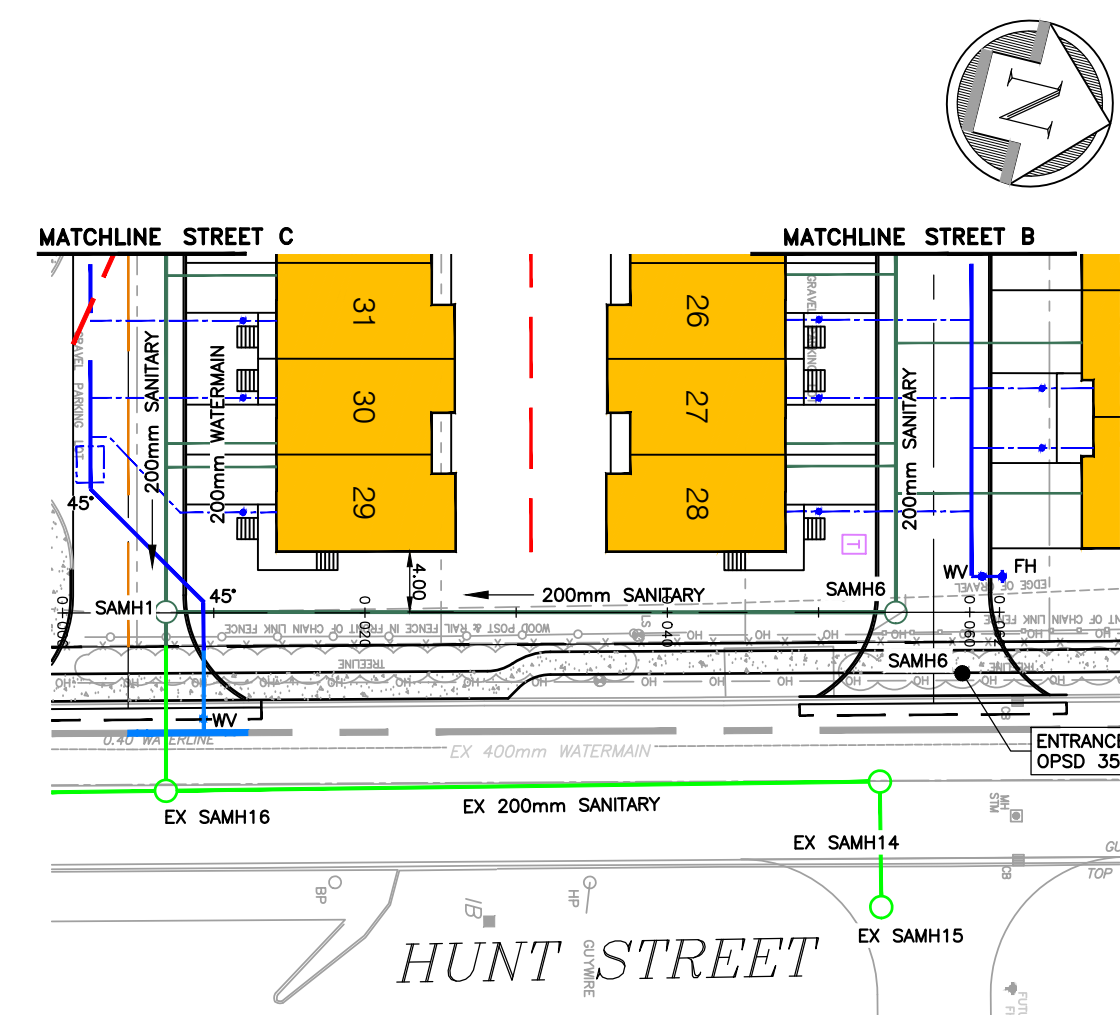
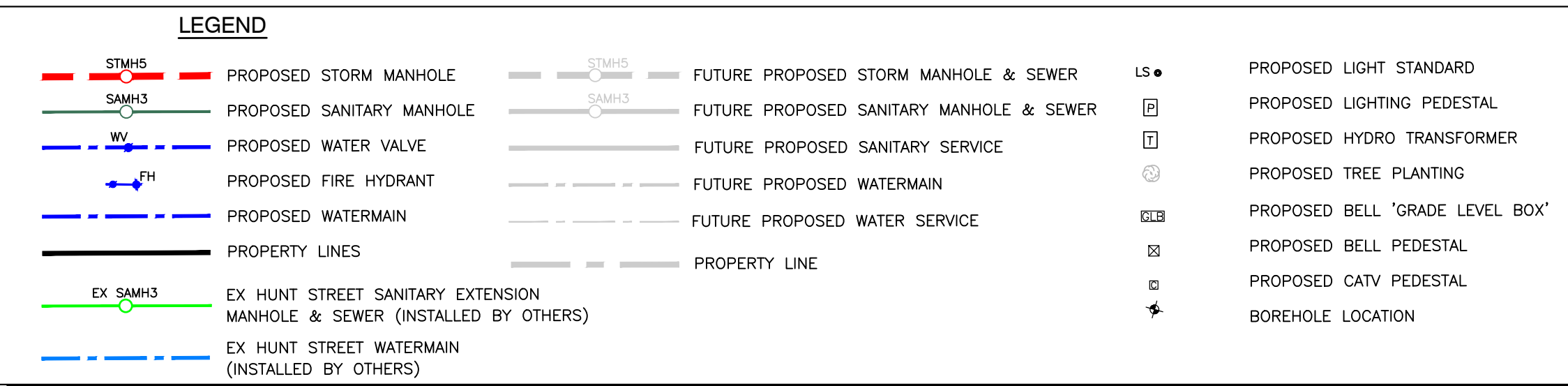
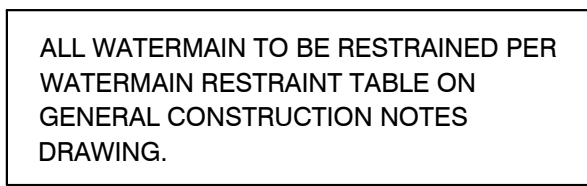
PLAN & PROFILE STREET A AND B

Designed by : NLO	Drawn By : NLO/NBN
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Checked by : JTI	Date Started : JAN 2023
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Drawing Scale :	Drawing No.
1:500	C100

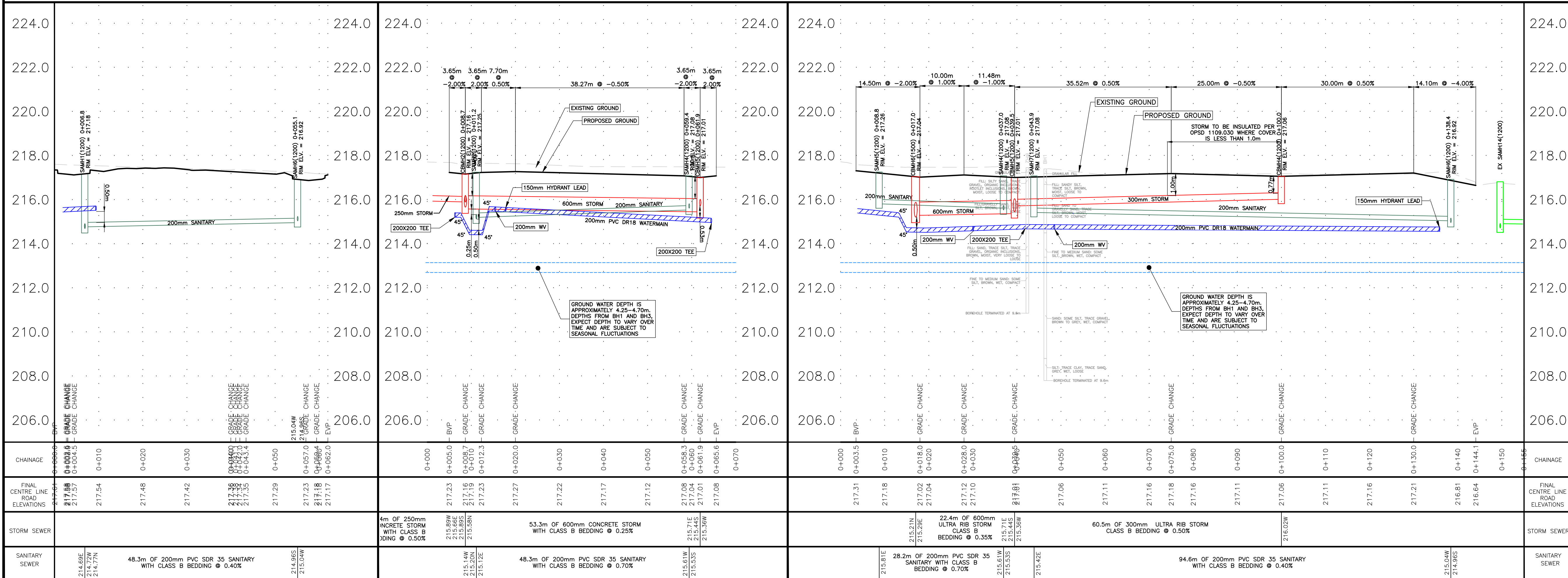
Project No.	22-013
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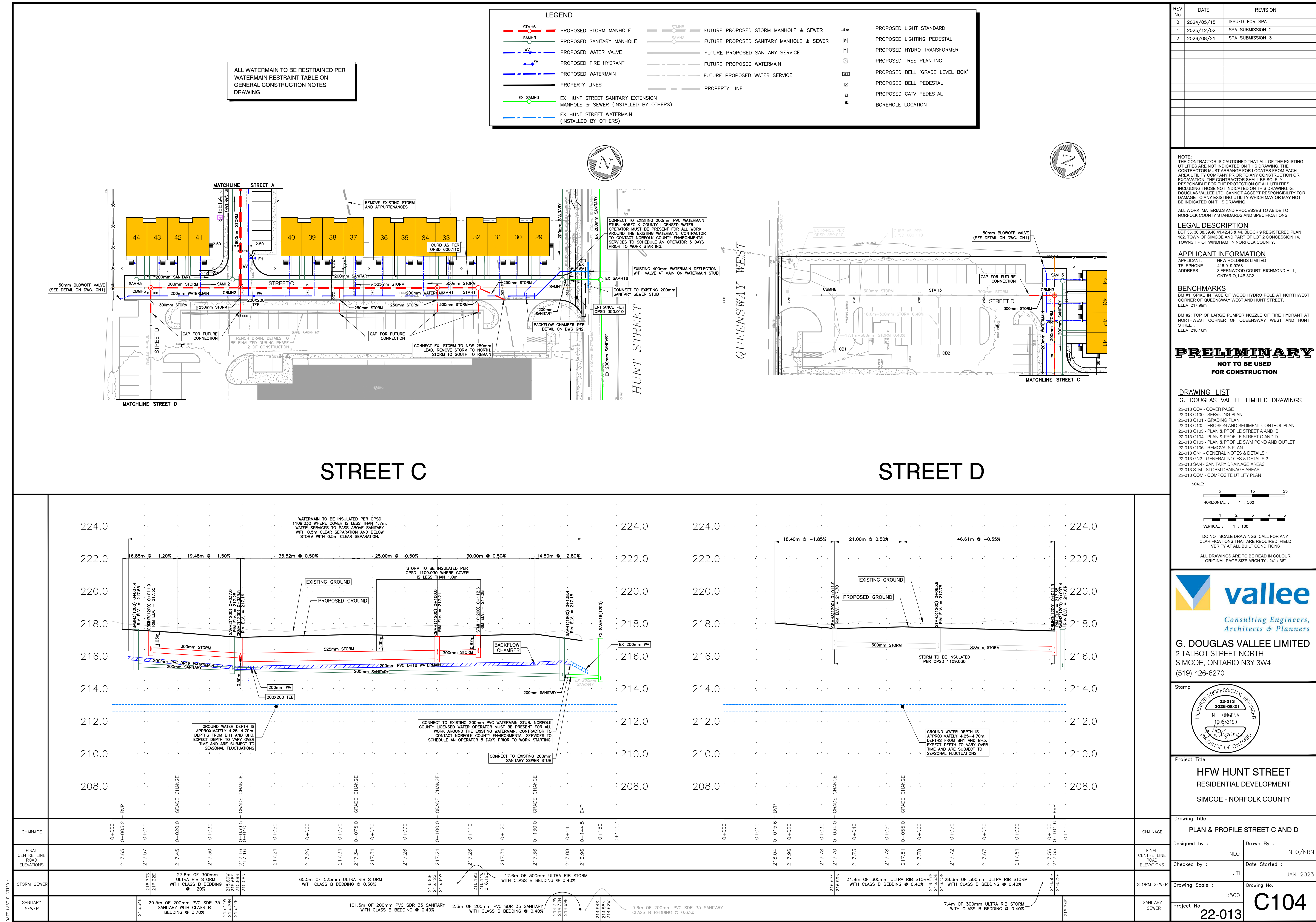


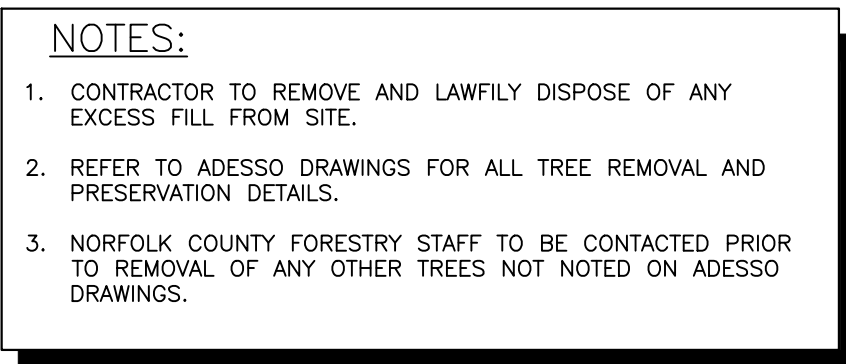
UNIT 28/29 SANITARY

STREET A

STREET B





[illegible]

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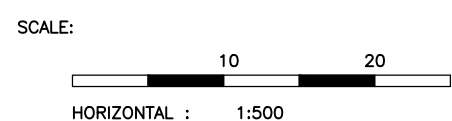
APPLICANT INFORMATION
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TELEPHONE: 416-918-8171
ADDRESS: 3 FERNWOOD COURT, RICHMOND HILL, ONTARIO, L4B 3C2

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G. DOUGLAS VALLEE LIMITED DRAWINGS

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2 TALBOT STREET NORTH
SIMCOE, ONTARIO N3Y 3W4
(519) 426-6270

Stamp



Project Title

**HFW HUNT STREET
RESIDENTIAL DEVELOPMENT**

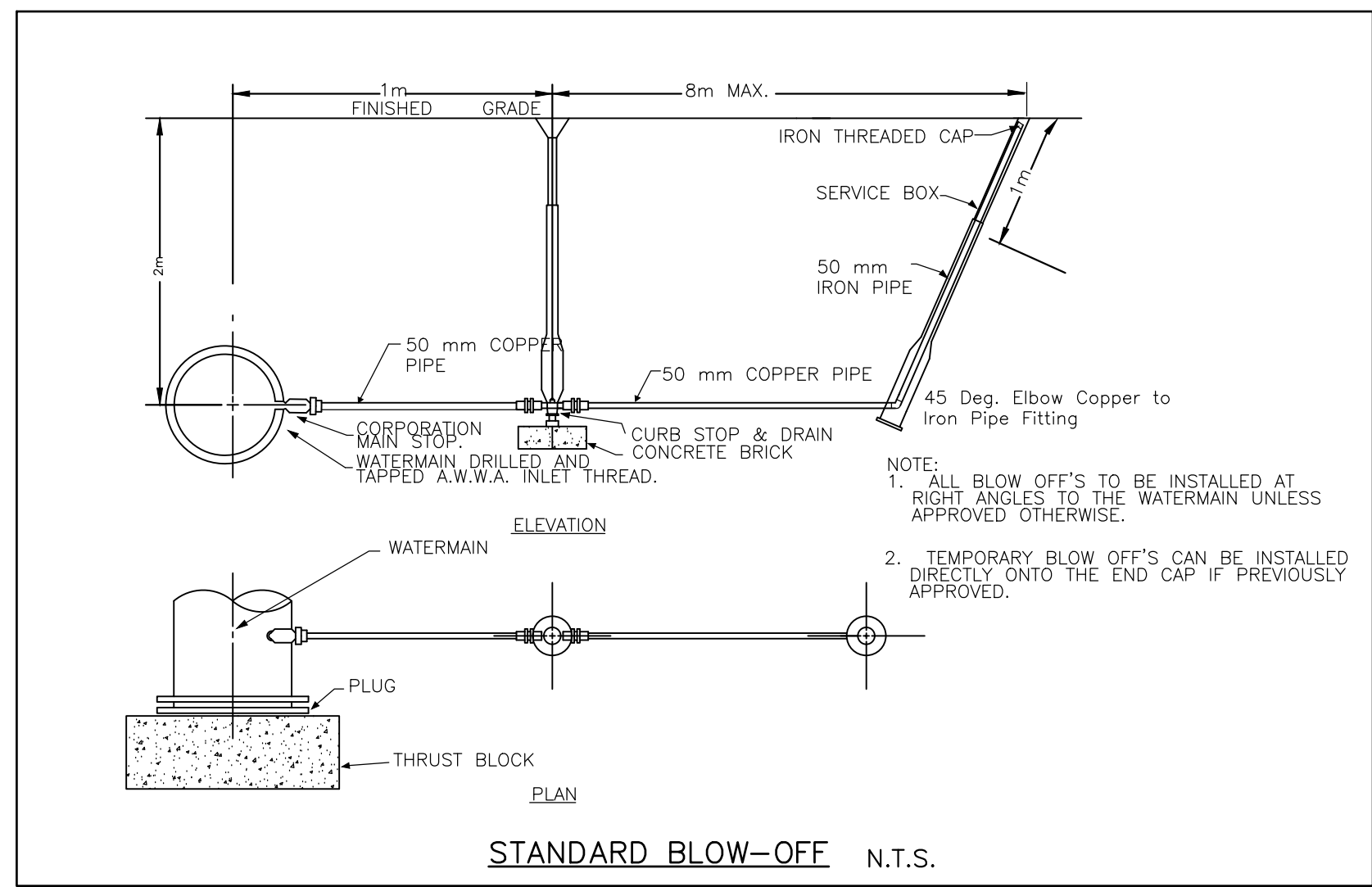
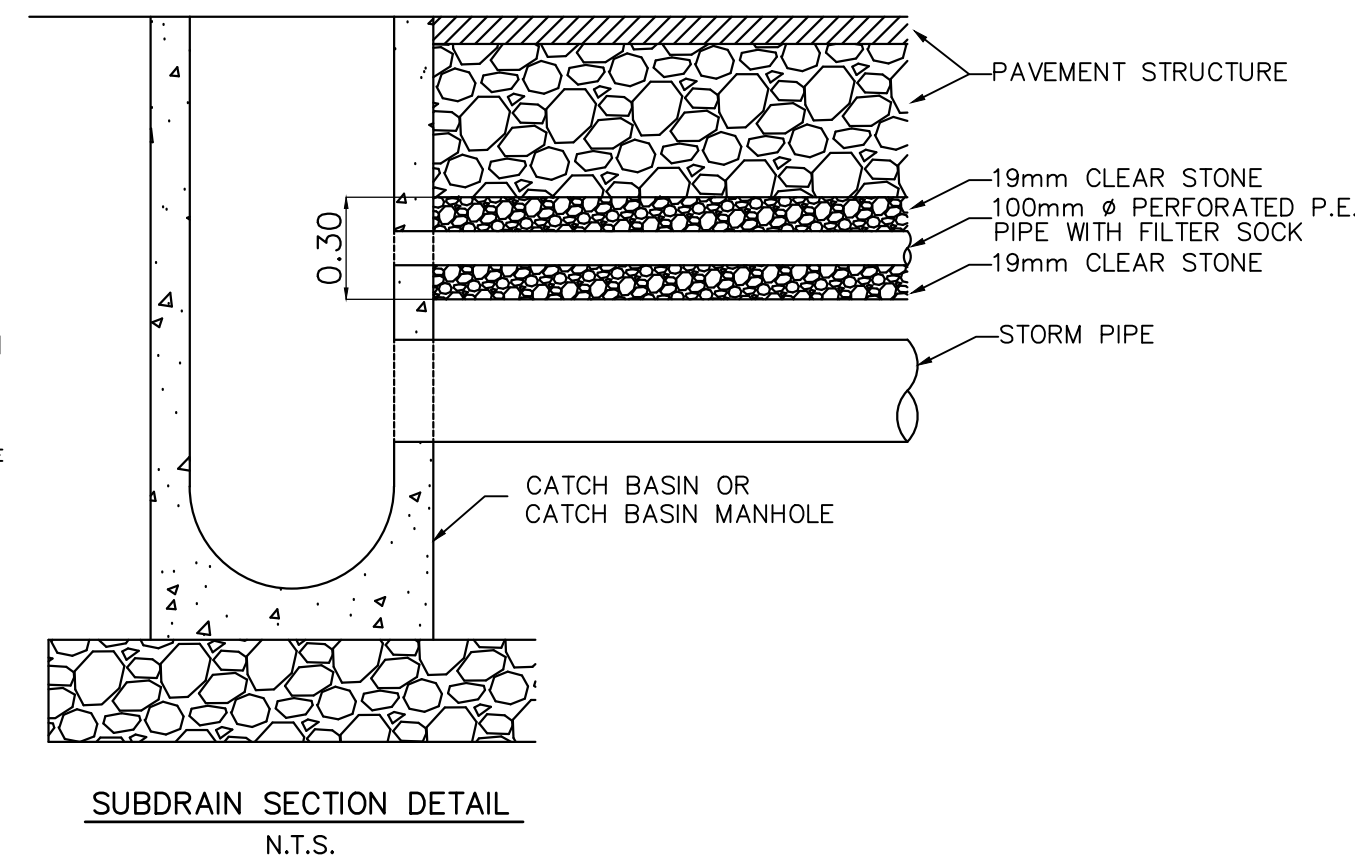
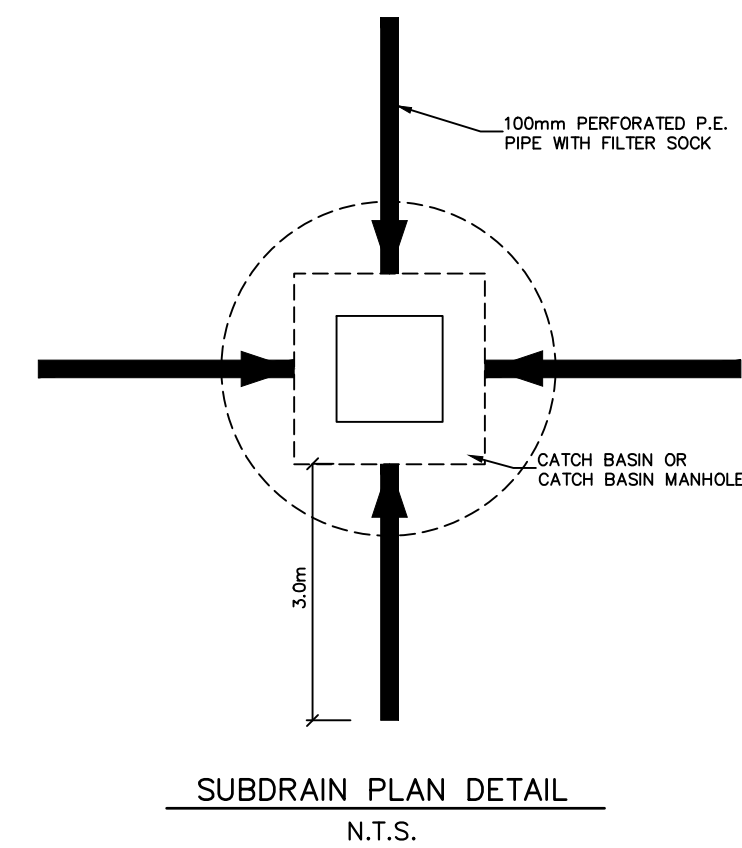
SIMCOE - NORFOLK COUNTY

Drawing Title	REMOVALS PLAN
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Designed by : NLO	Drawn By : NLO
Checked by : JI	Date Started : JAN 2023
Drawing Scale : 1:500	Drawing No. C106
Project No. 22-013	

GENERAL NOTES

- PRIOR TO CLOSING ANY STREET, THE CONTRACTOR SHALL OBTAIN CLEARANCE BY FILLING OUT THE COUNTY'S NOTICE OF ROAD CLOSURE FORM AND NOTIFY SCHOOL BUS OPERATORS OF STREETS USED FOR DETOUR AND THE DURATION OF THE DETOUR. THE CONTRACTOR MUST SUPPLY AND MAINTAIN ADEQUATE LOCAL DETOUR SIGNS AND LIGHTS. THE CONTRACTOR MUST MAINTAIN MAXIMUM ACCESS TO ALL PROPERTIES AS DIRECTED BY THE ENGINEER.
- THE CONTRACTOR SHALL CONSTRUCT TEMPORARY MEASURES TO CONTROL SILT ENTERING THE STORM DRAINAGE SYSTEM TO THE SPECIFICATIONS OUTLINED IN THE GUIDELINES ON EROSION AND SEDIMENT CONTROL FOR URBAN CONSTRUCTION SITES PREPARED BY THE MINISTRY OF NATURAL RESOURCES. THESE MEASURES ARE TO BE INSTALLED PRIOR TO COMMENCING ANY CONSTRUCTION FOR THIS STREET AND ARE TO REMAIN IN PLACE UNTIL CONSTRUCTION HAS BEEN COMPLETED TO THE SPECIFICATIONS OF THE ENGINEER.
- THE CONTRACTOR IS TO MEET ALL THE REQUIREMENTS OF THE OWNERS OF THE UTILITIES ON THIS PLAN, AND MUST MAKE SATISFACTORY ARRANGEMENTS WITH THE UTILITY COMPANIES FOR CROSSING THEIR INSTALLATIONS AND FOR PROVIDING ADEQUATE PROTECTION DURING CONSTRUCTION. PRIOR TO COMMENCING ANY CONSTRUCTION, ALL EXISTING UNDERGROUND UTILITIES SHALL BE LOCATED AND MARKED. ANY UTILITIES DAMAGED OR DISTURBED DURING CONSTRUCTION SHALL BE REPAIRED OR REPLACED TO THE SATISFACTION OF THE OWNER AT THE CONTRACTORS EXPENSE.
- ALL ORGANIC, SUITABLE OR UNSUITABLE MATERIALS BENEATH THE ROAD ALLOWANCES MUST BE REMOVED AND THESE AREAS BACKFILLED WITH AN APPROVED FILL MATERIAL, ALL TO THE SATISFACTION OF THE ENGINEER.
- PRIOR TO COMMENCING ANY CONSTRUCTION, ALL EXISTING SEWER OUTLET INFORMATION, BENCHMARKS, DIMENSIONS, ELEVATIONS AND GRADES MUST BE CHECKED AND VERIFIED AND ANY DISCREPANCIES REPORTED TO THE ENGINEER IMMEDIATELY.
- PDC's SHALL BE 100mmØ PVC SDR26 PRESSURE PIPE WITH CLASS 'B' BEDDING. PDC's SHALL BE LAID AT A 2% (min) GRADE G/W 22.5' OR 45' LONG RADIUS BENDS AS REQUIRED. PDC's SHALL BE CONNECTED TO THE EXISTING PDC's WITH APPROVED WATERTIGHT COUPLINGS. THE CONTRACTOR SHALL USE 22.5' OR 45' LONG RADIUS BENDS AND A MINIMUM 2% GRADE TO AVOID CONFLICTS WITH EXISTING SEWERS, WATERMANS AND UTILITIES.
- ALL CATCH BASIN LEADS FOR SINGLE CATCH BASINS SHALL BE 250mm Ø PVC SDR35 WITH CLASS 'B' BEDDING, UNLESS OTHERWISE NOTED. ALL CATCH BASIN LEADS FOR TWIN INLET CATCH BASINS SHALL BE 300mm Ø PVC SDR35 WITH CLASS 'B' BEDDING, UNLESS OTHERWISE NOTED.
- ALL PVC WATERMAIN SHALL HAVE TWU 10 COPPER TRACING WIRE LAID ALONG ENTIRE LENGTH. ALL COPPER SERVICES TO BE CONNECTED TO MAIN LINE TRACER WIRE PER COUNTY SPECIFICATIONS. ALL WATERMAIN SHALL HAVE 1.7m TO 1.9m COVER.
- ALL NEW WATER SERVICES SHALL BE 25mm CROSS-LINKED POLYETHYLENE (PEX) PIPE, CSA CERTIFIED TO CSA B137.5 CONFORMING TO AWWA C904 AND SHALL BE SDR9, PRESSURE RATED AT THE FOLLOWING:
 - 160 PSI AT 73.4°F (1100 kPa AT 23°C)
 - 100 PSI AT 180°F (690 kPa AT 82°C)
 - 80 PSI AT 200°F (55 kPa AT 93°C)
- TRACER WIRE SHALL BE TAPPED TO WATER SERVICE LINE 2.0m ON CENTER AND CONNECTED TO CURB STOP TAIL NUT AT PROPERTY LINE AND TO MAIN LINE TRACER WIRE WITH WATER TIGHT CONNECTIONS.
- WATERMAIN FITTINGS SHALL BE MECHANICAL JOINT OR PUSH-ON JOINT INSTALLED WITH APPROVED MECHANICAL THRUST RESTRAINTS. ALL MECHANICAL THRUST RESTRAINTS SHALL CONFORM TO CONTRACT DOCUMENT SPECIFICATIONS. ALL NON-COATED METAL SURFACES TO BE COMPLETELY WRAPPED IN DENS-O TAPE.
- WATERMAIN TRACER BOXES TO BE SNAKE PIT LD14TP-ADJ (BLUE) BY COPPERHEAD INDUSTRIES AND LOCATED AT EACH FIRE HYDRANT.
- WATERMAIN TO BE INSULATED PER OPSD 1109.030 WHERE COVER IS LESS THAN 1.7m.
- STORM SEWER TO BE INSULATED PER OPSD 1109.030 WHERE COVER IS LESS THAN 1.0m.
- ALL NEW PRIVATE FIRE HYDRANTS TO BE PAINTED PER NORFOLK COUNTY FIRE DEPARTMENT STANDARDS.



GENERAL SEDIMENT CONTROL MEASURES

- PROTECT ALL EXPOSED SURFACES AND CONTROL ALL RUNOFF DURING CONSTRUCTION.
- ALL EROSION CONTROL MEASURES TO BE IN PLACE BEFORE STARTING CONSTRUCTION AND REMAIN IN PLACE UNTIL RESTORATION IS COMPLETE.
- MAINTAIN EROSION CONTROL MEASURES DURING CONSTRUCTION
- ALL COLLECTED SEDIMENT TO BE DISPOSED OF AT AN APPROVED LOCATION.
- MINIMIZE AREA DISTURBED DURING CONSTRUCTION.
- ALL DEWATERING TO BE DISPOSED OF IN AN APPROVED SEDIMENTATION BASIN.
- PROTECT ALL CATCHBASINS, MANHOLES AND PIPE ENDS FROM SEDIMENT INTRUSION WITH GEOTEXTILE (TERRAFIX 270R OR APPROVED EQUIVALENT).
- KEEP ALL SUMPS CLEAN DURING CONSTRUCTION.
- PREVENT WIND-BLOWN DUST.
- STRAW BALES TO BE USED IN LOCALIZED AREAS AS SHOWN AND AS DIRECTED BY THE ENGINEER DURING CONSTRUCTION.

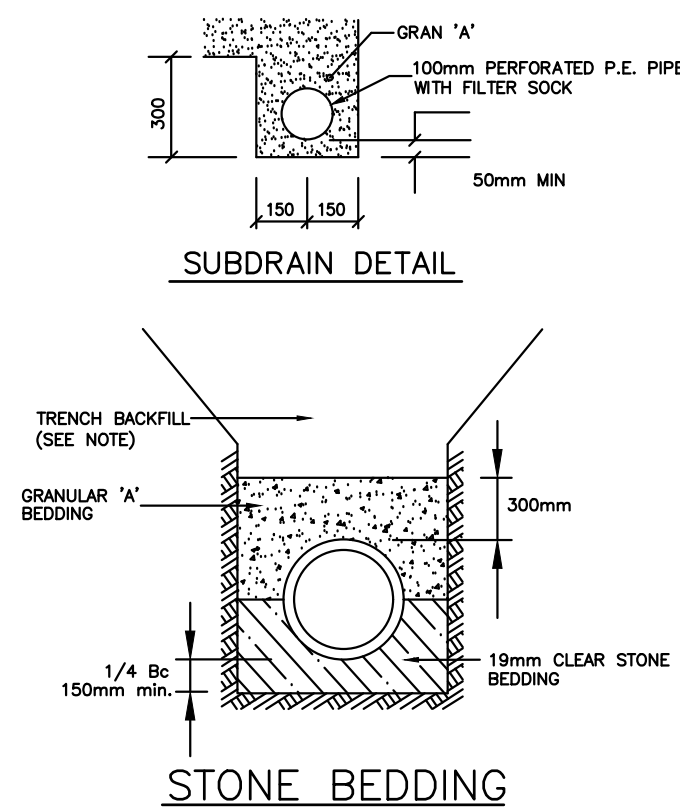
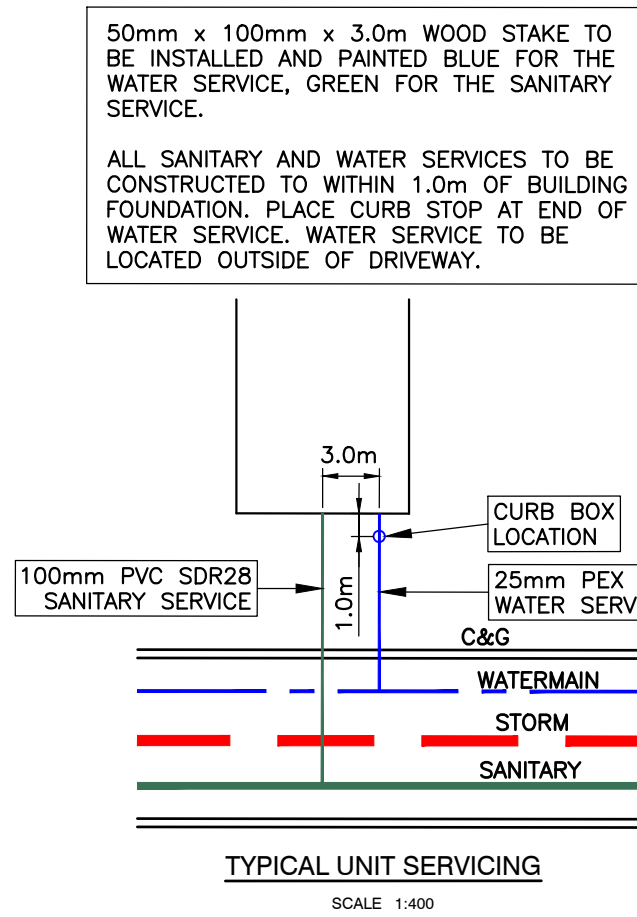
ROAD & BOULEVARD RESTORATION

ALL DISTURBED AREAS SHALL BE RESTORED AS FOLLOWS:

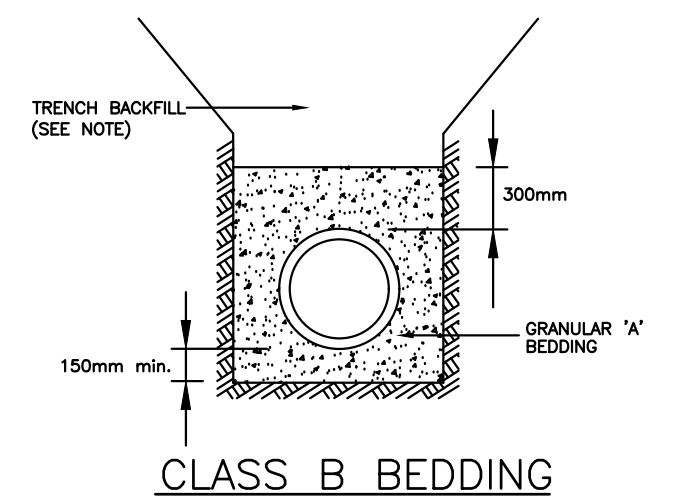
- ALL SIDE ROAD CUTS SHALL BE RESTORED WITH
 - 40mm HL3 SURFACE ASPHALT (97% MARSHALL)
 - 50mm HL8 BASE ASPHALT (97% MARSHALL)
 - 150mm GRANULAR "A" BASE (100% SPMD)
 - 450mm GRANULAR "B" TYPE 2 SUBBASE (100% SPMD)
- BOULEVARDS SHALL BE RESTORED WITH SOD OVER 100mm TOPSOIL (min) UNLESS OTHERWISE NOTED
- ASPHALT DRIVEWAYS SHALL BE RESTORED WITH 150mm OF GRANULAR "A" (100% SPMD) WITH 50mm OF HL3 ASPHALT (97% MARSHALL)
- GRAVEL DRIVEWAYS SHALL BE RESTORED WITH 150mm OF GRANULAR "A" (100% SPMD) WITH 50mm OF HL3 ASPHALT (97% MARSHALL)
- CONCRETE DRIVEWAYS SHALL BE RESTORED WITH 150mm OF GRANULAR "A" (100% SPMD) AND 150mm OF CONCRETE (CLASS C2) AT RESIDENTIAL DRIVEWAYS AND 200mm OF CONCRETE (CLASS C2) AT COMMERCIAL DRIVEWAYS.

LEGEND

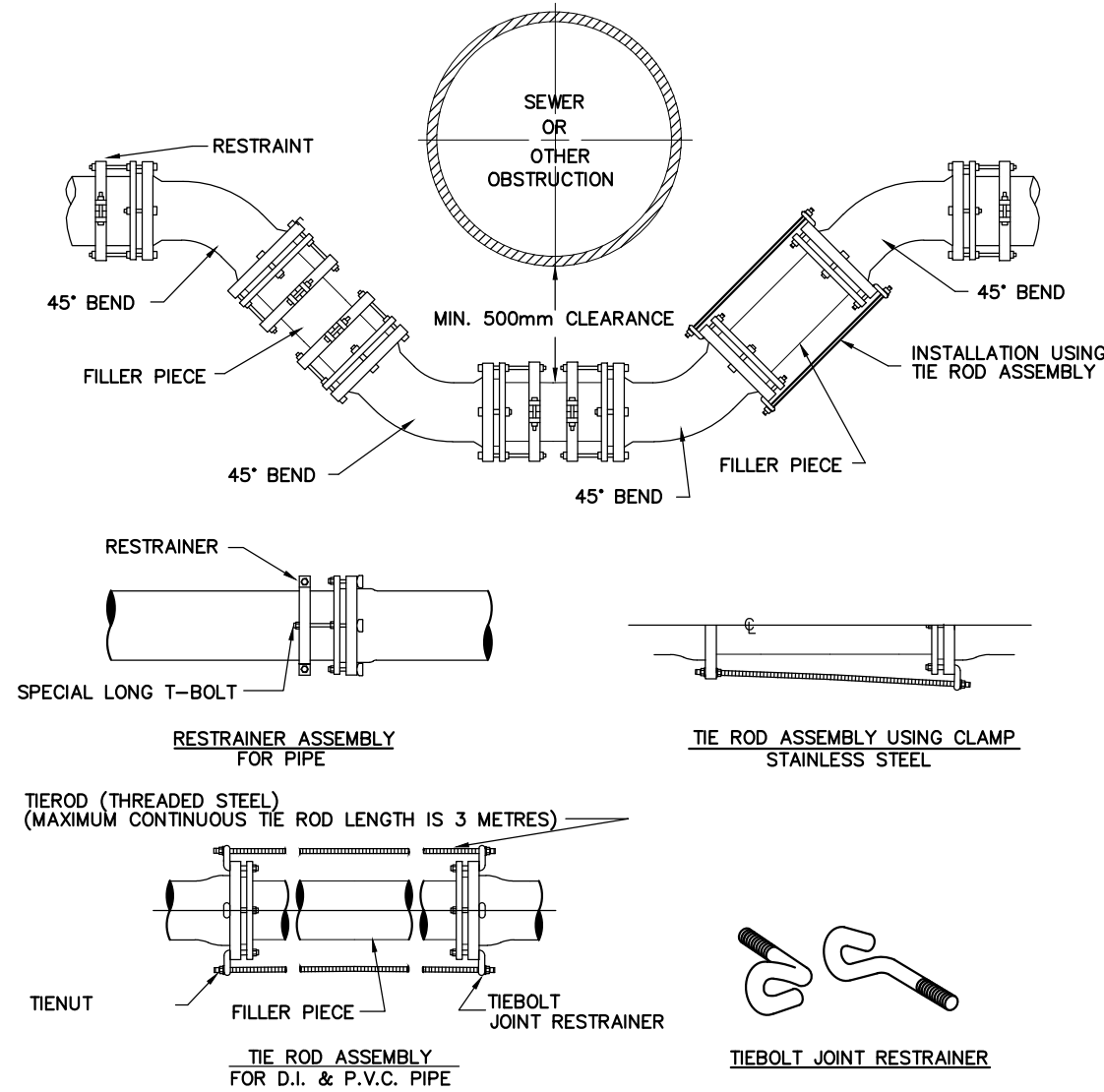
	EX. STORM SEWER		PROPOSED WATERMAIN
	PROPOSED STORM SEWER		EX. WATERMAIN
	EX. SANITARY SEWER		PROPOSED 3-WAY FIRE HYDRANT C/W STORZ CONNECTION
	PROPOSED SANITARY SEWER		EX. FIRE HYDRANT
	PROPOSED STORM MANHOLE		PROPOSED WATERVALVE
	PROPOSED SANITARY MANHOLE		EX. WATERVALVE
	EX. MANHOLE		EX. BURIED GAS LINE
	PROPOSED CATCHBASIN		EX. BURIED BELL LINE
	PROPOSED TWIN INLET CATCHBASIN		EX. BURIED CABLE LINE
	PROPOSED CATCHBASIN MANHOLE		EX. UNDERGROUND HYDRO LINE
	EX. CATCHBASIN		



NOTES:
1. 19mm CLEAR STONE BEDDING SHALL BE USED IN PLACE OF THE STANDARD BEDDING WHERE HIGH HYDRAULIC GRADIENT CONDITIONS ARE ENCOUNTERED DURING CONSTRUCTION.



NOTES:
1. PIPE BEDDING AS SPECIFIED ON PLAN AND PROFILE DRAWINGS COMPACTED TO 95% SPMD IN LAYERS NOT EXCEEDING 100mm, TO 300mm ABOVE TOP OF PIPE.
2. TRENCH BACKFILL FROM TOP OF PIPE BEDDING TO UNDERSIDE OF GRANULAR "B" SUBBASE SHALL CONSIST OF APPROVED NATIVE MATERIALS COMPACTED TO 90% SPMD IN LAYERS NOT EXCEEDING 300mm.
3. PRIOR TO PLACING THE GRANULAR SUBBASE MATERIAL, ALL TOPSOIL, SOFT OR OTHERWISE COMPRESSIBLE MATERIAL MUST BE REMOVED FROM THE SUBGRADE AREA, AND THE SUBGRADE SHALL BE PROOF-ROLLED TO COMPACT ANY LOOSE SURFACE ZONES. ALL EXCAVATED AREAS MUST BE BACKFILLED WITH APPROVED ON-SITE NATIVE MATERIALS OR IMPORTED

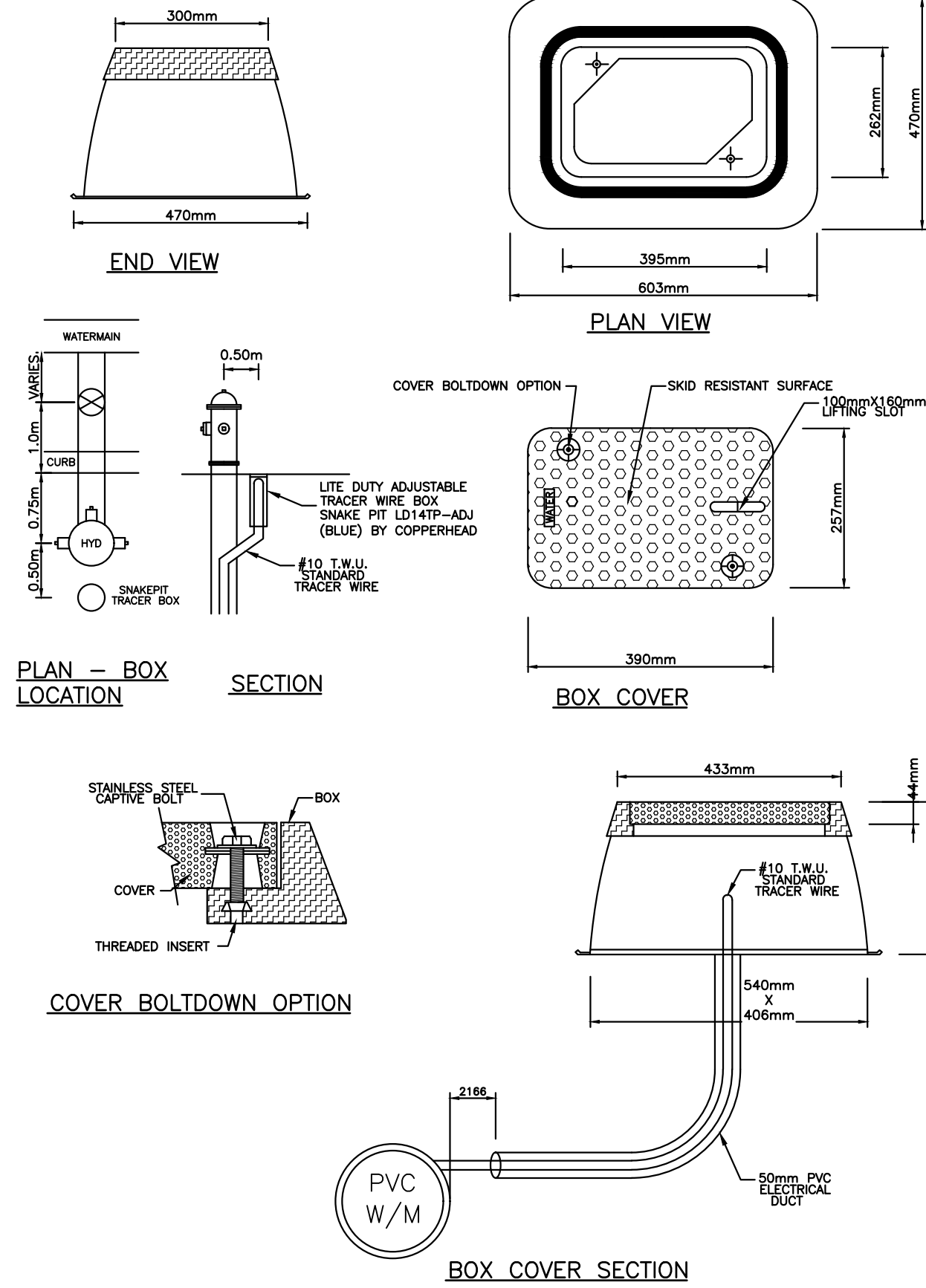


WATERMAIN DEFLECTION DETAIL

WATERMAIN RESTRAINTS TABLE					
DIAMETER (mm)	MINIMUM LENGTH TO BE RESTRAINED ON EACH SIDE OF FITTINGS (m)				
	11-1/4"	22-1/2"	45°	90° BENDS AND TEES (IN DIRECTION OF LARGER PIPE)	DEAD END AND VALVES
100		N/A		N/A	N/A
150		1.0		5	N/A
200		2.0		6	14

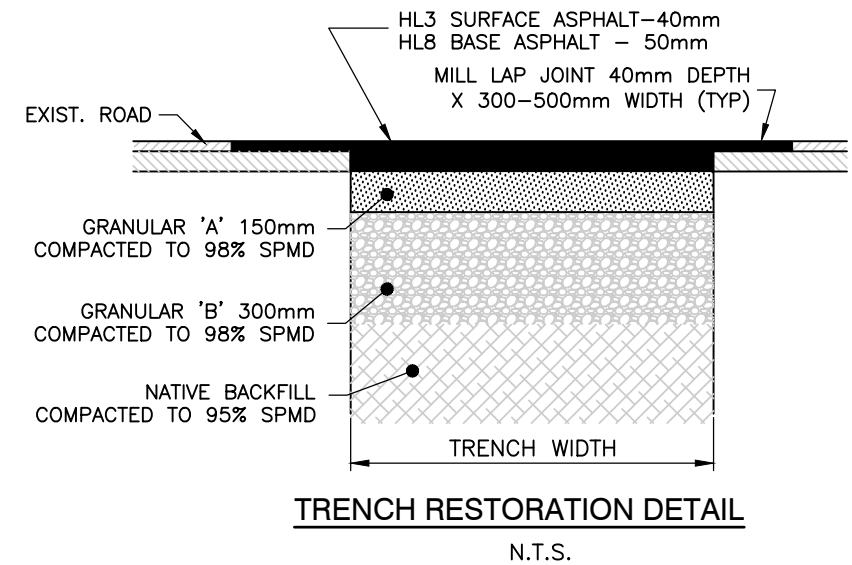
NOTES:

- ALL JOINTS WITHIN DISTANCES SHOWN SHALL BE RESTRAINED WITH A MEG-A-LUG JOINT RESTRAINT.
- ALL TEES SHALL HAVE A MINIMUM OF 1.0m SOLID PIPE OUT EACH SIDE OF THE MAIN RUN OF THE TEE.
- ALL DISTANCES TO BE CONFIRMED TO THE MANUFACTURERS STANDARDS FOR ALTERNATE RESTRAINTS TO MEGALUG.

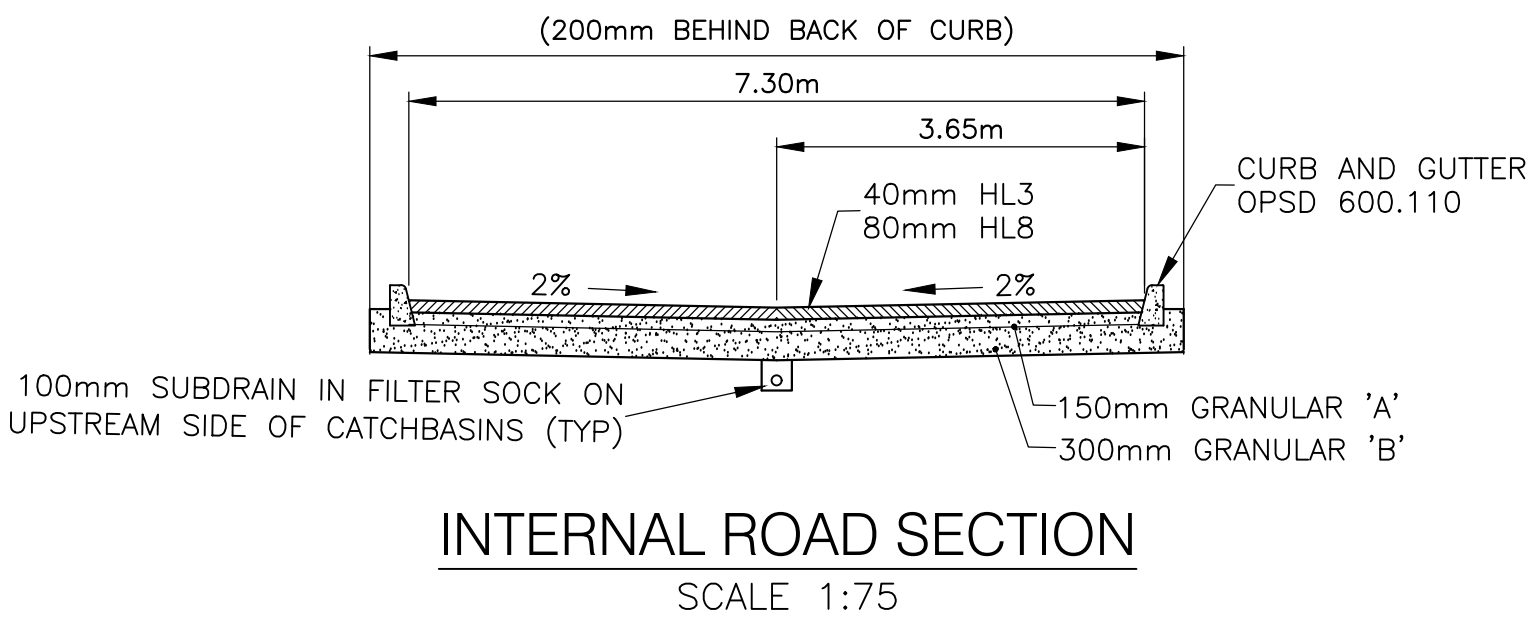


TRACER WIRE HAND HOLE DETAIL

N.T.S.



N.T.S.



INTERNAL ROAD SECTION

SCALE 1:75

REV. No.	DATE	REVISION
0	2024/05/15	ISSUED FOR SPA
2025/02/02	2025/02/02	SPA SUBMISSION 2
2	2026/08/21	SPA SUBMISSION 3

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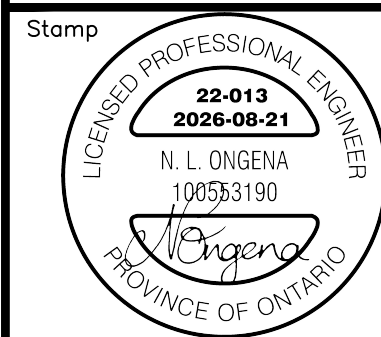
SCALE:
HORIZONTAL : 1:500

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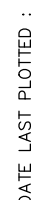
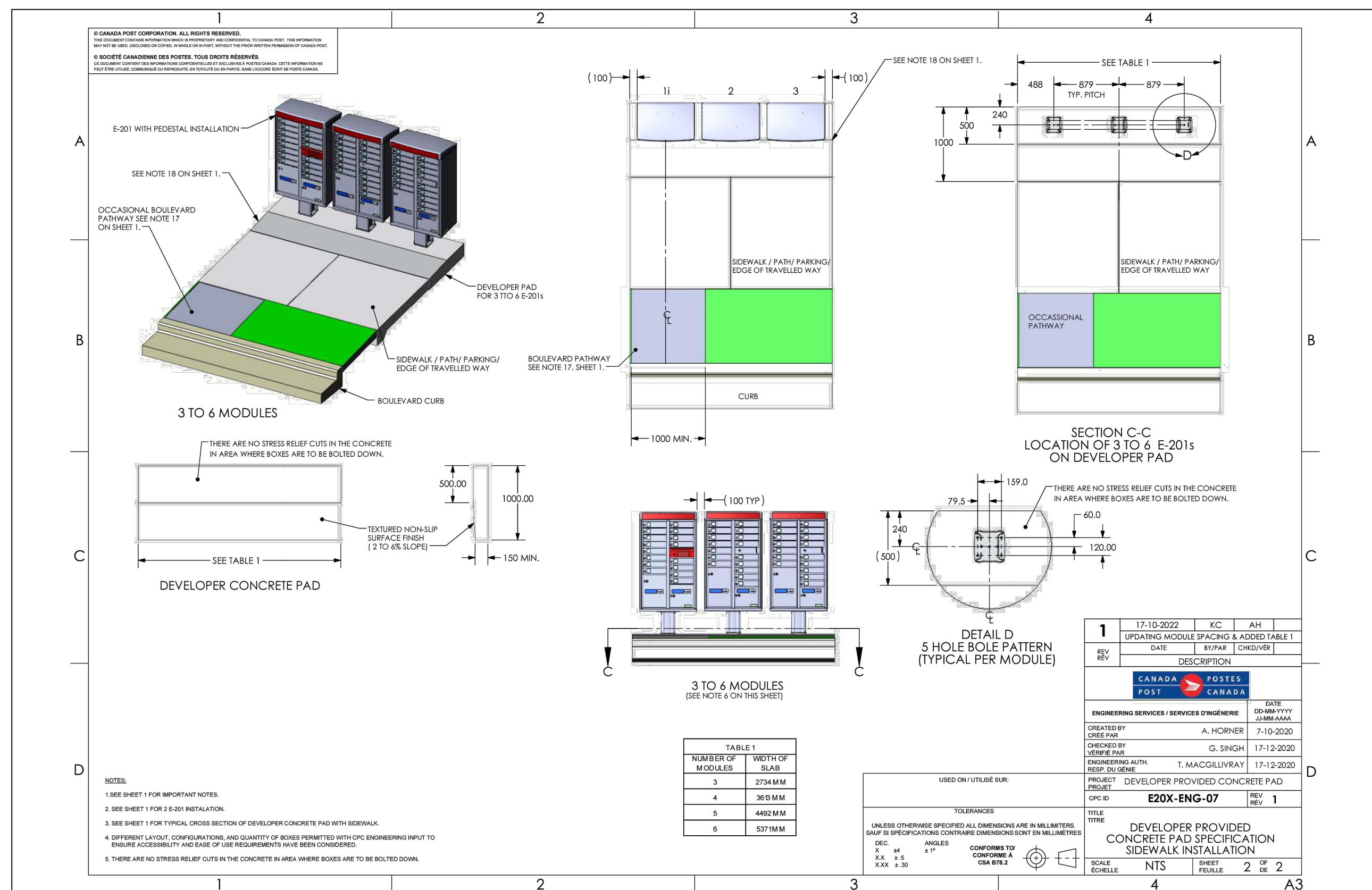
G. DOUGLAS VALLEE LIMITED
2 TALBOT STREET NORTH
SIMCOE, ONTARIO N3Y 3W4
(519) 426-6270



Project Title
HFW HUNT STREET
RESIDENTIAL DEVELOPMENT
SIMCOE - NORFOLK COUNTY

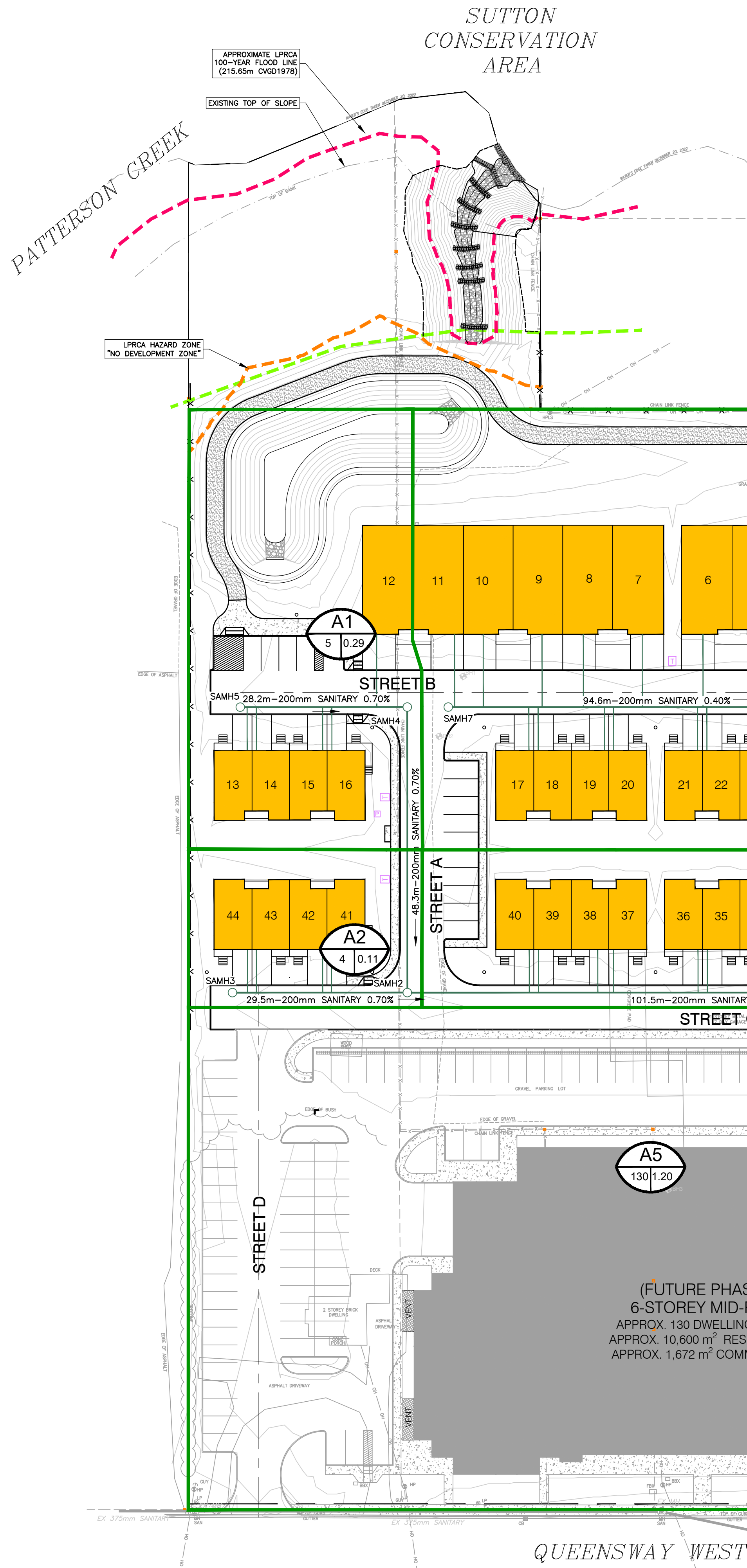
Drawing Title
GENERAL NOTES & DETAILS 1

Designed by : NLO	Drawn By : NLO/NBN
Checked by : JTI	Date Started : JAN 2023
Drawing Scale : 1:500	Drawing No. GN1
Project No. 22-013	

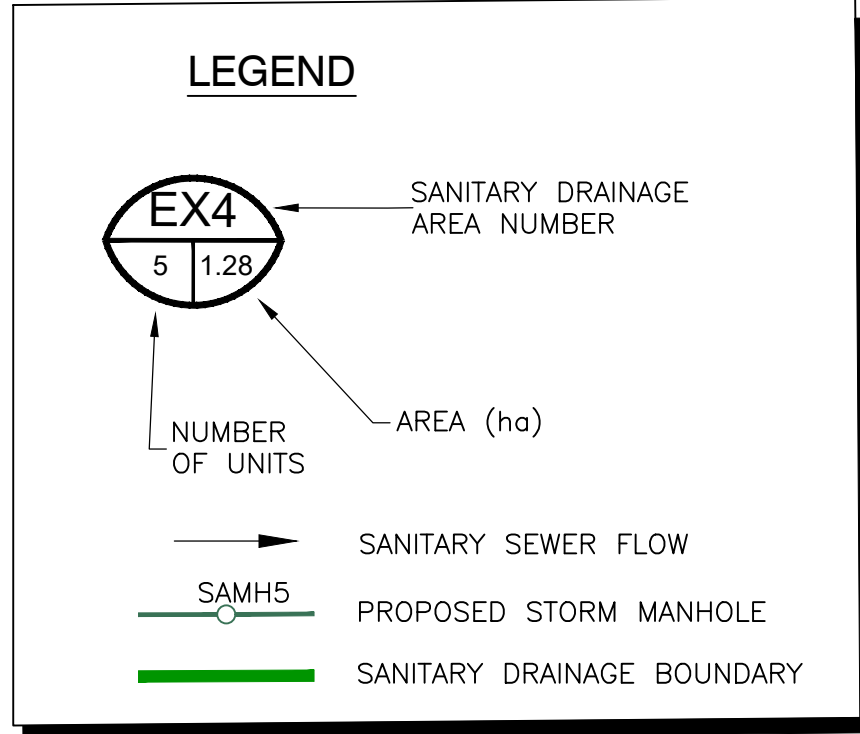
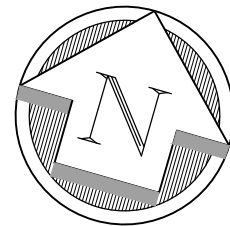


Drawing Scale : 1:500	Drawing No. GN2
Project No. 22-013	

DATE PLOTTED 8/21/2026 12:02 PM PROJECT NUMBER & NAME: 22-013 - HFW HUNT STREET FILE PATH: H:\PROJECTS\2022-22-013 HFW HOLDINGS HUNT ST RESIDENTIAL\DRAWINGS\CIVIL\PRODUCTION\DRAWINGS\22-013 SAN SANITARY DRAINAGE AREAS.DWG

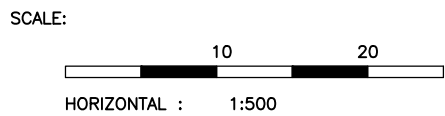


SANITARY SEWER DESIGN SHEET																			
Date: 4/30/2026 Project: 22013 HFW Development Town/County: Simcoe, Norfolk County										Pipe Material: PVC N 0.013					Designed by: NLO Checked by: JTI Sheet: 1 of 1				
Area	Street	From MH	To MH	Residential Area Section Ha	Cumul Ha	Commercial Area Section Ha	Cumul Ha	Total Area Ha	Residential Services Section	Cumul Services	Population Cumul	KAV Factor	M=Peak Factor	Q(i) L/s	Q(s) L/s	Q(d) L/s	Material	Size mm	Length m
A1	Street B	SAMH5	SAMH4	0.29	0.29	0.00	0.00	0.290	5	5	12	1,000	4.407	0.08	0.17	0.26	PVC	200	29.5
-	Street A	SAMH4	SAMH2	0.00	0.29	0.00	0.00	0.290	0	5	12	1,000	4.407	0.08	0.17	0.26	PVC	200	48.3
A2	Street C	SAMH3	SAMH2	0.11	0.11	0.00	0.00	0.110	4	4	10	1,000	4.416	0.03	0.14	0.17	PVC	200	28.2
A3	Street C	SAMH2	SAMH1	0.27	0.67	0.00	0.00	0.670	12	21	50	1,000	4.314	0.19	0.72	0.90	PVC	200	101.5
A4	Street B	SAMH7	SAMH6	0.76	0.76	0.00	0.00	0.760	23	23	55	1,000	4.306	0.21	0.78	1.00	PVC	200	94.6
-	Street A	SAMH6	SAMH1	0.00	0.76	0.00	0.00	0.760	0	23	55	1,000	4.306	0.21	0.78	1.00	PVC	200	48.3
-	Street C	SAMH1	EX SAMH16	0.00	1.43	0.00	0.00	1.430	0	44	106	1,000	4.237	0.40	1.48	1.88	PVC	200	11.9
A5	Mid-Rise Building	SAMH8	EX SAN	0.00	0.00	1.20	1.20	1.200	130	130	368	0.941	3.802	0.34	4.62	4.95	PVC	200	7.3
-	Street C	SAMH8	EX SAN	0.00	0.00	0.00	1.20	1.200	0	130	368	0.941	3.802	0.34	4.62	4.95	PVC	200	9.6
Design Information: Q(s) = Sewage Flow = P q M / 86.4 Q(i) = Infiltration Flow = I A Q(d) = Peak Design Flow = Q(s) + Q(i)										P = Population in thousands A = Tributary Area Residential M = Peaking Factor = 1 + 14 / (4 + P ^{0.5}) Commerical M = Peaking Factor = 0.8 (1 + 14 / (4 + P ^{0.5})) Combined M = KAV (1 + 14 / (4 + P ^{0.5})) KAV = (AR + (0.8*AC))/(AR+AC)					Residential q = Per Capita Flow = 285 L/cap/d Commercial q = Per Capita Flow = 40000 L/ha/d I = Peak Extraneous Flow = 0.28 L/s/ha Townhouse Residential Population Density = 2.4 persons /unit Apartment Residential Population Density = 2.0 persons /unit Commercial Population Density = 90 persons /ha				



REV. No.	DATE	REVISION
0	2024/05/15	ISSUED FOR SPA
1	2025/12/02	SPA SUBMISSION 2
2	2026/08/21	SPA SUBMISSION 3

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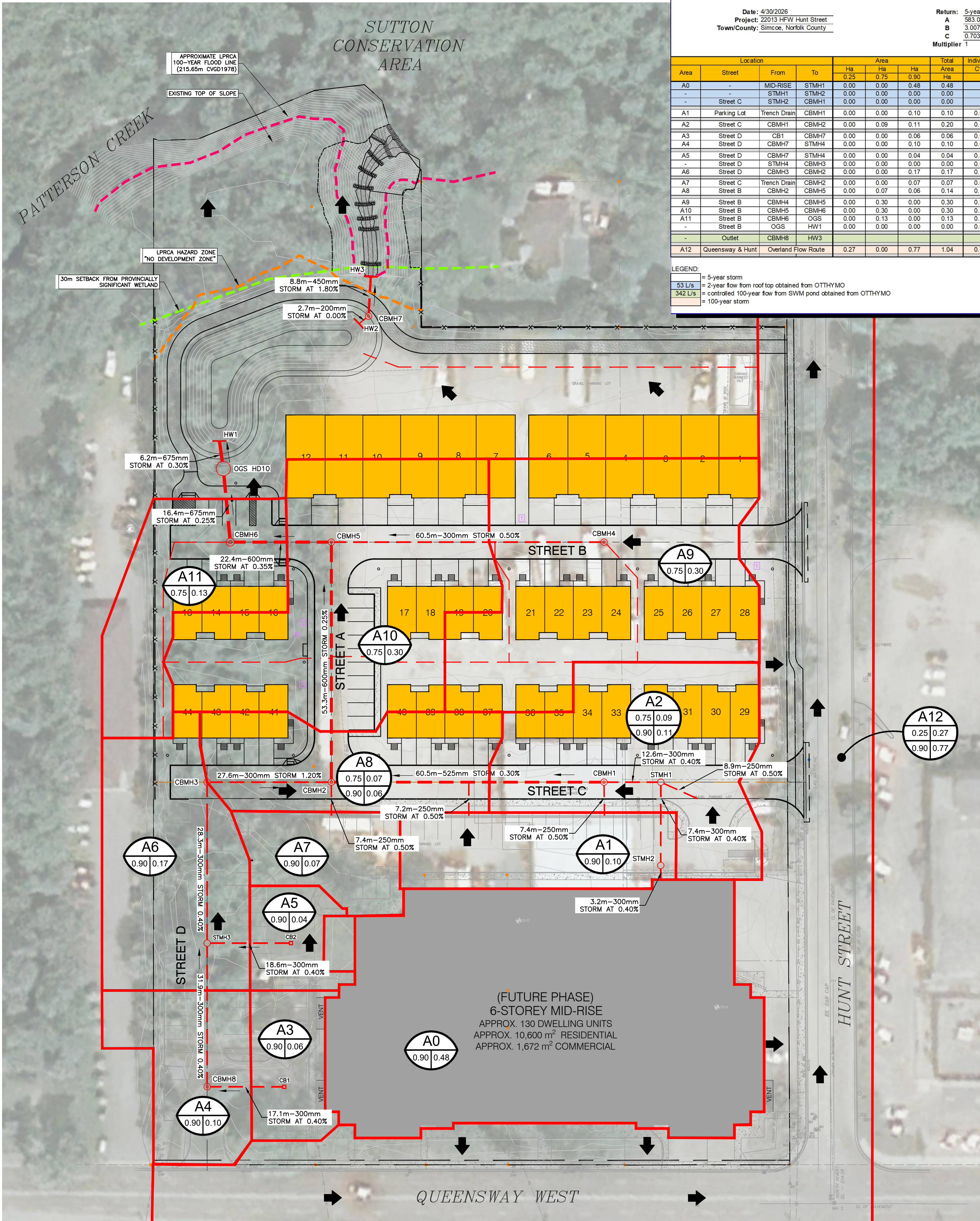
G. DOUGLAS VALLEE LIMITED
2 TALBOT STREET NORTH
SIMCOE, ONTARIO N3Y 3W4
(519) 426-6270



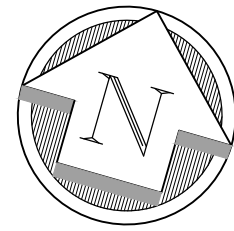
Project Title
**HFW HUNT STREET
RESIDENTIAL DEVELOPMENT**
SIMCOE - NORFOLK COUNTY

Drawing Title
SANITARY DRAINAGE AREAS

Designed by : NLO	Drawn By : NLO
Checked by : JTI	Date Started : JAN 2023
Drawing Scale : 1:500	Drawing No. SAN
Project No. 22-013	



STORM SEWER DESIGN SHEET																						
Date: 4/30/2026 Project: 22013 HFW Hunt Street Town/County: Simcoe, Norfolk County										Return: 5-year 100-year A 583.017 801.041 B 3.007 1.501 C 0.703 0.657 Multiplier 1 1.25			Pipe Material: PVC<=450, Concrete >450 n 0.013			Designed by: NLO Checked by: JLI			Inlet Type Capacity (L/s) Single 120 Double 170			
Location			Area			Total	Individual	Cumulative	Time of	Rainfall	Flow to Sewer	Sewer Design							Inlet Flow	Inlet Capacity at 0.15m Ponding Depth		
Area	Street	From To	Ha	Ha	Ha	Area	C/A	C/A	Concentration min	mm/hr	2.78I ² /A ² C	Size	Slope %	Capacity (Full) L/s	Vel (F=40) m/s	Length m	Time min	Cap %	2.78I ² /A ² C	Single or Double	Inlet Capacity (L/s)	Check
A0	-	MID-RISE	STMH1	0.00	0.00	0.48	0.48					53.0	300	0.40%	61.2	0.87	3.2	0.06	87%			
-	-	STMH1	STMH2	0.00	0.00	0.00	0.00					53.0	300	0.40%	61.2	0.87	18.5	0.36	87%			
-	Street C	STMH2	CBMH1	0.00	0.00	0.00	0.00					53.0	300	0.40%	61.2	0.87	12.6	0.24	87%			
A1	Parking Lot	Trench Drain	CBMH1	0.00	0.00	0.10	0.10	0.09	0.09	10.00	96.03	24.0	250	0.50%	42.0	0.86	7.4	0.14	57%	24.0	Single	120
A2	Street C	CBMH1	CBMH2	0.00	0.09	0.11	0.20	0.17	0.26	10.14	95.29	121.8	525	0.30%	235.6	1.09	60.5	0.93	52%	45.0	Single	120
A3	Street D	CB1	CBMH7	0.00	0.00	0.06	0.06	0.05	0.05	10.00	96.03	14.5	300	0.40%	61.2	0.87	17.1	0.33	24%	14.5	Single	120
A4	Street D	CBMH7	STMH4	0.00	0.00	0.10	0.10	0.09	0.14	10.33	94.36	37.9	300	0.40%	61.2	0.87	31.9	0.61	62%	23.6	Single	120
A5	Street D	CBMH7	STMH4	0.00	0.00	0.04	0.04	0.04	0.04	10.00	96.03	10.0	300	0.40%	61.2	0.87	16.6	0.36	16%	10.0	Single	120
-	Street D	STMH4	CBMH3	0.00	0.00	0.00	0.00	0.00	0.18	10.61	92.97	47.0	300	0.40%	61.2	0.87	35.7	0.69	77%			
A6	Street D	CBMH3	CBMH2	0.00	0.00	0.17	0.17	0.15	0.33	11.30	89.80	83.6	300	1.20%	105.9	1.50	27.6	0.31	79%	38.2	Single	120
A7	Street C	Trench Drain	CBMH2	0.00	0.00	0.07	0.07	0.06	0.06	10.00	96.03	17.0	250	0.50%	42.0	0.86	7.4	0.14	41%	17.0	Single	120
A8	Street B	CBMH2	CBMH5	0.00	0.07	0.08	0.14	0.11	0.77	11.61	88.47	243.1	600	0.25%	307.0	1.09	53.3	0.82	79%	26.1	Single	120
A9	Street B	CBMH4	CBMH5	0.00	0.30	0.00	0.30	0.23	0.23	10.00	96.03	60.1	300	0.50%	68.4	0.97	60.5	1.04	88%	60.1	Single	120
A10	Street B	CBMH5	CBMH6	0.00	0.30	0.00	0.30	0.23	1.22	12.43	85.15	342.5	600	0.35%	363.3	1.28	22.4	0.29	94%	53.3	Single	120
A11	Street B	CBMH6	OGS	0.00	0.13	0.00	0.13	0.10	1.32	12.72	84.04	361.5	675	0.25%	420.3	1.17	16.4	0.23	86%	22.8	Single	120
-	Street B	OGS	HW1	0.00	0.00	0.00	0.00	0.00	1.32	12.95	83.18	358.3	675	0.30%	460.4	1.29	6.2	0.08	78%			
-	Outlet	CBMH8	HW3									342.0	450	1.80%	382.5	2.41	6.8	0.06	89%			
A12	Queensway & Hunt	Overland Flow Route		0.27	0.00	0.77	1.04	0.76	0.76	10.00	201.22	478.4										
LEGEND																						
= 5-year storm																						
53 L/s = 2-year flow from roof top obtained from OTHYMO																						
342 L/s = controlled 100-year flow from SWM pond obtained from OTHYMO																						
= 100-year storm																						



LEGEND

EX4 STORM DRAINAGE AREA NUMBER

0.45 1.28

RUN-OFF COEFFICIENT

AREA (ha)

OVERLAND FLOW (MAJOR)

STORM SEWER FLOW (MINOR)

STMH5 PROPOSED STORM MANHOLE

PROPOSED SINGLE CATCH BASIN

PROPOSED DOUBLE CATCH BASIN

PROPOSED SINGLE CATCH BASIN MH

PROPOSED DOUBLE CATCH BASIN MH

STORM DRAINAGE BOUNDARY

REV. No. DATE REVISION

0 2024/05/15 ISSUED FOR SPA

1 2025/12/02 SPA SUBMISSION 2

2 2026/08/21 SPA SUBMISSION 3

PRELIMINARY

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HORIZONTAL : 1:500

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Consulting Engineers, Architects & Planners

G. DOUGLAS VALLEE LIMITED

2 TALBOT STREET NORTH

SIMCOE, ONTARIO N3Y 3W4

(519) 426-6270

Stamp

22-013 2026-08-21

N. L. ONGENA 100553190

Province of Ontario

Project Title

HFW HUNT STREET RESIDENTIAL DEVELOPMENT

SIMCOE - NORFOLK COUNTY

Drawing Title

STORM DRAINAGE AREAS

Designed by : NLO

Drawn By : NLO

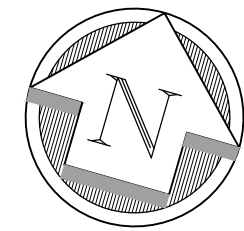
Checked by : JLI

Date Started : JAN 2023

Drawing Scale : 1:500

Drawing No. STM

Project No. 22-013



NOTES:

COMPOSITE UTILITY PLAN IS PREPARED BASED ON STREET, WATER, AND SANITARY DESIGNS (PREPARED BY VALLEE), HYDRO DESIGN BY HYDRO ONE, AND STREET LIGHTING DESIGN BY SEI. REFER TO VALLEE PLAN AND PROFILE DRAWINGS FOR STREET, WATER AND SEWER LOCATIONS. REFER TO HYDRO ONE DRAWING FOR THE LOCATION OF HYDRO AND APPURTENANCES. REFER TO SEI DRAWINGS FOR LOCATION OF STREET LIGHTS AND APPURTENANCES.

MINIMUM 0.3m HORIZONTAL SEPARATION TO BE MAINTAINED BETWEEN HYDRO DUCTS AND WATER/SANITARY SERVICES AND 0.6m SEPARATION BETWEEN HYDRO DUCTS AND LIGHT STANDARD POLES.

NOTE:
THE CONTRACTOR IS CAUTIONED THAT ALL OF THE EX. UTILITIES ARE NOT INDICATED ON THIS DRAWING. THE CONTRACTOR MUST BE RESPONSIBLE FOR LOCATING ALL UTILITIES FROM EACH AREA UTILITY COMPANY PRIOR TO ANY CONSTRUCTION OR EXCAVATION. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR THE PROTECTION OF ALL UTILITIES INCLUDING THOSE NOT INDICATED ON THIS DRAWING. G. CONTRACTOR SHALL BE RESPONSIBLE FOR THE AVAILABILITY FOR DAMAGE TO ANY EX. UTILITY WHICH MAY OR MAY NOT BE INDICATED ON THIS DRAWING.

ALL WORK, MATERIALS AND PROCESSES TO ABIDE TO NORFOLK COUNTY STANDARDS AND SPECIFICATIONS

LEGAL DESCRIPTION
LOT 36, 38, 39, 40, 41, 42, 43 & 44, BLOCK 9 REGISTERED PLAN 162, TOWN OF SIMCOE AND PART OF LOT 2 CONCESSION 14, TOWNSHIP OF WINDHAM IN NORFOLK COUNTY.

APPLICANT INFORMATION
APPLICANT: JAMES H. HOLMES LIMITED
TELEPHONE: 416-919-3768
ADDRESS: 3 FERNWOOD COURT, RICHMOND HILL, ONTARIO, L4B 3C2

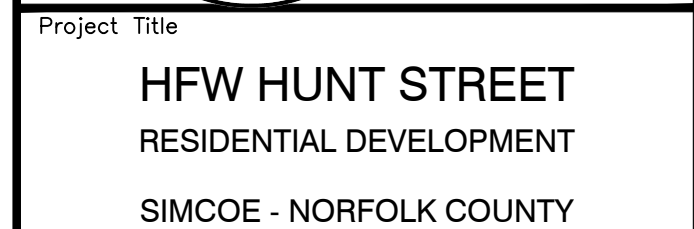
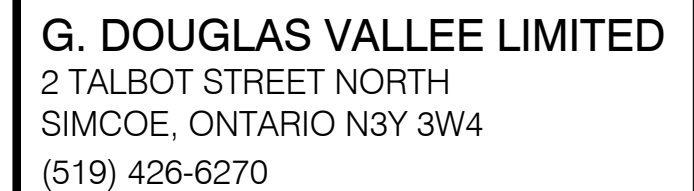
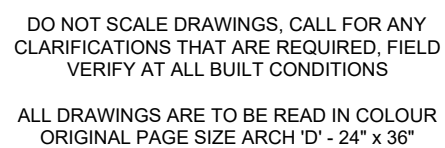
BENCHMARKS
BM #1: SPIKE IN MARK OF WOOD HYDRO POLE AT NORTHWEST CORNER OF INTERSECTION OF HUNT AND STREET.
ELEV. 217.99m

BM #2: TOP OF LARGE PUMPER NOZZLE OF FIRE HYDRANT AT NORTHWEST CORNER OF QUENSWORTH WOOD AND HUNT STREET.
ELEV. 218.16m

DRAWING LIST

G. DOUGLAS VALLEE LIMITED DRAWINGS

- 22-013 COV - COVER PAGE
- 22-013 C100 - SERVING PLAN
- 22-013 C101 - GRADING PLAN
- 22-013 C102 - EROSION AND SEDIMENT CONTROL PLAN
- 22-013 C103 - PLAN & PROFILE STREET A AND B
- 22-013 C104 - PLAN & PROFILE STREET C AND D
- 22-013 C105 - PLAN & PROFILE SWIM Pond AND OUTLET
- 22-013 C106 - REMOVALS PLAN
- 22-013 G01 - GENERAL NOTES & DETAILS 1
- 22-013 G02 - GENERAL NOTES & DETAILS 2
- 22-013 SAN - SANITARY DRAINAGE AREAS
- 22-013 STM - STORM DRAINAGE AREAS
- 22-013 COM - COMPOSITE UTILITY PLAN



Drawing Title	
COMPOSITE UTILITY PLAN	
Designed by : NLO	Drawn By : NLO
Checked by : JL	Date Started : JAN 2023
Drawing Scale : 1:500	Drawing No. COM
Project No. 22-013	



vallee

*Consulting Engineers,
Architects & Planners*

December 2, 2025

HFW Holdings Limited
3 Fernwood Court
Richmond Hill, Ontario
L4B 3C2

Attention: Mr. Herbert Chiu

**Reference: Functional Servicing Report
HFW Hunt Street Residential Development
Simcoe, Norfolk County
Project #22-013**

Introduction

This functional servicing report has been prepared on behalf of HFW Holdings Ltd, in support of the site plan application for the proposed HFW Hunt Street Residential Development located at the northwest corner of Queensway West and Hunt Street in Simcoe – Norfolk County. The site is an assembly of parcels known municipally as 395, 401, 403, 405 and 411 Queensway West. The proposed development will be constructed in two phases, with Phase 1 including a 44-unit condominium development, and Phase 2 including a 6-storey, 130-unit residential mid-rise building with main floor commercial units. This report presents the functional servicing for the proposed development, including sanitary, storm and domestic and fire water servicing.

The 2.89 ha development site is currently occupied by various buildings, including a single detached dwelling and storage/maintenance buildings and gravel yard for Wilson Truck and Trailer. The lands are bound by Hunt Street to the east, Queensway West to the south, Patterson Creek and the Sutton Conservation Area to the north, and the Queensway Veterinary Hospital to the west. Refer to Figure 1 below.

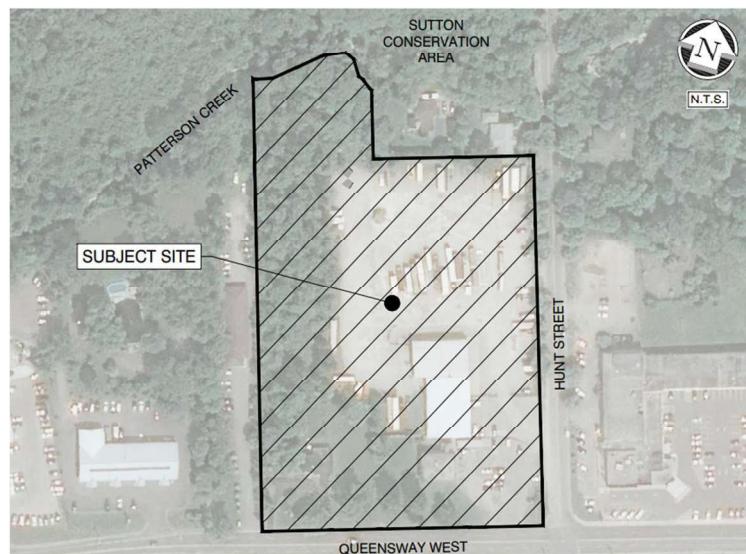


Figure 1 – Site Location

Land Use and Design Assumptions

The proposed development will consist of the following construction:

Phase 1:

- 12 – 1-storey townhouse residential dwelling units
- 32 – 3-storey townhouse residential dwelling units
- Water, storm and sanitary infrastructure to support the proposed construction
- Stormwater management facility for the entire development
- Curbs, sidewalks and other miscellaneous items to support the proposed construction

Phase 2:

- 6-storey residential/commercial mid-rise building with approximately 130 residential dwelling units and main floor commercial space
- Underground parking structure and ground-level parking lot
- Water, storm and sanitary infrastructure to support the proposed construction
- Curbs, sidewalks and other miscellaneous items to support the proposed construction

The following table outlines the mix of land use and calculates the anticipated population based on a townhouse dwelling density of 2.4 people per unit (ppu), an apartment residential dwelling density of 2.0 ppu and a commercial density of 90 people per hectare as utilized in the Norfolk County Design Criteria.

Table 1 Subject Lands – Estimate of Population				
Phase	Land Use	Number of Units	Population	
Phase 1	12 townhouse units 32 townhouse units	44 units @ 2.4 ppu	106 people	
Phase 2	130 apartment units	130 units @ 2.0 ppu	260 people	368 people
	Commercial Area	1.20 ha @ 90 pph	108 people	
Total			474 people	

Sanitary Servicing

Norfolk County GIS mapping and record drawings indicate an existing 375mm diameter sanitary sewer on Queensway West, and a 250mm diameter sanitary sewer stub on Hunt Street. It is proposed that sanitary flows from units 1-44 be discharged to the existing Hunt Street sanitary sewer. As part of the Sutton's Trail Condo Development (Vallee project #19-068), the Hunt Street sanitary sewer was extended northwards, making the proposed connection feasible. Sanitary flows from the mid-rise building will also be directed to the existing Hunt Street sanitary sewer with a separate service connection. Refer to drawing C100 – Servicing Plan.

Sanitary design flows for the proposed development were calculated using the Norfolk County Design Criteria. Table 2 presents the flow information associated with each of the proposed development zones. In summary, the proposed development is anticipated to generate a total additional sanitary flow of approximately 6.82 L/s to the existing sanitary sewer on Hunt Street after the construction of Phase 1 and Phase 2. Detailed calculations are outlined in Appendix A.

Table 2 Sanitary Design Flows		
	Phase 1	Phase 2
Total Number of Units	44	130
Development Area (ha)	1.42 ha	1.20 ha
Population	106	368
Per Capita Flow	285 L/person/day	
Peak Extraneous Flow	0.28 L/sec/ha	
Infiltration Flow	0.40 L/s	0.34 L/s
Sewage Flow	0.35 L/s	1.21 L/s
Peaking Factor	4.24	3.80
Peak Design Flow	1.87 L/s	4.95 L/s
Total Peak Design Flow	6.82 L/s	

Sanitary Network Review

R. V. Anderson Associates (RVA) Limited was retained by Norfolk County to determine the impact of the proposed development on the conveyance capacity of the existing sanitary sewers along the route to the Simcoe Wastewater Treatment Plant (WWTP).

In March 2025, sanitary modelling by RVA concluded that the existing sanitary collection system (with all committed/pending developments) can accommodate the additional flows from the proposed development. Refer to Appendix C for complete details of the sanitary servicing review completed by R.V. Anderson Associates.

Water Servicing

Record drawings indicate an existing 300mm diameter watermain on Queensway West, and a 400mm diameter watermain on Hunt Street. It is proposed that the existing watermain along Hunt Street will be utilized to service both the mid-rise building and the condo development, with separate service connections. Refer to drawing C100 – Servicing Plan.

Norfolk County's design criteria stipulates the following requirements for system pressures, and the system shall be designed to meet the greater of either of the following requirements;

- Fire flow conditions– not less than 140 kPa
- Normal operating conditions – not less than 280 kPa

Domestic Water Demand

Table 3 presents the domestic water flow information for the proposed development:

Table 3 Domestic Water Demands			
	Phase 1	Phase 2	
		Residential	Commercial
Population	106	260	108
Average Daily Demand (L/person/day)	285		
Maximum Day Demand Factor	2.25		
Maximum Day Demand (L/s)	0.79	1.93	0.80
Peak Hourly Demand Factor	4	4	2
Peak Hourly Demand (L/s)	1.40	3.43	0.71

In summary, the proposed development is anticipated to have a total maximum daily demand of 3.52 L/s and a maximum hourly demand of 5.54 L/s. Refer to Appendix B for detailed calculations.

Fire Water Service

According to the County GIS online mapping, there is a single fire hydrant at the corner of Queensway West and Hunt Street. However, a majority of the site is located outside of the 75m fire hydrant radius, therefore, two fire hydrants will be installed on-site to adequately service the proposed development, and the hydrant at the corner of Queensway West and Hunt Street will be replaced to accommodate the proposed sidewalk.

Typically, available fire flow during the maximum day demand is the critical criteria when evaluating a watermain distribution system's ability to service a residential subdivision. Using the requirements of the Ontario Building Code, the estimated fire flow required for the proposed development was determined to be 150 L/s. Refer to the complete calculations in Appendix B.

Norfolk County has revised their required fire flow criteria and has determined the required fire flow for a development shall be the greater of the fire flow required by the OBC and the required fire flow based on the land use, and the community which the development is located in. For a residential building with greater than 3 units in Simcoe, the required fire flow is 150 L/s. Therefore, the required fire flow for the proposed development has been determined to be 150 L/s. Refer to Form FFD1 in Appendix B.

Water Network Review

R. V. Anderson Associates Limited (RVA) was retained by Norfolk County to determine the impact of the proposed development on the existing distribution system and evaluate the ability to deliver sufficient water flow.

Water modelling by RVA concluded that pressures during the PHD in the existing 400mm watermain along Hunt Street were found to be 65 to 67 psi, greater than the required pressure of 40 psi, and the available fire flow during the MDD was found to be approximately 183 to 320 L/s.

Therefore, it can be concluded that the existing water distribution system along Queensway West provides sufficient fire flow for the proposed development. Refer to Appendix C for complete details of the hydraulic modelling completed by R.V. Anderson Associates.

Stormwater Management

Under existing conditions, the subject site features several commercial buildings, gravel and asphalt parking lots, an existing residential dwelling, and wooded areas. During major storm events, runoff from the majority of the site generally flows uncontrolled, overland in a northerly direction towards Patterson Creek and the Sutton Conservation Area. Existing catch basins within asphalt and gravel parking lots collect minor storm event flows and convey them northwards to an existing outlet via a storm sewer network. Minor flows from a small southern portion of the site along Queensway West drain in a southerly direction towards Queensway West where it is collected by the existing storm sewer system. Major flows from this portion of the site flow overland down Queensway West to Hunt Street, then northwards down Hunt Street and ultimately discharge to Patterson Creek.

The overall SWM strategy is to utilize site grading and a storm sewer system to convey flows from the 2-year through the 100-year storm events to the proposed stormwater management (SWM) pond at the north side of the development. Ultimately, runoff from the SWM Pond will be released to Patterson Creek as it is under pre-development conditions. The proposed SWM system will have two primary functions:

1. Reduce or control the post-development peak flow rates from the site to levels that do not exceed the 2-year pre-development flow rate, for all storm events up to and including the 100-year storm event.
2. Treat stormwater to an Enhanced Protection Level as defined in the Ministry of the Environment's *Stormwater Management Practices Planning and Design Manual* (March 2003).

Complete details of the SWM design are provided in the HFW Hunt Street Residential Development Stormwater Management Report dated September 8, 2025.

Conclusions and Recommendations

The functional servicing design for the proposed development can be summarized as follows:

- A peak sanitary design flow of approximately 6.82 L/s is anticipated from the proposed development.
- Modelling from Norfolk County's consultant has concluded that the existing sanitary collection system can accommodate the additional flows from the proposed development.
- The domestic maximum day demand and peak hourly demand were found to be 3.52 L/s and 5.54 L/s, respectively.
- The required fire flow demand for the proposed development was found to be 150 L/s based on Norfolk County's fire flow requirements.
- Modelling from Norfolk County's consultant has confirmed that the available fire flow at proposed development is 183 to 320 L/s, greater than the required fire flow of 150 L/s.
- Overland flow during major storm events, and internal storm sewers during minor storm events will convey stormwater to the proposed SWM facility, which will ultimately be released to Patterson Creek via a storm sewer.
- Under all storm events, peak flows associated with the post-development site are controlled to less than or equal to the pre-development peak flows under all storm events.
- Stormwater will be treated to an enhanced level of water quality protection.

It is recommended that this report be provided to Norfolk County and the Long Point Region Conservation Authority in support of the site plan application proposed development.

We trust that this information is complete and sufficient for submission. Should you have any questions or require further information please do not hesitate to contact us.

Respectfully submitted,



Natalie Ongena, P. Eng.
G. DOUGLAS VALLEE LIMITED
Consulting Engineers, Architects and Planners

Appendix A

– 22-013 Sanitary Flow Calculations

Appendix B

- 22-013 Domestic Water Demand Calculations
- 22-013 OBC Fire Flow Calculations
- 22-013 Norfolk County Form FFD1 – Fire Flow Determination
- 22-013 DWG FIRE – Fire Separation Distances

Appendix C

- Sanitary Sewer Hydraulic Capacity Assessment Report
(*R. V. Anderson Associates Limited dated July 17, 2023*)
- Water Modelling Report
(*R. V. Anderson Associates Limited dated July 17, 2023*)

G. DOUGLAS VALLEE LIMITED
Consulting Engineers, Architects & Planners



Professional Engineers
Ontario

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of Architects

APPENDIX A

22-013 Sanitary Flow Calculation

Proposed Per Capita Flow/Demand	
Water	285 L/c/d
Wastewater	285 L/c/d
Persons per unit Component (by zone basis)	
Low Density Res	25 units/ha at 3.0 ppu
Medium Density Res	75 units/ha at 2.4 ppu
High Density Res	150 units/ha at 1.6 ppu
Single and semi detach	3.0 ppu
Town/rowhomes	2.4 ppu
Apt and ADU's (2+ bdrm)	2.0 ppu
Apt and ADU's (1 bdrm)	1.6 ppu

PHASE 1 - TOWNHOUSE RESIDENTIAL DWELLINGS

Tributary Population

Townhouse Residential Development:	2.4 persons/unit
Units:	44 Units
Number of Persons:	106 persons
Site Area	1.42 ha

Sewage Flow

Per Capita Flow:	0.285 m ³ /person/day
Average Sewage Flow:	0.348 L/s

Peak Sanitary Flow Factor

Residential Peaking Factor Formula:

$$M = 1 + (14 / (4 + [14 / \{4 + P^{(0.5)}\}]))$$

P =	0.1056
M =	4.237

Infiltration Allowance

Infiltration Allowance:	0.28 L/s/ha
Infiltration Allowance:	0.398 L/s

Design Flow

Design Flow:

Design Flow = (Average Sewage Flow * Peak Sanitary Flow Factor) + Infil. Allowance

Design Flow =	1.87 L/s
---------------	----------

Proposed Per Capita Flow/Demand	
Water	285 L/c/d
Wastewater	285 L/c/d
Persons per unit Component (by zone basis)	
Low Density Res	25 units/ha at 3.0 ppu
Medium Density Res	75 units/ha at 2.4 ppu
High Density Res	150 units/ha at 1.6 ppu
Single and semi detach	3.0 ppu
Town/rowhomes	2.4 ppu
Apt and ADU's (2+ bdrm)	2.0 ppu
Apt and ADU's (1 bdrm)	1.6 ppu

PHASE 2 - APARTMENT DWELLINGS AND COMMERCIAL AREA

Tributary Population

Apartment Residential Development:	2 persons/unit
Units:	130 Units
Number of Persons:	260 persons
Commercial Development:	90 persons/ha
Site Area:	1.20 ha
Number of Persons:	108 persons
Total Population:	368 persons

Sewage Flow

Per Capita Flow:	0.285 m ³ /person/day
Average Sewage Flow:	1.214 L/s

Peak Sanitary Flow Factor

Combined Peaking Factor Formula:

$$\text{Combined } M = KAV(1 + (14 / (4 + (Pe^{0.5})))) \quad KAV = (PR + (0.8PC)) / P$$

KAV=	0.941
Pe=	0.368
M =	3.802

Infiltration Allowance

Infiltration Allowance:	0.28 L/s/ha
Infiltration Allowance:	0.336 L/s

Design Flow

Design Flow:

Design Flow = (Average Sewage Flow * Peak Sanitary Flow Factor) + Infil. Allowance

Design Flow =	4.95 L/s
---------------	----------

Summary of Design Flows

Phase 1: 1.87 L/s

Phase 2: 4.95 L/s

Total Design Flow:	6.82 L/s
---------------------------	-----------------

APPENDIX B

22-013 Domestic Water Demand Calculations

22-013 OBC Fire Flow Calculations

22-013 Norfolk County Form FFD1 – Fire Flow Determination

22-013 DWG FIRE – Fire Separation Distances



vallee

Consulting Engineers,
Architects & Planners

Subject: HFW Hunt Street Development
Date: 25/05/26 By: NLO
Project #: 22-013 Page: 1

Proposed Per Capita Flow/Demand	
Water	285 L/c/d
Wastewater	285 L/c/d
Persons per unit Component (by zone basis)	
Low Density Res	25 units/ha at 3.0 ppu
Medium Density Res	75 units/ha at 2.4 ppu
High Density Res	150 units/ha at 1.6 ppu
Single and semi detach	3.0 ppu
Town/rowhomes	2.4 ppu
Apt and ADU's (2+ bdrm)	2.0 ppu
Apt and ADU's (1 bdrm)	1.6 ppu

PHASE 1 - TOWNHOUSE RESIDENTIAL DWELLINGS

Maximum Daily Demand

Total Number of Units	44 units
Zoning of Land	Residential
Equiv. Population Density	2.4 ppl/unit
Equiv. Population	106
Av. Daily Demand Per Capita	0.285 m ³ /capita/day
Maximum Daily Demand Peaking Factor	2.25
Maximum Daily Demand	67.97 m ³ /day
	0.79 l/s

Maximum Hourly Demand

Total Number of Units	44 units
Zoning of Land	Residential
Equiv. Population Density	2.4 ppl/ha
Equiv. Population	106
Av. Daily Demand Per Capita	0.285 m ³ /capita/day
Maximum Hourly Demand Peaking Factor	4
Maximum Hourly Demand	5.04 m ³ /hour
	1.40 l/s

Proposed Per Capita Flow/Demand	
Water	285 L/c/d
Wastewater	285 L/c/d
Persons per unit Component (by zone basis)	
Low Density Res	25 units/ha at 3.0 ppu
Medium Density Res	75 units/ha at 2.4 ppu
High Density Res	150 units/ha at 1.6 ppu
Single and semi detach	3.0 ppu
Town/rowhomes	2.4 ppu
Apt and ADU's (2+ bdrm)	2.0 ppu
Apt and ADU's (1 bdrm)	1.6 ppu

PHASE 2 - APARTMENT DWELLINGS

Maximum Daily Demand

Total Number of Units	130 units
Zoning of Land	Residential
Equiv. Population Density	2 ppl/unit
Equiv. Population	260
Av. Daily Demand Per Capita	0.285 m ³ /capita/day
Maximum Daily Demand Peaking Factor	2.25
Maximum Daily Demand	166.73 m ³ /day
	1.93 l/s

Maximum Hourly Demand

Total Number of Units	130 units
Zoning of Land	Residential
Equiv. Population Density	2 ppl/ha
Equiv. Population	260
Av. Daily Demand Per Capita	0.285 m ³ /capita/day
Maximum Hourly Demand Peaking Factor	4
Maximum Hourly Demand	12.35 m ³ /hour
	3.43 l/s

PHASE 2 - COMMERCIAL AREA

Maximum Daily Demand

Area	1.20 ha
Zoning of Land	Commercial
Equiv. Population Density	90 ppl/ha
Equiv. Population	108
Av. Daily Demand Per Capita	0.285 m ³ /capita/day
Maximum Daily Demand Peaking Factor	2.25
Maximum Daily Demand	69.26 m ³ /day
	0.80 l/s

Maximum Hourly Demand

Area	1.20 ha
Zoning of Land	Commercial
Equiv. Population Density	90 ppl/ha
Equiv. Population	108
Av. Daily Demand Per Capita	0.285 m ³ /capita/day
Maximum Hourly Demand Peaking Factor	2
Maximum Hourly Demand	2.57 m ³ /hour
	0.71 l/s



vallee

*Consulting Engineers,
Architects & Planners*

Subject:	HFW Hunt Street Development		
Date:	25/05/26	By:	NLO
Project #:	22-013	Page:	4

Summary of Maximum Daily Demand

Phase 1: 0.79 L/s

Phase 2 Residential: 1.93 L/s

Phase 2 Commercial: 0.80 L/s

Total Maximum Daily Demand:	3.52 L/s
------------------------------------	-----------------

Summary of Maximum Hourly Demand

Phase 1: 1.40 L/s

Phase 2 Residential: 3.43 L/s

Phase 2 Commercial: 0.71 L/s

Total Maximum Hourly Demand:	5.54 L/s
-------------------------------------	-----------------

ON-SITE FIRE PROTECTION SUPPLY CALCULATION

Per Fire Protection Water Supply Guideline, Ontario Building Code Division 3, Part B, 3.2.5.7

Project:	22-013 HFW 395 Queensway West	Building/Block #:	Units 1-6
Project Location:	Simcoe, ON	Firewalls/Sprinkler:	No

Conditions not requiring On-Site Fire Protection:

Building area is Less than 200 m ² or Less	☐
Building height is 2 Storeys or Less	☒
Building does not have a Group B Occupancy (Care or Detention)	☒
Building does not require a sprinkler system or standpipe and hose system	☒
Limiting distance from the property line is at least 13 m if the building has an F-1 (high hazard industrial) occupancy	☒
Building constitutes no significant environmental contamination potential under fire conditions	☒
On-Site Supply Required?	YES

Calculation Information:

$$Q = K * V * S_{Tot}$$

where: Q = Minimum supply of water in litres (L)
V = Total Building Volume in cubic metres
K = Water supply coefficient from Table 1
S_{Tot} = total of spatial coefficient values from property line exposures on all sides, as obtained from the formula:

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

where: S_{Side} = values are obtained from Figure 1, as modified by Sections 6.3 (e) and 6.3 (f) of the OBC Guideline
S_{Tot} = need not exceed 2.0 (see Section 7.0 of the OBC Guideline)

Determining K Value:

Major Occupancy Classification	Residential Occupancies
Group	C
Division	-
Building is of combustible construction. Floor assemblies, roof assemblies, mezzanines, loadbearing walls, columns and arches do not have a fire resistance rating.	K Factor 23

Determining Building Volume:

Building Length (m)	50.9	
Building Width (m)	18.4	
Building Area (m ²)	936.6	
Height, including basements (m)	11.0 *2 Storeys, with basement	
	Building Volume (m³) 10302	

Total Spatial Coefficient:

Exposure Distance (m)	Factor	
North Side	>10 0	
East Side	>10 0	
South Side	>10 0	
West Side	3 0.7	
	S_{Tot} Factor 1.7	

Minimum Water Supply Flow:

Q (L) 402,814

Minimum Water Supply Flow Rate OBC:

9000	L/min
150.0	L/sec

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 600m ² (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⁾ Q = KVS_{Tot} as referenced in Section 3(a)

ON-SITE FIRE PROTECTION SUPPLY CALCULATION

Per Fire Protection Water Supply Guideline, Ontario Building Code Division 3, Part B, 3.2.5.7

Project:	22-013 HFW 395 Queensway West	Building/Block #:	Units 21-24
Project Location:	Simcoe, ON	Firewalls/Sprinkler:	No

Conditions not requiring On-Site Fire Protection:

Building area is Less than 200 m ² or Less	☐
Building height is 2 Storeys or Less	☐
Building does not have a Group B Occupancy (Care or Detention)	☒
Building does not require a sprinkler system or standpipe and hose system	☒
Limiting distance from the property line is at least 13 m if the building has an F-1 (high hazard industrial) occupancy	☒
Building constitutes no significant environmental contamination potential under fire conditions	☒
On-Site Supply Required?	YES

Calculation Information:

$$Q = K * V * S_{Tot}$$

where: Q = Minimum supply of water in litres (L)
V = Total Building Volume in cubic metres
K = Water supply coefficient from Table 1
S_{Tot} = total of spatial coefficient values from property line exposures on all sides, as obtained from the formula:

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

where: S_{Side} = values are obtained from Figure 1, as modified by Sections 6.3 (e) and 6.3 (f) of the OBC Guideline
S_{Tot} = need not exceed 2.0 (see Section 7.0 of the OBC Guideline)

Determining K Value:

Major Occupancy Classification	Residential Occupancies	
Group	C	
Division	-	
Building is of combustible construction. Floor assemblies, roof assemblies, mezzanines, loadbearing walls, columns and arches do not have a fire resistance rating.		
K Factor		23

Determining Building Volume:

Building Length (m)	25.5	
Building Width (m)	11.6	
Building Area (m ²)	295.8	
Height, including basements (m)	11.0 *3 Storeys, with no basement	
Building Volume (m³)		3254

Total Spatial Coefficient:

	Exposure Distance (m)	Factor	
North Side	>10	0	
East Side	3	0.7	
South Side	>10	0	
West Side	3	0.7	
S_{Tot} Factor			2.4

Minimum Water Supply Flow:

Q (L) 179,610

Minimum Water Supply Flow Rate OBC:

5400 L/min
90.0 L/sec

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 600m ² (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⁾ Q=KVS_{Tot} as referenced in Section 3(a)

ON-SITE FIRE PROTECTION SUPPLY CALCULATION

Per Fire Protection Water Supply Guideline, Ontario Building Code Division 3, Part B, 3.2.5.7

Project:	22-013 HFW 395 Queensway West	Building/Block #:	Mid-Rise
Project Location:	Simcoe, ON	Firewalls/Sprinkler:	No

Conditions not requiring On-Site Fire Protection:

Building area is Less than 200 m ² or Less	☐
Building height is 2 Storeys or Less	☐
Building does not have a Group B Occupancy (Care or Detention)	☒
Building does not require a sprinkler system or standpipe and hose system	☒
Limiting distance from the property line is at least 13 m if the building has an F-1 (high hazard industrial) occupancy	☒
Building constitutes no significant environmental contamination potential under fire conditions	☒
On-Site Supply Required?	YES

Calculation Information:

$$Q = K * V * S_{Tot}$$

where: Q = Minimum supply of water in litres (L)
V = Total Building Volume in cubic metres
K = Water supply coefficient from Table 1
S_{Tot} = total of spatial coefficient values from property line exposures on all sides, as obtained from the formula:

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

where: S_{Side} = values are obtained from Figure 1, as modified by Sections 6.3 (e) and 6.3 (f) of the OBC Guideline
S_{Tot} = need not exceed 2.0 (see Section 7.0 of the OBC Guideline)

Determining K Value:

Major Occupancy Classification	Residential Occupancies
Group	C
Division	-
Building is of combustible construction. Floor assemblies, roof assemblies, mezzanines, loadbearing walls, columns and arches do not have a fire resistance rating.	K Factor 23

Determining Building Volume:

Storey Height (m)	3.0	
Residential Building Area (m ²)	10600.0	
Commercial Building Area (m ²)	1672.0	
		Building Volume (m³) 36816

Total Spatial Coefficient:

	Exposure Distance (m)	Factor	
North Side	>10	0	
East Side	>10	0	
South Side	>10	0	
West Side	>10	0	
			S_{Tot} Factor 1

Minimum Water Supply Flow:

Q (L) 846,768

Minimum Water Supply Flow Rate OBC:

9000	L/min
150.0	L/sec

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 600m ² (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⁾ Q=KVS_{Tot} as referenced in Section 3(a)

Ontario Building Code Tables and Figures

Table 3.1.2.1.
Major Occupancy Classification

Forming Part of Sentences 3.1.2.1.(1), 3.1.2.2.(1) and 3.11.2.1.(3)

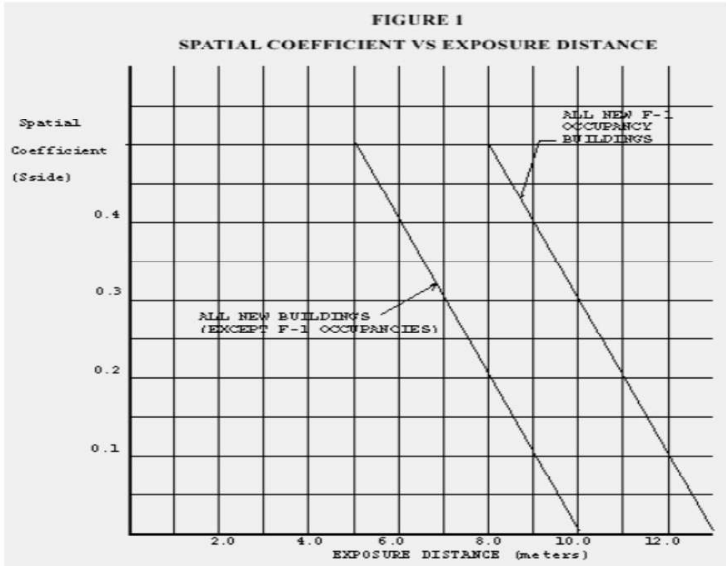
Item	Column 1 Group	Column 2 Division	Column 3 Description of Major Occupancies
1.	A	1	Assembly occupancies intended for the production and viewing of the performing arts
2.	A	2	Assembly occupancies not elsewhere classified in Group A
3.	A	3	Assembly occupancies of the arena type
4.	A	4	Assembly occupancies in which occupants are gathered in the open air
5.	B	1	Detention occupancies
6.	B	2	Care and treatment occupancies
7.	B	3	Care occupancies
8.	C	---	Residential occupancies
9.	D	---	Business and personal services occupancies
10.	E	---	Mercantile occupancies
11.	F	1	High hazard industrial occupancies
12.	F	2	Medium hazard industrial occupancies
13.	F	3	Low hazard industrial occupancies

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 600m ² (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⁾ Q=KVS_{tot} as referenced in Section 3(a)

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
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
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
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
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
Column 1		2	3	4	5



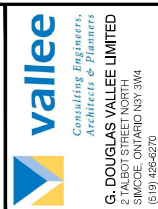


LEGEND

————— PROPERTY LINE

[illegible]

Figure 1 is a schematic diagram of the experimental setup. It shows a subject seated at a table, looking at a screen. The screen displays a horizontal line with a vertical line intersecting it. The horizontal line is labeled 'HORIZONTAL' and has a scale from 0 to 100. The vertical line is labeled 'VERTICAL' and has a scale from 0 to 100. The subject is viewing the screen through a viewing device. The viewing device is labeled 'VIEWING DEVICE' and has a scale from 0 to 100. The subject is viewing the screen through the viewing device. The viewing device is labeled 'VIEWING DEVICE' and has a scale from 0 to 100. The subject is viewing the screen through the viewing device. The viewing device is labeled 'VIEWING DEVICE' and has a scale from 0 to 100.



PRELIMINARY
NOT TO BE USED
FOR CONSTRUCTION

Project Title
HFW HUNT STREET
RESIDENTIAL DEVELOPMENT
SIMCOE - NORFOLK COUNTY

Drawing Title	
FIRE SEPARATION DISTANCES	
Designed by :	Drawn By : NLB
Checked by :	Date Started : JAN 2023

Drawing No. **1:500**
 Project No. **22-013**
FIRE

FORM FFD1 - Fire Flow Determination - Required Fire Flow (RFF) and Available Fire Flow (AFF)

Application Number: SPPL2024179

Municipal Address: 395 Queensway West, Simcoe - Northern Parcel - Units 1-6

Through staff report - Norfolk County Development Application Guidelines - a new Fire Flow Determination approach was adopted. This form is intended to guide applicants through the documentation requirements of this change. FUS calculations are no longer required for new submissions. This form is supplemental to related and supporting documentation/calculations.

1. REQUIRED FIRE FLOW - RFF**1 a) Required Fire Flow - RFF a) Ontario Building Code**

Q=KVS _{Tot}	
Please provide required fire flow -RFF using the water supply flow rate method (OBC section A-3.2.5.7; OFM-TG-03-1999 FIRE PROTECTION WATER SUPPLY GUIDELINE FOR PART 3 IN THE ONTARIO BUILDING CODE - Q=KVS _{Tot} . This methodology shall be applied to all buildings falling under Part 3 and Part 9 of the Building Code (OBC sections 1.1.2.2 and 1.1.2.4). Detailed calculations shall be submitted as an appended memo.	
Enter calculated value here (highest if multiple buildings)	
Required fire volume as calculated using Q=KVS _{Tot}	402,814 Litres
A. Required min. Water Supply Flow rate (Table 2 OBC A.3.2.5.7)	150 Litres/second
B. Sprinkler Requirements (per NFPA 13)	0 Litres/second
C. Standpipe Requirements (per NFPA 14)	0 Litres/second
Total OBC Requirements (A+B+C)	150 Litres/second

1 b) Required Fire Flow - RFF b) Land Use Based and based on Community Area

Land Use Target Table		
Please select from Table 1: Target Required Fire Flow (based on land use)		
	Community Area	
	Simcoe, Delhi, Port Dover	Waterford, Port Rowan, Courtland
Land Use	Target RFF (L/s)	Target RFF (L/s)
Commercial	150	150
Industrial	150	150
Institutional	150	150
Small ICI (<1800m ³)	100	100
Residential- Multi greater than 3 units)	150	90
Residential- Medium (3 units or less)	125	75
Residential- Single	85	50
Residential - Single (dead-end)	30	30

Enter calculated value here (highest if multiple buildings)	
150	Litres/second

1 c) Required Fire Flow - RFF c)

Enter the higher of a) or b) from above	
150	Litres/second

Comments:

--

FORM FFD1 - Fire Flow Determination - Required Fire Flow (RFF) and Available Fire Flow (AFF)

Application Number: SPPL2024179

Municipal Address: 395 Queensway West, Simcoe - Northern Parcel - Units 1-6

2 a) Available Fire Flow-AFF a)**Fire Hydrant Test calculated at 20 psi**

Please provide available fire flow-AFF as determined through developer hydrant fire flow test or County Hydrant test database.

Enter value here:

Please check: Litres/second

☐ Developer hydrant fire flow test, OR

☐ County Hydrant test database

Comments:

2 b) Available Fire Flow-AFF b)**Computer Modelling**

Please provide available fire flow-AFF as determined through computer modelling.



Modelling criteria and boundary conditions were approved by Norfolk County

Enter value here:

 183-320 Litres/second

Comments:

DECLARATION OF ADEQUATE SERVICES

RFF c) is less than or equal to AFF, or



RFF c) is greater than AFF.

Prepared by: N. Ongena

Date: 2025-05-29

FORM FFD1 - Fire Flow Determination - Required Fire Flow (RFF) and Available Fire Flow (AFF)Application Number: **SPPL2024179**Municipal Address: **395 Queensway West, Simcoe - Northern Parcel - Units 21-24**

Through staff report - Norfolk County Development Application Guidelines - a new Fire Flow Determination approach was adopted. This form is intended to guide applicants through the documentation requirements of this change. FUS calculations are no longer required for new submissions. This form is supplemental to related and supporting documentation/calculations.

1. REQUIRED FIRE FLOW - RFF**1 a) Required Fire Flow - RFF a) Ontario Building Code**

Q=KVS_{Tot}	
Please provide required fire flow -RFF using the water supply flow rate method (OBC section A-3.2.5.7; OFM-TG-03-1999 FIRE PROTECTION WATER SUPPLY GUIDELINE FOR PART 3 IN THE ONTARIO BUILDING CODE - Q=KVS _{Tot} . This methodology shall be applied to all buildings falling under Part 3 and Part 9 of the Building Code (OBC sections 1.1.2.2 and 1.1.2.4). Detailed calculations shall be submitted as an appended memo.	
Enter calculated value here (highest if multiple buildings)	
Required fire volume as calculated using Q=KVS _{Tot}	179,610 Litres
A. Required min. Water Supply Flow rate (Table 2 OBC A.3.2.5.7)	90 Litres/second
B. Spinkler Requirements (per NFPA 13)	0 Litres/second
C. Standpipe Requirements (per NFPA 14)	0 Litres/second
Total OBC Requirements (A+B+C)	90 Litres/second

1 b) Required Fire Flow - RFF b) Land Use Based and based on Community Area

Land Use Target Table		
Please select from Table 1: Target Required Fire Flow (based on land use)		
	Community Area	
	Simcoe, Delhi, Port Dover	Waterford, Port Rowan, Courtland
Land Use	Target RFF (L/s)	Target RFF (L/s)
Commercial	150	150
Industrial	150	150
Institutional	150	150
Small ICI (<1800m ³)	100	100
Residential- Multi greater than 3 units)	150	90
Residential- Medium (3 units or less)	125	75
Residential- Single	85	50
Residential - Single (dead-end)	30	30

Enter calculated value here (highest if multiple buildings)

150 Litres/second

1 c) Required Fire Flow - RFF c)

Enter the higher of a) or b) from above

150 Litres/second

Comments:

FORM FFD1 - Fire Flow Determination - Required Fire Flow (RFF) and Available Fire Flow (AFF)

Application Number: SPPL2024179

Municipal Address: 395 Queensway West, Simcoe - Northern Parcel - Units 21-24

2 a) Available Fire Flow-AFF a)**Fire Hydrant Test calculated at 20 psi**

Please provide available fire flow-AFF as determined through developer hydrant fire flow test or County Hydrant test database.

Enter value here:

Please check: Litres/second

☐ Developer hydrant fire flow test, OR

☐ County Hydrant test database

Comments:

2 b) Available Fire Flow-AFF b)**Computer Modelling**

Please provide available fire flow-AFF as determined through computer modelling.



Modelling criteria and boundary conditions were approved by Norfolk County

Enter value here:

 183-320 Litres/second

Comments:

DECLARATION OF ADEQUATE SERVICES

RFF c) is less than or equal to AFF, or



RFF c) is greater than AFF.

Prepared by: N. Ongena

Date: 2025-05-29

FORM FFD1 - Fire Flow Determination - Required Fire Flow (RFF) and Available Fire Flow (AFF)

Application Number: SPPL2024179

Municipal Address: 395 Queensway West, Simcoe - Southern Parcel - Mid-Rise

Through staff report - Norfolk County Development Application Guidelines - a new Fire Flow Determination approach was adopted. This form is intended to guide applicants through the documentation requirements of this change. FUS calculations are no longer required for new submissions. This form is supplemental to related and supporting documentation/calculations.

1. REQUIRED FIRE FLOW - RFF**1 a) Required Fire Flow - RFF a) Ontario Building Code**

Q=KVS _{Tot}	
Please provide required fire flow -RFF using the water supply flow rate method (OBC section A-3.2.5.7; OFM-TG-03-1999 FIRE PROTECTION WATER SUPPLY GUIDELINE FOR PART 3 IN THE ONTARIO BUILDING CODE - Q=KVS _{Tot} . This methodology shall be applied to all buildings falling under Part 3 and Part 9 of the Building Code (OBC sections 1.1.2.2 and 1.1.2.4). Detailed calculations shall be submitted as an appended memo.	
Enter calculated value here (highest if multiple buildings)	
Required fire volume as calculated using Q=KVS _{Tot}	846,768 Litres
A. Required min. Water Supply Flow rate (Table 2 OBC A.3.2.5.7)	150 Litres/second
B. Spinkler Requirements (per NFPA 13)	0 Litres/second
C. Standpipe Requirements (per NFPA 14)	0 Litres/second
Total OBC Requirements (A+B+C)	150 Litres/second

1 b) Required Fire Flow - RFF b) Land Use Based and based on Community Area

Land Use Target Table		
Please select from Table 1: Target Required Fire Flow (based on land use)		
	Community Area	
	Simcoe, Delhi, Port Dover	Waterford, Port Rowan, Courtland
Land Use	Target RFF (L/s)	Target RFF (L/s)
Commercial	150	150
Industrial	150	150
Institutional	150	150
Small ICI (<1800m ³)	100	100
Residential- Multi greater than 3 units)	150	90
Residential- Medium (3 units or less)	125	75
Residential- Single	85	50
Residential - Single (dead-end)	30	30

Enter calculated value here (highest if multiple buildings)

150 Litres/second

1 c) Required Fire Flow - RFF c)

Enter the higher of a) or b) from above

150 Litres/second

Comments:

FORM FFD1 - Fire Flow Determination - Required Fire Flow (RFF) and Available Fire Flow (AFF)

Application Number: SPPL2024179

Municipal Address: 395 Queensway West, Simcoe - Southern Parcel - Mid-Rise

2 a) Available Fire Flow-AFF a)**Fire Hydrant Test calculated at 20 psi**

Please provide available fire flow-AFF as determined through developer hydrant fire flow test or County Hydrant test database.

Enter value here:

Please check: Litres/second

☐ Developer hydrant fire flow test, OR

☐ County Hydrant test database

Comments:

2 b) Available Fire Flow-AFF b)**Computer Modelling**

Please provide available fire flow-AFF as determined through computer modelling.



Modelling criteria and boundary conditions were approved by Norfolk County

Enter value here:

 200 Litres/second

Comments:

DECLARATION OF ADEQUATE SERVICES

RFF c) is less than or equal to AFF, or



RFF c) is greater than AFF.

Prepared by: N. Ongena

Date: 2025-05-29

APPENDIX C

Sanitary Sewer Hydraulic Capacity Assessment Report
(*R.V. Anderson Associates Limited dated July 17, 2023*)

Water Modelling Report
(*R.V. Anderson Associates Limited dated July 17, 2023*)

TECHNICAL MEMORANDUM

To: Stephen Gradish RVA: 215718.59

From: Mukesh Choudhary, P.Eng., PMP

Date: July 17, 2023

Subject: Simcoe – HFW Hunt Street Development – Sanitary Sewer Hydraulic Capacity Assessment

1.0 Introduction

Norfolk County (County) requested that R.V. Anderson Associates Limited (RVA) conduct an analysis of the existing sanitary sewer system downstream of the proposed HFW Hunt Street development located in the Town of Simcoe. The purpose of the analysis was to determine the impact of the proposed development on the downstream sanitary sewer system.

The report summarizes the potential impact of the proposed development on the wastewater collection system by reviewing the capacity of the existing sewers and pumping stations to convey wastewater flows to the Simcoe Wastewater Treatment Plant (WWTP).

2.0 Background

The development consists of an assembly of parcels known municipally as 395, 401, 403, 405, and 411 of Queensway West. It would contain 152 residential units and 2 floors of commercial space. The site is bound to the east by Hunt Street and to the south by Queensway Highway. The site is approximately 2.86 hectares in size.

Wastewater generated at the proposed development will be discharged to the existing sewer on Hunt Street, which will eventually discharge to the Simcoe WWTP for treatment and disposal.

The County provided RVA with the following reports (including drawings and appendices) prepared by G. Douglas Vallee Limited to complete the analysis:

- Functional Servicing Report – HFW Hunt Street Development, May 11, 2023

Table 1 below presents the proposed development, and peak wastewater discharges.

Table 1 – Development Design Flows

	Residential	Commercial
Unit / Area [a]	152 units	1.01 ha
Density (persons per unit/persons per ha) ¹ [b]	2.75 persons/unit	90 persons/ha
Population [c]=[a]*[b]	419	90
Unit Sewage Rate ¹ [d]	450 L/cap/day	450 L/cap/day
Average Daily Flow [e]=[c]*[d]	2.18 L/s	0.47 L/s
Peaking Factor ² [f]	3.83	
Peak base Flow [g]=[e]*[f]	10.1 L/s	
Service Area [h]	2.86 ha	
Infiltration Allowance ¹ [i]	0.28 L/s/ha ¹	
Infiltration Flow [j]=[h]*[i]	0.8 L/s	
Peak Design Flow [k]=[g]+[j]	10.9 L/s	

Note:

- Norfolk County Design Criteria
- Residential Harmon peak factor 4.01 and commercial modified Harmon peak factor 3.40. Weighted arithmetic mean of the Harmon peak factor is 3.83. $[(4.01 \times 419 + 90 \times 3.40) / (419 + 90) = 3.83]$

Figure 1 – Limits of the Proposed Development

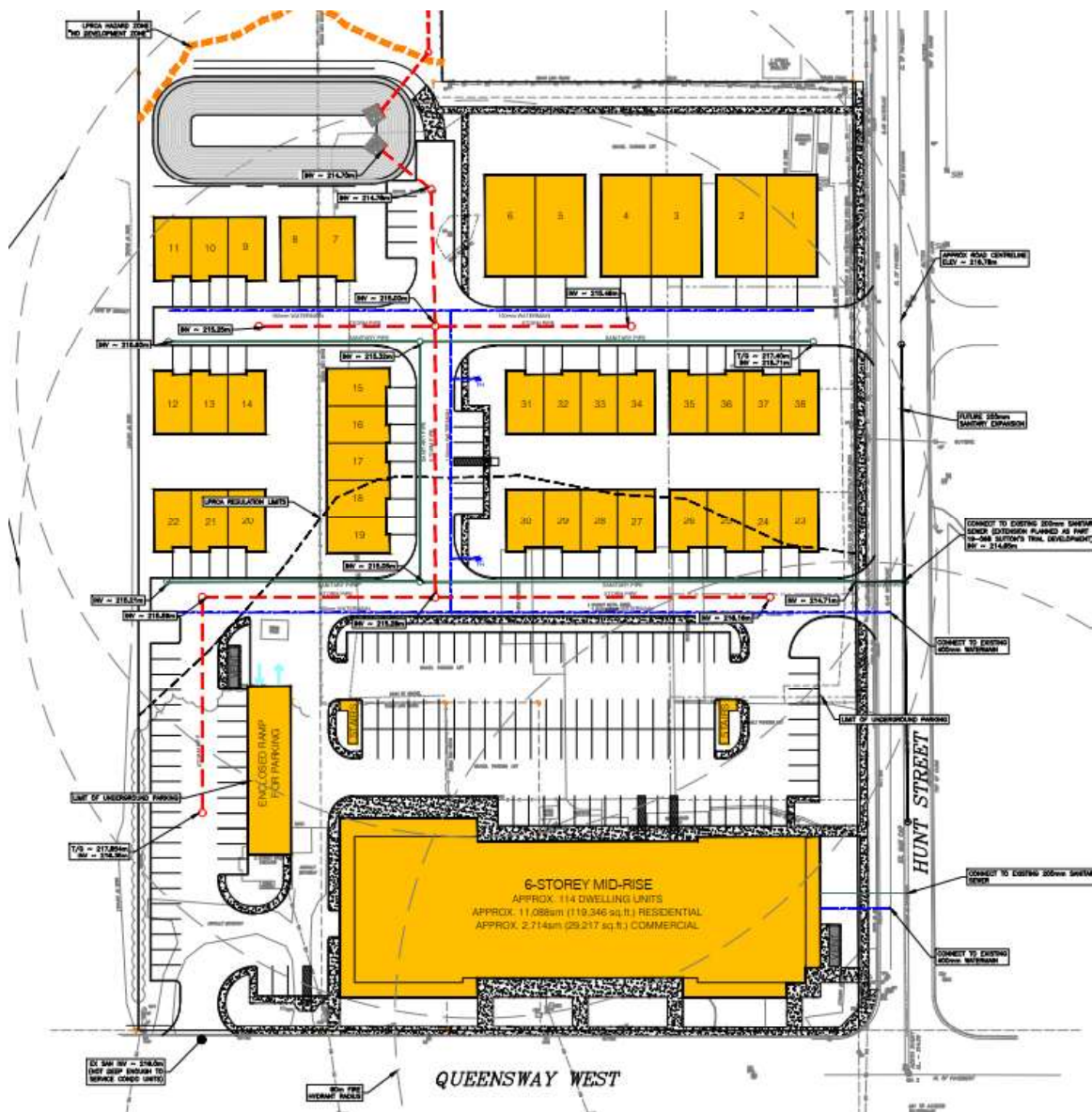
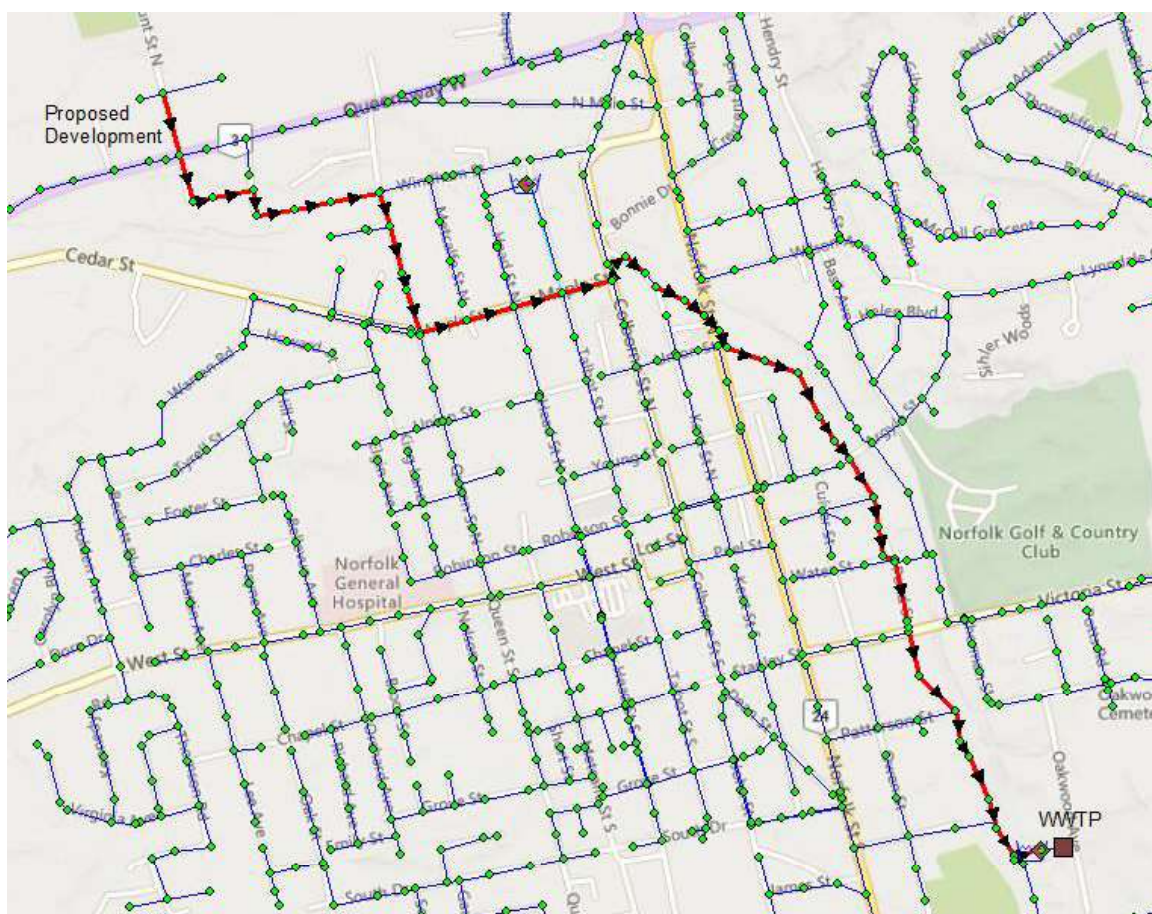


Figure 2 –Sanitary Sewer Route from the proposed development to WWTP



3.0 Summary of the Sanitary Sewer Hydraulic Modelling

An InfoSewer sanitary sewer model, provided by the County, was utilized for this study. The model included sewer attributes and flows from earlier master planning studies. The InfoSewer model was updated to include estimated flows from the proposed development. The following points summarize the modelling that was performed:

- The existing manholes, sewers, and pumps extracted from the County's shape files were reviewed for completeness to ensure the flow path from the proposed development to the WWTP was represented.
- Simulations were performed to assess the capacity to convey existing and proposed flows in the sewers between the proposed development and the WWTP.
- The following proposed wastewater system upgrades are not yet completed; however, they were modeled as completed with the understanding these have been approved by the County and as such, included in the Master Wastewater Model:
 - 50 Riverside Road Development;

- Hunt Street Development;
- Toyota dealership and carwash;
- Cedar Park Plaza;
- Meadows Development;
- 291 Victoria Street Development;
- Simcoe Stanley Street Development;
- 600 Norfolk Street Development;
- Ireland Heights Phase 2 Development;
- Rob Blake Way Residential Development;
- Sydenham Street Development;
- 80 Patterson Street Development;
- Metcalf Street South Development;
- Colborne Street Development;
- Judd Drive Development;
- 11 Elizabeth Street Development;
- 76 Evergreen Hill Road Development;
- 18 Decou Road Development;
- West Street Reconstruction;
- 166 Metcalfe South Development;
- 682 Ireland Road Development;
- Victoria Bridge Reconstruction;
- 210 Argyle Street Development; and
- 157 Queensway East Development.

It is important to note these upgrades have a significant impact on the result noted in this memorandum. If any of these developments are likely not to occur, the result may vary significantly.

4.0 Results of the Hydraulic Analysis

Table 2 summarizes the conveyance capacity usage along the flow path from the proposed development to the WWTP in the existing and proposed condition. Enclosed Figures A1 to A3 show the conveyance capacity usage with the proposed development.

Table 2 – Conveyance Capacity Usage for the Proposed Site

Sewer Sections	Pipe Diam. (mm)	Fraction of Conveyance Capacity Usage	
		Pre-development	Post Development
Hunt Street	375	0.30	0.35
Windham St	525	0.39	0.46
Queen St N	525	0.44	0.52
Maple St	600	0.68	0.73
Ken St N	600	0.64	0.68
ROW to Argyle St	675	0.47	0.50
Pond Street	750	0.58	0.60
ROW to Woodhouse St	900	0.66	0.68
Entry to WWTP	900	0.85	0.86

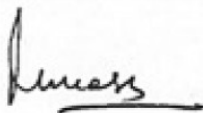
5.0 Conclusion

The proposed development at Hunt Street is projected to increase peak wastewater flows by 10.9 L/s along the path to the WWTP. To assess the potential impact, the Harmon peaking factor was calculated for the projected population of the development. The analysis shows that the sanitary collection system could accommodate the additional flow from the proposed development.

Hydraulic modeling further indicates that additional peak flows (with all the approved developments in service) would be reaching the conveyance capacity of the sewer downstream near WWTP. The peak design flows from each sub-catchment have been carried through to the WWTP where the Harmon peaking factor should be computed in terms of the total population of the town, as a result, the peak flow near WWTP in the model is conservative. However, the County should still monitor the trunk sewer near WWTP to detect and address any potential surcharge.

Yours very truly,

R.V. ANDERSON ASSOCIATES LIMITED



Mukesh Choudhary, P.Eng., PMP

Manager, Hydraulic Modeling

Enclosures:

1. Figure A1 – Capacity Usage Plan – From the proposed development to Norfolk Street North
2. Figure A2 – Capacity Usage Plan – From Norfolk Street North to Water Street
3. Figure A3 – Capacity Usage Plan – From Water Street to WWTP

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00	July 17, 2023	Tech Memo Issued via email	Stephen Gradish – Norfolk County



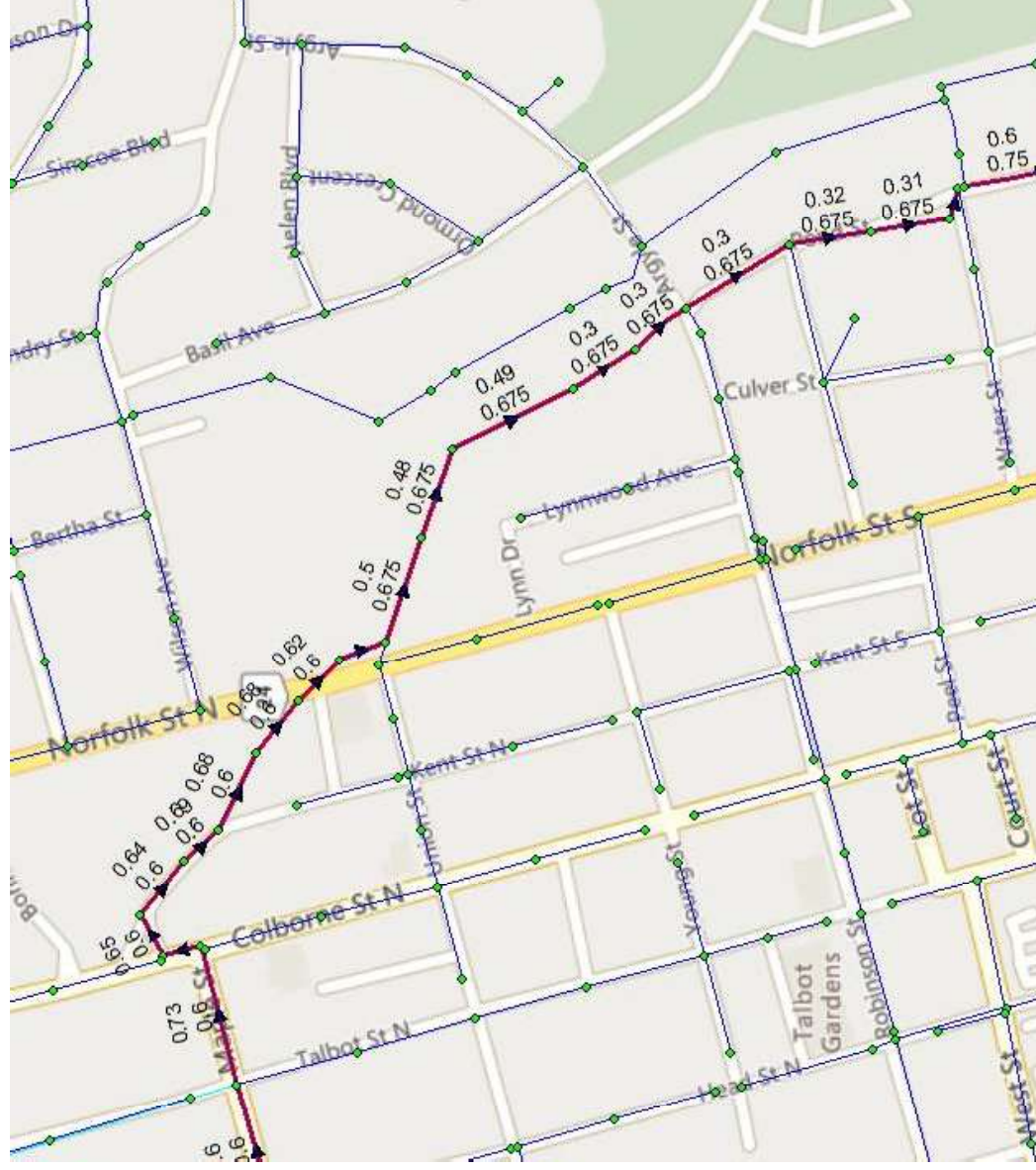
Simcoe HFW Hunt Street Development
Sanitary Sewer Capacity Review

Date: 2023-07

Scale: NTS

Project No.
215718.59

Figure: A1



LEGEND

- Manhole
- Existing Sewer
- Proposed Sewer from Development (Assumed Slope)
- Existing Sewer on the Flow Route to WWTP
- Forcemain
- Top Number: Ratio of full flow capacity
- Bottom Number: Sewer Diameter (m)
- Pump station

TECHNICAL MEMORANDUM

To: Stephen Gradish RVA: 215718.59

From: Mukesh Choudhary, P.Eng., PMP

Date: July 17, 2023

Subject: Simcoe – HFW Hunt Street Development – Water Modeling Report

1.0 Introduction

R.V. Anderson Associates Limited (RVA) was retained by Norfolk County (County) to perform a water system hydraulic assessment for the proposed residential development at Hunt Street. The proposed development will be serviced by the Simcoe water distribution network.

The purpose of the analysis was to assess the minimum system pressure and fire flow availability, as well as to determine the impact of the proposed development on the Simcoe water distribution system.

2.0 Background

The development involves an assembly of parcels known municipally as 395, 401, 403, 405, and 411 of Queensway West. It would contain 152 residential units and 2 floors of commercial space. The site is bound to the east by Hunt Street and to the south by Queensway Highway.

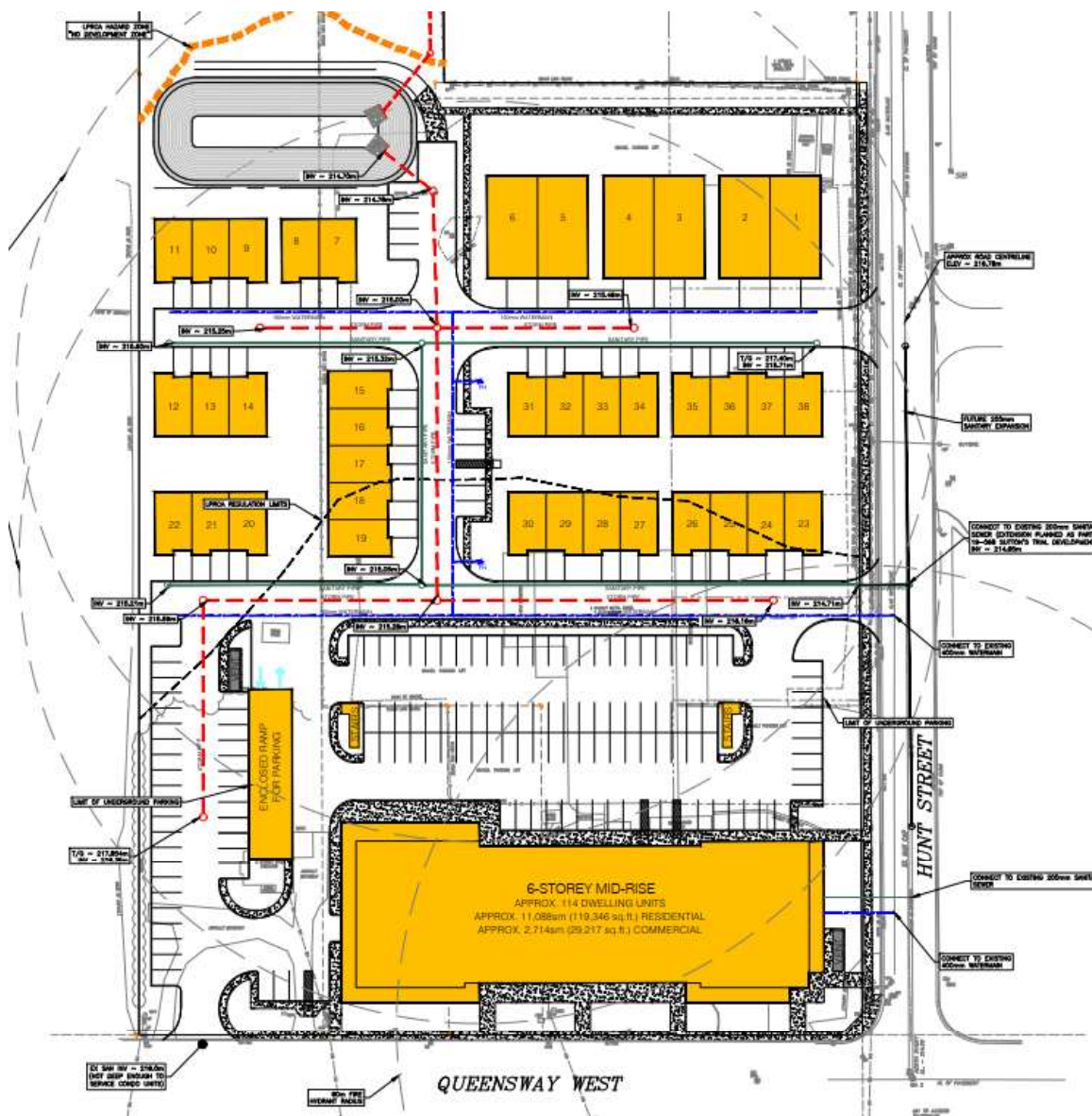
The report evaluates the adequacy of the existing network to supply the required fire flow to the proposed development under the Maximum Daily Demand (MDD) scenario and provide adequate pressure to the system under a Peak Hour Demand (PHD) scenario. The report further determines the impact of the proposed development on the existing water distribution system.

3.0 Data Review

The County provided RVA with the following reports (including drawings and appendices) prepared by G. Douglas Vallee Limited to complete the analysis:

- Functional Servicing Report – HFW Hunt Street Development, May 11, 2023

Figure 1 below shows the area of the proposed development.



4.0 Summary of the Water Distribution Hydraulic Modelling

RVA used the Simcoe Water Distribution Model calibrated in 2022 to review the impact of the proposed development on the water distribution system.

The following points summarize the assumptions and analysis that were completed:

- Based on the Norfolk County Design Criteria, the population density of 2.75 persons per residential unit and 90 persons per hectare for commercial was used for the new development. The average daily demand based upon 450 litres per person per day, was estimated as 2.65 L/s. Max daily demand and peak hourly demand were estimated as 5.96 L/s and 10.6 L/s, respectively.
- In the overall distribution system model, a peak hour demand (PHD) factor of 3.0 was used, per the Norfolk County Integrated Sustainable Master Plan (ISMP). The maximum day demand (MDD) factor of 1.61 was used, per the Norfolk ISMP update TM in 2022.
- The proposed development including new nodes, pipe segments, and average day demands, max daily demand and peak hour demand were added to the water model. Node elevation data was obtained from Site Servicing Plan;
- Simulations were completed to estimate the pressure in the system during PHD and available FF during MDD. The simulations were completed using the scenarios in the existing Simcoe Water Distribution Model;
- MECP recommended minimum system pressures of 40 psi to be maintained under Peak Hour Demand (PHD);
- MECP recommended minimum residual pressure of 20 psi to be maintained under Max Day Demand (MDD) + Fire Flow (FF);
- According to the Functional Servicing Report prepared by G. Douglas Vallee Limited, the estimated required fire flow for the proposed development following the Fire Underwriters Survey (FUS) guidelines, is 183 L/s
- The following proposed water distribution system upgrades are not yet completed; however, they were modeled as completed with the understanding these have been approved by the County and as such, included in the Master Water Model:
 - Connection of the Donly Drive condominiums to Ireland Road via 300mm watermain located in the Southeast corner of the Distribution System;
 - Stalker Park and Holden Avenue Watermain disconnection;
 - 50 Riverside Road Development;
 - Hunt Street Development;
 - Toyota dealership and carwash;

- Cedar Park Plaza;
- Meadows Development;
- 291 Victoria Street Development;
- Simcoe Stanley Street Development;
- 600 Norfolk Street Development;
- South Drive Reconstruction;
- Ireland Heights Phase 2 Development;
- Rob Blake Way Residential Development;
- Tyrell Street Trunk Main Upgrade;
- Sydenham Street Development;
- 80 Patterson Street Development;
- Metcalf Street South Development;
- Colborne Street Development;
- Judd Drive Development;
- 11 Elizabeth Street Development;
- 76 Evergreen Hill Road Development;
- 18 Decou Road Development;
- West Street Reconstruction;
- 166 Metcalfe South Development;
- 682 Ireland Road Development;
- Victoria Bridge Reconstruction;
- 210 Argyle Street Development; and
- 157 Queensway East Development.

It is important to note these upgrades have a significant impact on the result noted in this memorandum. If any of these developments are likely not to occur, the result may vary significantly.

5.0 Results of the Hydraulic Analysis

The following points summarize the results of the analysis completed by RVA.

5.1 Existing Conditions

- Figure A-1 shows the resulting system pressures under the existing PHD condition. The model results indicated that the pressures in the vicinity of the proposed Development are 67 ~ 69 psi on Hunt Street North which is higher than the MECRP recommended minimum operating pressure of 40 psi.

- Figure A-2 shows the resulting available FF under the existing MDD plus fire condition. The available FFs during MDD are approximately 444 ~462 L/s on Hunt Street North.

5.2 Proposed Conditions

The proposed development would have two connections to the existing 400mm diameter watermain on Hunt Street North.

- Figure B-1 shows the resulting system pressures with Phase 1 under the PHD condition. Based on the model results, the pressures in the development would be 65 ~ 67 psi, above the MECP-recommended pressure of 40 psi. The proposed development would reduce 1 psi on pressure in the vicinity.
- Figure B-2 – The model results indicated that the available FFs during MDD in the development would be approximately 183 ~ 320 L/s, which meet the required FF of 183 L/s. The model results further indicated that the proposed development would be 438 ~ 456 L/s on the FF in its vicinity, about a reduction of 6 L/s.

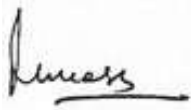
6.0 Conclusion

The existing water distribution system of Simcoe can provide sufficient pressure and required FF for the proposed HFW Hunt Street development.

The model results further indicate that the proposed development has a marginal impact on pressure and FF in its vicinity.

Yours very truly,

R.V. ANDERSON ASSOCIATES LIMITED



Mukesh Choudhary, P.Eng., PMP
Manager, Hydraulic Modeling

Enclosures:

1. Figure A-1 – Existing: Pressure During Peak Hour Demand
2. Figure A-2 – Existing: Available Fire Flow During Max Day Demand + Fire Flow
3. Figure B-1 – Proposed: Pressures During Peak Hour Demand
4. Figure B-2 – Proposed: Available Fire Flow During Max Day Demand + Fire Flow

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Revision #	Date	Details	Distribution
00	July 17, 2023	Tech Memo Issued via email	Stephen Gradish – Norfolk County

Figure A-1
Pressure during PHD
Existing

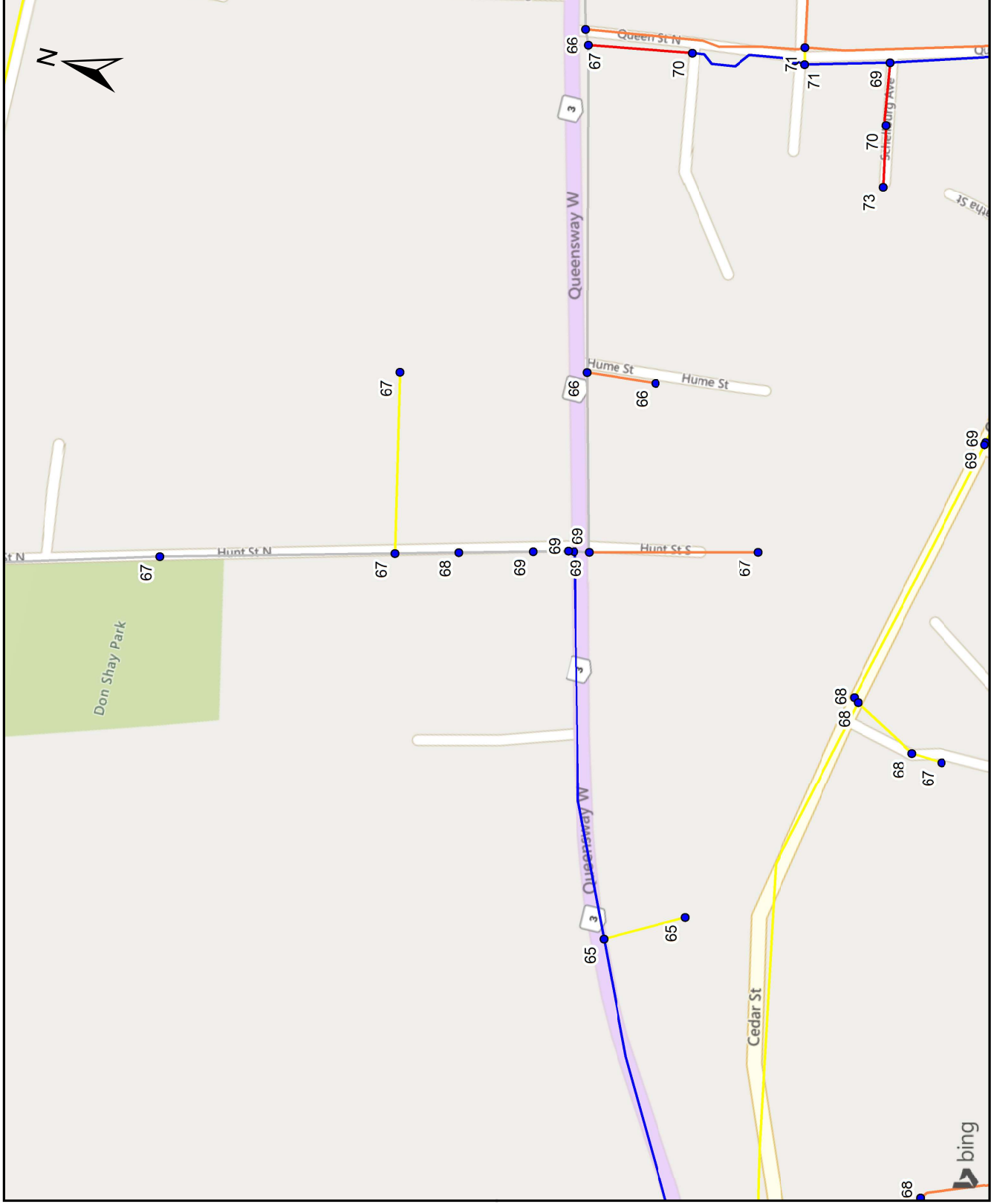
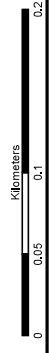
Legends

Node Pressure (psi)

- < 40
- 40 ~ 50
- 50 ~ 60
- 60 ~ 80
- 80 ~ 90
- 90 ~ 100

Watermains (mm)

- ≤100
- 150
- 200
- 250
- 300
- 350
- 400



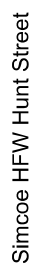
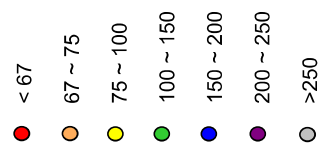


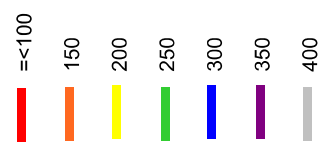
Figure A-2
Available Fire Flow during MDD
Existing

Legends

Node Flow (L/s)



Watermains (mm)



RVA Project Number: 215718.59
Date: 2023-07

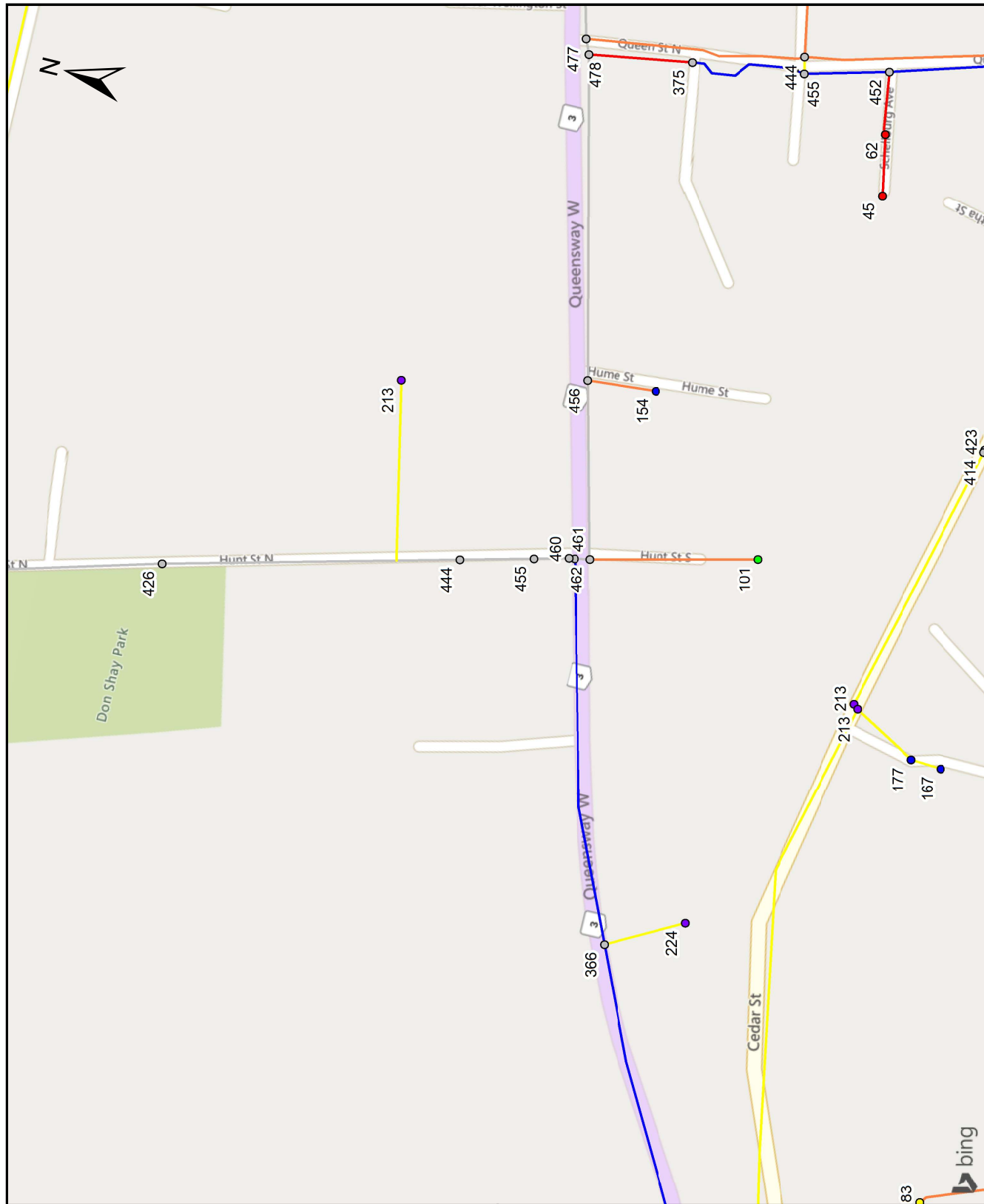


Figure B-1
Pressure during PHD
Proposed

Legends

Node Pressure (psi)

- < 40
- 40 ~ 50
- 50 ~ 60
- 60 ~ 80
- 80 ~ 90
- 90 ~ 100

Watermains (mm)

- ≤ 100
- 150
- 200
- 250
- 300
- 350
- 400

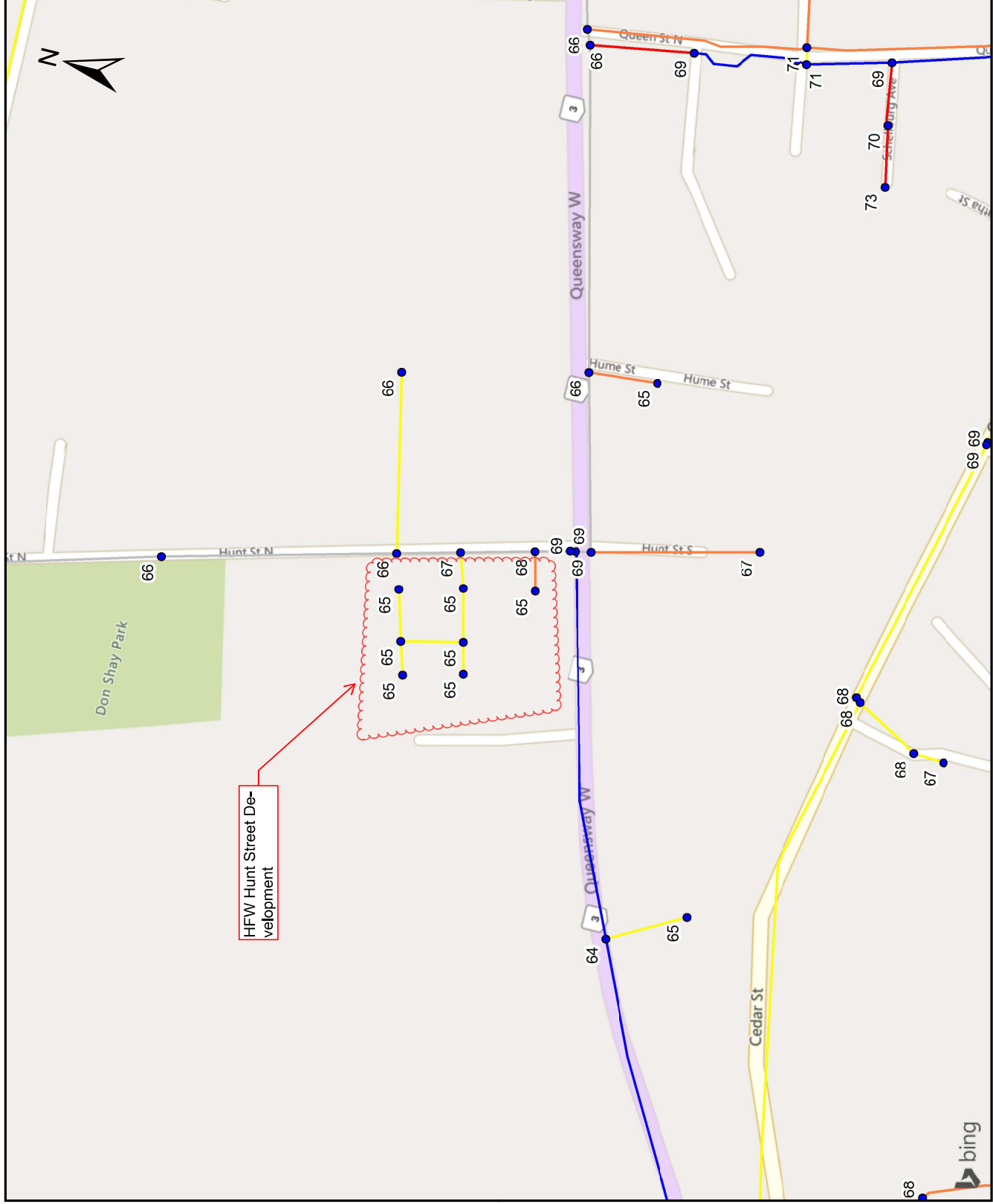
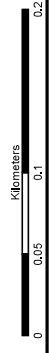


Figure B-2
Available Fire Flow during MDD
Proposed

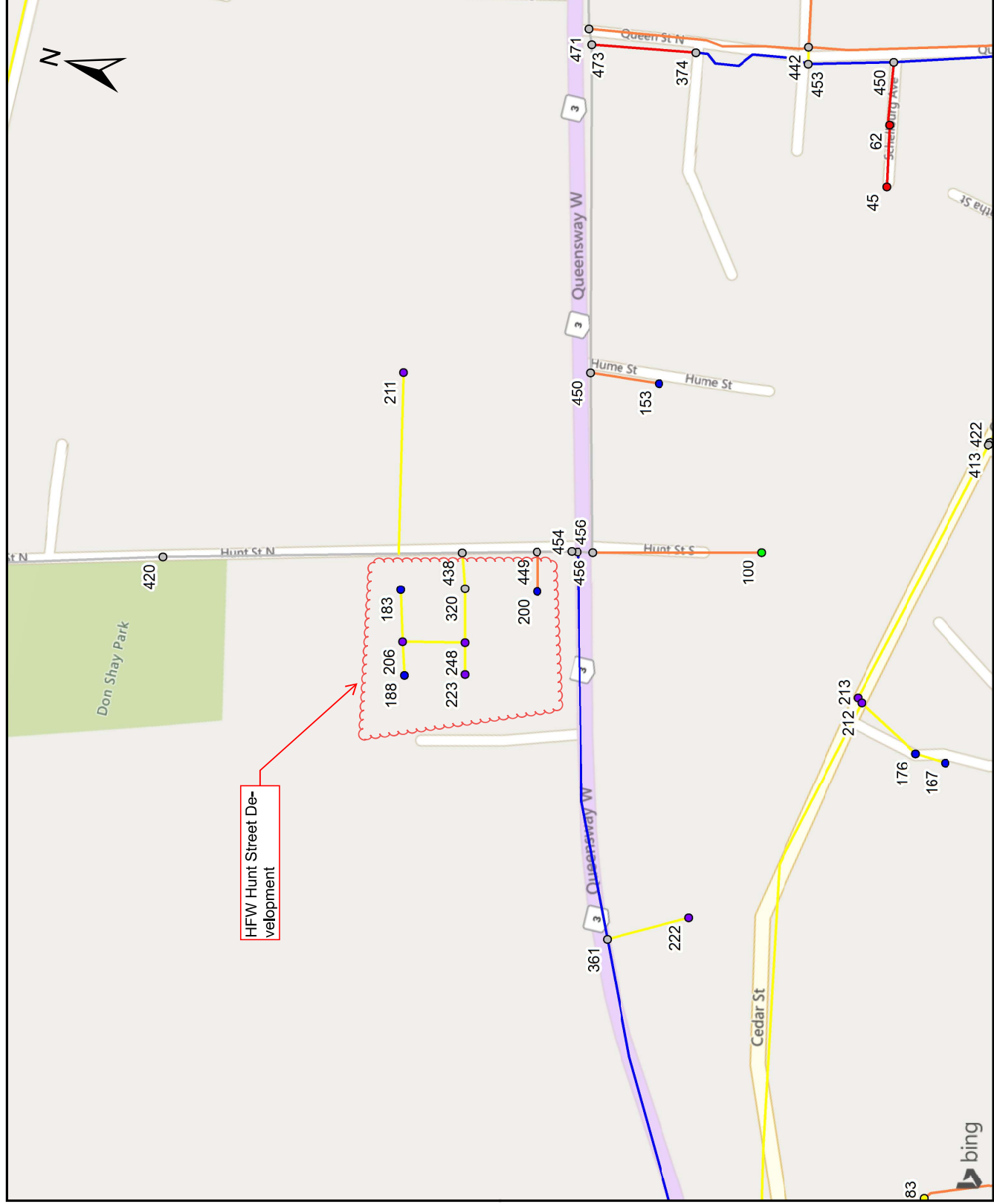
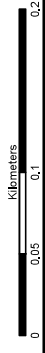
Legends

Node Flow (L/s)

- < 67
- 67 ~ 75
- 75 ~ 100
- 100 ~ 150
- 150 ~ 200
- 200 ~ 250
- > 250

Watermains (mm)

- ≤ 100
- 150
- 200
- 250
- 300
- 350
- 400





vallee

*Consulting Engineers,
Architects & Planners*

May 1, 2026

HFW Holdings Limited
3 Fernwood Court
Richmond Hill, Ontario
L4B 3C2

Attention: Mr. Gary Brasene

**Reference: Stormwater Management Report
HFW Hunt Street Residential Development
Simcoe, Norfolk County
Project #22-013**

Introduction

This Stormwater Management Report (SWM) has been prepared on behalf of HFW Holdings Ltd, in support of the site plan application for the proposed HFW Hunt Street Residential Development located at the northwest corner of Queensway West and Hunt Street in Simcoe – Norfolk County. This report outlines the detailed stormwater design for the proposed development. It is the intention to submit this report to Norfolk County and the Long Point Region Conservation Authority (LPRCA) for review and approval.

The proposed development will be constructed in two phases, with Phase 1 including a 44-unit condominium development, and Phase 2 including a 6-storey, 130-unit residential mid-rise building with main floor commercial units. The 2.89 ha development site is bound by Hunt Street to the east, Queensway West to the south, Patterson Creek and the Sutton Conservation Area to the north, and the Queensway Veterinary Hospital to the west. Refer to Figure 1 below.

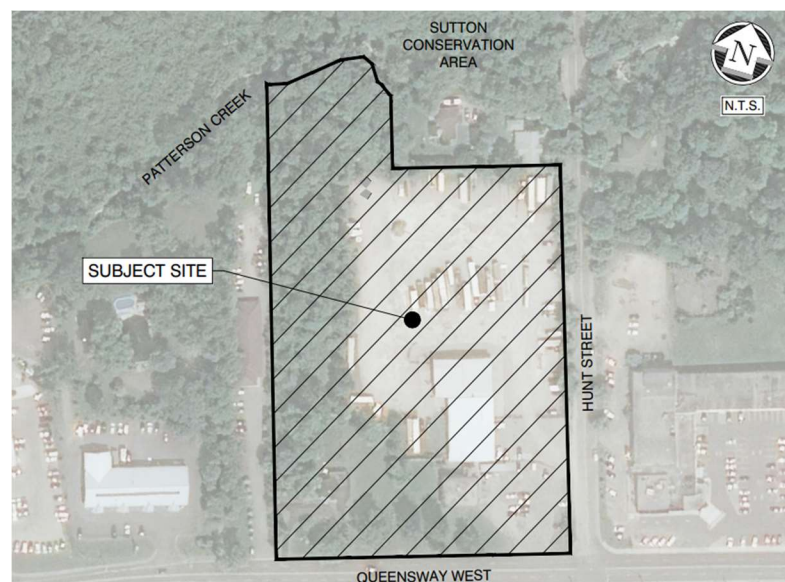


Figure 1 - Site Location

Stormwater Management Design Criteria

The design criteria for the proposed development are as follows:

- Quantity Control: Reduce or control the post-development peak flow rates from the site to levels that do not exceed the 2-year pre-development flow rate, for all storm events up to and including the 100-year storm event.
- Quality Control: Stormwater to be treated to the Enhanced Protection Level as defined in the Ministry of the Environment's *Stormwater Management Practices Planning and Design Manual* (March 2003).

A Visual Otthymo computer model has been used to simulate the drainage areas under pre-development conditions and post-development conditions. The simulations were conducted using the 4-hour Chicago Distribution design storm of the 2-year, 5-year, 10-year, 25-year, 50-year and 100-year storm events. The Norfolk County rainfall IDF curve data has been used for the storm analysis using the parameters in Table 1 below.

Table 1 Norfolk County Rainfall IDF Parameters			
Event	A	B	C
2-year	529.711	4.501	0.745
5-year	583.017	3.007	0.703
10-year	670.324	3.007	0.698
25-year	721.533	2.253	0.679
50-year	766.038	1.898	0.668
100-year	801.041	1.501	0.657

Pre-Development

Under pre-development conditions, the subject site features several commercial buildings, gravel and asphalt parking lots, an existing residential dwelling, and wooded areas. During major storm events, runoff from the majority of the site (Area PRE) generally flows uncontrolled, overland in a northerly direction towards Patterson Creek and the Sutton Conservation Area. Existing catch basins within asphalt and gravel parking lots collect minor storm event flows and convey them northwards to an existing culvert outlet to Patterson Creek. Minor flows from a small southern portion of the site (Area PRE-EXT) along Queensway West drain in a southerly direction towards Queensway West where it is collected by the existing storm sewer system. Major flows from this portion of the site flow overland down Queensway West to Hunt Street, then northwards down Hunt Street and ultimately discharge to Patterson Creek.

The two aforementioned pre-development catchments encompass a total area of 3.01 ha, as shown on Drawing PRE – Pre-Development Drainage Areas in Appendix E. A Visual Otthymo computer model was used to simulate pre-development conditions for this area. The model uses a modified SCS procedure to estimate losses that occur naturally during a rainfall event such as evaporation and infiltration. Table 2 summarizes the input parameters with complete details included in Appendix A.

Table 2 Visual Otthymo Model Input – Pre-Development		
Parameter	PRE	PRE-EXT
Description	Drains to Patterson Creek via an existing storm outlet	Drains to Queensway West & Hunt Street
Area	2.67 ha	0.34 ha
Soil Type	Sandy Textures over Silt Loam	
Hydrologic Soil Group	AB	
SCS Curve Number	Woodlot & Grass/Improved Land - 62	
Initial Abstraction	13.6 mm ($IA/S_{0.05} = 0.05$, with $S_{0.05} = 1.33 * S_{0.20}^{1.15}$ in inches and $S_{0.20} = 1000/CN-10$ in inches)	
Impervious Percentage (%)	43%	23%
Directly Connected Impervious Percentage (%)	29%	19%

Table 3 summarizes the pre-development peak runoff from the development site based on the pre-development drainage patterns identified above.

Table 3 Peak Pre-Development Runoff	
Event	Pre-Dev Peak Flows (m³/s)
2-year	0.162
5-year	0.222
10-year	0.267
25-year	0.333
50-year	0.386
100-year	0.438

Post-Development

The overall stormwater management (SWM) strategy is to reduce post-development peak flow rates from the site to less than or equal to pre-development flow rates for all storm events up to and including the 100-year storm event. To meet this quantity control target, runoff from the proposed development will be detained in a stormwater management pond at the northern edge of the site and released at a rate such that the pre-development flow rates are not exceeded. No impermeable liner will be provided in the SWM pond to promote groundwater infiltration, however no infiltration has been accounted for in the quantity control design of the system. Minor storm events (2 & 5-year storm) will be conveyed via the proposed storm sewer system, and major storm events will flow overland along the roadways to the proposed SWM system. Runoff released from the proposed SWM pond will be conveyed to Patterson Creek via a new storm sewer.

The post-development drainage areas are shown in Drawing POST- Post-Development Drainage Areas in Appendix E, and can generally be described as follows:

- Area POST 1: Approximately 0.48 ha. This area encompasses the rooftop of the proposed mid-rise building. Flows from this area are conveyed to the SWM pond via the proposed storm sewer. The entire roof area is directly connected to the proposed storm sewer system.
- Area POST 2: Approximately 2.07 ha. This area encompasses the majority of the development site, and a portion of the neighbouring property at #415 Queensway West. Flows from this area are conveyed to the SWM pond via the proposed storm sewer and overland flow. Directly connected impervious area from Area POST 2 includes all roads, parking areas, driveways and sidewalks.
- Area POST 3: Approximately 0.23 ha. This area encompasses the portion of the site within the Long Point Region Conservation Authority (LPRCA) no-development zone. Flows from this area will flow uncontrolled, overland towards Patterson Creek as they do under pre-development conditions.
- Area POST-EXT: Approximately 0.22 ha. This area encompasses the frontage along Queensway West and Hunt Street. Flows from this area will flow uncontrolled, overland down Queensway West and Hunt Street, ultimately releasing to the Sutton Conservation Area. Directly connected impervious area from Area POST 2 includes the roads and sidewalks which are on the back of the proposed curb.

Table 4 summarizes the post-development input parameters for the Visual OTTHYMO computer model with complete details included in Appendix A. The model uses a modified SCS procedure to estimate losses that occur naturally during a rainfall event such as evaporation and infiltration.

Table 4 Visual Otthymo Model Input – Post-Development				
Parameter	POST1	POST2	POST3	POST-EXT
Area	0.48 ha	2.07 ha	0.23 ha	0.22 ha
Soil Type	Sandy Textures over Silt Loam			
Hydrologic Soil Group	AB			
SCS Curve Number	Grass/Improved Land - 70		Woodlot & Grass/Improved Land - 62	Grass/Improved Land - 70
Initial Abstraction	9.0 mm		13.6 mm	9.0mm
Impervious Percentage	100%	67%	0%	49%
Directly Connected Impervious Percentage	100%	41%	0%	36%

Stormwater Management Pond

A dry pond facility is proposed for the HFW Hunt Street Residential Development. Due to the close proximity of the stormwater management pond to Patterson Creek, the storage in the pond and the discharge from the pond is limited during flood events. Runoff from the stormwater management pond can only be released when the ponding level exceeds the flood elevation, or as the flood level begins to recede. For example, during the 100-year storm event, the flood elevation of the creek reaches 215.65m, and as such, runoff from the stormwater management pond will only be released when the ponding level exceeds 215.65m. Correspondingly, the stormwater management facility needs to provide sufficient volume to store runoff when it cannot be released to the creek during flood events. Table 5 presents the flood elevations provided by the Long Point Region Conservation Authority (LPRCA) as well as the flood elevations that have been adjusted to the datum utilized throughout this report (CGVD-1978).

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Table 5 Patterson Creek Flood Elevations		
Event	LPRA Flood Elevation (m) (CGVD-2013)	Adjusted Flood Elevation (m) (CGVD-1978)
2-year	213.39	213.83
5-year	213.93	214.37
10-year	214.14	214.58
25-year	214.48	214.92
50-year	214.72	215.16
100-year	215.21	215.65

To determine the storage volume required in the proposed dry pond, the relationship between the storage volume of the pond and the discharge is defined by a pond-rating curve. This rating curve is determined by calculating the volume of the proposed pond facility up to a proposed contour elevation and then calculating the expected discharge from the facility based on the water level at this contour elevation and the proposed outlet control configuration. Note that for the 50-year and 100-year storm events, modified rating curves have been developed to take the flood elevations of Patterson Creek displayed in Table 5 into consideration.

Generally, orifices or weirs can control discharge from SWM facilities. Each of these control methods can be used by the singular control or they can be used in combination depending on the discharge characteristics desired. For this facility both an orifice and weir are proposed with the following equations used to estimate discharge:

Sharp-Crested Circular Orifice

$$Q = C * A * \sqrt{2 * g * h}$$

where: Q = Discharge in cms
 C = constant, 0.63
 A = orifice area in m²
 g = gravitational constant, 9.81 m/s²
 h = height above orifice, m

Weir

$$Q = 1.67 * w * h^{3/2}$$

where: Q = Discharge in cms
 w = width of the weir, m
 h = height above weir, m

For this facility, a 200mm orifice at an elevation of 215.00m and a 0.25m wide weir at an elevation of 215.75m will be used for flow control. The maximum active storage of the proposed facility is 603m³ at an elevation of 216.40m and the total maximum storage of this facility is 852m³ at freeboard elevation 216.70m. The complete discharge-to-storage rating curve for each storm event is appended to this report as part of Appendix A.

Table 6 summarizes the peak post-development flow rates from the proposed SWM pond, and the total post-development site and compares them to the allowable pre-development flow rates for each storm event. The utilized pond storage volumes and corresponding ponding depths for each storm event are also presented in Table 6. Note that for the 50 and 100-year storm event the storage volumes shown are above the corresponding floodplain elevation.

Table 6 Pre to Post-Development Release Rates, Storage Volumes & Ponding Depths							
Event	Pre (cms)	Post (cms)		Net Change	Utilized Storage Volume (m ³)	Ponding Elevation (m)	Drawdown (Hr)
		From Pond	Total				
2-year	0.162	0.079	0.085	-0.077	214	215.74	4.90
5-year	0.222	0.141	0.153	-0.069	289	215.90	5.10
10-year	0.267	0.185	0.203	-0.064	339	215.99	5.30
25-year	0.333	0.235	0.260	-0.073	402	216.10	5.50
50-year	0.386	0.279	0.309	-0.077	440	216.20	5.60
100-year	0.438	0.342	0.349	-0.059	421	216.39	5.70

As shown in Table 6, the peak post-development flow rates are attenuated to less than or equal to the pre-development peak flow rates for all design storm events. Complete details of all SWM calculations and the results from the Visual OTTHYMO analysis are outlined in Appendix A and E, respectively.

Overland Flow Capacity on Hunt Street

During minor and major storm events, runoff from area POST EXT will flow overland uncontrolled towards Queensway West and Hunt Street. Minor storm flows will be captured by the existing storm sewer on Hunt Street, and released to Patterson Creek as under pre-development conditions. Major storm flows will flow overland, uncontrolled down Hunt Street towards the Hunt Street Bridge, where it will overtop the roadway and flow overland into Patterson Creek, as under pre-development conditions. As per the 2019 Norfolk County Design Criteria, the maximum depth of ponding above the road centerline is 0.15m. Therefore, the flow capacity of the road cross-section to the top of the curb (0.023m above the road centerline) was calculated to ensure that the road cross-section can adequately convey flows from major storm event (ie. the 100-year event).

Table 7 outlines the road cross-section flow capacity at the lowest sloped section of the road, and the corresponding major storm event flow rates from post-development drainage area POST EXT. Overall, it can be concluded that the road-cross section provides adequate capacity, with a flow depth of less than 0.15m. Refer to the complete design calculations in Appendix A.

Table 7 Road Cross Section Capacity	
Road Cross Section Capacity (To Top of Curb)	0.640 m ³ /s
Peak 100-year Flow Rate	0.478 m ³ /s

Quality Control

The Ministry of the Environment's *Stormwater Management Practices Planning and Design Manual* (March 2003) was used in conjunction with requirements of the Norfolk County to determine the quality control design for the proposed SWM facility. For the proposed development, stormwater shall be treated to the Enhanced Protection Level, corresponding to a removal of 80% of total suspended solids.

Oil-Grit Separator

A Hydroworks HydroDome HD10, or approved oil-grit separator equivalent, shall be provided at the inlet to the stormwater management facility to provide 80% TSS removal of the ETV particle size distribution. The HydroDome HD10 has been sized to accommodate flows from areas POST 1 and POST 2. Refer to the completed sizing report found in Appendix C.

Inspection and maintenance are fundamental to the long-term performance of any stormwater quality treatment device. Hydroworks recommends that a HydroDome OGS be inspected at least once during the first year of operation to determine the pollutant accumulation rate. In subsequent years, inspections can be based on observations or local requirements. The unit should be inspected immediately after an oil, fuel or chemical spill, and a licensed waste management company should remove oil and sediment for proper disposal. Refer to the complete Hydroworks HydroDome Operations & Maintenance Manual in Appendix C.

Minimum Orifice Size

A minimum orifice of 75mm is recommended as per the MOE guidelines. For this facility, a 200mm orifice is proposed.

Active Storage Depth

The MOE guidelines and Norfolk Design Criteria recommend a maximum active storage depth of 2.0m. The active storage depth ranges between 0.71m +/- during the 2yr event and 1.32m +/- during the 100yr event.

Maintenance Access

Maintenance access to the proposed SWM facility is provided from Street A. As per Norfolk County Design Criteria, a minimum 3.0 wide access route is provided, and the slope of the maintenance access route does not exceed 10:1.

Slopes

The Norfolk Design Criteria and MOE guidelines specify a maximum side slope of 5:1 and 4:1, respectively in a dry pond facility. A side slope of 4:1 shall be utilized in the proposed SWM facility.

Erosion and Sediment Control

During construction, the contractor is required to protect the worksite and all adjacent lands from sediment and erosion regardless of the source, to the satisfaction of all applicable parties. The measures installed by the contractor are to remain in place until such time as there is no further threat of damage and all vegetation is established. Measures that are to be put into place as an absolute minimum include silt fences, mud mats, and filter cloths over catch basins onsite.

Proposed SWM Facility Summary

The following summarizes the proposed SWM Facility for the HFW Hunt Street Residential Development:

- A dry pond facility with a pond bottom elevation of 215.00, and a top of freeboard elevation of 216.70m will provide an active storage volume of 603 m³ and a total storage volume of 852 m³.
- An active storage depth of 1.4m with a minimum 0.3m freeboard depth is provided.
- The required storage ranges between 214m³ to 412m³ for the 2-year and 100-year storm event, respectively.
- Discharge from the proposed facility is controlled by a 200mm diameter orifice at an elevation of 215.00m and a 0.25m wide weir at an elevation of 215.75m.
- During events greater than the 100-year storm, runoff from the site will overtop the stormwater management facility and flow overland to Patterson Creek.
- A Hydroworks HydroDome HD10 OGS unit, or approved equal, shall be utilized to achieve an enhanced level of water quality protection.

Water Balance

As requested in the zoning amendment comments from Norfolk County, G. Douglas Vallee Ltd. has completed a water balance investigation for the pre-development and post-development site. A water balance is used to describe the hydrological cycle and provides an accounting of water across the system's boundaries over a specified time period. A continuous Visual OTTHYMO simulation was used to model the pre-development and post-development water balance for the subject site over a ten-year period. Historical climate data from the Brantford Airport station for the years 2015-2024 was obtained from the Government of Canada. This data includes daily precipitation (rainfall and/or snowfall) and daily minimum and maximum temperatures.

Table 8 presents the total average annual volume of precipitation (rainfall and/or snowfall), evapotranspiration, infiltration and runoff from the pre-development and post-development catchment areas found using Visual OTTHYMO. Note that no impermeable liner will be provided in the SWM pond to promote groundwater infiltration.

Table 8 Average Annual Water Balance Volumes (without LID)			
Hydrologic Cycle Component	Pre-Development (m ³)	Post-Development (m ³)	Δ Volume (%)
Precipitation	20010	20010	0%
Evapotranspiration	6802	4330	-36%
Groundwater Infiltration	5581	6300	13%
Runoff	7147	8889	24%

As shown above, there is a 13% increase in groundwater infiltration from the pre-development to post-development condition.

Conclusions and Recommendations

Based on the review presented by this Stormwater Management Report, it is concluded that:

- Post-development flows from the development site have been controlled to less than pre-development levels for all storm events up to and including the 100-year storm event.
- The proposed SWM design meets the design guidelines outlined by the MOE's *Stormwater Management Practices Planning and Design Manual* (March 2003) for enhanced water quality protection.

It is recommended that this report be provided to Norfolk County and the Long Point Region Conservation Authority in support of the application for site plan approval of the proposed development.

We trust that this information is complete and sufficient for submission. Should you have any questions or require further information please do not hesitate to contact us.

Respectfully submitted,



Natalie Ongena, P.Eng
G. DOUGLAS VALLEE LIMITED
Consulting Engineers, Architects and Planners

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G. DOUGLAS VALLEE LIMITED
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List of Appendices

Appendix A

- LPRCA Flood Plain Elevations
- Soil & Pre-Development Parameters
- Post-Development Parameters
- Rating Curves
- Pre to Post Flows & Utilized Storage
- Water Balance
- OGS Sizing
- Hunt Street Overland Flow Capacity

Appendix B

- Soil Parameters
- Preliminary Geotechnical Investigation (*GeoPro Consulting Limited dated October 20, 2022*)
- Preliminary Hydrogeological Assessment (*GeoPro Consulting Limited dated February 1, 2024*)
- Soil Infiltration Assessment (*G2S Consulting Inc. dated July 15, 2025*)
- Technical Memorandum - Comments from Norfolk County on Stormwater Management Pond (*G2S Consulting Inc. dated July 24, 2025*)

Appendix C

- Hydroworks HydroDome Sizing Report
- Hydroworks HydroDome Operations & Maintenance Manual
- OGS Buoyancy Calculations

Appendix D

- Visual OTTHYMO Outputs

Appendix E

- DWG PRE – Pre-Development Drainage Areas
- DWG POST – Post-Development Drainage Areas

APPENDIX A

LPRCA Flood Plain Elevations
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Hunt Street Overland Flow Capacity

FLOOD PLAIN ELEVATIONS

Flood Hazard Map Lynn River Black Creek Sheet 19 of 23

Cross Section Number: 910.98

Design Storm	LPRCA Flood Elevation (m)
	CGVD-2013
2	213.39
5	213.93
10	214.14
25	214.48
50	214.72
100	215.21

SOIL PARAMETERS

Soil Parameters	PRE-DEV	POST-DEV
Soil Type	Sandy Textures over Silt Loam (Woodlot & Grass/Improved Land)	Sandy Textures over Silt Loam (Grass/Improved Land)
Soil Group	AB	AB
CN (-)	62	70
Initial Abstraction (mm)	13.6	9.0

INFILTRATION PARAMETERS

Hydraulic Conductivity	2.10E-02 cm/sec	*Hydraulic Conductivity obtained from Soil Infiltration Assessment by G2S Consulting Inc. (June 13, 2024)
Infiltration Rate (i)	190 mm/hr	
Safety Factor	2.5	
Design Infiltration Rate	77 mm/hr	
Design Infiltration Rate	0.077 m/hr	
Void Ratio (Vr)	0.4	
Drainage Time (ts)	96 hr	
Max allowable stone depth (drmax)	18.53 m	

PRE-DEVELOPMENT AREA PARAMETERS:

Area Description	Runoff Coeff.	Area (ha)	
		PRE	EXTERNAL
Grass Area	0.25	1.29	0.27
Gravel	0.70	0.91	0.00
Asphalt/Concrete	0.95	0.30	0.07
Roofs	0.95	0.17	0.01

$$C = 0.9 (\% \text{ imperv}) + 0.25 (1 - \% \text{ Imperv})$$

$$\% \text{ Imperv} = \frac{C - 0.25}{0.65} \times 100$$

Drainage Area	Total Area (ha)	Composite Runoff Coeff.	TIMP (%)	XIMP (%)
PRE	2.67	0.53	43%	29%
PRE EXTERNAL	0.34	0.40	23%	19%
TOTAL	3.01	0.51	40%	

TOTAL PRE-DEVELOPMENT FLOW RATES

Design Storm	Q (m3/s)
2	0.162
5	0.222
10	0.267
25	0.333
50	0.386
100	0.438

POST-DEVELOPMENT AREA PARAMETERS:

Area Description	Impervious Area (ha)
7-Storey Mid Rise	0.48
Units	0.45
Roads/Parking	0.65
External Driveway (415 Queensway)	0.09
Driveways	0.10
Sidewalks	0.21

Drainage Area	Description	Control?	Total Area (ha)	Impervious Area (ha)	TIMP (%)	Dir. Conn. Imperv. Area (ha)	XIMP (%)
POST1	Mid-Rise Roof	SWM Pond	0.48	0.48	100%	0.48	100%
POST2	Development Site	SWM Pond	2.07	1.39	67%	0.85	41%
POST3	Back of Property	Uncontrolled to Patterson Creek	0.23	0.00	0%	0.00	0%
POST EXTERNAL	Frontage on Queensway & Hunt	Uncontrolled to Queensway & Hunt	0.22	0.11	49%	0.08	36%
Total Site			3.01	1.98	66%	1.41	47%

FLOOD PLAIN ELEVATIONS

Flood Hazard Map Lynn River Black Creek Sheet 19 of 23
Cross Section Number: 910.98

Design Storm	LPRCA Flood Elevation (m)	Adjusted Flood Elevation (m)
	CGVD-2013	CGVD-1978
2	213.39	213.83
5	213.93	214.37
10	214.14	214.58
25	214.48	214.92
50	214.72	215.16
100	215.21	215.65

POND PARAMETERS

Bottom of Pond	215.00 m
Active Storage Depth	1.4 m
Top of Active Storage	216.40 m
Top of Freeboard	216.70 m

ORIFICE PARAMETERS

Orifice	Diameter	0.200 m	$Q = CA\sqrt{2gh}$
	Area	0.0314 m ²	
	Inv. Elev.	215.00 m	
	CL Elev.	215.10 m	
C = 0.63			
Weir	Length	0.250 m	$Q = CLH^{1.5}$
	Elev.	215.75 m	
C = 1.67			

STAGE-STORAGE-DSICHARGE (2, 5, 10 & 25-Year Events)

Description	Elevation (m)	Stage (m)	Volume (m ³)	Volume (ha.m)	Q (m ³ /s)		
					Orifice	Weir	Total
Bottom of Pond/Orifice	215.00	0.00	0	0.000	0.000	0.000	0.000
	215.10	0.10	16	0.002	0.000	0.000	0.000
50-year floodplain (215.16m)	215.20	0.20	36	0.004	0.028	0.000	0.028
	215.30	0.30	60	0.006	0.039	0.000	0.039
	215.40	0.40	87	0.009	0.048	0.000	0.048
	215.50	0.50	119	0.012	0.055	0.000	0.055
	215.60	0.60	155	0.016	0.062	0.000	0.062
100-year floodplain (215.65m)	215.70	0.70	195	0.020	0.068	0.000	0.068
Weir (215.75m)	215.80	0.80	240	0.024	0.073	0.021	0.094
	215.90	0.90	289	0.029	0.078	0.063	0.141
	216.00	1.00	342	0.034	0.083	0.104	0.188
	216.10	1.10	400	0.040	0.088	0.146	0.234
	216.20	1.20	463	0.046	0.092	0.188	0.280
	216.30	1.30	531	0.053	0.096	0.230	0.326
Top of Active Storage	216.40	1.40	603	0.060	0.100	0.271	0.371
	216.50	1.50	681	0.068	0.104	0.313	0.417
	216.60	1.60	764	0.076	0.107	0.355	0.462
Top of Freeboard	216.70	1.70	852	0.085	0.111	0.397	0.508

*Storage volumes obtained from AutoCAD Civil 3D

STAGE-STORAGE-DSICHARGE (50-Year Event)

NOTE: No storage is provided below the flood plain elevation and discharge does not occur until the ponding level exceeds the flood plain elevation (215.16m)

Description	Elevation (m)	Stage (m)	Volume (m ³)	Volume (ha.m)	Q (m ³ /s)		
					Orifice	Weir	Total
Bottom of Pond/Orifice	215.00	0.00	0	0.000	0.000	0.000	0.000
	215.10	0.10	0	0.000	0.000	0.000	0.000
50-year floodplain (215.16m)	215.20	0.20	10	0.001	0.018	0.000	0.018
	215.30	0.30	34	0.003	0.033	0.000	0.033
	215.40	0.40	61	0.006	0.043	0.000	0.043
	215.50	0.50	93	0.009	0.051	0.000	0.051
	215.60	0.60	129	0.013	0.058	0.000	0.058
100-year floodplain (215.65m)	215.70	0.70	169	0.017	0.064	0.000	0.064
Weir (215.75m)	215.80	0.80	214	0.021	0.070	0.021	0.091
	215.90	0.90	263	0.026	0.075	0.063	0.138
	216.00	1.00	316	0.032	0.080	0.104	0.185
	216.10	1.10	374	0.037	0.085	0.146	0.231
	216.20	1.20	437	0.044	0.089	0.188	0.277
	216.30	1.30	505	0.051	0.094	0.230	0.323
Top of Active Storage	216.40	1.40	577	0.058	0.098	0.271	0.369
	216.50	1.50	655	0.066	0.101	0.313	0.415
	216.60	1.60	738	0.074	0.105	0.355	0.460
Top of Freeboard	216.70	1.70	826	0.083	0.109	0.397	0.505

*Storage volumes obtained from AutoCAD Civil 3D

STAGE-STORAGE-DSICHARGE (100-Year Event)

NOTE: No storage is provided below the flood plain elevation and discharge does not occur until the ponding level exceeds the flood plain elevation (215.65m)

Description	Elevation (m)	Stage (m)	Volume (m ³)	Volume (ha.m)	Q (m ³ /s)		
					Orifice	Weir	Total
Bottom of Pond/Orifice	215.00	0.00	0	0.000	0.000	0.000	0.000
	215.10	0.10	0	0.000	0.000	0.000	0.000
50-year floodplain (215.16m)	215.20	0.20	0	0.000	0.000	0.000	0.000
	215.30	0.30	0	0.000	0.000	0.000	0.000
	215.40	0.40	0	0.000	0.000	0.000	0.000
	215.50	0.50	0	0.000	0.000	0.000	0.000
	215.60	0.60	0	0.000	0.000	0.000	0.000
100-year floodplain (215.65m)	215.70	0.70	20	0.002	0.020	0.000	0.020
Weir (215.75m)	215.80	0.80	65	0.007	0.034	0.021	0.055
	215.90	0.90	114	0.011	0.044	0.063	0.106
	216.00	1.00	167	0.017	0.052	0.104	0.156
	216.10	1.10	225	0.023	0.059	0.146	0.205
	216.20	1.20	288	0.029	0.065	0.188	0.253
	216.30	1.30	356	0.036	0.071	0.230	0.300
Top of Active Storage	216.40	1.40	428	0.043	0.076	0.271	0.347
	216.50	1.50	506	0.051	0.081	0.313	0.394
	216.60	1.60	589	0.059	0.085	0.355	0.440
Top of Freeboard	216.70	1.70	677	0.068	0.090	0.397	0.486

*Storage volumes obtained from AutoCAD Civil 3D

PRE TO POST FLOWS

Return Period	Q (m ³ /s)				Check
	Pre	From Pond	Total Post	Net	
2	0.162	0.079	0.085	-0.077	✓
5	0.222	0.141	0.153	-0.069	✓
10	0.267	0.185	0.203	-0.064	✓
25	0.333	0.235	0.260	-0.073	✓
50	0.386	0.279	0.309	-0.077	✓
100	0.438	0.342	0.379	-0.059	✓

STAGE-STORAGE-DISCHARGE

Description	Elevation (m)	Stage Depth (m)	2 - 25 YR		50 YR		100 YR	
			Volume (m ³)	Q (m ³ /s)	Volume (m ³)	Q (m ³ /s)	Volume (m ³)	Q (m ³ /s)
Bottom of Pond/Orifice	215.00	0.00	0	0.000	0	0.000	0	0.000
	215.10	0.10	16	0.000	0	0.000	0	0.000
50-year floodplain (215.16m)	215.20	0.20	36	0.028	10	0.018	0	0.000
	215.30	0.30	60	0.039	34	0.033	0	0.000
	215.40	0.40	87	0.048	61	0.043	0	0.000
	215.50	0.50	119	0.055	93	0.051	0	0.000
	215.60	0.60	155	0.062	129	0.058	0	0.000
100-year floodplain (215.65m)	215.70	0.70	195	0.068	169	0.064	20	0.020
	215.80	0.80	240	0.094	214	0.091	65	0.055
Weir (215.75m)	215.90	0.90	289	0.141	263	0.138	114	0.106
	216.00	1.00	342	0.188	316	0.185	167	0.156
	216.10	1.10	400	0.234	374	0.231	225	0.205
	216.20	1.20	463	0.280	437	0.277	288	0.253
	216.30	1.30	531	0.326	505	0.323	356	0.300
Top of Active Storage	216.40	1.40	603	0.371	577	0.369	428	0.347
	216.50	1.50	681	0.417	655	0.415	506	0.394
Top of Freeboard	216.60	1.60	764	0.462	738	0.460	589	0.440
	216.70	1.70	852	0.508	826	0.505	677	0.486

*Storage volumes obtained from AutoCAD Civil 3D

APPROXIMATE STORAGE & PONDING DEPTHS

Return Period	Q (m ³ /s) From Pond	Utilized Storage (m)	Depth (m)	Elev. (m)	Drawdown (hr)
2	0.079	214	0.74	215.74	4.90
5	0.141	289	0.90	215.90	5.10
10	0.185	339	0.99	215.99	5.30
25	0.235	402	1.10	216.10	5.50
50	0.279	440	1.20	216.20	5.60
100	0.342	421	1.39	216.39	5.70

*Storage volumes and drawdown times obtained from OTTHYMO

*For the 50 and 100-year events, the storage volumes shown are above the corresponding floodplain elevation, and the drawdown times are after floodplain has receded. The ponding depths and elevations are relative to the bottom of the pond.



Climate Data

Station: Brantford Airport

Time Range: 2015 - 2024

Average Annual Pre-to Post Development Water Balance Volumes

	Vol. (m3)		
	Pre-Development	Post-Development	Δ Volume (%)
Precipitation	20010	20010	0%
Evapotranspiration	6802	4330	-36%
Ground Infiltration	5581	6300	13%
Runoff	7147	8889	24%



vallee

*Consulting Engineers,
Architects & Planners*

Subject: OGS Sizing

Date: 4/16/2026

By: NLO

Project #: 22-013

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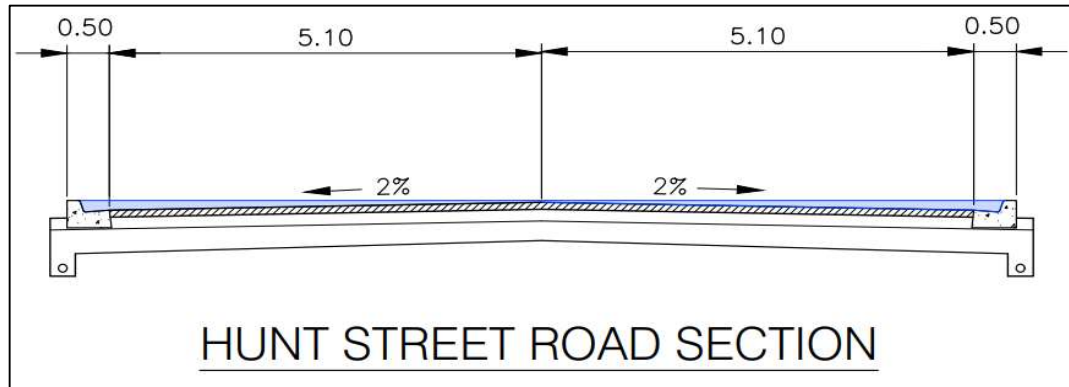
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Water Quality - OGS Parameters

Particle Size Distribution	CA ETV
Target TSS Removal	80%
Catchment Areas	POST1 & POST2
Catchment Area (ha)	2.55
Impervious Area (ha)	1.87
Impervious Percentage	73%
Selected Model	HydroDome HD10

Hunt Street Road Cross Section	Maximum Capacity
Depth (m) at Road Centreline to Top of Curb	0.023
Area (m ²)	0.846
Wetted Perimeter (m)	11.127
Hydraulic Radius (m)	0.076
Slope (%)	0.30
Manning Coeff. (Asphalt Smooth)	0.013
Flow, Q (m³/s)	0.640
Velocity, V (m/s)	0.76

$$Q = \frac{1}{n} A \left(\frac{A}{P} \right)^{\frac{2}{3}} \sqrt{S}$$



Capacity Check	Area A12	
100-year flow rate (m ³ /s)	0.478	*Refer to Storm Sewer Design Sheet for calculations
Check Flow < Road Cross Section Capacity		

APPENDIX B

Soil Parameters

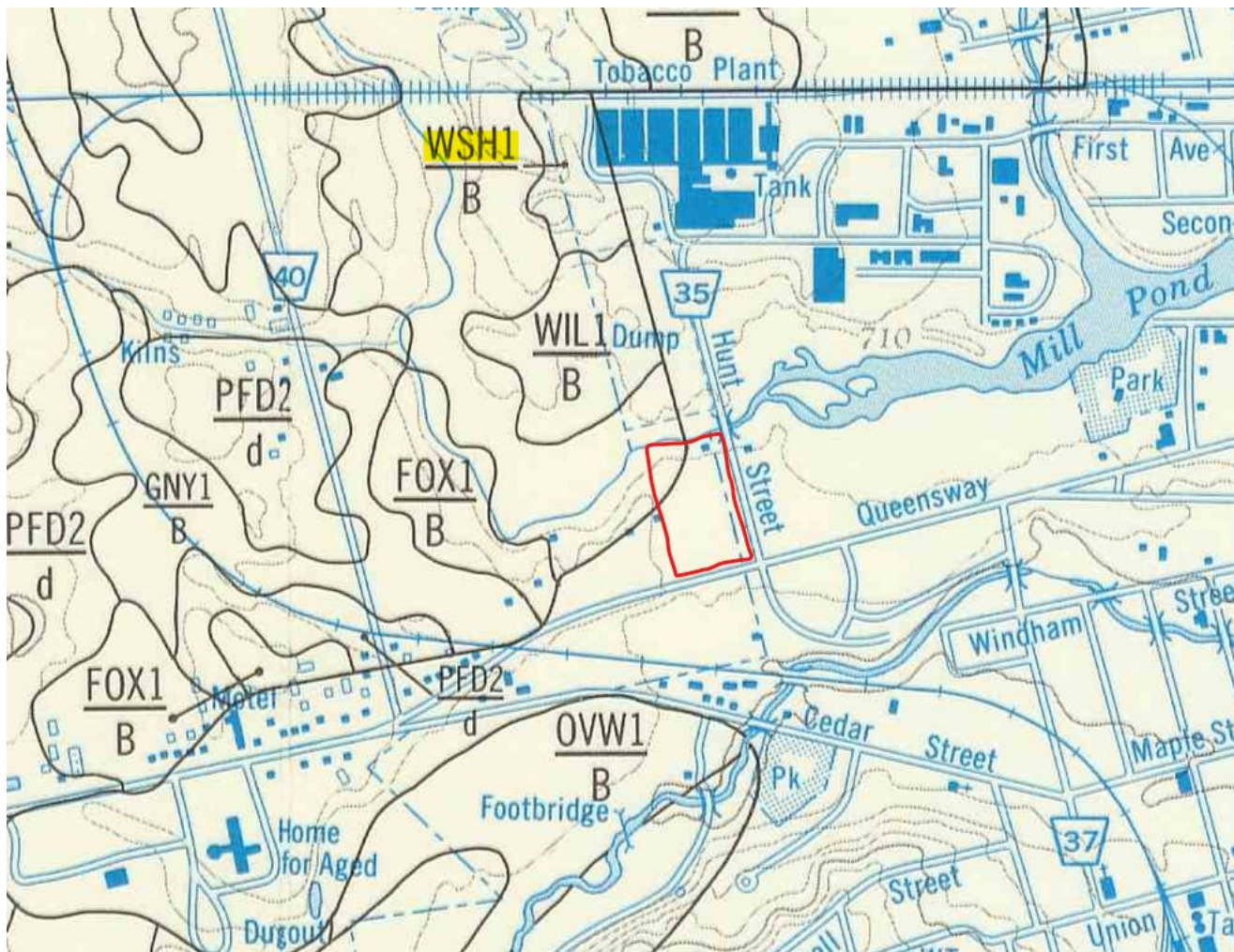
Preliminary Geotechnical Investigation
(GeoPro Consulting Limited dated October 20, 2022)

Preliminary Hydrogeological Assessment
(GeoPro Consulting Limited dated February 1, 2024)

Soil Infiltration Assessment
(G2S Consulting Inc. dated July 15, 2025)

Technical Memorandum
Comments from Norfolk County on Stormwater Management Pond
(G2S Consulting Inc. dated July 24, 2025)

22-013 Soil Mapping



WSH - Walsher

WSH 1	WSH	None	40-100 cm sandy textures over lacustrine silt loam	Well
-------	-----	------	--	------

CHART C2-2 - HYDROLOGIC SOIL GROUPS FOR GENERAL SOIL TYPES

<u>Sands, sandy loams, and gravels</u> - overlying sand, gravel or limestone bedrock, very well drained - ditto, imperfectly drained - Shallow, overlying precambrian bedrock or clay subsoil	A AB B
<u>Coarse loams</u> - overlying sand, gravel or limestone, well drained - shallow, overlying precambrian bedrock or clay subsoil	AB B
<u>Medium textured loams</u> - shallow, overlying limestone bedrock - overlying medium textured subsoil	B BC
<u>Silt loams, some loams</u> - with good internal drainage - with slow internal drainage and good external drainage	BC C
<u>Clays, clay loams, silty clay loams</u> - with good internal drainage - with imperfect or poor external drainage - with slow internal drainage and good external drainage	C C D

Note: Soils are classified on the basis of bare soil having maximum swelling at the end of a long storm whose rainfall exceeds infiltration into soil. Classifications shown are subject to modification as experience dictates.

Classifications are based on S.C.S. definitions (9) modified to suit Ontario conditions.

CHART C2-8 - SOIL/LAND USE CURVE NUMBERS

Land Use	Hydrologic Soil Group						
	A	AB	B	BC	C	CD	D
Fallow (special cases only)	77	82	86	89	91	93	94
Crop and other improved land	66*	70	74	78	82	84	86
Pasture & other unimproved land	58*	62*	65	71	76	79	81
Woodlots and forest	50*	54*	58	65	71	74	77
Impervious areas (paved)	98						
Bare rock draining <u>directly</u> to stream	98						
Bare rock draining <u>indirectly</u> to stream	70						
Water surfaces	100 (use in special cases only)						

Notes

1. Figures are based on average antecedent moisture condition (AMC II) except those marked *, which are initially wet (AMC III) or an intermediate condition. For definition of AMC's see Chart C2-10.
2. Table is not applicable to frozen soils or to periods in which snowmelt contributes to runoff.
3. For detailed values in urban areas see Table 2.2 of ref. 14.
4. Source: SCS Handbook of Hydrology, Chapter 9 (9), with modifications.

CHART C2-9 - PERCENT IMPERVIOUSNESS OF URBAN AREAS

Urban Land Use	% Imperviousness
Business - Commercial	40 - 90
Industrial - Light	45 - 65
Industrial - Heavy	50 - 70
Residential - Low density	20 - 30
Residential - Medium density	25 - 35
Residential - High density	30 - 40

Source: SCS Handbook of Hydrology, Chapter 15 (9)



GeoPro Consulting Limited

Geotechnical-Hydrogeology-Environmental-Materials-Inspection

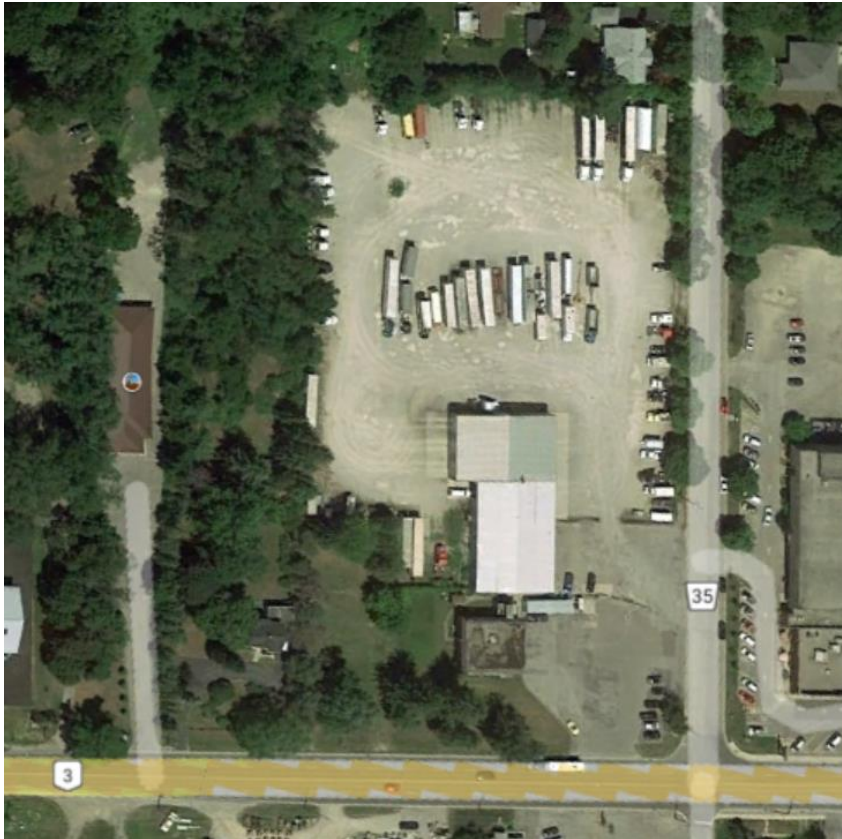
Preliminary Geotechnical Investigation

Proposed Residential Development

395-411 Queensway West, Simcoe, Ontario

Prepared For:

T. Harris Environmental Management



GeoPro Project No.: 22-4078GH

Report Date: October 20, 2022

Professional, Proficient, Proactive

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GeoPro
CONSULTING LIMITED

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Limitations to the Report

1. INTRODUCTION

GeoPro Consulting Limited (GeoPro) was retained by T. Harris Environmental Management (the Client) to conduct a preliminary geotechnical investigation to support the preliminary design and planning of the proposed residential development consisting of 3-storey townhouses with one level of basement and an 8-storey commercial/residential building with one level of underground parking located at 395 - 411 Queensway West, Simcoe, Ontario.

The purpose of this preliminary geotechnical investigation was to obtain preliminary information on the existing subsurface conditions by means of a limited number of boreholes, in-situ tests and laboratory tests of soil samples to provide required preliminary geotechnical design information. Based on GeoPro's interpretation of the data obtained, preliminary geotechnical comments and recommendations related to the general planning and project concept design purposes are provided.

The report is prepared with the condition that the planning and preliminary designs will be in accordance with all applicable standards and codes, regulations of authorities having jurisdiction, and good engineering practice. Further, the preliminary recommendations and opinions in this report are applicable only to the proposed project as described above. On-going liaison and communication with GeoPro prior to and during the planning and preliminary design stage of the project is strongly recommended to confirm that the preliminary recommendations in this report are applicable and/or correctly interpreted and implemented. Also, any queries concerning the geotechnical aspects of the proposed project shall be directed to GeoPro for further elaboration and/or clarification.

This report is provided on the basis of the terms of reference presented in our approved proposal prepared based on our understanding of the project. If there are any changes in the preliminary design and planning features relevant to the geotechnical analyses, or if any questions arise concerning the geotechnical aspects of the codes and standards, this office should be contacted to review the design. It may then be necessary to carry out additional borings and reporting before the preliminary recommendations of this report can be relied upon.

This report deals with geotechnical issues only. The geo-environmental (chemical) aspects of the subsurface conditions, including the consequences of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources, were not investigated and were beyond the scope of this assignment.

The site investigation and recommendations follow generally accepted practice for geotechnical and geo-environmental consultants in Ontario. Laboratory testing follows ASTM or CSA Standards or modifications of these standards that have become standard practice in Ontario.

This report has been prepared for the Client only. Third party use of this report without GeoPro's consent is prohibited. The limitations to the report presented in this report form an integral part of the report and they must be considered in conjunction with this report.

2. INVESTIGATION PROCEDURE

The field work for the preliminary geotechnical investigation was carried out on August 31 and September 1, 2022, during which time four (4) boreholes (Boreholes BH1, BH2, BH3 and BH5) were advanced at the locations shown on the Borehole Location Plan, Drawing 1. The boreholes were drilled to depths ranging from about 6.6 m to 9.6 m below the existing ground surface.

The requested borehole locations were provided by the Client. The boreholes were located and staked in the field by the Client; the borehole locations in the field were adjusted according to the drill rig accessibility and the underground utility conditions. The field work for this investigation was monitored by the Client and a member of our engineering staff who logged the boreholes and cared for the recovered samples.

The boreholes were advanced using a continuous flight auger drilling equipment supplied by a drilling specialist subcontracted to the Client. Samples were retrieved with a 51 mm (2 inches) O.D. split-barrel (split spoon) sampler driven with a hammer weighing 624 N and dropping 760 mm (30 inches) in accordance with the Standard Penetration Test (SPT) method.

Groundwater condition observations were made in the boreholes during drilling and upon completion of drilling. A monitoring well (51 mm in diameter) was installed in Boreholes BH1 and BH3 to measure the groundwater table as well as to facilitate the in-situ hydrogeological testing. The remaining borehole(s) were backfilled and sealed upon completion of drilling.

All soil samples obtained during this investigation were brought to our laboratory for further examination. These soil samples will be stored for a period of three (3) months after the day of issuing draft report, after which time they will be discarded unless we are advised otherwise in writing. Geotechnical classification testing (including water content, grain size distribution and Atterberg Limits, when applicable) was carried out on selected soil samples. The laboratory test results are provided in attached Figures.

The ground surface elevations at the as drilled borehole locations were not available at the time of preparing this report. Therefore, the stratigraphy at each borehole location has been referenced to the current grade level. Contractors performing the work should confirm the elevations prior to construction. The borehole locations plotted on Borehole Location Plan were based on the measurements of the site features and should be considered to be approximate.

3. SUBSURFACE CONDITIONS

Notes on sample descriptions are presented in Enclosure 1A. Explanation of terms used in the borehole logs is presented in Enclosure 1B. The subsurface conditions in the boreholes are

presented in the individual borehole logs. Detailed descriptions of the major soil strata encountered in the boreholes advanced at the site are provided as follows.

3.1 Soil Conditions

Topsoil

Topsoil with a thickness of about 150 mm was encountered surficially in Borehole BH3. In general, the topsoil consists of high contents of organics with trace to some rootlets. It should be noted that the thickness of the topsoil explored at the borehole locations may not be representative for the site and should not be relied on to calculate the amount of topsoil at the site.

Portland Cement Concrete

Portland cement concrete with a thickness of about 340 mm was encountered surficially in Borehole BH5.

Granular Fill

Granular fill with thicknesses ranging from about 220 mm to 250 mm were encountered surficially in Boreholes BH1 and BH2. Due to the generally silty/sandy nature of the subgrade soils, the exact depth of granular fill was difficult to distinguish.

Fill Materials

Fill materials consisting of silt, sandy silt, silty sand, sand, and gravelly sand were encountered below the topsoil, Portland cement concrete or granular fill in all boreholes, and extended to depths ranging from about 1.0 m to 4.0 m below the existing ground surface. SPT N values ranging from 2 to 23 blows per 300 mm penetration indicated a very loose to compact compactness. The in-situ moisture content measured in the soil samples ranged from approximately 2% to 33%.

Upper Silt

Upper silt deposit was encountered below the fill materials in Boreholes BH3 and BH5, and extended to depths ranging from about 2.9 m to 5.6 m below the existing ground surface. SPT N values ranging from 1 to 11 blows per 300 mm penetration indicated a very loose to compact compactness. The natural moisture content measured in the soil samples ranged from approximately 23% to 32%.

Lower Silt

Lower silt deposit was encountered below the sand deposit in Borehole BH1, and extended to a depth of about 9.6 m below the existing ground surface. Borehole BH1 was terminated in this deposit. An SPT N value of 6 blows per 300 mm penetration indicated a loose compactness. The natural moisture content measured in the soil sample was approximately 22%.

Fine To Medium Sand

Fine to medium sand deposit was encountered below the upper silt deposit and/or fill materials in Boreholes BH1 and BH3, and extended to a depth of about 4.0 m below the existing ground surface. SPT N values ranging from 23 to 29 blows per 300 mm penetration indicated a compact compactness. The natural moisture content measured in the soil samples ranged from approximately 4% to 16%.

Sand

Sand deposit was encountered below the upper silt, fine to medium sand deposits and/or fill materials in all boreholes, and extended to depths ranging from about 6.6 m to 8.6 m below the existing ground surface. Boreholes BH2, BH3 and BH5 were terminated in these deposits. SPT N values ranging from 9 to 23 blows per 300 mm penetration indicated a loose to compact compactness. The natural moisture content measured in the soil samples ranged from approximately 13% to 22%.

3.2 Groundwater Conditions

Groundwater condition observations made in the boreholes during and immediately upon completion of drilling are shown in the borehole logs and are also summarized in the following table.

Borehole No.	BH Depth (m)	Depth of Water Encountered during Drilling (mBGS)	Water Level upon Completion of Drilling (mBGS)	Cave-in Depth upon Completion of Drilling (mBGS)
BH1	9.6	4.6	4.7	5.5
BH2	6.6	4.6	4.4	4.6
BH3	6.6	0.7	4.8	5.2
BH5	8.1	1.5	4.6	4.6

Note: mBGS = meters below ground surface

The monitoring well construction details and measured groundwater level are shown in the borehole log and also summarized in the following table.

Monitoring ID	Screen Interval (mBGS)	Water Level (mBGS)
		September 14, 2022
BH1	3.1 - 6.1	4.65
BH3	3.1 - 6.1	4.73

Note: mBGS = meters below ground surface

It should be noted that groundwater levels can vary and are subject to seasonal fluctuations in response to weather events.

4. PRELIMINARY GEOTECHNICAL INFORMATION

This report contains the findings of GeoPro's preliminary geotechnical investigation, together with the preliminary geotechnical engineering recommendations and comments. These preliminary recommendations and comments are based on factual information and are intended only for use by the design engineers. The number of boreholes is not sufficient for the detailed design and are not sufficient to determine all the factors that may affect construction methods and costs. Once the actual development plans are available, the information in this report should be reviewed by the geotechnical engineer from GeoPro and an additional detailed geotechnical investigation shall be carried out, compatible with the actual proposed development plans for the site.

Based on the results of this preliminary geotechnical investigation, the native soils encountered at the site are generally considered to be suitable for supporting the proposed development. The following preliminary geotechnical information is provided for the planning and preliminary design of the proposed developments. The preliminary geotechnical recommendations provided in this report are not sufficient for detailed design or construction purposes.

4.1 Preliminary Foundation Consideration

4.1.1 Shallow Spread and/or Continuous Strip Footings

Fill materials were encountered below the topsoil, granular fill or Portland cement concrete in all boreholes, and extended to depths ranging from about 1.0 m to 4.0 m below the existing ground surface. The existing fill materials are considered to be unsuitable for supporting the proposed development and any other settlement sensitive structures. The existing fill materials are also considered to be unsuitable for supporting the engineered fill.

Based on the results of this investigation, the proposed building may be founded on conventional shallow spread and/or continuous strip footings bearing in the native, undisturbed, competent native soil deposits. The soil bearing resistances at Serviceability Limit States (SLS) and a factored bearing resistance at Ultimate Limit States (ULS) together with the corresponding founding depths at the borehole locations are provided in the following table.

Proposed Townhouse (Boreholes BH1 and BH2)

BH No.	Bearing Resistance at SLS (kPa)	Factored Geotechnical Resistance at ULS (kPa)	Minimum Founding Depths (m)	Expected Soil Condition
BH1	100	150	3.2	Compact Fine to Medium Sand

BH No.	Bearing Resistance at SLS (kPa)	Factored Geotechnical Resistance at ULS (kPa)	Minimum Founding Depths (m)	Expected Soil Condition
BH2	100	150	4.5	Compact Sand

Note: the bearing resistances provided in above table are based on the condition that groundwater level will be lowered to at least 1 m below the excavation base prior to and during the construction.

Footings founded on approved engineered fill, if utilized at the site, may be designed using a preliminary allowable bearing pressure of 100 kPa.

Due to the limited number of boreholes and anticipated soil variation, additional boreholes with monitoring wells shall be carried out during the detailed design stage.

Proposed 8-Storey Commercial/Residential Building (Boreholes BH3 and BH5)

BH No.	Bearing Resistance at SLS (kPa)	Factored Geotechnical Resistance at ULS (kPa)	Minimum Founding Depths (m)	Expected Soil Condition
BH3	100	150	2.5	Loose to Compact Silt
BH5	75	112	1.6	Loose to Compact Silt
	100	150	6.0	Compact Sand

Note: the bearing resistances provided in above table are based on the condition that groundwater level will be lowered to at least 1 m below the excavation base prior to and during the construction; should higher bearing resistance be required, consideration may be given to deep foundation system such as continuous flight auger (CFA) piles to support the proposed building. A detailed geotechnical investigation consisting of additional boreholes shall be carried out and the geotechnical recommendations for CFA will be provided in the detailed geotechnical report.

Due to the limited number of boreholes and anticipated soil variation, additional boreholes with monitoring wells shall be carried out during the detailed design stage.

4.1.2 General Foundation Design Consideration

All exterior footings and footings in unheated areas should be protected with a minimum of 1.2 m of earth cover for frost protection.

Where it is necessary to place foundations at different levels, the upper foundation must be founded below an imaginary 7 vertical to 10 horizontal (7V:10H) line drawn up from the base of the lower foundation. The lower footing must be installed first to help minimize the risk of undermining the upper footing.

All foundation bases must be inspected by GeoPro to confirm design bearing values prior to pouring concrete.

Due to the great variation of soil conditions encountered in the boreholes carried out, a sufficient number of boreholes shall be considered in the detailed geotechnical investigation.

The anticipated founding soils to be exposed at the founding/subgrade level are susceptible to disturbance from construction traffic and ponded water, leading to degradation of the founding soils. To limit this detrimental condition, a working mat consisting of at least 100 mm lean concrete (i.e. 15 MPa) should be placed on the subgrade as soon as possible after the base of excavation has been inspected and approved by the geotechnical engineer from GeoPro, unless the foundation concrete is to be placed immediately after inspection.

In the event of construction during freezing temperatures, the foundation stratum should be protected from freezing by the use of loose straw, tarpaulins, propane heaters or other suitable means. In this regard, the base of the excavation should be insulated from sub-zero temperatures immediately upon exposure and until such time the footings are protected with sufficient soil cover to prevent freezing at the foundation level.

It should be noted that the recommended foundation type, founding depths, and bearing resistances were based on the borehole information only. The geotechnical recommendations and comments are necessarily on-going as new information of the underground conditions becomes available. For example, more specific information is available with respect to the subsurface conditions between and beyond the boreholes when foundation construction is underway. The interpretation between and beyond the boreholes and the recommendations of this report **must** therefore be checked through field inspections provided by a qualified geotechnical engineer from GeoPro to validate the information for use during the construction stage. Due to the anticipated variation of the subsurface conditions at this specific site, the geotechnical engineer who carried out the geotechnical investigation shall be retained during the construction stage to avoid the potential misinterpretation of the soil information presented in the report.

4.2 Uplift Consideration

Raft and Bath Tubbing

Should a water tight foundation system (i.e. raft foundation in conjunction with waterproof) be considered, the uplift forces resulting from the hydrostatic pressures for the water tight foundation system must be considered in the structural design due to the relatively high groundwater tables.

Due to the fluctuating nature of the groundwater table, the groundwater level considered for the uplifting resistances can be assumed to be at least 2.0 m above the highest groundwater table at the site in consideration of the storm events, or as an alternative, groundwater level at the ground surface can be assumed for the uplifting resistance analysis by the structural engineer. A sufficient factor of safety should be considered for the design of the uplifting resistance by the structural engineer.

Spread Footings and No Bath Tubbing

It is understood that one level of underground parking and basement are considered for the proposed commercial/residential building and townhouse, respectively. Although the groundwater was measured below the slab elevation, the slab on grade might be subject to an uplift pressure due to the pressure of a hydrostatic head (i.e. after heavy storm). Therefore, as a precaution, providing pressure relief valves/cores in the slab may be considered. Unless waterproofing in conjunction with raft foundation is considered, a layer of granular bedding with a sufficient thickness and a sufficient number of weeping tiles below the floor slabs may alternatively be considered to sufficiently intercept and collect the groundwater, which can be discharged prior to rising to the floor slabs.

A detailed hydrogeological study and long-term groundwater level monitoring should be carried out in the detail design stage to evaluate the potential uplift forces resulting from the hydrostatic pressures from the sandy/silty deposits and establish the stable groundwater table to facilitate the detailed designs.

4.3 Excavation, Backfill and Groundwater Control

- The fill materials and native silty/sandy deposits are extremely easy to be disturbed by construction activities and foot traffic, especially below the prevailing groundwater tables. Positive dewatering consisting of well points or eductors may be required to draw down the groundwater table to at least 1 m below the excavation base elevation prior to excavation in conjunction with conventional sump pump. A 100 mm thick of concrete skim coat on the founding subgrade immediately after its approval may be required, to prevent its disturbance by construction activities.
- Based on the results of this preliminary geotechnical investigation, perched groundwater may be expected in the fill materials and native silty/sandy soils above the groundwater tables at various depths. Groundwater control during excavation within the fill materials and native silty/sandy soils above the groundwater tables at the site can be handled, as required, by pumping from properly constructed and filtered sumps located within the excavations. However, more significant groundwater seepage should be expected from the fill materials and cohesionless silty/sandy deposits below the prevailing groundwater tables. The groundwater level should be lowered to at least 1 m below the excavation base prior to excavations.

It should be noted that any construction dewatering or water taking in Ontario is governed by Ontario Regulation 387/04 - Water Taking and Transfer, made under the Ontario Water Resources Act (OWRA), and/or Ontario Regulation 63/16 – Registrations under Part II.2 of the Act – Water Taking, made under Environmental Protection Act. Based on these regulations, water taking of more than 400,000 L/day is subject to a Permit to Take Water (PTTW), while water taking of 50,000 L/day to 400,000 L/day is to be registered through the Environmental Activity and Sector Registry (EASR).

In this regard, further investigation of the native soil types and stabilized groundwater levels should be carried out as part of the follow-up, site specific geotechnical investigation at the site. The need for and the type of groundwater control measures can be reviewed by the engineer as part of the detailed geotechnical and hydrogeological investigations including long-term groundwater level monitoring, which would be required to support the detailed designs of the proposed development.

- It is anticipated that the trench excavations for underground servicing would consist of conventional temporary open cuts with side slopes not steeper than 1.5 horizontal to 1 vertical above the groundwater table. However, some local flattening of side slopes may be required in some areas in looser soil zones or where significant water seepage is encountered. Conventional bedding thicknesses are anticipated for underground services founded within the native competent subsoils at the site. Additional bedding thicknesses may be required for services founded in wet sandy/silty soils, depending upon the excavation depths and success of the contractor's groundwater control measures. It should be noted that cobbles and boulders may be encountered throughout the soils at the site.
- Some of the subsoils above the local water table are generally near their estimated optimum water contents for compaction and may be suitable for reuse as trench backfill, provided they are free of significant amounts of topsoil, organics and other deleterious materials. Some of the cohesionless soils above groundwater levels are generally drier than their estimated laboratory optimum water contents for compaction. These materials will likely require some adjustments in their water content (wetting) prior to placement and compaction. Excavated subsoils from below the local water table (i.e. for deeper excavations, if required) would likely require some drying prior to placement. It should also be noted that due to the existing fine-grained, silty/fine sandy nature of the majority of the existing native soils, some difficulty would be expected in achieving adequate compaction during wet weather.
- Where the backfill against the exterior walls is to support settlement sensitive structures, such as concrete slabs, pavements or walkways, it should be uniformly compacted to at least 98% of SPMDD.
- Complete removal of the existing septic systems, wells, old foundations and underground utility pipes, etc. would likely to be required as part of the site redevelopment.
- Should the structure footprint be extending to the property lines, it is anticipated that the proposed excavations will be supported by a temporary shoring system consisting of timber lagging/soldier piles and/or continuous caisson walls and tie back anchors. Unsupported open cut excavation may be utilized at the areas where the sufficient space is available.

The shoring system must be designed in accordance with the 4th Edition of the Canadian Foundation Engineering Manual.

The soldier piles should be installed in pre-augered holes filled with concrete below the excavation level. The concrete strength must be specified by the shoring designer. Temporary liners may be required in order to help prevent the silty/sandy/gravelly soils from caving-in during installation.

In order to install the shoring system, dewatering might be required in the areas where sandy/silty soils are encountered.

Soil anchors should be required to support the shoring. Casing may be required during the construction of the tiebacks to prevent caving of soils. The anchors must be of a length that meets the recommendation of the 4th Edition of Canadian Foundation Engineering Manual.

Movement of the shoring system is inevitable. Vertical movements will result from the vertical load on the soldier piles resulting from the inclined tiebacks and inward horizontal movement results from earth and water pressures. The magnitude of this movement can be controlled by sound construction practices, and it is anticipated that the horizontal movement will be in the range of 0.1 to 0.25%H.

To ensure that movements of the shoring are within an acceptable range, monitoring must be carried out. Vertical and horizontal targets on the soldier piles must be located and surveyed before excavation begins. Weekly readings during excavation should show that the movements will be within those predicted; if not, the monitoring results will enable directions to be given to improve the shoring.

4.4 Grading and Engineered Fills

- Depending upon the final site grading scheme and proposed final grade elevations, the areas may need to be brought up to the underside of the footings, as required, using engineered fill. The materials proposed for use as engineered fill should be approved by qualified geotechnical personnel from GeoPro at the source, prior to hauling to the site. Portion of the native soils at the site may be suitable for reuse as engineered fill subject to the environmental quality of the soils. Difficulties may be expected for using the native soils for engineered fill due to the fine grained silty/fine sandy soils. Imported materials meeting the requirements of OPSS Select Subgrade Material (SSM) would also be suitable for use as engineered fill, which may be required. Details regarding placement and compaction requirements for engineered fill, if utilized at the site, can be provided once the actual development plans are available, as part of the detailed geotechnical recommendations for the project.

4.5 Floor Slabs and Drainage System

Proposed Townhouse

- The type of foundation drainage system required (perimeter drains and/or under slab drains; damp-proofing or water-proofing) depends upon the proposed founding elevations, soil types in the area and actual stabilized groundwater levels. Based on the results of this preliminary investigation, it is anticipated that conventional foundation drainage (i.e. perimeter drains and damp-proofing) would be adequate for basement above the groundwater tables. Basements founded in sandy/silty soils below the groundwater level (if any) may require water-proofing and/or under slab drains. In any event, the type of foundation drainage should be confirmed by the geotechnical engineer once the site grading plans are available, as part of final design process. The drainage tiles consisting of 100 mm diameter perforated pipes with filter fabric, should discharge into a positive frost-free outlet, as shown on illustrative concepts of the Drainage and Backfill Recommendations, schematic Drawing 2 or, alternatively, the drainage tiles can be connected to sump wells/pits.

Proposed 8-Storey Commercial/Residential Building

- The floor slab may be supported on grade provided all fill materials, very loose native soils and surficially softened native soils are removed and the base thoroughly proof rolled. The fill required to raise the grade can consist of inorganic soil, placed in shallow lifts not exceeding 200 mm and compacted to 98 % of Standard Proctor Maximum Dry Density (SPMDD).

It should be noted that for the underground parking level floor slabs within the silty/sandy deposits below the prevailing groundwater tables, a permanent under-slab drainage system shall be considered.

A moisture barrier consisting of at least 200 mm of 19 mm clear crushed stone should be installed under the floor slab. However, for the floor slabs in the sandy/silty soils, a thicker drainage layer may be required. The thickness of the drainage layer will have to be determined by a hydrogeological study.

Where the exposed subgrade is cohesionless soil consisting of silt, sand or a mixture of the two, the subgrade and all openings should be covered or wrapped with filter fabric. Typically, a Class II non-woven geotextile with a filtration opening size (F.O.S.) of 50 to 100 µm can be used.

Special care should be taken to ensure compaction around columns and adjacent to foundation walls. The floor slabs should be structurally separated from the foundation walls and columns. Sawcut control joints should be provided at regular intervals and

along column lines to minimize shrinkage cracking and to allow for differential settlement of the floor slabs.

For floor slabs above the prevailing groundwater tables, the placement of underfloor drainage should also be considered to collect the perched groundwater.

A perimeter drainage system will also be required. The illustrative concepts of the drainage systems are presented on the schematic Drawings 2 to 7.

For floor slabs below the prevailing groundwater tables and depending on the volume of the groundwater seepage into the building drainage system (i.e. exceeding 50,000L/day or not), a raft foundation in conjunction with water proof of the entire building foundation (i.e. bathtub) may be considered unless a permanent Permit To Take Water (PTTW) is allowed at this site.

Where a raft foundation is used, a moisture barrier consisting of a 200 mm thick layer of 19 mm clear crushed stone and subdrains should be installed between the top of the raft and the underside of the floor slab in case minor water seepage may migrate through the water proof system.

4.6 Pavement Designs

- The recommended pavement structures provided in the following table are based upon an estimate of the subgrade soil properties determined from visual examination and textural classification of the soil samples. The values may need to be adjusted based on the city/regional standards. Consequently, the recommended pavement structures should be considered for preliminary design purposes only. A functional design life of eight to ten years has been used to establish the pavement recommendations. This represents the number of years to the first rehabilitation, assuming regular maintenance is carried out. If required, a more refined pavement structure design can be performed based on specific traffic data and design life requirements and will involve specific laboratory tests to determine frost susceptibility and strength characteristics of the subgrade soils, as well as specific data input from the client.

Recommended Pavement Structure Thickness

Pavement Layer	Compaction Requirements	Light Duty Parking (Cars)	Heavy Duty Parking (Delivery Trucks)
Asphaltic Concrete	92.0 to 96.5% Maximum Relative Density (MRD)	40 mm HL 3	40 mm HL 3
		50 mm HL 8	80 mm HL 8
OPSS Granular A Base (or 19 mm Crusher Run Limestone)	100% SPMDD*	150 mm	150 mm

Granular B Type I Subbase	100% SPMDD*	200 mm	300 mm
---------------------------	-------------	--------	--------

Pavement Layer	Compaction Requirements	Local Residential Road	Collector Road
Asphaltic Concrete	92.0 to 96.5% Maximum Relative Density (MRD)	40 mm HL 3 (1 lift)	40 mm HL 3 (1 lift)
		60 mm HL 8 (1 lift)	80 mm HL 8 (1 lift)
OPSS Granular A Base (or 19 mm Crusher Run Limestone)	100% SPMDD*	150 mm	150 mm
Granular B Type I Subbase	100% SPMDD*	300 mm	400 mm

* Denotes Standard Proctor Maximum Dry Density, ASTM-D698

The subgrade must be compacted to 98% SPMDD for at least the upper 300 mm unless accepted by GeoPro.

The long term performance of the pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure that uniform subgrade moisture and density conditions are achieved. In addition, the need for adequate drainage cannot be over-emphasized. The finished pavement surface and underlying subgrade should be free of depressions and should be sloped (preferably at a minimum grade of 2%) to provide effective surface drainage toward catch basins. Surface water should not be allowed to pond adjacent to the outside edges of pavement areas. Subdrains should be installed to intercept excess subsurface moisture and prevent subgrade softening. This is particularly important in heavy-duty pavement areas.

Prior to placing the granular subbase material, the exposed soil subgrade should be heavily proof-rolled in conjunction with inspection by qualified geotechnical personnel. Deleterious, organic, softened or loosened native subsoils or any fills will require subexcavation and replacement with approved material (i.e. controlled fill), as directed by geotechnical personnel.

5. CLOSURE

The preliminary geotechnical recommendations provided in this report are not sufficient for final design or construction purposes. Once the actual development plans are available, the information in this report should be reviewed by the geotechnical engineer and an additional detailed geotechnical and hydrogeological investigation compatible with the actual proposed

development plans for the site shall be carried out. In this regard, GeoPro would be pleased to provide further geotechnical and hydrogeological services if site development plans proceed forward.

We appreciate the opportunity to be of service to you and trust that this report provides sufficient preliminary geotechnical engineering information to facilitate the planning and preliminary concept design of this project. We look forward to providing you with continuing service during the detailed design stage. Please do not hesitate to contact our office should you wish to discuss, in further detail, any aspects of this project.

Yours very truly

GEOPRO CONSULTING LIMITED

DRAFT

Dylan Q. Xiao, M.A.Sc., P.Eng.
Geotechnical Group

DRAFT

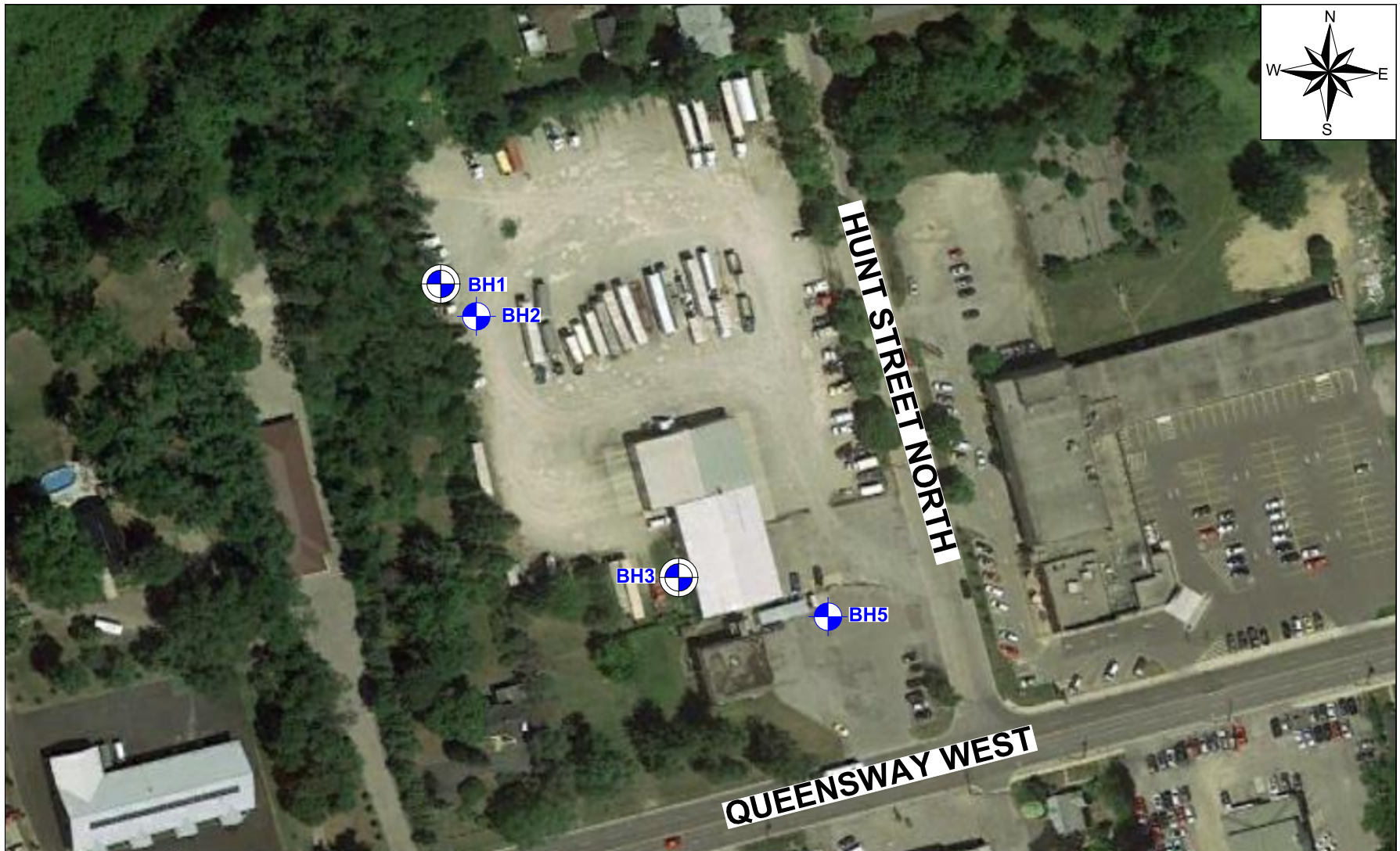
David B. Liu, P.Eng., Principal



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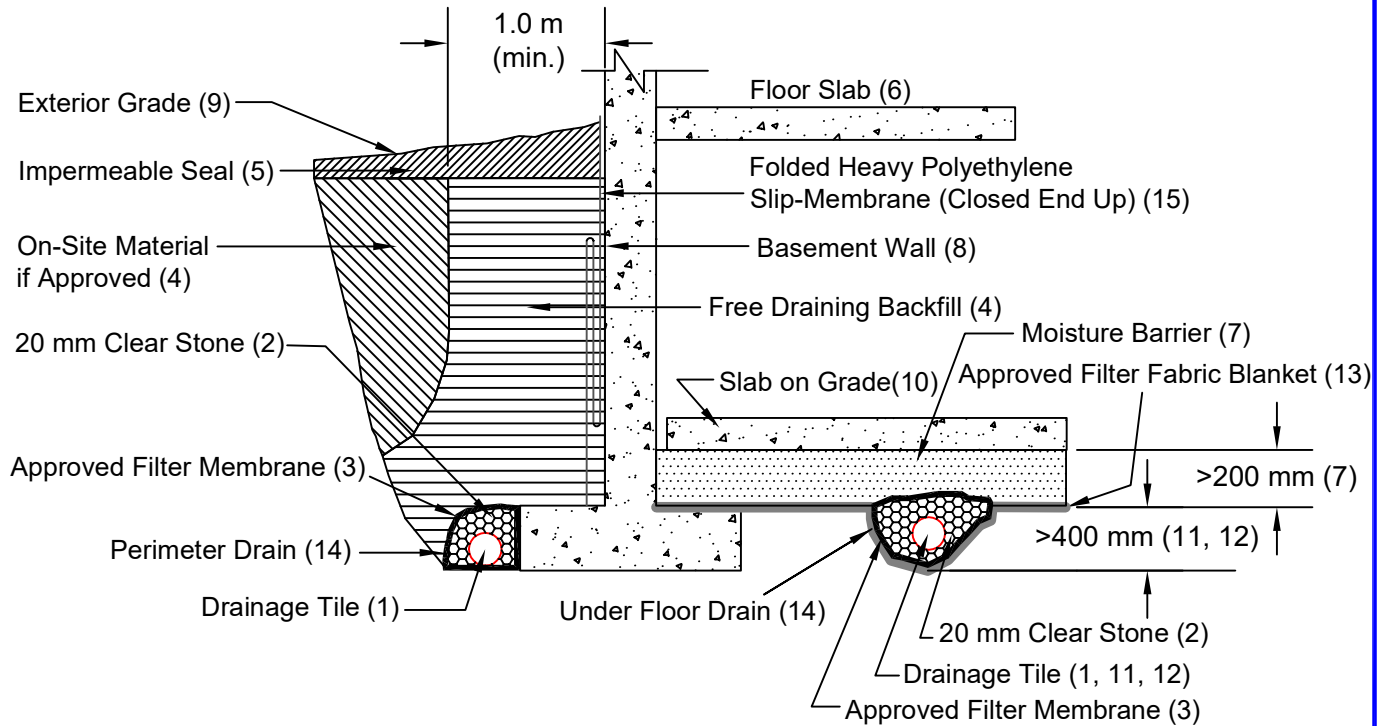
DRAWINGS



Legend:

-  **Borehole Location**
-  **Monitoring Well**

Client: T. Harris Environmental Management		Project No.: 22-4078GH	Drawing No.: 1
Drawn: DL	Approved: DL	Title: Borehole Location Plan	
Date: September 2022	Scale: N.T.S.	Project: Geotechnical Investigation Proposed Development 395-411 Queensway West, Simcoe, Ontario	
Original Size: Letter	Rev: DX	 GeoPro Consulting Limited	



EXTERIOR FOOTING

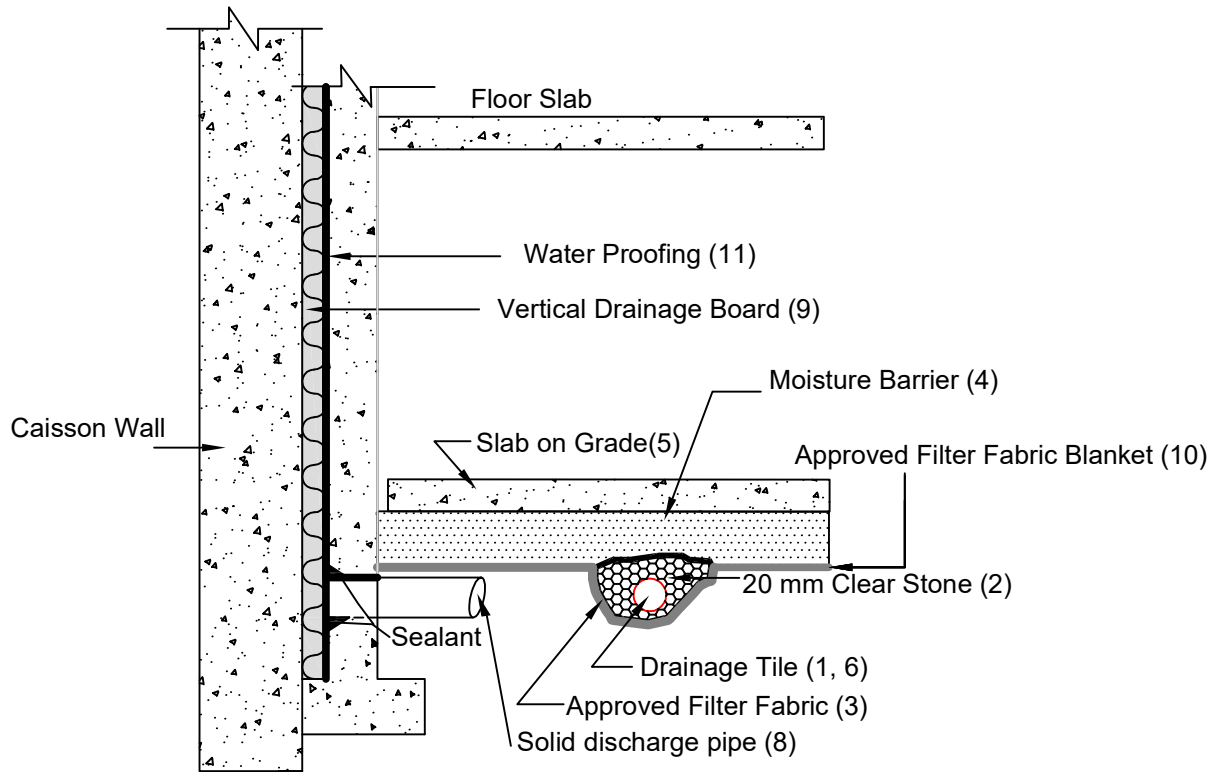
Notes

1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet.
2. 20 mm (3/4") clear stone - 150 mm (6") top and side of drain. If drain is not on footing, place 100 mm (4 inches) of stone below drain.
3. Wrap the clear stone with an approved filter membrane (Terrafix 270R or equivalent).
4. Free Draining backfill - OPSS Granular B or equivalent compacted to the specified density. Do not use heavy compaction equipment within 450 mm (18") of the wall. Use hand controlled light compaction equipment within 1.8 m (6') of wall. The minimum width of the Granular 'B' backfill must be 1.0 m.
5. Impermeable backfill seal - compacted clay, clayey silt or equivalent. If original soil is free-draining, seal may be omitted. Maximum thickness of seal to be 0.5 m.
6. Do not backfill until wall is supported by basement and floor slabs or adequate bracing.
7. Moisture barrier to be at least 200 mm (8") of compacted clear 20 mm (3/4") stone or equivalent free draining material. A vapour barrier may be required for specialty floors.
8. Basement wall to be damp proofed /water proofed.
9. Exterior grade to slope away from building.
10. Slab on grade should not be structurally connected to the wall or footing.
11. Underfloor drain invert to be at least 300 mm (12") below underside of floor slab.
12. Drainage tile placed in parallel rows 2 to 6 m (7' to 20') centers one way. Place drain on 100 mm (4") clear stone with 150 mm (6") of clear stone on top and sides. Enclose stone with filter fabric as noted in (3).
13. The entire subgrade to be sealed with approved filter fabric (Terrafix 270R or equivalent) if non-cohesive (sandy) soils below ground water table encountered.
14. Do not connect the underfloor drains to perimeter drains.
15. Externally Applied Folded Heavy Polyethylene Drainage Membrane.
16. Review the geotechnical report for specific details.

DRAINAGE AND BACKFILL RECOMMENDATIONS

Basement with Underfloor Drainage

(not to scale)



EXTERIOR FOOTING

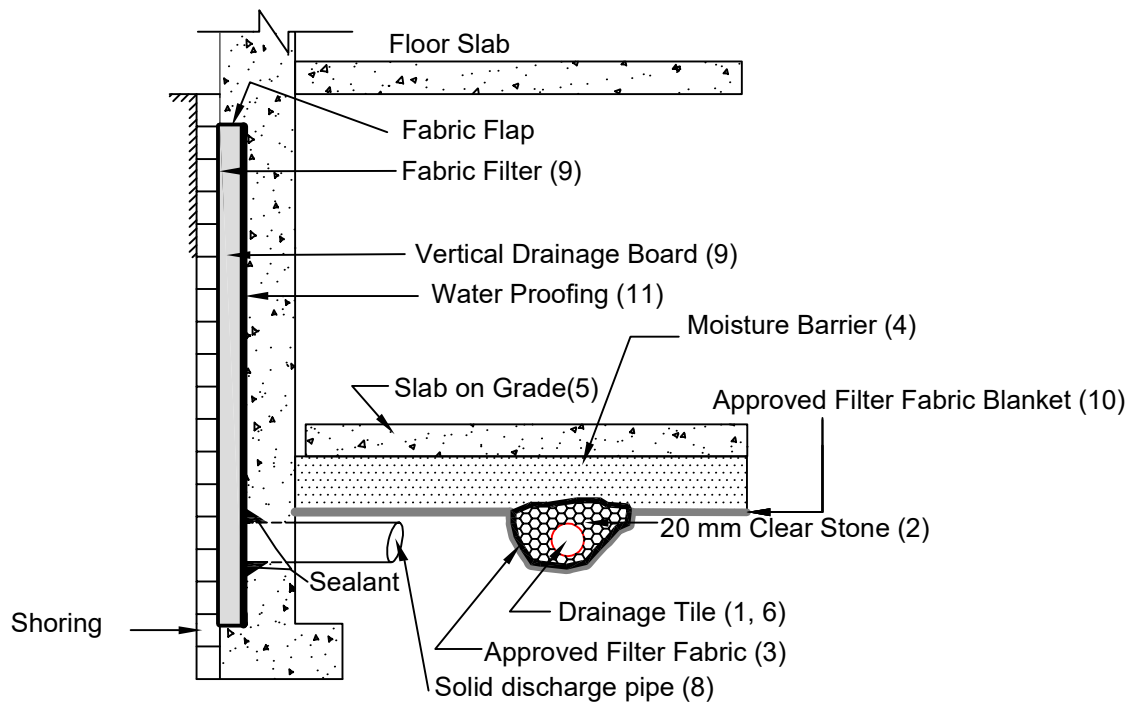
Notes

1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet, spaced between columns.
2. 20 mm (3/4") clear stone - 150 mm (6") top and side of drain. If drain is not on footing, place 100 mm (4 inches) of stone below drain.
3. Wrap the clear stone with an approved filter membrane (Terrafix 270R or equivalent).
4. Moisture barrier to be at least 200 mm (8") of compacted clear 20 mm (3/4") stone or equivalent free draining material. A vapour barrier may be required for specialty floors.
5. Slab on grade should not be structurally connected to the wall or footing.
6. Underfloor drain invert to be at least 300 mm (12") below underside of floor slab.
Drainage tile placed in parallel rows 2 to 6 m (7' to 20') centers one way. Place drain on 100 mm (4") clear stone with 150 mm (6") of clear stone on top and sides. Enclose stone with filter fabric as noted in (3).
7. Do not connect the underfloor drains to perimeter drains.
8. Solid discharge pipe located at the middle of each bay between the solid piles, approximate spacing 2.5 m, outletting into a solid pipe leading to a sump.
9. Vertical drainage board mira-drain 6000 or equivalent with filter cloth should be continuous from bottom to 1.2 m below exterior finished grade.
10. The entire subgrade to be sealed with approved filter fabric (Terrafix 270R or equivalent) if non-cohesive (sandy) soils below ground water table encountered.
11. The basement walls must be water proofed using bentonite or equivalent water-proofing system.
12. Review the geotechnical report for specific details. Final detail must be approved before system is considered acceptable.

DRAINAGE RECOMMENDATIONS

Shored Basement wall with Underfloor Drainage System

(not to scale)



EXTERIOR FOOTING

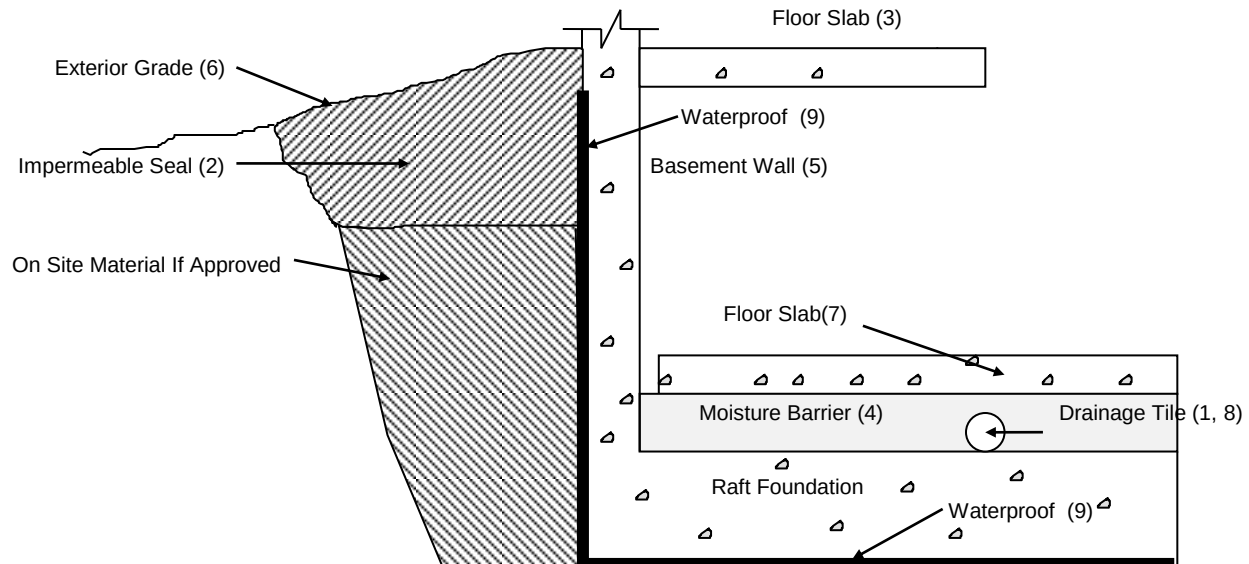
Notes

1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet, spaced between columns.
2. 20 mm (3/4") clear stone - 150 mm (6") top and side of drain. If drain is not on footing, place 100 mm (4 inches) of stone below drain.
3. Wrap the clear stone with an approved filter membrane (Terrafix 270R or equivalent).
4. Moisture barrier to be at least 200 mm (8") of compacted clear 20 mm (3/4") stone or equivalent free draining material. A vapour barrier may be required for specialty floors.
5. Slab on grade should not be structurally connected to the wall or footing.
6. Underfloor drain invert to be at least 300 mm (12") below underside of floor slab.
Drainage tile placed in parallel rows 2 to 6 m (7' to 20') centers one way. Place drain on 100 mm (4") clear stone with 150 mm (6") of clear stone on top and sides. Enclose stone with filter fabric as noted in (3).
7. Do not connect the underfloor drains to perimeter drains.
8. Solid discharge pipe located at the middle of each bay between the solid piles, approximate spacing 2.5 m, outletting into a solid pipe leading to a sump.
9. Vertical drainage board with filter cloth should be kept a minimum of 1.2 m below exterior finished grade.
10. The entire subgrade to be sealed with approved filter fabric (Terrafix 270R or equivalent) if non-cohesive (sandy) soils below ground water table encountered.
11. The basement walls should be water proofed using bentonite or equivalent water-proofing system.
12. Review the geotechnical report for specific details. Final detail must be approved before system is considered acceptable.

DRAINAGE RECOMMENDATIONS

Shored Underground Parking/Basement wall with Underfloor Drainage System

(not to scale)

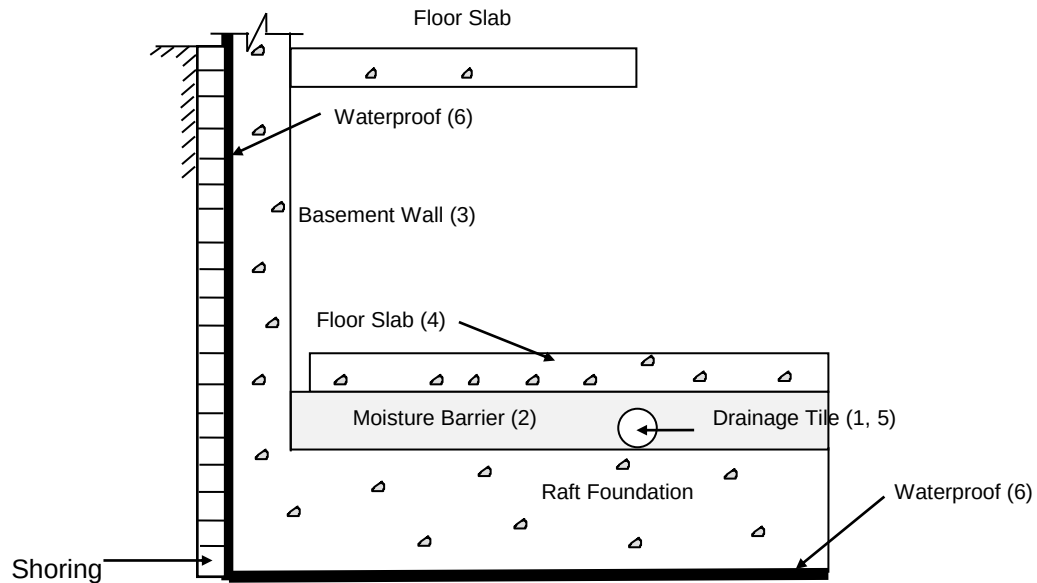


Notes

1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet. Invert to be a minimum of 150 mm (6") below underside of floor slab.
2. Impermeable backfill seal - compacted clay, clayey silt or equivalent. If original soil is free-draining, seal may be omitted.
3. Do not backfill until wall is supported by basement and floor slabs or adequate bracing.
4. Moisture barrier to be at least 200 mm (8") of compacted clear 20 mm (3/4") stone or equivalent free draining material.
5. Basement wall to be water-proofed and the wall has to be designed in consideration of the hydrostatic water pressure.
6. Exterior grade to slope away from building.
7. Slab on grade should not be structurally connected to the wall or footing.
8. Underfloor drain invert to be placed on raft foundation slab. Drainage tile placed in parallel rows 6 to 8 m (20 to 25') centres one way.
9. The waterproof should be at least 1 m above the highest groundwater tables. The water-proofing must be approved by engineer.

DRAINAGE AND BACKFILL RECOMMENDATIONS

Waterproofed Underground Parking Structure/Basement with Underfloor Drainage System
(raft foundations) (not to scale)

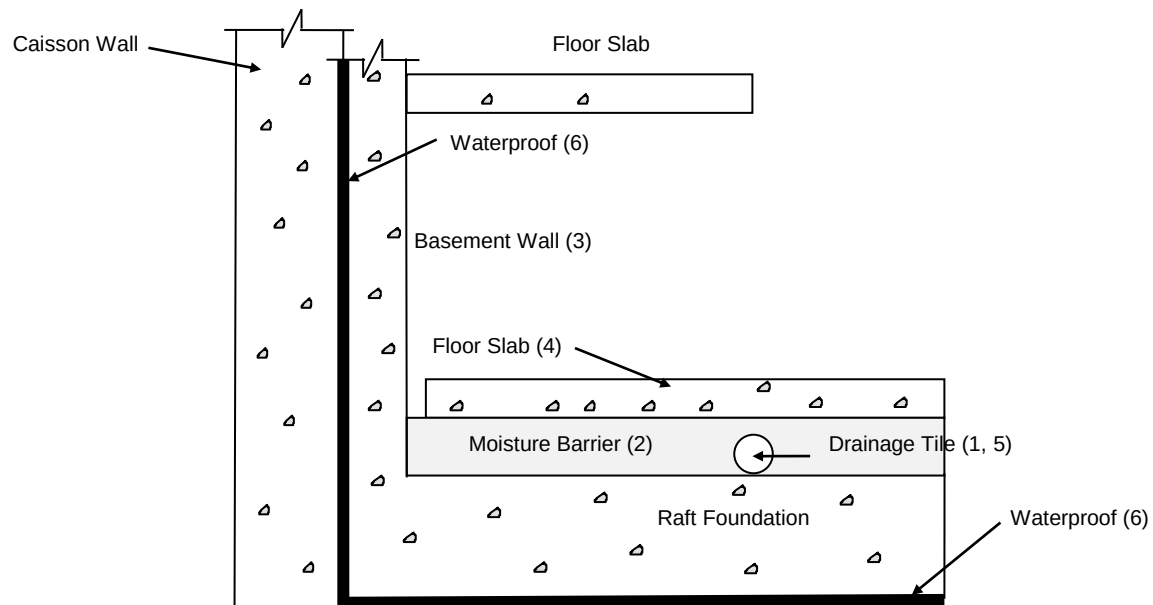


Notes

1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet. Invert to be a minimum of 150 mm (6") below underside of floor slab.
2. Moisture barrier to be at least 200 mm (8") of compacted clear 20 mm (3/4") stone or equivalent free draining material.
3. Basement wall to be water-proofed and the wall has to be designed in consideration of the hydrostatic water pressure.
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6. The waterproof should be at least 1 m above the highest groundwater tables. The water-proofing system must be approved by engineer.

DRAINAGE RECOMMENDATIONS

Waterproofed Underground Parking Structure/Basement with Underfloor Drainage System
(raft foundations) (not to scale)



Notes

1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet. Invert to be a minimum of 150 mm (6") below underside of floor slab.
2. Moisture barrier to be at least 200 mm (8") of compacted clear 20 mm (3/4") stone or equivalent free draining material.
3. Basement wall to be water-proofed and the wall has to be designed in consideration of the hydrostatic water pressure.
4. Slab on grade should not be structurally connected to the wall or footing.
5. Underfloor drain invert to be placed on raft foundation slab. Drainage tile placed in parallel rows 6 to 8 m (20 to 25') centres one way.
6. The waterproof should be at least 1 m above the highest groundwater tables. The water-proofing system must be approved by engineer.

DRAINAGE RECOMMENDATIONS

Waterproofed Underground Parking Structure/Basement with Underfloor Drainage System
(raft foundations) (not to scale)



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ENCLOSURES



Enclosure 1A: Notes on Sample Descriptions

1. Each soil stratum is described according to the *Modified Unified Soil Classification System*. The compactness condition of cohesionless soils (SPT) and the consistency of cohesive soils (undrained shear strength) are defined according to Canadian Foundation Engineering Manual, 4th Edition. Different soil classification systems may be used by others. Please note that a description of the soil strata is based on visual and tactile examination of the samples augmented with field and laboratory test results, such as a grain size analysis and/or Atterberg Limits testing. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.
2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional preliminary geotechnical site investigation.
3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (75 to 300 mm) or boulders (over 300 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.



Enclosure 1B: Explanation of Terms Used in the Record of Boreholes

Sample Type

AS	Auger sample
BS	Block sample
CS	Chunk sample
DO	Drive open
DS	Dimension type sample
FS	Foil sample
NR	No recovery
RC	Rock core
SC	Soil core
SS	Spoon sample
SH	Shelby tube Sample
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

Penetration Resistance

Standard Penetration Resistance (SPT), N:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in) required to drive a 50 mm (2 in) drive open sampler for a distance of 300 mm (12 in).

PM – Samples advanced by manual pressure

WR – Samples advanced by weight of sampler and rod

WH – Samples advanced by static weight of hammer

Dynamic Cone Penetration Resistance, N_d :

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in) to drive uncased a 50 mm (2 in) diameter, 60° cone attached to “A” size drill rods for a distance of 300 mm (12 in).

Piezo-Cone Penetration Test (CPT):

An electronic cone penetrometer with a 60 degree conical tip and a projected end area of 10 cm² pushed through ground at a penetration rate of 2 cm/s. Measurement of tip resistance (Q_t), porewater pressure (PWP) and friction along a sleeve are recorded electronically at 25 mm penetration intervals.

Textural Classification of Soils (ASTM D2487)

Classification	Particle Size
Boulders	> 300 mm
Cobbles	75 mm - 300 mm
Gravel	4.75 mm - 75 mm
Sand	0.075 mm – 4.75 mm
Silt	0.002 mm-0.075 mm
Clay	<0.002 mm(*)

(*) Canadian Foundation Engineering Manual (4th Edition)

Coarse Grain Soil Description (50% greater than 0.075 mm)

Terminology	Proportion
Trace	0-10%
Some	10-20%
Adjective (e.g. silty or sandy)	20-35%
And (e.g. sand and gravel)	> 35%

Soil Description

a) Cohesive Soils (*)

Consistency	Undrained Shear Strength (kPa)	SPT “N” Value
Very soft	<12	<2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very stiff	100-200	15-30
Hard	>200	>30

(*) Hierarchy of Shear Strength prediction

1. Lab triaxial test
2. Field vane shear test
3. Lab. vane shear test
4. SPT “N” value
5. Pocket penetrometer

b) Cohesionless Soils (*)

Compactness Condition (Formerly Relative Density)	SPT “N” Value
Very loose	0-4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	>50

Soil Tests

w	Water content
w _p	Plastic limit
w _l	Liquid limit
C	Consolidation (oedometer) test
CID	Consolidated isotropically drained triaxial test
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement
D _R	Relative density (specific gravity, G _s)
DS	Direct shear test
ENV	Environmental/ chemical analysis
M	Sieve analysis for particle size
MH	Combined sieve and hydrometer (H) analysis
MPC	Modified proctor compaction test
SPC	Standard proctor compaction test
OC	Organic content test
U	Unconsolidated Undrained Triaxial Test
V	Field vane (LV-laboratory vane test)
γ	Unit weight

PROJECT: Preliminary Geotechnical Investigation for Proposed Residential Development										DRILLING DATA									
CLIENT: T. Harris Environmental Management					METHOD: Continuous Flight Auger - Auto Hammer					DIAMETER: 155 mm									
PROJECT LOCATION: 395-411 Queensway West, Simcoe, Ontario					FIELD ENGINEER: DG/SN					DATE: 2022-08-31									
DATUM: N/A					SAMPLE REVIEW: IG					REF. NO.: 22-4078GH									
BH LOCATION: See Borehole Location Plan					CHECKED: DX					ENCL. NO.: 2									
SOIL PROFILE			SAMPLES			GROUND WATER	DYNAMIC PENETRATION TEST				Natural Moisture Content				REMARKS AND GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3ft		SPT				Plastic Limit W _p	Natural Moisture Content W	Liquid Limit W _L						
							SHEAR STRENGTH (kPa)												
							UNIT WT (kN/m ³)												
						○ SPT ≧ Cone blows/0.3m 20 40 60 80													
						● Unconfined X Field Vane & Sensitivity ▲ Quick Triaxial □ Penetrometer + Lab Vane													
						20 40 60 80													
0.0	GRANULAR FILL: (220 mm)		1A	SS															
0.2	FILL: sandy silt, trace silt, trace gravel, organic inclusions, rootlet inclusions, brown, moist, compact		1B	SS	19														
0.7	FILL: sand to gravelly sand, trace silt, brown, moist, loose to compact		2	SS	10														
			3	SS	21														
			4	SS	23														
2.9	FINE TO MEDIUM SAND: some silt, brown, wet, compact		5	SS	23														
4.0	SAND: some silt, trace gravel, brown to grey, wet, compact		6	SS	17														
			7	SS	18														
			8	SS	21														
8.6	SILT: trace clay, trace sand, grey, wet, loose		9	SS	6														
9.6	END OF BOREHOLE																		
Notes:																			

01 - GEOPRO SOIL LOG - GEOPRO 22-4078GH BH LOG 20221005 - JR - DX - MY - DX - GPJ - 2022-10-05 16:06

Notes:

Continued Next Page

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3 , X 3 : Numbers refer to Sensitivity

▲ = 3% Strain at Failure

PROJECT: Preliminary Geotechnical Investigation for Proposed Residential Development										DRILLING DATA																						
CLIENT: T. Harris Environmental Management					METHOD: Continuous Flight Auger - Auto Hammer					DIAMETER: 155 mm																						
PROJECT LOCATION: 395-411 Queensway West, Simcoe, Ontario					FIELD ENGINEER: DG/SN					DATE: 2022-08-31																						
DATUM: N/A					SAMPLE REVIEW: IG					REF. NO.: 22-4078GH																						
BH LOCATION: See Borehole Location Plan					CHECKED: DX					ENCL. NO.: 2																						
SOIL PROFILE			SAMPLES		GROUND WATER	DYNAMIC PENETRATION TEST								Plastic Limit				Natural Moisture Content				Liquid Limit		REMARKS AND GRAIN SIZE DISTRIBUTION (%)								
ELEV. DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE		"N" BLOWS/0.3m	ELEVATION	SPT				Cone				blows/0.3m				W _p		W			W _L							
								SHEAR STRENGTH (kPa)				Field Vane & Sensitivity				Penetrometer + Lab Vane				WATER CONTENT (%)												
							● Unconfined				X Field Vane & Sensitivity																					
							▲ Quick Triaxial				☒ Penetrometer + Lab Vane																					
							20				40				60				80				10				20		30		40	
1) Water encountered at a depth of 4.6 m below ground surface (mBGS) during drilling. 2) Water was at a depth of 4.7 mBGS upon completion of drilling. 3) Borehole caved at a depth of 5.5 mBGS upon completion of drilling. 4) 51 mm dia. monitoring well was installed in borehole upon completion of drilling. Water Level Readings Date W.L.Depth(mBGS) Sep. 14, 2022 4.65																																

PROJECT: Preliminary Geotechnical Investigation for Proposed Residential Development							DRILLING DATA													
CLIENT: T. Harris Environmental Management							METHOD: Continuous Flight Auger - Auto Hammer							DIAMETER: 155 mm						
PROJECT LOCATION: 395-411 Queensway West, Simcoe, Ontario							FIELD ENGINEER: DG/SN							DATE: 2022-08-31						
DATUM: N/A							SAMPLE REVIEW: IG							REF. NO.: 22-4078GH						
BH LOCATION: See Borehole Location Plan							CHECKED: DX							ENCL. NO.: 3						
SOIL PROFILE			SAMPLES			GROUND WATER	ELEVATION	DYNAMIC PENETRATION TEST				Natural Moisture Content				UNIT WT (kN/m ³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)			
ELEV. DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3m			SPT				Plastic Limit W _p	Natural Moisture Content W	Liquid Limit W _L						
								○ SPT	≥ Cone	blows/0.3m										
								20	40	60	80									
							SHEAR STRENGTH (kPa)				WATER CONTENT (%)									
							● Unconfined X Field Vane & Sensitivity													
							▲ Quick Triaxial □ Penetrometer + Lab Vane													
							20	40	60	80	10	20	30	40						
0.0	GRANULAR FILL: (250 mm)		1A	SS	22															
0.3	FILL: silty sand, trace gravel, organic inclusions, rootlet inclusions, brown, moist, loose to compact		1B	SS				○									○			
																	○			
				2	SS	5			○								○			
1.4	FILL: gravelly sand, some silt, brown, moist, very loose																○			
			3	SS	2				○							○				
2.1	FILL: sand, trace silt, trace gravel, organic inclusions, brown, moist, very loose to loose																○			
	--- rootlet inclusions		4	SS	2				○							○				
																	○			
			5	SS	5				○							○				
4.0	SAND: trace silt, trace gravel, brown, wet, compact																			
			6	SS	13				○							○		9	84 6	

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3 , × 3 : Numbers refer to Sensitivity

▲ = 3% Strain at Failure

PROJECT: Preliminary Geotechnical Investigation for Proposed Residential Development

DRILLING DATA

CLIENT: T. Harris Environmental Management

METHOD: Continuous Flight Auger - Auto Hammer

DIAMETER: 155 mm

PROJECT LOCATION: 395-411 Queensway West, Simcoe, Ontario

FIELD ENGINEER: DG/SN

DATE: 2022-09-01

DATUM: N/A

SAMPLE REVIEW: IG

REF. NO.: 22-4078GH

BH LOCATION: See Borehole Location Plan

CHECKED: DX

ENCL. NO.: 4

SOIL PROFILE			SAMPLES		GROUND WATER	ELEVATION	DYNAMIC PENETRATION TEST				Plastic Limit W _p	Natural Moisture Content W	Liquid Limit W _L	UNIT WT (kN/m ³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
ELEV. DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE			○ SPT 20	≧ Cone 40	blows/0.3m 60	80					
0.0	TOPSOIL: (150 mm)														
0.2	FILL: silty sand, trace gravel, organic inclusions, rootlet inclusions, brown, moist, very loose		1	SS	3										
0.7	FILL: silt, trace to some clay, trace sand, organic inclusions, rootlet inclusions, layers of clayey silt, brown, wet, very loose		2A	SS	2										
1.0	SILT: trace clay, trace sand, layers of clayey silt, brown, wet, very loose to compact		2B	SS											
			3	SS	1										
			4	SS	10										
2.9	FINE TO MEDIUM SAND: some silt, trace gravel, brown, moist, compact		5	SS	29										
4.0	SAND: trace to some silt, trace gravel, brown, wet, loose to compact		6	SS	9										
			7	SS	17										
6.6	END OF BOREHOLE														
Notes: 1) Water encountered at a depth of 0.7 m below ground surface (mBGS) during drilling. 2) Water was at a depth of 4.8 mBGS upon completion of drilling. 3) Borehole caved at a depth of 5.2 mBGS upon completion of drilling. 4) 51 mm dia. monitoring well was installed in borehole upon completion of drilling. Water Level Readings Date W.L. Depth(mBGS) Sep. 14, 2022 4.73															

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3 , × 3 : Numbers refer to Sensitivity

▲ = 3% Strain at Failure

PROJECT: Preliminary Geotechnical Investigation for Proposed Residential Development						DRILLING DATA					
CLIENT: T. Harris Environmental Management			METHOD: Continuous Flight Auger - Auto Hammer			DIAMETER: 155 mm					
PROJECT LOCATION: 395-411 Queensway West, Simcoe, Ontario			FIELD ENGINEER: DG/SN			DATE: 2022-09-01					
DATUM: N/A			SAMPLE REVIEW: IG			REF. NO.: 22-4078GH					
BH LOCATION: See Borehole Location Plan			CHECKED: DX			ENCL. NO.: 5					

SOIL PROFILE			SAMPLES		GROUND WATER	DYNAMIC PENETRATION TEST				SHEAR STRENGTH (kPa)			WATER CONTENT (%)		UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
ELEV. DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE		"N" BLOWS/0.3m	ELEVATION	SPT				Plastic Limit	Natural Moisture Content	Liquid Limit		
								20	40	60	80					
0.0	PORTLAND CEMENT CONCRETE: (340 mm)															
0.3	FILL: silty sand, trace gravel, organic inclusions, rootlet inclusions, brown, moist		1	AS												
0.8	FILL: sand, some silt, trace gravel, pockets/layers of silt, brown, moist, loose		2	SS	6											
1.4	SILT: trace to some clay, trace gravel, layers of clayey silt, pockets of sand, brown to grey, wet, loose to compact		3	SS	7											
			4	SS	9											
			5	SS	11											
	--- grey		6	SS	5											
5.6	SAND: trace silt, trace gravel, wet, brown, compact		7	SS	12											
			8	SS	23											
8.1	END OF BOREHOLE Notes: 1) Water encountered at a depth of 1.5 m below ground surface (mBGS) during drilling. 2) Water was at a depth of 4.6 mBGS upon completion of drilling. 3) Borehole caved at a depth of 4.6 mBGS upon completion of drilling.															

01 - GEOPRO SOIL LOG GEOPRO 22-4078GH BH LOG 20221005 - JR - DX - MY - DX - GPJ - 2022-10-05 16:15

GROUNDWATER ELEVATIONS

 Measurement    
GRAPH NOTES

+ 3 , × 3 : Numbers refer to Sensitivity

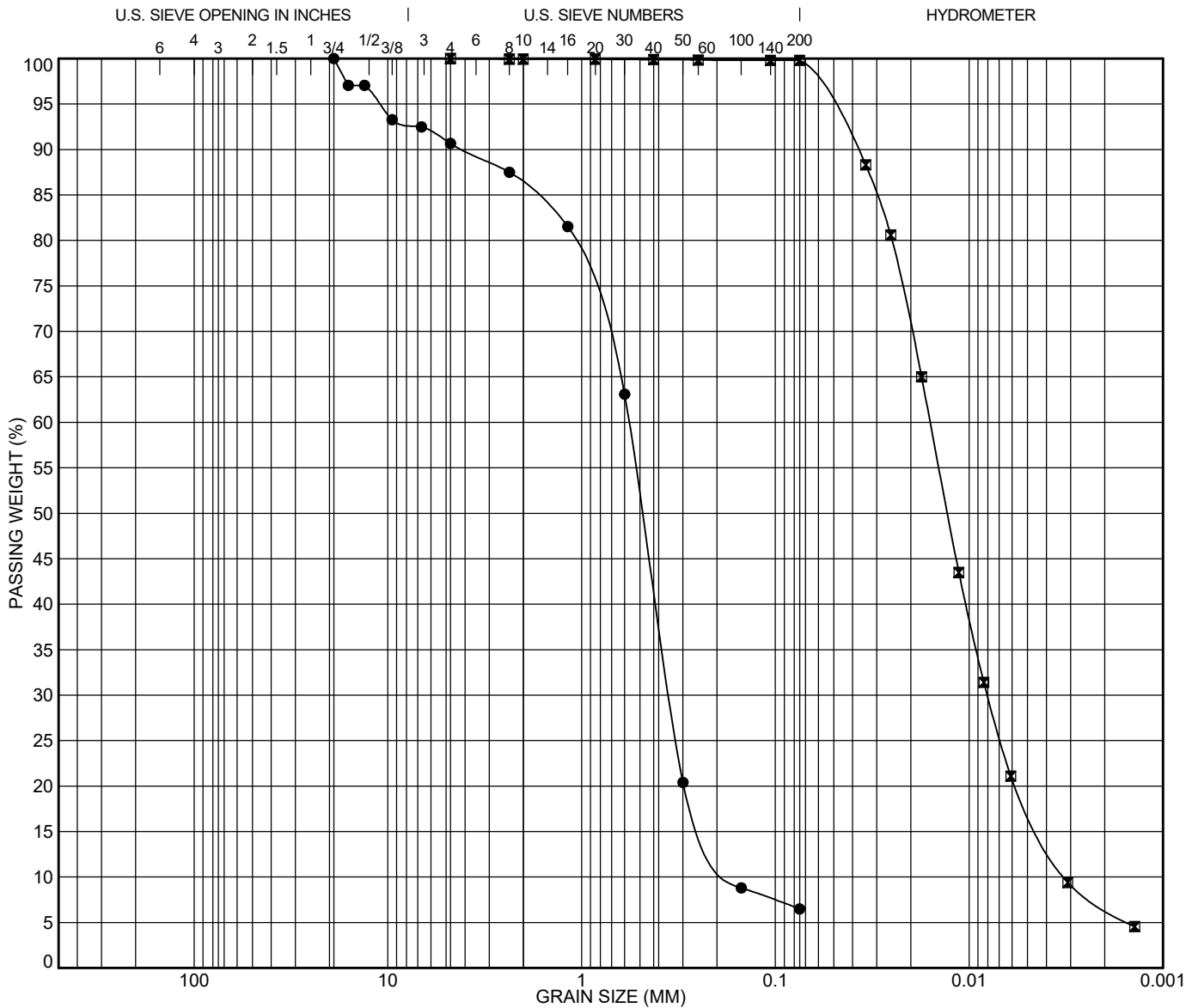
▲ = 3% Strain at Failure



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Geotechnical-Hydrogeology-Environmental-Materials-Inspection

FIGURES



COBBLES	GRAVEL		SAND			SILT	CLAY
	coarse	fine	coarse	medium	fine		

Specimen Identification			Classification				LL	PL	PI	Cc	Cu
●	BH2	SS6	4.57							1.34	3.54
■	BH3	SS4	2.29							1.27	4.95
Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay	
●	BH2	SS6	4.57	19	0.571	0.351	0.161	9.3	84.2	6.5	
■	BH3	SS4	2.29	4.75	0.016	0.008	0.003	0.0	0.2	93.1	



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GRAIN SIZE DISTRIBUTION

PROJECT: Preliminary Geotechnical Investigation for Proposed Residential Development

LOCATION: 395-411 Queensway West, Simcoe, Ontario

PROJECT NO.: 22-4078GH

SAMPLED ON: 2022-09-01

FIGURE NO.: 1

TESTED ON: 2022-09-22

LIMITATIONS TO THE REPORT

This report is intended solely for the Client named. The report is prepared based on the work has been undertaken in accordance with normally accepted geotechnical engineering practices in Ontario.

The comments and recommendations given in this report are based on information determined at the limited number of the test hole and test pit locations. The boundaries between the various strata as shown on the borehole logs are based on non-continuous sampling and represent an inferred transition between the various strata and their lateral continuation rather than a precise plane of geological change. Subsurface and groundwater conditions between and beyond the test holes and test pits may differ significantly from those encountered at the test hole and test pit locations. The benchmark and elevations used in this report are primarily to establish relative elevation differences between the test hole and test pit locations and should not be used for other purposes, such as grading, excavating, planning, development, etc.

It should be noted that the results of the designated substance and chemical analysis refer only to the sample analyzed which was obtained from specific sampling location and sampling depth, and the presence of designated substance and soil chemistry may vary between and beyond the location and depth of the sample taken. Please note that the level of chemical testing outlined herein is meant to provide a broad indication of soil quality based on the limited soil samples tested. The analytical results contained in this report should not be considered a warranty with respect to the soil quality or the use of the soil for any specific purpose or the acceptability of the soils for any excess soil receiving sites.

The report reflects our best judgment based on the information available to GeoPro Consulting Limited at the time of preparation. Unless otherwise agreed in writing by GeoPro Consulting Limited, it shall not be used to express or imply warranty as to any other purposes. No portion of this report shall be used as a separate entity, it is written to be read in its entirety. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated.

The design recommendations given in this report are applicable only to the project designed and constructed completely in accordance with the details stated in this report. Otherwise, our responsibility is limited to interpreting the subsurface information at the borehole or test pit locations.

Should any comments and recommendations provided in this report be made on any construction related issues, they are intended only for the guidance of the designers. The number of test holes and test pits may not be sufficient to determine all the factors that may affect construction activities, methods and costs. Such as, the thickness of surficial topsoil or fill layers may vary significantly and unpredictably; the amount of the cobbles and boulders may vary significantly than what described in the report; unexpected water bearing zones/layers with various thickness and extent may be encountered in the fill and native soils. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and make their own conclusions as to how the subsurface conditions may affect their work and determine the proper construction methods.

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. GeoPro Consulting Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.



GeoPro Consulting Limited

Geotechnical-Hydrogeology-Environmental-Materials-Inspection

Preliminary Hydrogeological Assessment

Proposed Residential Development

395-411 Queensway West, Simcoe, Ontario

Prepared For:

HFW Holdings Limited



GeoPro Project No.: 22-4078H

Report Date: February 1, 2024

Professional, Proficient, Proactive

GeoPro Consulting Limited Tel. (905) 237-8336

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GeoPro
CONSULTING LIMITED

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Limitations to the Report

1.0 INTRODUCTION

GeoPro Consulting Limited (“GeoPro”) was retained by HFW Holdings Limited (the “Client”) to conduct a preliminary hydrogeological assessment for the proposed Hunt Street Residential development at 395-411 Queensway West, Simcoe, Ontario (the “Site”). The approximate site location is shown on Drawing No. 1.

It should be noted that the hydrogeological report was prepared based on the preliminary design information provided at the time of preparing the report. In the event the design information is modified or updated, this report should be reviewed by GeoPro and further recommendations will be provided as needed.

1.1 Purposes

The purposes of this preliminary hydrogeological assessment are to characterize the subsurface soil and groundwater conditions in the limited number of boreholes at the Site and to assess temporary dewatering and groundwater control needs (if any) in order to facilitate the design of the Project.

It should be noted that the preliminary hydrogeological assessment was completed concurrently with a geotechnical investigation carried out by GeoPro at the Site. The results of the geotechnical investigation were summarized in a separate report.

1.2 Scope of Work

In conjunction with the geotechnical investigation, the preliminary hydrogeological assessment comprised the following tasks:

- 1) Conducting a search and review of the available geology and hydrogeology data resources, including Ministry of the Environment, Conservation and Parks (“MECP”) Water Well Records (“WWR”), Ontario Geological Survey (“OGS”) and Ontario Source Water Protection Program;
- 2) Completing groundwater level monitoring and in-situ hydraulic conductivity testing (slug testing); and
- 3) Data analyses, interpretation, and report preparation.

This report has been prepared for the Client. Third party use of this report without GeoPro’s consent is prohibited. The limitation conditions presented in this report form an integral part of the report and they must be considered in conjunction with this report.

1.3 Previous and Concurrent Investigations and Reports

1.3.1 Geotechnical Investigations by GeoPro

A geotechnical investigation was carried out concurrently by GeoPro, which consisted of the advancement of four (4) boreholes (BH1, BH2, BH3 and BH5) drilled to the depths ranging from 6.6 to 9.6 mBGS, and the installation of two (2) monitoring wells in each of the advanced boreholes BH1 and BH3.

The information and data obtained from GeoPro's geotechnical investigation report has been incorporated in this preliminary hydrogeological assessment report. The approximate borehole and monitoring well locations are shown on Drawing No. 2, and the Borehole Logs are included in Appendix A.

In addition, one (1) borehole (BHMW5) was drilled adjacent to the BH5 location by T. Harris Environmental Management, and a monitoring well was installed in the advanced borehole.

2.0 SITE CONDITIONS

2.1 Site Feature Observations

A site visit was conducted on September 22, 2022 to observe the general site features and sources of potential contamination and/or environmental concern.

The Site is currently occupied by residential and commercial properties on the north side of Queensway West between Hunt Street North and Park Road and generally surrounded by vacant lands, parkland, residential and commercial properties.

Catch basins and/or manholes were observed along the roadway near the Site.

Patterson Creek was observed approximately 5 m north of the Site.

Kent Creek was observed approximately 190 m south of the Site.

Auto garages (auto service shops) were noted in the area within a 500 m radius from the Site based on Google Maps and are summarized below:

- Scott's Auto Body Repair (at 6 Hunt Street South) is approximately 95 m south of the site.
- Future Auto Service & Sales (at 10 Hunt Street South) is approximately 135 m south of the site.
- Demeyere's Simcoe Honda (at 443 Queensway West) is approximately 225 m west of the Site
- Honda Service (At 456 Queensway West) is approximately 320 m west of the Site
- Cardial Muffler Centre (at 335 Queensway West) is approximately 160 m east of the site.
- NAPA AUTOPRO (at 10 Hunt Street South) is approximately 130 m south of the site.
- Koncir Automotive (at 425 Queensway West) is approximately 130 m West of the site.
- UniglassPlus/Ziebart (at 321 Queensway West) is approximately 180 m East of the site.

2.2 Physiography and Drainage

The Site is located within the Norfolk Sand Plain physiographical region in an area comprised of Sand Plains according to the “Physiography Map of South Central Portion of Southern Ontario” prepared by the Ontario Department of Mines and Northern Affairs, and based on the Ontario Geological Survey (“OGS”) database.

The Site is located in the Lynn Creek Subwatershed, part of the Long Point Region Watershed, under the jurisdiction of the Long Point Region Conservation Authority (LPRCA). Patterson Creek, located approximately 5 m north of the site, flows easterly and drain into Crystal Lake approximately 2.1 km east to southeast of the site, then flows southerly toward Spring Creek approximately 3.0 km southeast of the Site. and eventually drains into Lake Erie approximately 14.3 km southeast of the site. Kent Creek, located approximately 190 m south of the Site, flows easterly to Crystal Lake Proximately 1.0 km southeast of the site, then flows southerly toward Spring Creek approximately 3.0 km southeast of the Site, and drains into Lake Erie approximately 14.3 km southeast of the Site.

2.3 Geology

2.3.1 Bedrock Geology

The bedrock beneath the Site consists of Middle Devonian Limestone, dolostone and shale, at the depths ranging from approximately 32 to 41 mBGS, according to the “Bedrock Geology of Southern Ontario” prepared by the Ontario Ministry of Northern Development and Mines and based on the OGS database.

2.3.2 Surficial Geology

As shown on Drawing No. 3, the Site and its surrounding area are located in an area covered with fine-course textured glaciolacustrine deposits and older alluvial deposits, according to the “Surficial Geology of Southern Ontario” database maintained by the OGS.

2.3.3 Site Stratigraphy

As indicated in the appended Borehole Logs the soil stratigraphy at the Site generally consists of fill materials below pavement structure or topsoil, underlain by cohesionless silty/sandy soils. No bedrock was encountered at the maximum drilled depth of approximately 9.6 mBGS.

Detailed descriptions of soil strata encountered in the boreholes drilled at the Site are provided on the Borehole Logs in Appendix A.

2.4 Hydrogeology

The hydrogeological conditions at the Site were evaluated based on the information obtained from the Ministry of Natural Resources and Forestry and the Ontario Source Protection Information Atlas, the water well data collected from the MECP database, the information obtained during the geotechnical investigation, and the data collected from the additional work conducted at the Site.

2.4.1 Highly Vulnerable Aquifer (“HVA”)

Based on the Ontario Source Protection Information Atlas, the Site is located in an area with a Highly Vulnerable Aquifer (“HVA”). HVAs are delineated according to Technical Rules under the Clean Water Act. In general, an HVA will consist of source granular aquifer materials or fractured rock that have a high permeability and are exposed near the ground surface with a relatively shallow water table.

An aquifer is indicated as vulnerable if possible contaminants could quickly flow into it and impact water quality. In addition, a plume of the possible contaminants would migrate quickly within an HVA.

2.4.2 MECP WWR

A search of the MECP WWR database was conducted focusing on a 500 m radius from the Site. The locations of the MECP water wells are shown on Drawing No. 4. A summary of water well records is included in Appendix B and presented in the following table.

Types of Well Record	Number of Records
Commercial	1
Domestic	3
Industrial	3
Municipal	1
Monitoring	11
Monitoring and Test Hole	7
Not Used	7
Unknown	25
Total	58

Eight (8) well records are identified in the MECP WWR database as water supply wells. No bedrock was encountered at the maximum recorded depth of 42.4 mBGS, and water was reported at recorded depths ranging from 1.5 to 15.5 mBGS in overburden deposits.

As the MECP WWR coordinate data is unreliable, the wells plotted on the drawing should be considered as reference only. If more accurate information is needed for the wells, a door-to-door well survey may be considered.

2.4.3 Wellhead Protection Area (“WHPA”)

Based on the Ontario Source Protection Information Atlas, southwest portion of the Site is located within municipal Wellhead Protection Areas WHPA-B and WHPA-C, where water (and pollutants) moves through the aquifer toward the municipal well in 2 to 5 years. The nearest municipal well is approximately 450 m southwest of the Site.

2.4.4 Intake Protection Zone (“IPZ”)

Based on the information obtained from the Ontario Source Protection Information Atlas, the Site and its neighboring properties are not located within a municipal surface water intake protection zone (“IPZ”).

2.4.5 Provincially Significant Wetland (“PSW”)

Based on the information obtained from the Ministry of Natural Resources and Forestry, northwest corner of the Site is located within a PSW.

2.4.6 Groundwater Levels

Groundwater conditions were observed in the advanced boreholes during and immediately upon completion of drilling. The observations are included on the Borehole Logs in Appendix A.

Groundwater levels were measured between September 14, 2022 and December 13, 2023 in all GeoPro’s monitoring wells (BH1 and BH3).

The monitoring well construction details and the measured groundwater levels are recorded on the appended Borehole Logs and summarized in the following table.

Monitoring Well ID	Screen Interval (mBGS)	Groundwater Level (mBGS)				
		September 14, 2022	March 23, 2023	June 16, 2023	September 13, 2023	December 13, 2023
BH1	3.1 ~ 6.1	4.65	4.25	4.44	4.60	4.51
BH3	3.0 ~ 6.0	4.73	4.36	4.51	4.70	4.66

As shown in the above table, groundwater levels ranged from 4.25 to 4.73 mBGS during the monitoring period.

Groundwater is expected to flow northwards towards Patterson Creek; however, the extensive underground infrastructure in this urban setting may influence local groundwater flow patterns.

It should be noted that the groundwater levels can be expected to vary over time and are subject to seasonal fluctuations.

2.4.7 Groundwater Quality

Groundwater sampling was conducted on September 20, 2022 by GeoPro from Monitoring Well BHMW5. The groundwater samples were collected in appropriate laboratory-supplied containers, placed in a cooler, and submitted to ALS Environmental (“ALS”) in Waterloo, Ontario for analysis of selected physical and chemical parameters as specified in the Norfolk Sanitary Sewer Use Bylaw (“the Local Sewer-Bylaw”). The analytical results are provided in Appendix C.

The results were compared with the respective criteria specified in the Local Sewer Bylaw. Based on the comparison, exceedances of the sanitary criteria were measured for Total Suspended Solids (“TSS”), iron,

manganese in the analyzed groundwater samples. Exceedances of PWQO were measured for phosphorus, aluminum, arsenic, cadmium, cobalt, copper, iron, lead, nickel, silver, vanadium, zinc in the analyzed groundwater samples. A summary of the exceedances is presented in the following table.

Sample ID	Parameter	Total Concentration	Sanitary	PWQO	Unit
BHMW5	TSS	<u>16300</u>	350	-	mg/L
	Iron	90.9	50	0.3	mg/L
	Manganese	<u>10.4</u>	5	-	mg/L
	Phosphorus	0.618	10	0.01	mg/L
	Aluminum	41.4	50	0.015	mg/L
	Arsenic	0.0240	1	0.005	mg/L
	Cadmium	0.000659	0.1	0.0001	mg/L
	Cobalt	0.0366	5	0.0009	mg/L
	Copper	0.131	2	0.001	mg/L
	Lead	0.0523	3	0.001	mg/L
	Nickel	0.0798	3	0.025	mg/L
	Silver	0.000194	5	0.0001	mg/L
	Vanadium	0.0895	5	0.006	mg/L
	Zinc	0.252	2	0.02	mg/L

Notes: **41.4** = sample concentration exceeds the PWQO criteria
16300 = sample concentration exceeds the sanitary criteria

3.0 ESTIMATED HYDRAULIC CONDUCTIVITY

Hydraulic conductivity (K-value) of the soils was estimated based on the results obtained from grain size analysis of selected soil samples.

3.1 Grain Size Distribution Method

Grain size analysis (sieve and hydrometer) was conducted on two (2) soil samples collected from boreholes BH2 and BH3. The grain size analyses results are presented in Figure No. 1.

The hydraulic conductivity of the selected soil samples was estimated using applicable empirical equations based on the particle size gradations. It should be noted that where effective particle size was not observed during grain size analysis testing, the value was approximated for the empirical hydraulic conductivity calculations.

The hydraulic conductivity of the selected soil samples was estimated using applicable empirical equations based on the particle size gradation details. As shown in the table below, the estimated K value for the tested soil ranged from 2.4×10^{-8} cm/s to 2.5×10^{-2} cm/s.

Borehole ID	Sample #	Soil sample Depth (mBGS)	Soil Type	K Value (cm/s)
BH2	SS6	4.6 – 5.0	Sand	2.5×10^{-2}
BH3	SS4	2.3 – 2.7	Silt	2.4×10^{-8}

4.0 TEMPORARY DEWATERING REQUIREMENTS

Temporary dewatering is intended to lower the groundwater table within the excavation area in order to provide a “dry” working condition during excavation and installation operations.

The temporary dewatering flow rate generally depends on the design specifications of the proposed structures (such as invert elevation, length, depth, size, etc.), the site hydrogeological conditions (such as existing groundwater levels and flow regime), and the drawdown levels required for maintaining dry working conditions and stable excavation bases and slopes.

4.1 The Project Concept

Based on the concept site plan and design information provided by the Client dated June 14, 2022, the proposed development consists of townhouse blocks and 4-storey mid-rise building with excavation depth of 4 mBGS.

A copy of the concept site plan is provided in Appendix D.

4.2 Excavation and Temporary Dewatering Requirements

Groundwater levels measured in the on-site monitoring wells range from 4.25 to 4.73 mBGS during the monitoring period. Considering seasonal fluctuations, the initial water level for dewatering is assumed to be 0.5 m higher than the highest measured groundwater level (e.g., 3.75 mBGS). As a result, the excavations for the project are anticipated to occur below the groundwater table, and temporary dewatering or groundwater control is anticipated to lower the water level to at least 1 m below the excavation base to achieve dry work conditions for the excavation and installation.

Dewatering involves controlling groundwater by pumping, to locally lower groundwater levels in the vicinity of the excavation. Sump pumping is the simplest form of dewatering, by which groundwater is allowed to enter the excavation, and is then collected in a sump and pumped away by robust solids-handling pumps. Sump pumping can be effective in many circumstances, but continual seepage into the excavation may create the risk of instability and other problems.

To prevent significant groundwater seepage into the excavation and ensure stability of the excavation base and side slopes, it may be necessary to lower groundwater levels prior to excavation, which is known as ‘pre-drainage’. The pre-drainage methods may include deep wells, wellpoints, eductors (ejectors), vacuum wells, horizontal wells, etc.

Excavations for the Project are anticipated to cut through fill materials and cohesionless silty/sandy soils. Considering the nature of the cohesionless soils, pre-drainage groundwater control measures using wells and/or well points should be considered in conjunction with conventional sump pumping.

4.3 Temporary Dewatering Estimation

The following assumptions are considered in estimating the temporary dewatering requirements:

- An initial groundwater level at 3.75 mBGS;
- A target water level 1 m below the excavation bottom;
- Excavation width to be 2 m plus the proposed estimated width;
- Excavation length to be 2 m plus the proposed estimated length;
- The geometric mean of the hydraulic conductivity values obtained from grain size (2.5×10^{-3} cm/s or 2.5×10^{-5} m/s) was used for the dewatering rate estimation, which was assumed for all water bearing soils encountered by the excavation.

The following Dupuit-Thiem equation was used to calculate radial flow to an open excavation from an unconfined aquifer under steady-state condition:

$$Q = [\pi \times K \times (H^2 - h_w^2)] / \ln(R_o/r_e)$$

Where:

Q = Flow Rate [m^3/s]

H = Initial Water Level [m]

h_w = Target water Level [m]

K = Hydraulic Conductivity [m/s]

r_e = effective radius [m], $r_e = (\text{excavation area} / \pi)^{0.5}$ [m]

$R_o = 3000 \times (H - h_w) \times K^{1/2}$ [m]

Based on the calculations shown above, the estimated steady-state groundwater inflow rate for the Project is summarized in the following table:

Type	Steady-State Dewatering Rate
	(L/day)
Entire Site	2,887,876

It should be noted that the dewatering requirement is expected to be highest at the beginning of the dewatering process, when the volume of groundwater stored within the pore space of the soil matrix must be removed. The additional pumping rates to be considered to allow removal of the overburden storage within 30 days for the Project are summarized in the following table:

Type	Removal of Overburden Storage
	(L/day)
Entire Site	449,596

During and after storm events, significantly higher dewatering flow rates are anticipated to account for direct precipitation and runoff into the excavation. The highest recorded daily rainfall at a nearby Environment Canada station (DELHI CDA) is 138.8 mm (based on data from Environmental Canada).

Assuming removal of a 138.8 mm storm event within 24 hours, the additional pumping capacities for the Project are summarized in the following table:

Type	Removal of Precipitation
	(L/day)
Entire Site	4,941,211

Based on the conservative assumptions described above, a total maximum daily dewatering flow rates for the Project were summarized in the following table:

Type	Estimated Total Dewatering Rate
	(L/day)
Entire Site	8,278,682

Based on the conservative assumptions described above, the total maximum daily dewatering flow rate for the Project would be more than 400,000 L/day, with consideration of removal of the aquifer storage within a 30-day period and storm events. The maximum estimated zone of influence for dewatering the entire site area would be 19 m from the edge of the excavation.

It should be noted that the assumed excavation depths and areas for the dewatering volume estimation are based on our understanding of the proposed development and the preliminary information provided by the Client. Should there be any modifications of the design or the assumed depths and areas, or if dewatering of the project is proposed to take place in phases, this office should be further consulted, and the dewatering estimation will need to be revised accordingly.

It is known that the subsurface soil conditions may change significantly between and beyond the on-site boreholes. As the information obtained and assumptions made in this investigation report are based on the results obtained from a limited number of investigated locations, unexpected water bearing zones with a hydraulic conductivity higher than that used in these calculations may be present. In addition, the above estimated dewatering volumes are based on the estimated hydraulic conductivities (K-value) from a limited number of grain size analysis.

Please note that it is the responsibility of the contractor to ensure dry conditions are maintained within the excavation at all times and at all costs.

4.4 Preliminary Long-term Dewatering or Under-slab Drainage

Considering the groundwater levels to the proposed basement level, unless all foundations are designed to be waterproof and resist hydrostatic uplift a sub-slab drainage system or foundation drainage/weeping tile system in conjunction with a perimeter drainage system should be installed for long-term control of the groundwater level to avoid wet conditions in the basement. The drainage system should be connected to a storm sewer system to provide a positive drainage, or alternatively, the water seepage collected from the drainage system can be discharged to a LID facility installed at the Site.

The basement slab elevations are not known at the time of preparing this preliminary hydrogeological assessment report. Should the basement level be sufficiently above the prevailing ground water tables, long-term groundwater control may not be anticipated.

4.5 Permit-to-Take-Water/Regulatory Registration

According to O. Reg. 387/04, any water taking over 50,000 litres per day requires a Permit to Take Water ("PTTW"), which shall be obtained in accordance with the MECP's PTTW Manual, dated April 2005.

According to O. Reg. 63/16, a PTTW will not be required for temporary dewatering at a construction site in an amount less than 400,000 L/day. However, the dewatering at a construction site in an amount between 50,000 L/day and 400,000 L/day shall be registered through the Environmental Activity and Sector Registry ("EASR").

According to the dewatering rate estimations, the total temporary dewatering rate of the proposed development would more than 400,000 L/day, for which a Category 3 PTTW will be required.

The basement slab elevations and long-term stable groundwater tables are not known at the time of preparing this preliminary hydrogeological assessment report. However, subject to the final designed basement slab and the stable groundwater tables, the long-term drainage rate may exceed the limit of 50,000 L/day; should this be the case, a long term PTTW will be required for the permanent drainage.

It is important to consider the permanent drainage would require a Sewer Use permit from the local municipality to allow discharge to the municipal storm or sanitary sewer. As noted below, temporary dewatering will either require a Sewer Use permit, or haulage and disposal of discharge effluent from the Site.

5.0 POTENTIAL TEMPORARY DEWATERING IMPACTS

5.1 Potential Sources of Contamination

As exceedances of the local Sewer Use By-Law were measured in the on-site groundwater sample, and roadways and commercial/industrial properties are present adjacent to the site and within the study area, treatment of pumped water prior to discharge may be required to satisfy the local Sewer Use By-Law should be considered when designing a dewatering system.

Please note that the level of environmental issues outlined herein is meant to provide a broad indication of environmental concerns. The input contained in this report should not be considered a warranty with respect to environmental evaluation or assessment of the subject site for any specific purpose. Furthermore, it must be noted that our scope of work was limited to the preliminary opinion of potential environmental concerns; the scope of work did not include any environmental evaluation or assessment of the subject site (such as a Phase One or Phase Two Environmental Site Assessment).

5.2 Highly Vulnerable Aquifer (“HVA”)

As discussed previously, the Site is located in an area with a HVA present beneath the Site, which indicates that contaminants could potentially affect the aquifer if contamination occurs at the Site.

Any drinking water quality threat activities may pose a risk to a municipal or domestic drinking water supply. Frequent monitoring of the excavation and installation activities should be carried out during the project. Any products considered flammable, corrosive, hazardous, or which may contain chemicals that could contaminate a drinking water source should be stored, used, and disposed of properly following a Spill Management Plan for the project. Waste which contains pathogens that can run into storm sewers during a rainstorm should be properly managed and disposed of following a Spill Management Plan for the project. Preventative measures (such as the implementation of safe equipment fueling practices) should be in place during excavation and installation, and spill management equipment should be readily available on-site during the project.

5.3 Intake Protection Zone

As discussed previously, the Site and its neighboring properties are not located within an Intake Protection Zone. Therefore, impact on a surface water intake source due to the temporary dewatering activities should not be anticipated.

5.4 Water Supply Wells near the Site Area

Based on the MECP water well records, no water supply wells are located within the estimated zone of influence. Therefore, the impact on the water supply wells due to the temporary dewatering activities may not be anticipated. The data in the MECP WWR may not be up to date and may not be accurate, as such, a door-to-door well survey to confirm the existence of water supply wells in the neighboring properties may be considered.

5.5 Wellhead Protection Sensitivity Area

As discussed previously, the Site and its neighboring properties are located within a wellhead protection area WHPA-B and WHPA-C. Therefore, impact on the municipal supply wells due to the temporary dewatering activities should be anticipated and mitigated following the guidelines outlined previously in Section 5.2.

5.6 Surface Water

As discussed previously, PSW and Patterson Creek are located within the estimated zone of influence. Therefore, impact on PSW and Patterson Creek due to the temporary dewatering activities should be anticipated.

5.7 Ground Subsidence in Adjacent Structures

Under certain conditions, dewatering activities can cause ground settlement or subsidence. When groundwater levels are lowered in the soil deposits, effective stresses will be increased, and consolidation and subsequent settlement may occur.

During the site visit, catch basins, manholes, and residential and commercial properties were noted along the roadways on or near the Site within the preliminarily calculated radius of influence of dewatering. Therefore, potential impacts associated with the temporary dewatering should be considered for the buildings, structures, roadways, and underground utilities which are located within the estimated zone of influence.

6.0 RECOMMENDATIONS

6.1 PTTW Application

- Based on the preliminary dewatering calculations presented above, the total temporary dewatering rate is more than 400,000 L/day, for which a Category 3 PTTW will be required. In addition, subject to the final designed basement slab and the stable groundwater tables, the long-term drainage rate may exceed the limit of 50,000 L/day; should this be the case, and a separate Category 3 PTTW for long-term drainage will be required.
- The PTTW application should be conducted in accordance with the Permit to Take Water Manual, dated April 2005, issued by Ministry of the Environment and Climate Change.
- The PTTW application process will generally take a minimum of three (3) months.

6.2 Municipal Sewer Use Permit

- Should discharge of temporary dewatering effluent to the municipal sewers be desired, a Sewer Use permit would be required for temporary construction dewatering.
- The process of obtaining a Sewer Use permit can take six to twelve months or more, depending on the review and turnaround time at the City. We would recommend that the application be started as soon as practical.

6.3 Point of Discharge

As discussed, catch basins and manholes were noted along the roadway on or near the Site during the site visit. Prior to the start-up of dewatering operations, samples of groundwater shall be obtained from the dewatering system and submitted for analysis of the appropriate Sewer Use By-Law parameters. It should be noted that filtration and/or settlement of the pumped water prior to discharge would be expected to improve the water quality.

Installation of an appropriate water filtration/treatment system designed to address any measured exceedances will be necessary prior to the start-up of dewatering. Should the treated water meet the Local Sewer Bylaw criteria, the water generated could be discharged into the local municipal sewer system

provided a Municipal Sewer Use Permit is in place. In addition, during discharge, the water quality must be in compliance with the requirements set up in the Local Sewer Use By-Law.

As an option, the water generated could be hauled and disposed off-site in a licensed water treatment facility; however, a cost analysis would need to be performed to compare treatment and discharge costs to haulage costs.

6.4 Discharge Permit

Should discharge into the local sewer system be selected, prior to temporary dewatering consultations with the local municipality should be conducted to obtain a permit to use the selected sewer system for the water generated during the excavation and installation.

It should be noted that in support of applying for a discharge permit, a temporary dewatering plan may be required by the local municipality.

6.5 Temporary Dewatering Plan

Prior to the dewatering activities, a temporary dewatering plan shall be prepared by the selected contractor for GeoPro's review.

It should be noted that the design and installation of a temporary dewatering system is the responsibility of the construction contractor, including selection of a sump pump, wellpoint system or well system. The extent and details of the dewatering scheme (well size, spacing, pump level, screen size, wick gradation, etc.) are left solely to the contractor's discretion to achieve the performance objectives for stable slopes and dry conditions and will be based on their own interpretation and analysis of the site conditions, equipment, experience and system efficiency.

Once the pumping system, header pipes and a decanter tank/holding tank are installed, a trial dewatering for a short period of time should be conducted to obtain a representative groundwater sample from the decanting tank for chemical analysis to confirm the water quality.

6.6 Building/Structure Settlement Monitoring

As discussed above, structures located within the zone of influence may be susceptible to potential settlement or subsidence due to the temporary dewatering. Therefore, the following monitoring and mitigative measures are recommended to be carried out before and during the temporary dewatering:

- Complete a pre-excavation condition survey and install settlement monitoring monuments for the existing buildings and roadways within the estimated zone of influence.
- The settlement monitoring monuments should be surveyed prior to the dewatering to establish a baseline and surveyed on a daily basis during the dewatering. The survey results will be provided to the geotechnical engineer of GeoPro for evaluation. The estimated potential and actual

settlements should also be reviewed by a structural engineer to assess the potential damage to the existing structures.

- If the settlement monitoring indicates an undesirable deformation, the dewatering will have to be reduced to a lower rate or ceased temporarily, and alternative measures may be considered for the excavation, which should be approved by the geotechnical engineer and project team.

6.7 Surface Water Monitoring and Contingency/Mitigation Measures

As discussed above, PSW and Patterson Creek may be impacted due to the temporary dewatering activities because of their proximity to the excavation site. Therefore, monitoring of the creeks and PSW may be necessary.

6.7.1 Baseline Study

A baseline study of the river and tributaries within the estimated zone of influence should be conducted to establish the pre-dewatering water level, baseflow and water quality conditions, which may include chemical testing of surface water samples for general metals and inorganics or other parameters per recommendations from the local Conservation Authority.

6.7.2 Surface Water Level and Baseflow Monitoring

The monitoring of the water levels of the creek and PSW at the staff gages installed at the upstream and downstream locations will be conducted daily during the dewatering activities. Should adverse impact be observed during the dewatering, the dewatering volume should be reviewed and modified appropriately. If required, water with acceptable water quality which meets the Provincial Water Quality Objectives ("PWQO") standards may be introduced to the Creek and PSW to maintain the baseflow in the Creek and PSW.

6.7.3 Surface Water Quality Monitoring

As the pumped water is not expected to be discharged to the Creek and PSW, the surface water quality impacts are not anticipated. However, if significant water level changes occur during temporary dewatering, water sampling and chemical testing may be required to assess any change in surface water quality. Should adverse impact be observed during the temporary dewatering, the dewatering volume may need to be modified. If required, water with acceptable water quality which meets the Provincial Water Quality Objectives ("PWQO") standards may be introduced to the Creek and PSW to maintain the baseflow in the Creek and PSW.

6.8 Groundwater Monitoring and Contingency/Mitigation Measures for Temporary Dewatering

Prior to commencement of the temporary dewatering, water level measurements shall be obtained from all on-site monitoring wells to verify the assumed water levels used in the calculations. If significant variation occurs, the dewatering volume calculations may be reviewed and updated.

6.8.1 Total Dewatering Volume

- The pumping rate and discharged volume shall be measured daily using a flow measuring device to ensure that the dewatering rate/volume does not exceed the approved or accepted limits.
- If the measured daily volume exceeds the approved limit, either the dewatering methodology or the construction methodology will need to be altered to ensure the maximum permitted rate is not exceeded.
- The contractor on behalf of the Client shall maintain a record of all water takings, including the dates and durations of water takings, and the rates and total measured volumes of water pumped per day for each day that water is taken under the permit.

6.8.2 Water Quality

Depending on the selected point of discharge, water quality should be regularly monitored during the temporary dewatering to ensure that discharge meets the relevant Local Sewer Use By-Law quality criteria.

As TSS is an important parameter which may directly reflect the water quality, a treatment facility should be considered to reduce the concentration of suspended solids in the pumped water.

Prior to discharge of the treated water, a representative water sample should be collected and analyzed for the parameters specified in the applicable standards or criteria. During the temporary dewatering, daily field monitoring of the TSS and turbidity in the water to be discharged should be carried out at the first week of dewatering to establish the approximate correlation of the TSS and turbidity, which can be used for daily monitoring; a confirmatory testing of TSS should be considered on a weekly basis if required.

In addition, groundwater quality shall be monitored via chemical testing for parameters as specified in the local Sewer Use By-Law weekly for the first month. If the results demonstrate that groundwater quality consistently meets the applicable standards, the monitoring frequency can be reduced to once each month afterwards.

6.9 Groundwater Monitoring and Contingency/Mitigation Measures for Long-Term Drainage

If basements are not designed to be waterproof and resist to hydrostatic uplift, and long-term under slab drainage is used to control groundwater levels beneath the foundations, long-term monitoring and mitigation measures may need to be implemented as part of a long-term Sewer Use agreement with the local municipality. Consultation with the local municipality may be required to understand the scope of the required monitoring and mitigation program.

6.10 Monitoring Well Decommissioning

According to Ontario Regulation 903 ("O. Reg. 903"), when the monitoring wells are no longer used, they should be decommissioned by a licensed water well contractor.

7.0 CLOSURE

We trust that the information contained in this report is complete within our terms of reference. If you have any questions or require further information, please do not hesitate to contact our office.

Sincerely,

GeoPro Consulting Limited

Geotechnical - Hydrogeology - Environmental - Materials Testing – Inspection

Draft

Nick Lan

Draft

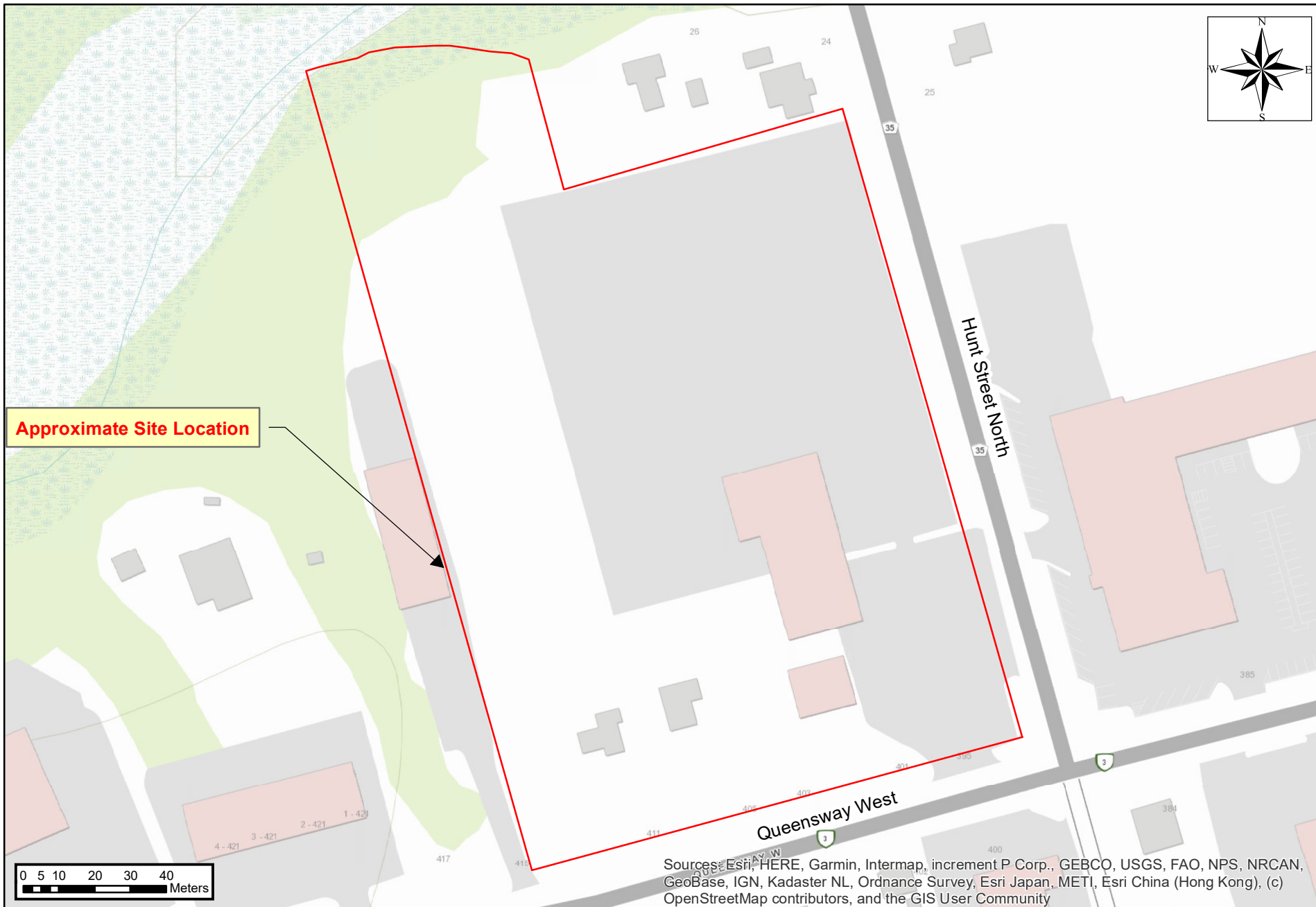
David B. Liu, P.Eng., Principal



GeoPro Consulting Limited

Geotechnical-Hydrogeology-Environmental-Materials-Inspection

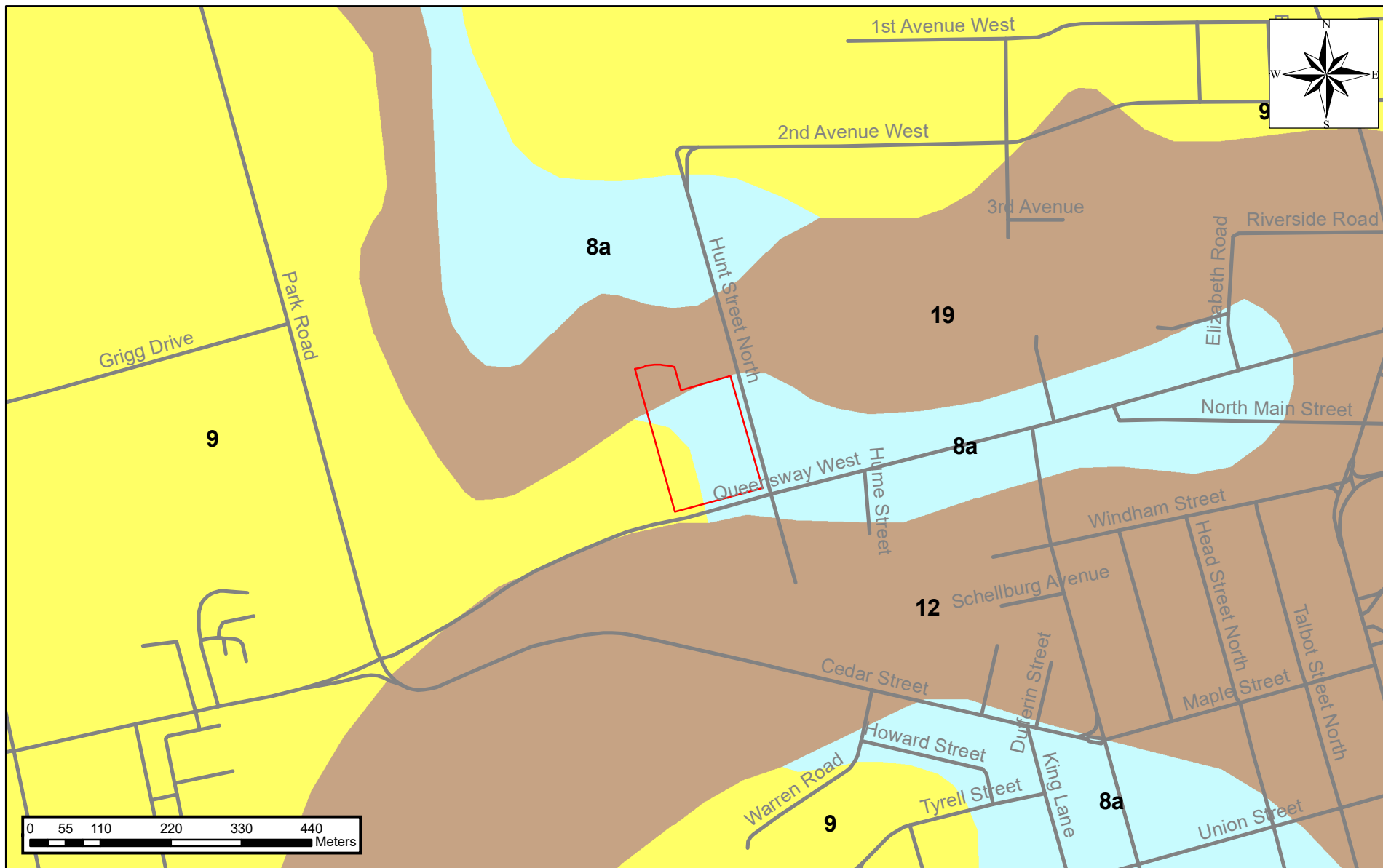
DRAWINGS



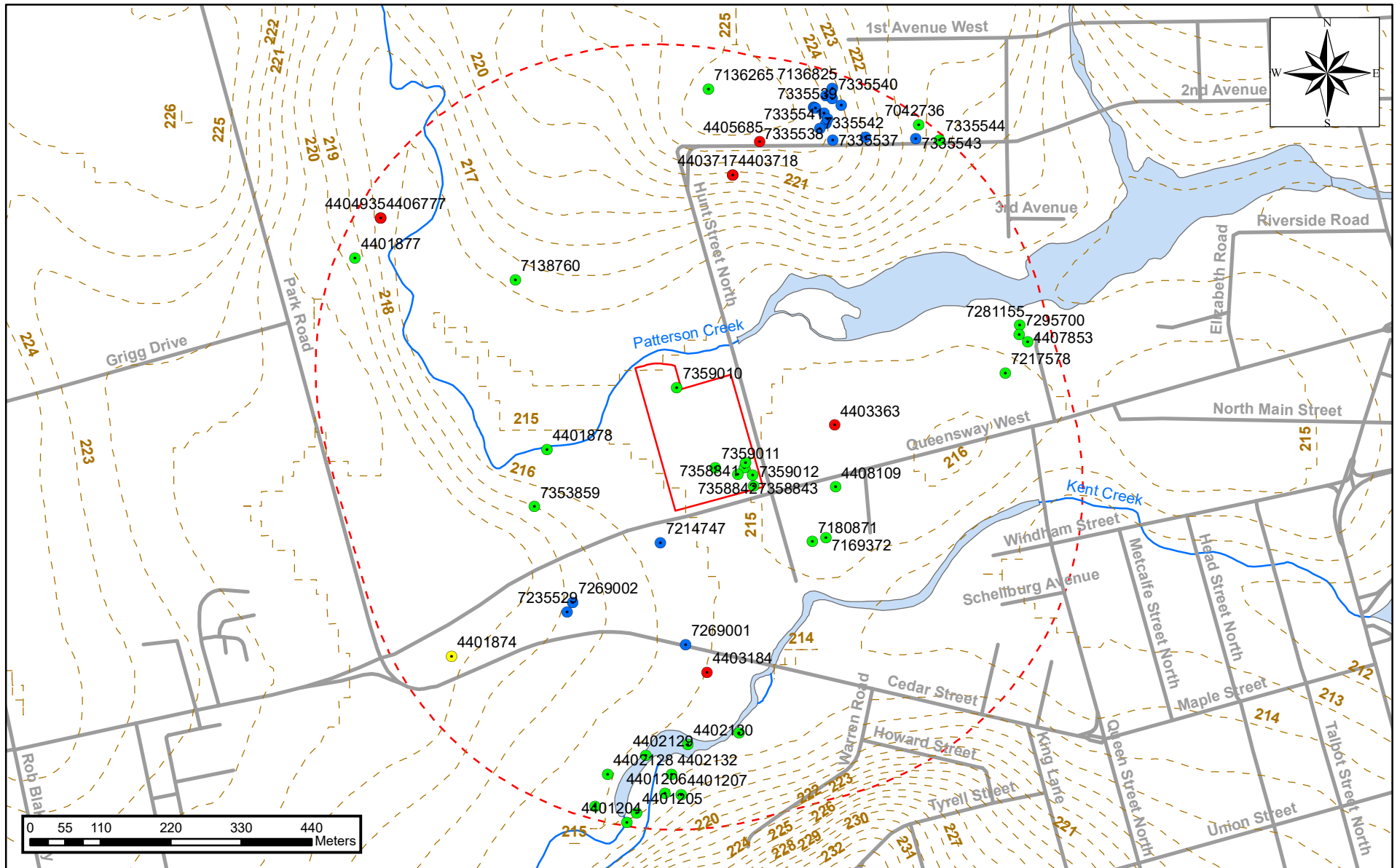
Prepared by: DP	Rev: NL	Approved: DL	Scale: As Shown	Project No.: 22-4078H	Drawing No.: 1	Original Size: Letter
Date: August 2022	Client: HFW Holdings Limited	Title: Site Location Plan	Project: Preliminary Hydrogeological Assessment Proposed Residential Development 395-411 Queensway West, Simcoe, Ontario		 GeoPro Consulting Limited Geotechnical Hydrogeology-Environmental Materials Inspection	



Legend  Site Location  Borehole Location  Monitoring Well Location	Client: HFW Holdings Limited		Project No.: 22-4078H	Drawing No.: 2
	Prepared by: BN	Approved: DL	Title: Borehole/Monitoring Well Location Plan	
	Date: Nov 2022	Scale: As Shown	Project: Preliminary Hydrogeological Assessment Proposed Residential Development 395-411 Queensway West, Simcoe, Ontario	
	Original Size: Letter	Rev: NL	 GeoPro Consulting Limited	



Legend Site Location 8a: Fine-textured glaciolacustrine deposits. Silt and clay, minor sand and gravel. Massive-well laminated 9: Coarse-textured glaciolacustrine deposits: sand, gravel, minor, silt and clay 12: Older alluvial deposits: clay, silt, sand, gravel, may contain organic remains					Map Sources: 1. Surficial Geology of Southern Ontario 2. Natural Resources Canada	
Prepared by: DP	Rev: NL	Approved: DL	Scale: As Shown	Project No.: 22-4078H	Drawing No.: 3	Original Size: Letter
Date: August 2022	Client: HFW Holdings Limited	Title: Surficial Geology	Project: Preliminary Hydrogeological Assessment Proposed Residential Development 395-411 Queensway West, Simcoe, Ontario		 GeoPro Consulting Limited Geoscientific-Hydrogeology-Environmental-Marshals-Inspection	



Legend Site Location 500 m Study Area Waterbody Watercourse Surface contour Road Railway Commercial / Domestic / Industrial Monitoring / Monitoring and Test Hole Municipal Not Used / Unknown						Map Sources: 1. Atlas Canada - Toporama 2. MECP Water Well Database 3. Resources Canada	
Prepared by: DP	Rev: NL	Approved: DL	Scale: As Shown	Project No.: 22-4078H	Drawing No.: 4	Original Size: Letter	
Date: August 2022	Client: HFW Holdings Limited	Title: MECP Well Location Plan	Project: Preliminary Hydrogeological Assessment Proposed Residential Development 395-411 Queensway West, Simcoe, Ontario				

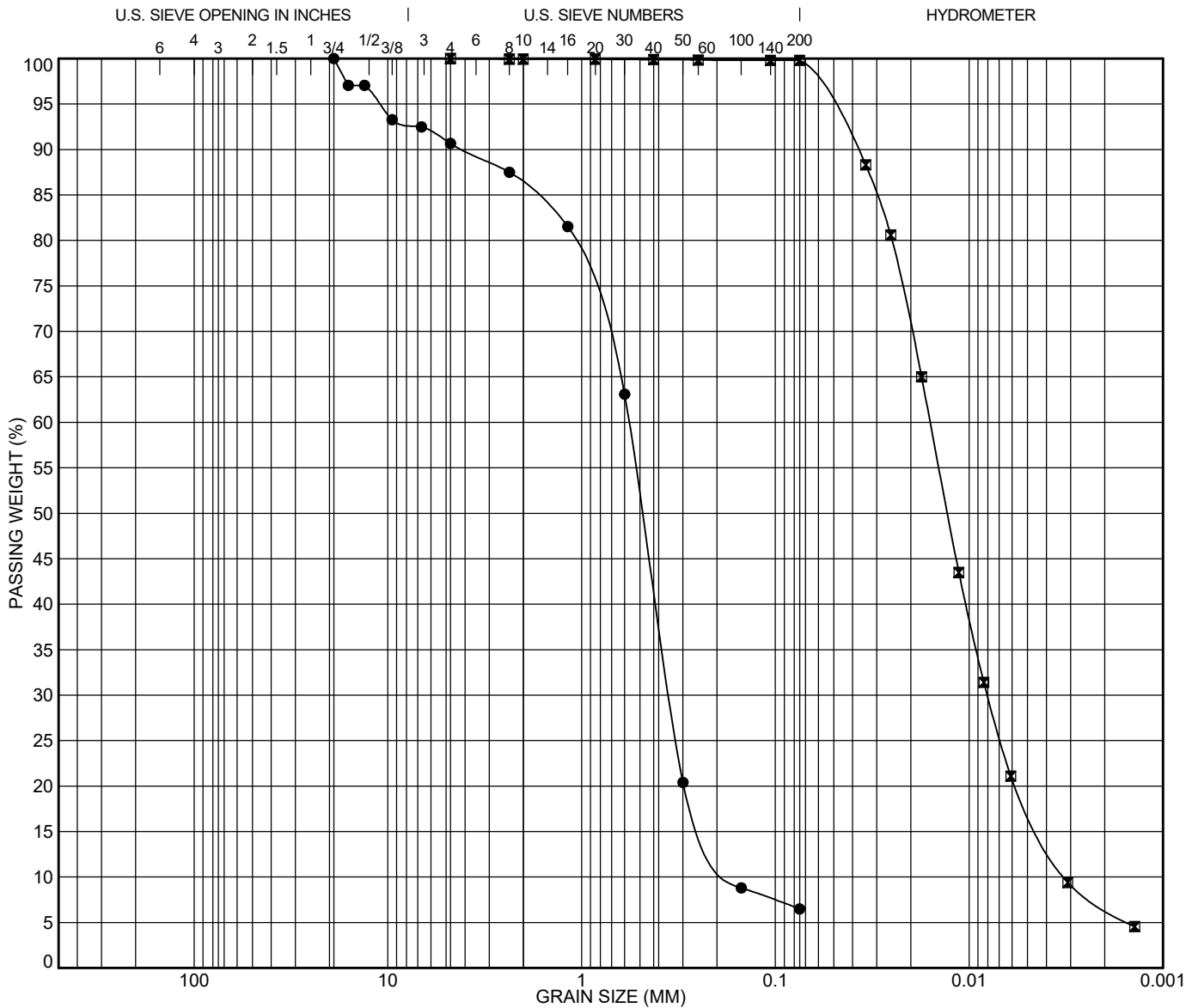
Note: the MECP WWR coordinate data may not be accurate based on our previous experiences, as such, the wells plotted on the drawing should be considered as reference only. If more accurate information of the wells is required, a door-to-door well survey should be considered.



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FIGURES



COBBLES	GRAVEL		SAND			SILT	CLAY
	coarse	fine	coarse	medium	fine		

Specimen Identification			Classification				LL	PL	PI	Cc	Cu
●	BH2	SS6	4.57							1.34	3.54
■	BH3	SS4	2.29							1.27	4.95
Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay	
●	BH2	SS6	4.57	19	0.571	0.351	0.161	9.3	84.2	6.5	
■	BH3	SS4	2.29	4.75	0.016	0.008	0.003	0.0	0.2	93.1	



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GRAIN SIZE DISTRIBUTION

PROJECT: Preliminary Geotechnical Investigation for Proposed Residential Development

LOCATION: 395-411 Queensway West, Simcoe, Ontario

PROJECT NO.: 22-4078GH

SAMPLED ON: 2022-09-01

FIGURE NO.: 1

TESTED ON: 2022-09-22



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Geotechnical-Hydrogeology-Environmental-Materials-Inspection

APPENDIX A



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ENCLOSURES



Enclosure 1A: Notes on Sample Descriptions

1. Each soil stratum is described according to the *Modified Unified Soil Classification System*. The compactness condition of cohesionless soils (SPT) and the consistency of cohesive soils (undrained shear strength) are defined according to Canadian Foundation Engineering Manual, 4th Edition. Different soil classification systems may be used by others. Please note that a description of the soil strata is based on visual and tactile examination of the samples augmented with field and laboratory test results, such as a grain size analysis and/or Atterberg Limits testing. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.
2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional preliminary geotechnical site investigation.
3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.



Enclosure 1B: Explanation of Terms Used in the Record of Boreholes

Sample Type

AS	Auger sample
BS	Block sample
CS	Chunk sample
DO	Drive open
DS	Dimension type sample
FS	Foil sample
NR	No recovery
RC	Rock core
SC	Soil core
SS	Spoon sample
SH	Shelby tube Sample
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

Penetration Resistance

Standard Penetration Resistance (SPT), N:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in) required to drive a 50 mm (2 in) drive open sampler for a distance of 300 mm (12 in).

PM – Samples advanced by manual pressure

WR – Samples advanced by weight of sampler and rod

WH – Samples advanced by static weight of hammer

Dynamic Cone Penetration Resistance, N_d :

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in) to drive uncased a 50 mm (2 in) diameter, 60° cone attached to “A” size drill rods for a distance of 300 mm (12 in).

Piezo-Cone Penetration Test (CPT):

An electronic cone penetrometer with a 60 degree conical tip and a projected end area of 10 cm² pushed through ground at a penetration rate of 2 cm/s. Measurement of tip resistance (Q_t), porewater pressure (PWP) and friction along a sleeve are recorded electronically at 25 mm penetration intervals.

Textural Classification of Soils (ASTM D2487)

Classification	Particle Size
Boulders	> 300 mm
Cobbles	75 mm - 300 mm
Gravel	4.75 mm - 75 mm
Sand	0.075 mm – 4.75 mm
Silt	0.002 mm-0.075 mm
Clay	<0.002 mm(*)

(*) Canadian Foundation Engineering Manual (4th Edition)

Coarse Grain Soil Description (50% greater than 0.075 mm)

Terminology	Proportion
Trace	0-10%
Some	10-20%
Adjective (e.g. silty or sandy)	20-35%
And (e.g. sand and gravel)	> 35%

Soil Description

a) Cohesive Soils(*)

Consistency Value	Undrained Shear Strength (kPa)	SPT “N”
Very soft	<12	0-2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very stiff	100-200	15-30
Hard	>200	>30

(*) Hierarchy of Shear Strength prediction

1. Lab triaxial test
2. Field vane shear test
3. Lab. vane shear test
4. SPT “N” value
5. Pocket penetrometer

b) Cohesionless Soils

Density Index (Relative Density)	SPT “N” Value
Very loose	<4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	>50

Soil Tests

w	Water content
w _p	Plastic limit
w _l	Liquid limit
C	Consolidation (oedometer) test
CID	Consolidated isotropically drained triaxial test
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement
D _R	Relative density (specific gravity, G _s)
DS	Direct shear test
ENV	Environmental/ chemical analysis
M	Sieve analysis for particle size
MH	Combined sieve and hydrometer (H) analysis
MPC	Modified proctor compaction test
SPC	Standard proctor compaction test
OC	Organic content test
U	Unconsolidated Undrained Triaxial Test
V	Field vane (LV-laboratory vane test)
γ	Unit weight

PROJECT: Preliminary Geotechnical Investigation for Proposed Residential Development

DRILLING DATA

CLIENT: HFW Holdings Limited

METHOD: Continuous Flight Auger - Auto Hammer

DIAMETER: 155 mm

PROJECT LOCATION: 395-411 Queensway West, Simcoe, Ontario

FIELD ENGINEER: DG/SN

DATE: 2022-08-31

DATUM: N/A

SAMPLE REVIEW: IG

REF. NO.: 22-4078GH

BH LOCATION: See Borehole Location Plan

CHECKED: DX

ENCL. NO.: 2

SOIL PROFILE			SAMPLES			GROUND WATER	DYNAMIC PENETRATION TEST				Plastic Limit			Natural Moisture Content			Liquid Limit			UNIT WT (kN/m ³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	#N" BLOWS/0.3m		SHEAR STRENGTH (kPa)				W _P	W	W _L											
							● Unconfined	▲ Quick Triaxial	✕ Field Vane & Sensitivity	✕ Penetrometer + Lab Vane														
						20	40	60	80															
0.0	GRANULAR FILL: (220 mm)		1A	SS																				
0.2	FILL: sandy silt, trace silt, trace gravel, organic inclusions, rootlet inclusions, brown, moist, compact		1B	SS	19																			
0.7	FILL: sand to gravelly sand, trace silt, brown, moist, loose to compact		2	SS	10																			
			3	SS	21																			
			4	SS	23																			
2.9	FINE TO MEDIUM SAND: some silt, brown, wet, compact		5	SS	23																			
4.0	SAND: some silt, trace gravel, brown to grey, wet, compact		6	SS	17																			
			7	SS	18																			
	--- grey		8	SS	21																			
8.6	SILT: trace clay, trace sand, grey, wet, loose		9	SS	6																			
9.6	END OF BOREHOLE																							
	Notes:																							

Notes:

Continued Next Page

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

▲ = 3% Strain at Failure

PROJECT: Preliminary Geotechnical Investigation for Proposed Residential Development										DRILLING DATA																					
CLIENT: HFW Holdings Limited										METHOD: Continuous Flight Auger - Auto Hammer										DIAMETER: 155 mm											
PROJECT LOCATION: 395-411 Queensway West, Simcoe, Ontario										FIELD ENGINEER: DG/SN										DATE: 2022-08-31											
DATUM: N/A										SAMPLE REVIEW: IG										REF. NO.: 22-4078GH											
BH LOCATION: See Borehole Location Plan										CHECKED: DX										ENCL. NO.: 2											
SOIL PROFILE			SAMPLES			GROUND WATER		DYNAMIC PENETRATION TEST								Plastic Limit				Natural Moisture Content				Liquid Limit		REMARKS AND GRAIN SIZE DISTRIBUTION (%)					
ELEV. DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3m			ELEVATION	SPT	Cone	blows/0.3m	W _p	W	W _L	UNIT WT (kN/m ³)																
								SHEAR STRENGTH (kPa)								WATER CONTENT (%)															
								● Unconfined X Field Vane & Sensitivity																							
								▲ Quick Triaxial ☒ Penetrometer + Lab Vane																							
								20 40 60 80								10 20 30 40															
1) Water encountered at a depth of 4.6 m below ground surface (mBGS) during drilling. 2) Water was at a depth of 4.7 mBGS upon completion of drilling. 3) Borehole caved at a depth of 5.5 mBGS upon completion of drilling. 4) 51 mm dia. monitoring well was installed in borehole upon completion of drilling. Water Level Readings Date W.L.Depth(mBGS) Sep. 14, 2022 4.65																															

PROJECT: Preliminary Geotechnical Investigation for Proposed Residential Development

DRILLING DATA

CLIENT: HFW Holdings Limited

METHOD: Continuous Flight Auger - Auto Hammer

DIAMETER: 155 mm

PROJECT LOCATION: 395-411 Queensway West, Simcoe, Ontario

FIELD ENGINEER: DG/SN

DATE: 2022-08-31

DATUM: N/A

SAMPLE REVIEW: IG

REF. NO.: 22-4078GH

BH LOCATION: See Borehole Location Plan

CHECKED: DX

ENCL. NO.: 3

SOIL PROFILE			SAMPLES			GROUND WATER	ELEVATION	DYNAMIC PENETRATION TEST								Plastic Limit			Natural Moisture Content			Liquid Limit			UNIT WT (kN/m ³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3m			SHEAR STRENGTH (kPa)								WATER CONTENT (%)													
								○ SPT				≥ Cone				blows/0.3m				W _p W W _L									
								● Unconfined				X Field Vane & Sensitivity				▲ Quick Triaxial				☒ Penetrometer + Lab Vane									
								20	40	60	80					10	20	30	40				GR	SA	SI	CL			
0.0	GRANULAR FILL: (250 mm)		1A	SS	22																								
0.3	FILL: silty sand, trace gravel, organic inclusions, rootlet inclusions, brown, moist, loose to compact		1B	SS																									
1.1			2	SS	5																								
1.4	FILL: gravelly sand, some silt, brown, moist, very loose		3	SS	2																								
2.1	FILL: sand, trace silt, trace gravel, organic inclusions, brown, moist, very loose to loose		4	SS	2																								
3.1	--- rootlet inclusions	5	SS	5																									
4.0	SAND: trace silt, trace gravel, brown, wet, compact		6	SS	13																								
6.6	END OF BOREHOLE		7	SS	16																								
Notes: 1) Water encountered at a depth of 4.6 m below ground surface (mBGS) during drilling. 2) Water was at a depth of 4.4 mBGS upon completion of drilling. 3) Borehole caved at a depth of 4.6 mBGS upon completion of drilling.																													

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3 , × 3 : Numbers refer to Sensitivity

▲ = 3% Strain at Failure

PROJECT: Preliminary Geotechnical Investigation for Proposed Residential Development										DRILLING DATA									
CLIENT: HFW Holdings Limited					METHOD: Continuous Flight Auger - Auto Hammer					DIAMETER: 155 mm									
PROJECT LOCATION: 395-411 Queensway West, Simcoe, Ontario					FIELD ENGINEER: DG/SN					DATE: 2022-09-01									
DATUM: N/A					SAMPLE REVIEW: IG					REF. NO.: 22-4078GH									
BH LOCATION: See Borehole Location Plan					CHECKED: DX					ENCL. NO.: 4									
SOIL PROFILE			SAMPLES			GROUND WATER	DYNAMIC PENETRATION TEST				Natural Moisture Content				UNIT WT (kN/m ³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)			
ELEV. DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3m		SHEAR STRENGTH (kPa)				Plastic Limit W _p	Natural Moisture Content W	Liquid Limit W _L	WATER CONTENT (%)					
							blows/0.3m												
				● Unconfined X Field Vane & Sensitivity ▲ Quick Triaxial ⊠ Penetrometer + Lab Vane															
0.0	TOPSOIL: (150 mm)																		
0.2	FILL: silty sand, trace gravel, organic inclusions, rootlet inclusions, brown, moist, very loose		1	SS	3														
0.7	FILL: silt, trace to some clay, trace sand, organic inclusions, rootlet inclusions, layers of clayey silt, brown, wet, very loose		2A	SS	2														
1.0	SILT: trace clay, trace sand, layers of clayey silt, brown, wet, very loose to compact		2B	SS															
			3	SS	1														
			4	SS	10														
2.9	FINE TO MEDIUM SAND: some silt, trace gravel, brown, moist, compact		5	SS	29														
4.0	SAND: trace to some silt, trace gravel, brown, wet, loose to compact		6	SS	9														
			7	SS	17														
6.6	END OF BOREHOLE																		
Notes: 1) Water encountered at a depth of 0.7 m below ground surface (mBGS) during drilling. 2) Water was at a depth of 4.8 mBGS upon completion of drilling. 3) Borehole caved at a depth of 5.2 mBGS upon completion of drilling. 4) 51 mm dia. monitoring well was installed in borehole upon completion of drilling. Water Level Readings Date W.L.Depth(mBGS) Sep. 14, 2022 4.73																			

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3 , × 3 : Numbers refer to Sensitivity

▲ = 3% Strain at Failure

PROJECT: Preliminary Geotechnical Investigation for Proposed Residential Development

DRILLING DATA

CLIENT: HFW Holdings Limited

METHOD: Continuous Flight Auger - Auto Hammer

DIAMETER: 155 mm

PROJECT LOCATION: 395-411 Queensway West, Simcoe, Ontario

FIELD ENGINEER: DG/SN

DATE: 2022-09-01

DATUM: N/A

SAMPLE REVIEW: IG

REF. NO.: 22-4078GH

BH LOCATION: See Borehole Location Plan

CHECKED: DX

ENCL. NO.: 5

SOIL PROFILE			SAMPLES			GROUND WATER	ELEVATION	DYNAMIC PENETRATION TEST				Plastic Limit W _P	Natural Moisture Content W	Liquid Limit W _L	UNIT WT (kN/m ³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3m			SHEAR STRENGTH (kPa)								
								● Unconfined	▲ Quick Triaxial	✕ Field Vane & Sensitivity	⊠ Penetrometer + Lab Vane					
						20	40	60	80							
0.0	PORTLAND CEMENT CONCRETE: (340 mm)															
0.3	FILL: silty sand, trace gravel, organic inclusions, rootlet inclusions, brown, moist		1	AS												
0.8	FILL: sand, some silt, trace gravel, pockets/layers of silt, brown, moist, loose		2	SS	6											
1.4	SILT: trace to some clay, trace gravel, layers of clayey silt, pockets of sand, brown to grey, wet, loose to compact		3	SS	7											
																
			4	SS	9											
																
			5	SS	11											
																
	--- grey															
			6	SS	5											
																
5.6	SAND: trace silt, trace gravel, wet, brown, compact															
			7	SS	12											
																
																
			8	SS	23											
8.1	END OF BOREHOLE															
	Notes: 1) Water encountered at a depth of 1.5 m below ground surface (mBGS) during drilling. 2) Water was at a depth of 4.6 mBGS upon completion of drilling. 3) Borehole caved at a depth of 4.6 mBGS upon completion of drilling.															

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3 , × 3 : Numbers refer to Sensitivity

▲ = 3% Strain at Failure



GeoPro Consulting Limited

Geotechnical-Hydrogeology-Environmental-Materials-Inspection

APPENDIX B

22-4078H

Well ID	East	North	Use Type
4403363	555714	4743810	Commercial
Total: 1			
4404935	555003	4744134	Domestic
4405685	555596	4744254	Domestic
4406777	555003	4744134	Domestic
Total: 3			
4403184	555514	4743422	Industrial
4403717	555554	4744202	Industrial
4403718	555554	4744202	Industrial
Total: 3			
4401874	555114	4743447	Municipal
Total: 1			
7136825	555681	4744307	Monitoring
7136825	555700	4744326	Monitoring
7136825	555710	4744338	Monitoring
7136825	555681	4744308	Monitoring
7136825	555697	4744299	Monitoring
7136825	555700	4744282	Monitoring
7214747	555441	4743626	Monitoring
7235529	555295	4743516	Monitoring
7269001	555480	4743465	Monitoring
7269002	555304	4743532	Monitoring
7348133	555724	4744311	Monitoring
Total: 11			
7335537	555711	4744256	Monitoring and Test Hole
7335538	555703	4744289	Monitoring and Test Hole
7335539	555684	4744306	Monitoring and Test Hole
7335540	555710	4744322	Monitoring and Test Hole
7335541	555690	4744275	Monitoring and Test Hole
7335542	555762	4744261	Monitoring and Test Hole
7335543	555841	4744258	Monitoring and Test Hole
Total: 7			
4401877	554964	4744072	Not Used
4402128	555359	4743262	Not Used
4402129	555419	4743292	Not Used
4402132	555459	4743262	Not Used
4407853	556015	4743940	Not Used
7042736	555845	4744281	Not Used
7136265	555516	4744336	Not Used
Total: 7			
4401188	555339	4743212	Unknown
4401189	555564	4743327	Unknown
4401204	555389	4743187	Unknown
4401205	555404	4743202	Unknown

4401206	555449	4743232	Unknown
4401207	555474	4743230	Unknown
4401878	555264	4743772	Unknown
4402130	555484	4743309	Unknown
4408109	555715	4743713	Unknown
7138760	555214	4744037	Unknown
7169372	555700	4743633	Unknown
7180871	555679	4743627	Unknown
7217578	555980	4743892	Unknown
7281155	556003	4743966	Unknown
7295700	556002	4743952	Unknown
7335544	555878	4744256	Unknown
7353859	555244	4743682	Unknown
7358616	555572	4743743	Unknown
7358841	555574	4743751	Unknown
7358842	555562	4743733	Unknown
7358843	555585	4743731	Unknown
7359010	555467	4743868	Unknown
7359011	555527	4743743	Unknown
7359012	555587	4743715	Unknown
7389906	555819	4744013	Unknown
Total: 25			

Summary of Well Types within 500 m Radius from the Site			
Well Types	Number of Record		Total
Commercial	1	7	58
Domestic	3		
Industrial	3		
Municipal	1	1	
Monitoring	11	18	
Monitoring and Test Hole	7		
Not Used	7	32	
Unknown	25		

Water Well Records

miércoles, 24 de agosto de 2022

2:10:39 p. m.

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
SIMCOE TOWN	17 555389 4743187 W	1963/08 2801	5					4401204 ()	BLCK LOAM 0001 MSND CLAY GRVL 0005 MSND GRVL 0019 SILT 0021
SIMCOE TOWN	17 555474 4743230 W	1963/08 2801	5					4401207 ()	LOAM 0001 CLAY MSND 0004 SILT 0023
SIMCOE TOWN	17 555404 4743202 W	1963/08 2801	5					4401205 ()	BLCK LOAM 0001 MSND GRVL CLAY 0003 MSND GRVL 0011 MSND CLAY GRVL 0019 CLAY SILT 0021
SIMCOE TOWN	17 555564 4743327 W	1959/11 2801	2					4401189 ()	BLCK MUCK 0005 BLCK MUCK MSND 0011 CLAY 0025 CLAY 0078 CLAY GRVL 0085 ROCK 0086
SIMCOE TOWN	17 556003 4743966 W	2016/10 7464						7281155 (C35013) A208349 P	
SIMCOE TOWN	17 555480 4743465 W	2015/10 6607	2,00			MO	0020 5	7269001 (Z219995) A192807	BRWN SAND GRVL FILL 0004 BLCK PEAT SAND SOFT 0006 BRWN SAND FSND 0012 GREY SILT SAND SOFT 0025
SIMCOE TOWN	17 555714 4743810 W	1974/09 3310	1	FR 0027	15//25/1:0	CO	0030 4	4403363 ()	BRWN SAND 0004 YLLW CLAY 0009 BLUE CLAY 0027 GREY CSND 0037
SIMCOE TOWN	17 556002 4743952 W	2017/08 7464						7295700 (C39126) P	
SIMCOE TOWN	17 555715 4743713 W	2004/04 7190	1,97	UK 0011			0005 10	4408109 (Z06383) A006787	BRWN GRVL SAND LOOS 0005 BRWN SAND SILT LOOS 0015
SIMCOE TOWN	17 555554 4744202 W	1976/10 5201	5	FR 0038	28/28/30/2:0	IN	0050 5	4403718 ()	YLLW FILL 0010 YLLW CLAY 0023 BLUE CLAY 0044 GREY CSND 0055
SIMCOE TOWN	17 555554 4744202 W	1976/10 5201	5	FR 0036	30/30/30/2:0	IN	0052 5	4403717 ()	YLLW FILL 0010 YLLW CLAY 0030 BLUE CLAY 0048 GREY CSND 0057
SIMCOE TOWN	17 555449 4743232 W	1963/08 2801	5					4401206 ()	BLCK LOAM 0001 MSND CLAY GRVL 0004 MSND 0010 SILT 0017
SIMCOE TOWN	17 555214 4744037 W	2009/01 7193						7138760 (Z76986) A072114 A	
SIMCOE TOWN	17 555339 4743212 W	1959/11 2801	2					4401188 ()	LOAM 0001 FSND MSND 0017 CLAY SILT 0020 SILT MSND 0040 CLAY 0077 CLAY SILT 0087 CLAY GRVL 0100 ROCK 0101
SIMCOE TOWN	17 555711 4744256 W	2019/01 7241	2		///:	MT	0045 5	7335537 (Z305000) A263186	BRWN SILT SAND CLAY 0014 GREY SILT SAND WBRG 0025 GREY SILT SAND CLAY 0043 BRWN CSND WBRG 0050
SIMCOE TOWN	17 555703 4744289 W	2019/01 7241	2		///:	MT	0025 5	7335538 (Z305329) A263192	GREY GRVL 0001 BRWN FILL 0005 BRWN SAND SILT 0022 GREY SAND SILT 0030

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
SIMCOE TOWN	17 555684 4744306 W	2019/01 7241	2		///:	MT	0025 5	7335539 (Z305327) A263193	GREY GRVL 0001 BRWN FILL 0005 BRWN SAND SILT 0022 GREY SAND SILT 0030
SIMCOE TOWN	17 555514 4743422 W	1973/11 5201	4	FR 0013	13/20/45/2:0	IN	0021 5	4403184 ()	GREY LOAM CMTD 0001 GREY GRVL 0003 BLCK PEAT 0013 GREY SAND 0026 BLUE CLAY 0031
SIMCOE TOWN	17 555710 4744322 W	2019/01 7241	2		///:	MT	0025 5	7335540 (Z305326) A263194	GREY GRVL 0001 BRWN FILL 0005 BRWN SAND SILT 0022 GREY SAND SILT 0030
SIMCOE TOWN	17 555690 4744275 W	2019/01 7241	2		///:	MT	0020 5	7335541 (Z305325) A263195	GREY GRVL 0001 BRWN FILL 0005 BRWN SAND SILT 0018 GREY SAND SILT 0025
SIMCOE TOWN	17 555762 4744261 W	2019/01 7241	2		///:	MT	0015 5	7335542 (Z305324) A263196	BRWN LOAM 0002 BRWN FILL 0004 BRWN SAND SILT 0016 GREY SAND SILT 0020
SIMCOE TOWN	17 555841 4744258 W	2019/01 7241	2		///:	MT	0015 5	7335543 (Z290286) A263142	GREY ---- 0001 BRWN FILL 0003 BRWN SILT SAND 0020
SIMCOE TOWN	17 555878 4744256 W	2019/01 7241	2		///:		0034 5	7335544 (Z305267) A263346	BLCK ---- 0003 BRWN SILT 0035 BRWN SAND 0039
SIMCOE TOWN	17 555572 4743743 W	2020/03 7241						7358616 (Z334575) A291898 P	
WINDHAM TOWNSHIP	17 555700 4743633 W	2011/09 7464						7169372 (M10996) A121616 P	
WINDHAM TOWNSHIP	17 555574 4743751 W	2020/04 7241						7358841 (Z337871) A288970 P	
WINDHAM TOWNSHIP	17 555980 4743892 W	2014/02 7147						7217578 (C25002) A149643 P	
WINDHAM TOWNSHIP	17 555724 4744311 W	2019/10 7241	2		///:	MO	0010 10	7348133 (Z323481) A281669	BRWN SAND SILT WBRG 0007 BRWN SILT SAND WBRG 0018 GREY SILT CLAY 0020
WINDHAM TOWNSHIP	17 555587 4743715 W	2020/03 7241						7359012 (Z334571) A291897 P	
WINDHAM TOWNSHIP	17 555527 4743743 W	2020/03 7241						7359011 (Z334572) A291896 P	

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
WINDHAM TOWNSHIP	17 555467 4743868 W	2020/03 7241						7359010 (Z334573) A291895 P	
WINDHAM TOWNSHIP	17 555679 4743627 W	2011/12 7464						7180871 (Z137853) A	
WINDHAM TOWNSHIP	17 555295 4743516 W	2014/09 7472	0,75			MO	0015 10	7235529 (Z200687) A168472	BRWN SILT FSND PCKD 0010 GREY SILT FSND PCKD 0025
WINDHAM TOWNSHIP	17 555562 4743733 W	2020/04 7241						7358842 (Z337869) A265739 P	
WINDHAM TOWNSHIP	17 555441 4743626 W	2013/11 7190	2			MO	0018 10	7214747 (Z180391) A146236	BRWN SAND GRVL LOOS 0002 BRWN SAND SILT LOOS 0028
WINDHAM TOWNSHIP	17 555304 4743532 W	2015/10 6607	2,00			MO	0010 5	7269002 (Z219996) A192835	BRWN SAND SILT SOFT 0007 BRWN SAND SOFT 0015
WINDHAM TOWNSHIP	17 555585 4743731 W	2020/04 7241						7358843 (Z337870) A265738 P	
WINDHAM TOWNSHIP 14 002	17 555845 4744281 W	2007/03 7282	1,97 1,97	FR 0012		NU	0027 5 0015 10	7042736 (Z66007) A048068	BLCK 0000 BLUE GRVL 0001 BRWN CSND 0005 BRWN FSND SILT 0020 BRWN SILT CLAY 0025 GREY MSND 0032 0044
WINDHAM TOWNSHIP CON 14	17 555244 4743682 W	2019/11 7190						7353859 (C44966) A281409 P	
WINDHAM TOWNSHIP CON 14 001	17 556015 4743940 W	2002/07 2801				NU		4407853 (249780) A	
WINDHAM TOWNSHIP CON 14 002	17 555516 4744336 W	2009/12 7147	1,25	FR 0008		NU MO	0005 10	7136265 (Z097824) A093031	BRWN FILL 0006 BRWN CLAY SILT TILL 0015
WINDHAM TOWNSHIP CON 14 002	17 555596 4744254 L	1990/06 5201	5	FR 0024	19/19/25/1:0	DO	0030 5	4405685 (78379)	BRWN LOAM 0002 BRWN CLAY 0017 BLUE CLAY 0024 GREY CSND 0035
WINDHAM TOWNSHIP CON 14 002	17 555681 4744307 W	2009/11 7238	2,00	UK 0051		MO		7136825 (M04691) A090716	BRWN SILT SAND 0049 BRWN SAND 0062
WINDHAM TOWNSHIP CON 14 003	17 555264 4743772 W	1960/11 2801	5					4401878 ()	BLCK CLAY MSND 0015 BLUE CLAY 0038 CLAY SILT 0050 SILT 0078 SILT CLAY 0090 CLAY 0138 ROCK 0139
WINDHAM TOWNSHIP CON 14 003	17 555114 4743447 W	1958/07 2608	2	FR 0005	//50/1:0	MN		4401874 ()	BLCK MUCK 0005 FSND 0011 CSND 0016
WINDHAM TOWNSHIP CON 14 003	17 554964 4744072 W	1960/10 2801	5	UK		NU		4401877 ()	FILL 0003 BLCK MUCK 0009 MSND GRVL 0011 CLAY 0021 FSND 0026 CLAY SILT 0077 CLAY 0124 CLAY BLDR 0133 ROCK 0134

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
WINDHAM TOWNSHIP CON 14 003	17 555003 4744134 L	1996/03 5201	1	UK 0015	15//10/2:30	DO	0022 4	4406777 (168582)	BLCK LOAM 0002 BRWN CSND 0015 GREY CSND 0026
WINDHAM TOWNSHIP CON 14 003	17 555003 4744134 L	1985/06 5201	4	FR 0023	23/23/10/1:30	DO	0048 4	4404935 ()	BLCK LOAM 0002 BRWN CLAY 0015 BRWN SAND 0023 BRWN SAND 0035 GREY CSND WBRG 0052
WOODHOUSE TOWNSHIP GORE 016	17 555359 4743262 W	1962/09 2801	2	FR	1///:	NU	0015 10	4402128 ()	GRVL MSND 0001 MSND SILT CLAY 0005 MSND SILT GRVL 0011 FSND CSND CLAY 0025 CLAY 0028
WOODHOUSE TOWNSHIP GORE 016	17 555459 4743262 W	1962/10 2801	2	FR	4///:	NU	0021 5	4402132 ()	MSND CLAY 0004 MSND 0025 MSND GRVL 0026 MSND SILT CLAY 0039
WOODHOUSE TOWNSHIP GORE 016	17 555484 4743309 W	1962/09 2801	5					4402130 ()	MSND GRVL 0001 BLCK MUCK 0003 MSND GRVL 0005 CLAY SILT 0051
WOODHOUSE TOWNSHIP GORE 016	17 555419 4743292 W	1962/09 2801	2	FR	0///:	NU	0019 5	4402129 ()	LOAM 0001 MSND 0003 FSND CSND CLAY 0024 CLAY 0027

Notes:

UTM: ☐TM in Zone, Easting, Northing and Datum is NAD83; L: UTM estimated from Centroid of Lot; W: UTM not from Lot Centroid

DATE CNTR: ☐ate Work Completedand ☐Well Contractor Licence Number

CASING DIA: ☐asing diameter in inches

WATER: ☐nit of Depth in Fee. ☐ee Table 4 for Meaning of Code

PUMP TEST: Static Water Level in Feet / Water Level After Pumping in Feet / ☐ump Test Rate in GPM / Pump Test Duration in Hour : Minutes

WELL USE: ☐ee Table 3 for Meaning of Code

SCREEN: ☐creen Depth and Length in feet

WELL: ☐WEL (AUDIT #) Well Tag . ☐: Abandonment; P: Partial Data Entry Only

FORMATION: ☐ee Table 1 and 2 for Meaning of Code

1. Core Material and Descriptive terms

Code	Description	Code	Description	Code	Description	Code	Description	Code	Description
BLDR	BOULDERS	FCRD	FRACTURED	IRFM	IRON FORMATION	PORS	POROUS	SOFT	SOFT
BSLT	BASALT	FGRD	FINE-GRAINED	LIMY	LIMY	PRDG	PREVIOUSLY DUG	SPST	SOAPSTONE
CGRD	COARSE-GRAINED	FGVL	FINE GRAVEL	LMSN	LIMESTONE	PRDR	PREV. DRILLED	STKY	STICKY
CGVL	COARSE GRAVEL	FILL	FILL	LOAM	TOPSOIL	QRTZ	QUARTZITE ☐	STNS	STONES
CHRT	CHERT	FLDS	FELDSPAR	LOOS	LOOSE	QSND	QUICKSAND	STNY	STONEY
CLAY	CLAY	FLNT	FLINT	LTCL	LIGHT-COLOURED	QTZ	QUARTZ	THIK	THICK
CLN	CLEAN	FOSS	FOSILIFEROUS	LYRD	LAYERED	ROCK	ROCK	THIN	THIN
CLYY	CLAYEY	FSND	FINE SAND	MARL	MARL	SAND	SAND	TILL	TILL
CMTD	CEMENTED	GNIS	GNEISS	MGRD	MEDIUM-GRAINED	SHLE	SHALE	UNKN	UNKNOWN TYPE
CONG	CONGLOMERATE	GRNT	GRANITE	MGVL	MEDIUM GRAVEL	SHLY	SHALY	VERY	VERY
CRYS	CRYSTALLINE	GRSN	GREENSTONE	MRBL	MARBLE	SHRP	SHARP	WBRG	WATER-BEARING
CSND	COARSE SAND	GRVL	GRAVEL	MSND	MEDIUM SAND	SHST	SCHIST	WDFR	WOOD FRAGMENTS
DKCL	DARK-COLOURED	GRWK	GREYWACKE	MUCK	MUCK	SILT	SILT	WTHD	WEATHERED
DLMT	DOLOMITE	GVLY	GRAVELLY	OBDN	OVERBURDEN ☐	SLTE	SLATE ☐		
DNSE	DENSE	GYPG	GYPGUM	PCKD	PACKED	SLTY	SILTY ☐		
DRTY	DIRTY	HARD	HARD	PEAT	PEAT	SNDS	SANDSTONE ☐		
DRY	DRY	HPAN	HARDPAN	PGVL	PEA GRAVEL	SNDY	SANDYOAPSTONE		

2. Core Color

Code	Description
WHIT	WHITE
GREY	GREY
BLUE	BLUE
GREN	GREEN
YLLW	YELLOW
BRWN	BROWN
RED	RED
BLCK	BLACK
BLGY	BLUE-GREY

3. Well Use

Code	Description	Code	Description
DO	Domestic	OT	Other
ST	Livestock	TH	Test Hole
IR	Irrigation	DE	Dewatering
IN	Industrial	MO	Monitoring
CO	Commercial	MT	Monitoring TestHole
MN	Municipal ☐		
PS	Public ☐		
AC	Cooling And A/C ☐		
NU	Not Used		

4. Water Detail

Code	Description	Code	Description
FR	Fresh	GS	Gas
SA	Salty	IR	Iron
SU	Sulphur ☐		
MN	Mineral ☐		
UK	Unknown		



GeoPro Consulting Limited

Geotechnical-Hydrogeology-Environmental-Materials-Inspection

APPENDIX C

CERTIFICATE OF ANALYSIS (GUIDELINE EVALUATION)

Work Order : **WT2215075**
Client : **GeoPro Consulting Limited**
Contact : Elab
Address : 40 Vogell Road Unit 57
 Richmond Hill ON Canada L4B 3N6
Telephone : 416 209 5668
Project : 22-4078 (NORFOLK SEWER USE)
PO : ----
C-O-C number : ----
Sampler : ----
Site : ----
Quote number : GEOPRO 2022 Standing Offer
No. of samples received : 1
No. of samples analysed : 1

Page : 1 of 7
Laboratory : Waterloo - Environmental
Account Manager : Costas Farassoglou
Address : 60 Northland Road, Unit 1
 Waterloo, Ontario Canada N2V 2B8
Telephone : 613 225 8279
Date Samples Received : 21-Sep-2022 17:15
Date Analysis Commenced : 22-Sep-2022
Issue Date : 29-Sep-2022 13:48

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Guideline Comparison

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Caitlin Macey	Team Leader - Inorganics	Inorganics, Burnaby, British Columbia
Greg Pokocky	Supervisor - Inorganic	Inorganics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Metals, Waterloo, Ontario
Jocelyn Kennedy	Department Manager - Semi-Volatile Organics	Organics, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Inorganics, Waterloo, Ontario
Walt Kippenhuck	Team Leader - Inorganics	Inorganics, Waterloo, Ontario



Summary of Guideline Breaches by Sample

SampleID/Client ID	Matrix	Analyte	Analyte Summary	Guideline	Category	Result	Limit
BH5	Water	solids, total suspended [TSS]		NORSAN	SAN	16300 mg/L	350 mg/L
	Water	iron, total		NORSAN	SAN	90.9 mg/L	50 mg/L
	Water	manganese, total		NORSAN	SAN	10.4 mg/L	5 mg/L
	Water	phosphorus, total		ONPWQO	PWQO	0.618 mg/L	0.01 mg/L
	Water	aluminum, total		ONPWQO	PWQO	41.4 mg/L	0.015 mg/L
	Water	arsenic, total		ONPWQO	PWQO	0.0240 mg/L	0.005 mg/L
	Water	cadmium, total		ONPWQO	PWQO	0.000659 mg/L	0.0001 mg/L
	Water	cobalt, total		ONPWQO	PWQO	0.0366 mg/L	0.0009 mg/L
	Water	copper, total		ONPWQO	PWQO	0.131 mg/L	0.001 mg/L
	Water	iron, total		ONPWQO	PWQO	90.9 mg/L	0.3 mg/L
	Water	lead, total		ONPWQO	PWQO	0.0523 mg/L	0.001 mg/L
	Water	nickel, total		ONPWQO	PWQO	0.0798 mg/L	0.025 mg/L
	Water	silver, total		ONPWQO	PWQO	0.000194 mg/L	0.0001 mg/L
	Water	vanadium, total		ONPWQO	PWQO	0.0895 mg/L	0.006 mg/L
	Water	zinc, total		ONPWQO	PWQO	0.252 mg/L	0.02 mg/L
	Water	phenols, total (4AAP)		ONPWQO	PWQO	0.0012 mg/L	0.001 mg/L



General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guidelines are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Key : LOR: Limit of Reporting (detection limit).

Unit	Description
mg/L	milligrams per litre
pH units	pH units

>: greater than.

<: less than.

Red shading is applied where the result is greater than the Guideline Upper Limit or the result is lower than the Guideline Lower Limit.

For drinking water samples, Red shading is applied where the result for E.coli, fecal or total coliforms is greater than or equal to the Guideline Upper Limit.

Qualifiers

Qualifier	Description
BODL	Limit of Reporting for BOD was increased to account for the largest volume of sample tested.
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).

Matrix: Water	Client sample ID		BH5	----	----	----	----	----	----
	Sampling date/time		20-Sep-2022	----	----	----	----	----	----
	Sub-Matrix		Water	----	----	----	----	----	----
	Analyte	CAS Number	Unit	WT2215075-001	-----	-----	-----	-----	-----
Physical Tests									
pH	----	pH units	7.34		----	----	----	----	----
solids, total suspended [TSS]	----	mg/L	16300	DLHC	----	----	----	----	----
Anions and Nutrients									
chloride	16887-00-6	mg/L	237	DLDS	----	----	----	----	----
fluoride	16984-48-8	mg/L	<0.100	DLDS	----	----	----	----	----
Kjeldahl nitrogen, total [TKN]	----	mg/L	<0.500	DLM	----	----	----	----	----
phosphorus, total	7723-14-0	mg/L	0.618		----	----	----	----	----
sulfate (as SO4)	14808-79-8	mg/L	35.3	DLDS	----	----	----	----	----
Cyanides									
cyanide, strong acid dissociable (total)	----	mg/L	<0.0020		----	----	----	----	----
Total Sulfides									
sulfide, total (as H2S)	7783-06-4	mg/L	<0.011		----	----	----	----	----
sulfide, total (as S)	18496-25-8	mg/L	<0.010		----	----	----	----	----
Total Metals									
aluminum, total	7429-90-5	mg/L	41.4	DLHC	----	----	----	----	----
antimony, total	7440-36-0	mg/L	<0.00100	DLHC	----	----	----	----	----
arsenic, total	7440-38-2	mg/L	0.0240	DLHC	----	----	----	----	----
barium, total	7440-39-3	mg/L	0.207	DLHC	----	----	----	----	----
bismuth, total	7440-69-9	mg/L	0.000570	DLHC	----	----	----	----	----
cadmium, total	7440-43-9	mg/L	0.000659	DLHC	----	----	----	----	----
chromium, total	7440-47-3	mg/L	0.0647	DLHC	----	----	----	----	----
cobalt, total	7440-48-4	mg/L	0.0366	DLHC	----	----	----	----	----
copper, total	7440-50-8	mg/L	0.131	DLHC	----	----	----	----	----
iron, total	7439-89-6	mg/L	90.9	DLHC	----	----	----	----	----
lead, total	7439-92-1	mg/L	0.0523	DLHC	----	----	----	----	----
manganese, total	7439-96-5	mg/L	10.4	DLHC	----	----	----	----	----
mercury, total	7439-97-6	mg/L	0.0000115		----	----	----	----	----
molybdenum, total	7439-98-7	mg/L	0.000978	DLHC	----	----	----	----	----



Analytical Results Evaluation

Matrix: Water			Client sample ID	BH5	----	----	----	----	----	----
			Sampling date/time	20-Sep-2022	----	----	----	----	----	----
			Sub-Matrix	Water	----	----	----	----	----	----
Analyte	CAS Number	Unit	WT2215075-001	-----	-----	-----	-----	-----	-----	-----
Total Metals										
nickel, total	7440-02-0	mg/L	0.0798	DLHC	----	----	----	----	----	----
selenium, total	7782-49-2	mg/L	<0.000500	DLHC	----	----	----	----	----	----
silver, total	7440-22-4	mg/L	0.000194	DLHC	----	----	----	----	----	----
tin, total	7440-31-5	mg/L	0.00406	DLHC	----	----	----	----	----	----
titanium, total	7440-32-6	mg/L	0.795	DLHC	----	----	----	----	----	----
vanadium, total	7440-62-2	mg/L	0.0895	DLHC	----	----	----	----	----	----
zinc, total	7440-66-6	mg/L	0.252	DLHC	----	----	----	----	----	----
Aggregate Organics										
biochemical oxygen demand [BOD]	----	mg/L	<3.0	BODL	----	----	----	----	----	----
carbonaceous biochemical oxygen demand [CBOD]	----	mg/L	<3.0	BODL	----	----	----	----	----	----
chemical oxygen demand [COD]	----	mg/L	26		----	----	----	----	----	----
oil & grease (gravimetric)	----	mg/L	<5.0		----	----	----	----	----	----
oil & grease, animal/vegetable (gravimetric)	----	mg/L	<5.0		----	----	----	----	----	----
oil & grease, mineral (gravimetric)	----	mg/L	<5.0		----	----	----	----	----	----
phenols, total (4AAP)	----	mg/L	0.0012		----	----	----	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analyte	CAS Number	Unit	NORSAN SAN	ONPWQO PWQO					
Physical Tests									
pH	----	pH units	6 - 9.5 pH units	6.5 - 8.5 pH units					
solids, total suspended [TSS]	----	mg/L	350 mg/L						
Anions and Nutrients									
chloride	16887-00-6	mg/L	1500 mg/L						
fluoride	16984-48-8	mg/L	10 mg/L						
Kjeldahl nitrogen, total [TKN]	----	mg/L	100 mg/L						
phosphorus, total	7723-14-0	mg/L	10 mg/L	0.01 mg/L					
sulfate (as SO4)	14808-79-8	mg/L							
Cyanides									
cyanide, strong acid dissociable (total)	----	mg/L		0.005 mg/L					
Total Sulfides									
sulfide, total (as H2S)	7783-06-4	mg/L							
sulfide, total (as S)	18496-25-8	mg/L	2 mg/L						
Total Metals									
aluminum, total	7429-90-5	mg/L	50 mg/L	0.015 mg/L					
antimony, total	7440-36-0	mg/L	5 mg/L	0.02 mg/L					
arsenic, total	7440-38-2	mg/L	1 mg/L	0.005 mg/L					
barium, total	7440-39-3	mg/L	5 mg/L						
bismuth, total	7440-69-9	mg/L	5 mg/L						
cadmium, total	7440-43-9	mg/L	0.1 mg/L	0.0001 mg/L					
chromium, total	7440-47-3	mg/L	1 mg/L						
cobalt, total	7440-48-4	mg/L	5 mg/L	0.0009 mg/L					
copper, total	7440-50-8	mg/L	2 mg/L	0.001 mg/L					
iron, total	7439-89-6	mg/L	50 mg/L	0.3 mg/L					
lead, total	7439-92-1	mg/L	3 mg/L	0.001 mg/L					
manganese, total	7439-96-5	mg/L	5 mg/L						
mercury, total	7439-97-6	mg/L	0.1 mg/L	0.0002 mg/L					
molybdenum, total	7439-98-7	mg/L	5 mg/L	0.04 mg/L					
nickel, total	7440-02-0	mg/L	3 mg/L	0.025 mg/L					
selenium, total	7782-49-2	mg/L	1 mg/L	0.1 mg/L					
silver, total	7440-22-4	mg/L	5 mg/L	0.0001 mg/L					
tin, total	7440-31-5	mg/L	5 mg/L						
titanium, total	7440-32-6	mg/L	5 mg/L						
vanadium, total	7440-62-2	mg/L	5 mg/L	0.006 mg/L					
zinc, total	7440-66-6	mg/L	2 mg/L	0.02 mg/L					
Aggregate Organics									



Analyte	CAS Number	Unit	NORSAN SAN	ONPWQO PWQO					
Aggregate Organics - Continued									
biochemical oxygen demand [BOD]	----	mg/L							
carbonaceous biochemical oxygen demand [CBOD]	----	mg/L	300 mg/L						
chemical oxygen demand [COD]	----	mg/L	1000 mg/L						
oil & grease (gravimetric)	----	mg/L							
oil & grease, animal/vegetable (gravimetric)	----	mg/L	100 mg/L						
oil & grease, mineral (gravimetric)	----	mg/L	15 mg/L						
phenols, total (4AAP)	----	mg/L	1 mg/L	0.001 mg/L					

Please refer to the General Comments section for an explanation of any qualifiers detected.

- Key:
- NORSAN

SAN

ONPWQO

PWQO
- Ontario Norfolk Sanitary Sewer Use By-Law (2022-10-1)

Norfolk Sanitary Sewer By-Law (2022-10-1)

Ontario PWQO (Provincial Water Quality Objectives, JULY, 1994)

Surface Water PWQO

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: WT2215075	Page	: 1 of 10
Client	: GeoPro Consulting Limited	Laboratory	: Waterloo - Environmental
Contact	: Elab	Account Manager	: Costas Farassoglou
Address	: 40 Vogell Road Unit 57 Richmond Hill ON Canada L4B 3N6	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 416 209 5668	Telephone	: 613 225 8279
Project	: 22-4078 (NORFOLK SEWER USE)	Date Samples Received	: 21-Sep-2022 17:15
PO	: ----	Issue Date	: 29-Sep-2022 13:44
C-O-C number	: ----		
Sampler	: ----		
Site	: ----		
Quote number	: GEOPRO 2022 Standing Offer		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.

DQO: Data Quality Objective.

LOR: Limit of Reporting (detection limit).

RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "----" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.



Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Water** Evaluation: * = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Aggregate Organics : Biochemical Oxygen Demand - 5 day										
HDPE [BOD HT-48h] BH5	E550	20-Sep-2022	----	----	----		22-Sep-2022	48 hrs	48 hrs	✓
Aggregate Organics : Biochemical Oxygen Demand (Carbonaceous) - 5 day										
HDPE [BOD HT-48h] BH5	E555	20-Sep-2022	----	----	----		22-Sep-2022	48 hrs	48 hrs	✓
Aggregate Organics : Chemical Oxygen Demand by Colourimetry (Low Level)										
Amber glass total (sulfuric acid) BH5	E559-L	20-Sep-2022	----	----	----		22-Sep-2022	28 days	3 days	✓
Aggregate Organics : Mineral Oil & Grease by Gravimetry										
Amber glass (hydrochloric acid) BH5	E567SG	20-Sep-2022	22-Sep-2022	28 days	2 days	✓	23-Sep-2022	40 days	1 days	✓
Aggregate Organics : Oil & Grease by Gravimetry										
Amber glass (hydrochloric acid) BH5	E567	20-Sep-2022	22-Sep-2022	28 days	2 days	✓	23-Sep-2022	40 days	1 days	✓
Aggregate Organics : Phenols (4AAP) in Water by Colorimetry										
Amber glass total (sulfuric acid) BH5	E562	20-Sep-2022	22-Sep-2022	----	----		22-Sep-2022	28 days	2 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE [ON MECP] BH5	E235.Cl	20-Sep-2022	22-Sep-2022	----	----		22-Sep-2022	28 days	2 days	✓



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Anions and Nutrients : Fluoride in Water by IC										
HDPE [ON MECP] BH5	E235.F	20-Sep-2022	22-Sep-2022	----	----		22-Sep-2022	28 days	2 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE [ON MECP] BH5	E235.SO4	20-Sep-2022	22-Sep-2022	----	----		22-Sep-2022	28 days	2 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) BH5	E318	20-Sep-2022	22-Sep-2022	----	----		23-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) BH5	E372-U	20-Sep-2022	22-Sep-2022	----	----		22-Sep-2022	28 days	2 days	✓
Cyanides : Total Cyanide										
UV-inhibited HDPE - total (sodium hydroxide) BH5	E333	20-Sep-2022	22-Sep-2022	----	----		22-Sep-2022	14 days	2 days	✓
Physical Tests : pH by Meter										
HDPE [ON MECP] BH5	E108	20-Sep-2022	22-Sep-2022	----	----		22-Sep-2022	14 days	2 days	✓
Physical Tests : TSS by Gravimetry										
HDPE [ON MECP] BH5	E160	20-Sep-2022	----	----	----		22-Sep-2022	7 days	2 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) [ON MECP] BH5	E508	20-Sep-2022	22-Sep-2022	----	----		22-Sep-2022	28 days	2 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) BH5	E420	20-Sep-2022	22-Sep-2022	----	----		22-Sep-2022	180 days	2 days	✓

Page : 5 of 10
 Work Order : WT2215075
 Client : GeoPro Consulting Limited
 Project : 22-4078 (NORFOLK SEWER USE)



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group	Method	Sampling Date	Extraction / Preparation				Analysis			
Container / Client Sample ID(s)			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Total Sulfides : Total Sulfide by Colourimetry (Automated Flow)										
HDPE total (zinc acetate+sodium hydroxide) BH5	E395-H	20-Sep-2022	----	----	----		23-Sep-2022	7 days	4 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).



Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water** Evaluation: ✖ = QC frequency outside specification; ✔ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Laboratory Duplicates (DUP)							
Biochemical Oxygen Demand - 5 day	E550	659730	1	19	5.2	5.0	✓
Biochemical Oxygen Demand (Carbonaceous) - 5 day	E555	659731	1	20	5.0	5.0	✓
Chemical Oxygen Demand by Colourimetry (Low Level)	E559-L	660129	1	7	14.2	5.0	✓
Chloride in Water by IC	E235.Cl	659337	1	2	50.0	5.0	✓
Fluoride in Water by IC	E235.F	659334	1	2	50.0	5.0	✓
pH by Meter	E108	659248	1	3	33.3	5.0	✓
Phenols (4AAP) in Water by Colorimetry	E562	659535	1	2	50.0	5.0	✓
Sulfate in Water by IC	E235.SO4	659338	1	2	50.0	5.0	✓
Total Cyanide	E333	659627	1	1	100.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	659533	1	2	50.0	5.0	✓
Total Mercury in Water by CVAAS	E508	659434	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	659273	1	4	25.0	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	659534	1	2	50.0	5.0	✓
Total Sulfide by Colourimetry (Automated Flow)	E395-H	662928	1	7	14.2	5.0	✓
TSS by Gravimetry	E160	659519	1	3	33.3	4.7	✓
Laboratory Control Samples (LCS)							
Biochemical Oxygen Demand - 5 day	E550	659730	1	19	5.2	5.0	✓
Biochemical Oxygen Demand (Carbonaceous) - 5 day	E555	659731	1	20	5.0	5.0	✓
Chemical Oxygen Demand by Colourimetry (Low Level)	E559-L	660129	1	7	14.2	5.0	✓
Chloride in Water by IC	E235.Cl	659337	1	2	50.0	5.0	✓
Fluoride in Water by IC	E235.F	659334	1	2	50.0	5.0	✓
Mineral Oil & Grease by Gravimetry	E567SG	659260	1	7	14.2	5.0	✓
Oil & Grease by Gravimetry	E567	659259	1	20	5.0	5.0	✓
pH by Meter	E108	659248	1	3	33.3	5.0	✓
Phenols (4AAP) in Water by Colorimetry	E562	659535	1	2	50.0	5.0	✓
Sulfate in Water by IC	E235.SO4	659338	1	2	50.0	5.0	✓
Total Cyanide	E333	659627	1	1	100.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	659533	1	2	50.0	5.0	✓
Total Mercury in Water by CVAAS	E508	659434	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	659273	1	4	25.0	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	659534	1	2	50.0	5.0	✓
Total Sulfide by Colourimetry (Automated Flow)	E395-H	662928	1	7	14.2	5.0	✓
TSS by Gravimetry	E160	659519	1	3	33.3	4.7	✓
Method Blanks (MB)							
Biochemical Oxygen Demand - 5 day	E550	659730	1	19	5.2	5.0	✓
Biochemical Oxygen Demand (Carbonaceous) - 5 day	E555	659731	1	20	5.0	5.0	✓
Chemical Oxygen Demand by Colourimetry (Low Level)	E559-L	660129	1	7	14.2	5.0	✓



Matrix: **Water**

Evaluation: ✖ = QC frequency outside specification; ✔ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Method Blanks (MB) - Continued							
Chloride in Water by IC	E235.Cl	659337	1	2	50.0	5.0	✔
Fluoride in Water by IC	E235.F	659334	1	2	50.0	5.0	✔
Mineral Oil & Grease by Gravimetry	E567SG	659260	1	7	14.2	5.0	✔
Oil & Grease by Gravimetry	E567	659259	1	20	5.0	5.0	✔
Phenols (4AAP) in Water by Colorimetry	E562	659535	1	2	50.0	5.0	✔
Sulfate in Water by IC	E235.SO4	659338	1	2	50.0	5.0	✔
Total Cyanide	E333	659627	1	1	100.0	5.0	✔
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	659533	1	2	50.0	5.0	✔
Total Mercury in Water by CVAAS	E508	659434	1	20	5.0	5.0	✔
Total Metals in Water by CRC ICPMS	E420	659273	1	4	25.0	5.0	✔
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	659534	1	2	50.0	5.0	✔
Total Sulfide by Colourimetry (Automated Flow)	E395-H	662928	1	7	14.2	5.0	✔
TSS by Gravimetry	E160	659519	1	3	33.3	4.7	✔
Matrix Spikes (MS)							
Chemical Oxygen Demand by Colourimetry (Low Level)	E559-L	660129	1	7	14.2	5.0	✔
Chloride in Water by IC	E235.Cl	659337	1	2	50.0	5.0	✔
Fluoride in Water by IC	E235.F	659334	1	2	50.0	5.0	✔
Phenols (4AAP) in Water by Colorimetry	E562	659535	1	2	50.0	5.0	✔
Sulfate in Water by IC	E235.SO4	659338	1	2	50.0	5.0	✔
Total Cyanide	E333	659627	1	1	100.0	5.0	✔
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	659533	1	2	50.0	5.0	✔
Total Mercury in Water by CVAAS	E508	659434	1	20	5.0	5.0	✔
Total Metals in Water by CRC ICPMS	E420	659273	1	4	25.0	5.0	✔
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	659534	1	2	50.0	5.0	✔
Total Sulfide by Colourimetry (Automated Flow)	E395-H	662928	1	7	14.2	5.0	✔



Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
pH by Meter	E108 Waterloo - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally $20 \pm 5^{\circ}\text{C}$). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160 Waterloo - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at $104 \pm 1^{\circ}\text{C}$, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
Chloride in Water by IC	E235.Cl Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Water by IC	E235.F Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Waterloo - Environmental	Water	Method Fialab 100, 2018	TKN in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021).
Total Cyanide	E333 Waterloo - Environmental	Water	ISO 14403 (mod)	Total or Strong Acid Dissociable (SAD) Cyanide is determined by Continuous Flow Analyzer (CFA) with in-line UV digestion followed by colourimetric analysis. Method Limitation: High levels of thiocyanate (SCN) may cause positive interference (up to 0.5% of SCN concentration).
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U Waterloo - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Total Sulfide by Colourimetry (Automated Flow)	E395-H Vancouver - Environmental	Water	APHA 4500 -S E-Auto-Colorimetry	Sulfide is determined using the gas dialysis automated methylene blue colourimetric method. Results expressed "as H ₂ S" if reported represent the maximum possible H ₂ S concentration based on the total sulfide concentration in the sample. The H ₂ S calculation converts Total Sulphide as (S ₂ -) and reports it as Total Sulphide as (H ₂ S)



Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Total Metals in Water by CRC ICPMS	E420 Waterloo - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Mercury in Water by CVAAS	E508 Waterloo - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS
Biochemical Oxygen Demand - 5 day	E550 Waterloo - Environmental	Water	APHA 5210 B (mod)	Samples are diluted and incubated for a specified time period, after which the oxygen depletion is measured using a dissolved oxygen meter. Free chlorine is a negative interference in the BOD method; please advise ALS when free chlorine is present in samples.
Biochemical Oxygen Demand (Carbonaceous) - 5 day	E555 Waterloo - Environmental	Water	APHA 5210 B (mod)	Samples are diluted and incubated for a specified time period, after which the oxygen depletion is measured using a dissolved oxygen meter. Nitrification inhibitor is added to samples to prevent nitrogenous compounds from consuming oxygen resulting in only carbonaceous oxygen demand being reported by this method. Free chlorine is a negative interference in the BOD method; please advise ALS when free chlorine is present in samples.
Chemical Oxygen Demand by Colourimetry (Low Level)	E559-L Waterloo - Environmental	Water	APHA 5220 D (mod)	Samples are analyzed using the closed reflux colourimetric method.
Phenols (4AAP) in Water by Colorimetry	E562 Waterloo - Environmental	Water	EPA 9066	This automated method is based on the distillation of phenol and subsequent reaction of the distillate with alkaline ferricyanide ($K_3Fe(CN)_6$) and 4-amino-antipyrine (4-AAP) to form a red complex which is measured colorimetrically.
Oil & Grease by Gravimetry	E567 Waterloo - Environmental	Water	BC MOE Lab Manual (Oil & Grease) (mod)	The entire water sample is extracted with hexane and the extract is evaporated to dryness. The residue is then weighed to determine Oil and Grease.
Mineral Oil & Grease by Gravimetry	E567SG Waterloo - Environmental	Water	BC MOE Lab Manual (Oil & Grease) (mod)	The entire water sample is extracted with hexane, followed by silica gel treatment after which the extract is evaporated to dryness. The residue is then weighed to determine Mineral Oil and Grease.
Animal & Vegetable Oil & Grease by Gravimetry	EC567A.SG Waterloo - Environmental	Water	APHA 5520 (mod)	Animal & vegetable oil and grease is calculated as follows: Oil & Grease (gravimetric) minus Mineral Oil & Grease (gravimetric)

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
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<i>Preparation Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Digestion for TKN in water	EP318 Waterloo - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested at high temperature using Sulfuric Acid with Copper catalyst, which converts organic nitrogen sources to Ammonia, which is then quantified by the analytical method as TKN. This method is unsuitable for samples containing high levels of nitrate. If nitrate exceeds TKN concentration by ten times or more, results may be biased low.
Digestion for Total Phosphorus in water	EP372 Waterloo - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Oil & Grease Extraction for Gravimetry	EP567 Waterloo - Environmental	Water	BC MOE Lab Manual (Oil & Grease) (mod)	The entire water sample is extracted with hexane by liquid-liquid extraction.

QUALITY CONTROL REPORT

Work Order	: WT2215075	Page	: 1 of 10
Client	: GeoPro Consulting Limited	Laboratory	: Waterloo - Environmental
Contact	: Elab	Account Manager	: Costas Farassoglou
Address	: 40 Vogell Road Unit 57 Richmond Hill ON Canada L4B 3N6	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 416 209 5668	Telephone	: 613 225 8279
Project	: 22-4078 (NORFOLK SEWER USE)	Date Samples Received	: 21-Sep-2022 17:15
PO	: ----	Date Analysis Commenced	: 22-Sep-2022
C-O-C number	: ----	Issue Date	: 29-Sep-2022 13:49
Sampler	: ----		
Site	: ----		
Quote number	: GEOPRO 2022 Standing Offer		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Caitlin Macey	Team Leader - Inorganics	Vancouver Inorganics, Burnaby, British Columbia
Greg Pokocky	Supervisor - Inorganic	Waterloo Inorganics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Waterloo Metals, Waterloo, Ontario
Jocelyn Kennedy	Department Manager - Semi-Volatile Organics	Waterloo Organics, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Waterloo Inorganics, Waterloo, Ontario
Walt Kippenhuck	Team Leader - Inorganics	Waterloo Inorganics, Waterloo, Ontario



General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percent Difference

= Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.



Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: Water					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Physical Tests (QC Lot: 659248)											
WT2215072-001	Anonymous	pH	----	E108	0.10	pH units	7.43	7.47	0.537%	4%	----
Physical Tests (QC Lot: 659519)											
WT2214912-001	Anonymous	solids, total suspended [TSS]	----	E160	3.0	mg/L	<3.0	<3.0	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 659334)											
WT2214666-001	Anonymous	fluoride	16984-48-8	E235.F	0.020	mg/L	0.094	0.092	0.003	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 659337)											
WT2214666-001	Anonymous	chloride	16887-00-6	E235.Cl	0.50	mg/L	166	171	2.55%	20%	----
Anions and Nutrients (QC Lot: 659338)											
WT2214666-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	31.9	32.6	2.31%	20%	----
Anions and Nutrients (QC Lot: 659533)											
WT2215075-001	BH5	Kjeldahl nitrogen, total [TKN]	----	E318	0.500	mg/L	<0.500	<0.500	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 659534)											
WT2215080-001	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0026	0.0027	0.00006	Diff <2x LOR	----
Cyanides (QC Lot: 659627)											
WT2215075-001	BH5	cyanide, strong acid dissociable (total)	----	E333	0.0020	mg/L	<0.0020	<0.0020	0	Diff <2x LOR	----
Total Sulfides (QC Lot: 662928)											
GP2201750-001	Anonymous	sulfide, total (as S)	18496-25-8	E395-H	0.100	mg/L	1.46	1.50	2.39%	20%	----
Total Metals (QC Lot: 659273)											
WT2214981-001	Anonymous	aluminum, total	7429-90-5	E420	0.0300	mg/L	<0.0300	<0.0300	0	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00100	mg/L	0.00520	0.00492	0.00028	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000500	mg/L	<0.000500	<0.000500	0	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0000500	mg/L	<0.0000500	<0.0000500	0	Diff <2x LOR	----
		chromium, total	7440-47-3	E420	0.00500	mg/L	<0.00500	<0.00500	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00100	mg/L	0.00950	0.00938	0.00013	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00500	mg/L	0.00676	0.00676	0.000001	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.100	mg/L	0.828	0.816	0.012	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000500	mg/L	<0.000500	<0.000500	0	Diff <2x LOR	----
		manganese, total	7439-96-5	E420	0.00100	mg/L	0.332	0.330	0.815%	20%	----
		molybdenum, total	7439-98-7	E420	0.000500	mg/L	0.00545	0.00532	2.35%	20%	----



Sub-Matrix: Water					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Total Metals (QC Lot: 659273) - continued											
WT2214981-001	Anonymous	nickel, total	7440-02-0	E420	0.00500	mg/L	0.0230	0.0225	0.00051	Diff <2x LOR	----
		selenium, total	7782-49-2	E420	0.000500	mg/L	0.00486	0.00479	0.000078	Diff <2x LOR	----
		silver, total	7440-22-4	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00300	mg/L	<0.00300	<0.00300	0	Diff <2x LOR	----
		vanadium, total	7440-62-2	E420	0.00500	mg/L	<0.00500	<0.00500	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0300	mg/L	<0.0300	<0.0300	0	Diff <2x LOR	----
Total Metals (QC Lot: 659434)											
TY2201724-001	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Aggregate Organics (QC Lot: 659535)											
WT2215080-001	Anonymous	phenols, total (4AAP)	----	E562	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Aggregate Organics (QC Lot: 659730)											
WT2214988-001	Anonymous	biochemical oxygen demand [BOD]	----	E550	2.0	mg/L	17.8	17.9	0.0%	30%	----
Aggregate Organics (QC Lot: 659731)											
WT2215029-001	Anonymous	carbonaceous biochemical oxygen demand [CBOD]	----	E555	2.0	mg/L	<2.0	<2.0	0.0%	30%	----
Aggregate Organics (QC Lot: 660129)											
WT2214983-002	Anonymous	chemical oxygen demand [COD]	----	E559-L	10	mg/L	78	79	1	Diff <2x LOR	----



Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 659519)						
solids, total suspended [TSS]	----	E160	3	mg/L	<3.0	----
Anions and Nutrients (QCLot: 659334)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 659337)						
chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 659338)						
sulfate (as SO ₄)	14808-79-8	E235.SO ₄	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 659533)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 659534)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Cyanides (QCLot: 659627)						
cyanide, strong acid dissociable (total)	----	E333	0.002	mg/L	<0.0020	----
Total Sulfides (QCLot: 662928)						
sulfide, total (as S)	18496-25-8	E395-H	0.01	mg/L	<0.010	----
Total Metals (QCLot: 659273)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
chromium, total	7440-47-3	E420	0.0005	mg/L	<0.00050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----



Sub-Matrix: **Water**

<i>Analyte</i>	<i>CAS Number</i>	<i>Method</i>	<i>LOR</i>	<i>Unit</i>	<i>Result</i>	<i>Qualifier</i>
Total Metals (QCLot: 659273) - continued						
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
Total Metals (QCLot: 659434)						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
Aggregate Organics (QCLot: 659259)						
oil & grease (gravimetric)	----	E567	5	mg/L	<5.0	----
Aggregate Organics (QCLot: 659260)						
oil & grease, mineral (gravimetric)	----	E567SG	5	mg/L	<5.0	----
Aggregate Organics (QCLot: 659535)						
phenols, total (4AAP)	----	E562	0.001	mg/L	<0.0010	----
Aggregate Organics (QCLot: 659730)						
biochemical oxygen demand [BOD]	----	E550	2	mg/L	<2.0	----
Aggregate Organics (QCLot: 659731)						
carbonaceous biochemical oxygen demand [CBOD]	----	E555	2	mg/L	<2.0	----
Aggregate Organics (QCLot: 660129)						
chemical oxygen demand [COD]	----	E559-L	10	mg/L	<10	----



Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: Water

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 659248)									
pH	----	E108	----	pH units	7 pH units	101	98.0	102	----
Physical Tests (QCLot: 659519)									
solids, total suspended [TSS]	----	E160	3	mg/L	150 mg/L	89.0	85.0	115	----
Anions and Nutrients (QCLot: 659334)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 659337)									
chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 659338)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 659533)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	98.0	75.0	125	----
Anions and Nutrients (QCLot: 659534)									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	0.53 mg/L	96.6	80.0	120	----
Cyanides (QCLot: 659627)									
cyanide, strong acid dissociable (total)	----	E333	0.002	mg/L	0.25 mg/L	93.6	80.0	120	----
Total Sulfides (QCLot: 662928)									
sulfide, total (as H2S)	7783-06-4	E395-H	----	mg/L	0.085 mg/L	98.8	80.0	120	----
sulfide, total (as S)	18496-25-8	E395-H	0.01	mg/L	0.08 mg/L	99.3	80.0	120	----
Total Metals (QCLot: 659273)									
aluminum, total	7429-90-5	E420	0.003	mg/L	0.1 mg/L	102	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	0.05 mg/L	104	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	0.05 mg/L	102	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.0125 mg/L	102	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	0.05 mg/L	93.4	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.005 mg/L	106	80.0	120	----
chromium, total	7440-47-3	E420	0.0005	mg/L	0.0125 mg/L	100	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.0125 mg/L	99.6	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.0125 mg/L	96.8	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	0.05 mg/L	99.8	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.025 mg/L	96.3	80.0	120	----



Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 659273) - continued									
manganese, total	7439-96-5	E420	0.0001	mg/L	0.0125 mg/L	102	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.0125 mg/L	105	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.025 mg/L	99.7	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	0.05 mg/L	102	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.005 mg/L	100	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.025 mg/L	107	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.0125 mg/L	98.7	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.025 mg/L	102	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.025 mg/L	102	80.0	120	----
Total Metals (QCLot: 659434)									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	100	80.0	120	----
Aggregate Organics (QCLot: 659259)									
oil & grease (gravimetric)	----	E567	5	mg/L	200 mg/L	85.8	70.0	130	----
Aggregate Organics (QCLot: 659260)									
oil & grease, mineral (gravimetric)	----	E567SG	5	mg/L	100 mg/L	77.9	70.0	130	----
Aggregate Organics (QCLot: 659535)									
phenols, total (4AAP)	----	E562	0.001	mg/L	0.02 mg/L	110	85.0	115	----
Aggregate Organics (QCLot: 659730)									
biochemical oxygen demand [BOD]	----	E550	2	mg/L	198 mg/L	98.5	85.0	115	----
Aggregate Organics (QCLot: 659731)									
carbonaceous biochemical oxygen demand [CBOD]	----	E555	2	mg/L	198 mg/L	101	85.0	115	----
Aggregate Organics (QCLot: 660129)									
chemical oxygen demand [COD]	----	E559-L	10	mg/L	100 mg/L	108	85.0	115	----



Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: Water					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 659334)										
WT2214666-001	Anonymous	fluoride	16984-48-8	E235.F	1.01 mg/L	1 mg/L	101	75.0	125	----
Anions and Nutrients (QCLot: 659337)										
WT2214666-001	Anonymous	chloride	16887-00-6	E235.Cl	ND mg/L	100 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 659338)										
WT2214666-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	103 mg/L	100 mg/L	103	75.0	125	----
Anions and Nutrients (QCLot: 659533)										
WT2215075-001	BH5	Kjeldahl nitrogen, total [TKN]	----	E318	24.0 mg/L	2.5 mg/L	95.9	70.0	130	----
Anions and Nutrients (QCLot: 659534)										
WT2215080-001	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0815 mg/L	0.1 mg/L	81.5	70.0	130	----
Cyanides (QCLot: 659627)										
WT2215075-001	BH5	cyanide, strong acid dissociable (total)	----	E333	0.207 mg/L	0.25 mg/L	82.8	75.0	125	----
Total Sulfides (QCLot: 662928)										
GP2201751-001	Anonymous	sulfide, total (as S)	18496-25-8	E395-H	1.09 mg/L	1 mg/L	109	75.0	125	----
Total Metals (QCLot: 659273)										
WT2214981-002	Anonymous	aluminum, total	7429-90-5	E420	0.104 mg/L	0.1 mg/L	104	70.0	130	----
		antimony, total	7440-36-0	E420	0.0509 mg/L	0.05 mg/L	102	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0506 mg/L	0.05 mg/L	101	70.0	130	----
		barium, total	7440-39-3	E420	0.0122 mg/L	0.0125 mg/L	97.3	70.0	130	----
		bismuth, total	7440-69-9	E420	0.0466 mg/L	0.05 mg/L	93.1	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00496 mg/L	0.005 mg/L	99.2	70.0	130	----
		chromium, total	7440-47-3	E420	0.0125 mg/L	0.0125 mg/L	99.7	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0120 mg/L	0.0125 mg/L	95.8	70.0	130	----
		copper, total	7440-50-8	E420	0.0118 mg/L	0.0125 mg/L	94.7	70.0	130	----
		iron, total	7439-89-6	E420	ND mg/L	0.05 mg/L	ND	70.0	130	----
		lead, total	7439-92-1	E420	0.0235 mg/L	0.025 mg/L	93.9	70.0	130	----
		manganese, total	7439-96-5	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0128 mg/L	0.0125 mg/L	102	70.0	130	----
		nickel, total	7440-02-0	E420	0.0226 mg/L	0.025 mg/L	90.6	70.0	130	----
		selenium, total	7782-49-2	E420	0.0504 mg/L	0.05 mg/L	101	70.0	130	----
silver, total	7440-22-4	E420	0.00470 mg/L	0.005 mg/L	94.1	70.0	130	----		



Sub-Matrix: Water					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 659273) - continued										
WT2214981-002	Anonymous	tin, total	7440-31-5	E420	0.0255 mg/L	0.025 mg/L	102	70.0	130	----
		titanium, total	7440-32-6	E420	0.0118 mg/L	0.0125 mg/L	94.6	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0254 mg/L	0.025 mg/L	101	70.0	130	----
		zinc, total	7440-66-6	E420	0.0231 mg/L	0.025 mg/L	92.4	70.0	130	----
Total Metals (QCLot: 659434)										
TY2201778-001	Anonymous	mercury, total	7439-97-6	E508	0.0000732 mg/L	0.0001 mg/L	73.2	70.0	130	----
Aggregate Organics (QCLot: 659535)										
WT2215080-001	Anonymous	phenols, total (4AAP)	----	E562	0.106 mg/L	0.1 mg/L	106	75.0	125	----
Aggregate Organics (QCLot: 660129)										
WT2214983-002	Anonymous	chemical oxygen demand [COD]	----	E559-L	100 mg/L	100 mg/L	100	75.0	125	----



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Work Order Reference

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GeoPro Consulting Limited

Geotechnical-Hydrogeology-Environmental-Materials-Inspection

APPENDIX D

H:\Projects\2022\2013 HFM Holdings Hunt St Residential Drawings\Arch2013 Hunt St Residential Site.rvt

5/30/2023 11:05:36 AM

DATE LAST PLOTTED

SITE STATISTIC & ZONING REQ.'S

ZA - ZONING AMENDMENTS (RED TEXT)

PROPERTY LEGAL DESCRIPTION:			
395, 401, 402, 405, 411 QUEENSWAY WEST IN THE TOWN OF NORTH SIMCOE, IN THE DISTRICT OF NORFOLK COUNTY			
ZONING:			
IN ACCORDANCE TO THE TOWN OF SIMCOE, ZONING BY-LAW 1-Z-2014 NORFOLK COUNTY - JANUARY-2021-CONSOLIDATION			
PROVISION	LAND USE EXISTING (SOUTHERN PORTION)		
6.3	EX. - SERVICE COMMERCIAL ZONE (CS)		
6.3.1	PERMITTED USES <i>Permitted uses</i> In a CS Zone, no land, building or structure shall be used except in accordance with the following uses: a) ambulance service b) animal hospital, provided the entire operation is carried on within an enclosed building c) any non-residential use permitted in the Neighbourhood Institutional Zone (NI), subject to the provisions of that Zone d) auction centre e) automobile gas station f) automobile service and repair station g) automobile washing establishment h) automotive parts shop i) bar or night club j) clinic or doctors' offices k) commercial greenhouse, tree and plant nursery l) community centre m) contractor shop n) contractor supply and service shop o) convenience store p) day care nursery q) dry cleaning distribution station r) dry cleaning establishment s) dwelling, single detached or dwelling unit in a non-residential building - maximum one (1) (8-2-2020) t) equipment rental establishment u) farm implement sales and service establishment v) financial institution w) fire hall x) florist shop y) fruit and vegetable outlet z) funeral home aa) garden supply centre bb) home occupation cc) hotel dd) laundromat ee) lumber yard and building supply establishment ff) manufacturing and retail sale of monuments gg) merchandise service shop hh) miniature golf, golf driving range and baseball pitch ii) outdoor storage accessory to permitted uses jj) parking lot on structure kk) personal service shop ll) place of assembly mm) place of sports and recreation nn) place of worship oo) police station pp) private club qq) restaurant rr) restaurant, fast-food ss) restaurant, take-out tt) sheet metal, plumbing, heating, electrical or woodworking shop or any similar activity uu) swimming pool sales and service establishment vv) training and rehabilitation centre ww) vehicle sales or rental establishment xx) video store yy) wholesale outlets zz) office, all types (special provision 14.6.2f) ADD THE FOLLOWING ADDITIONAL PERMITTED USES: aaa) dwelling units in a commercial building, max. bbb) boutique ccc) college or trade school ddd) delicatessen and specialty food stores eee) farmers market fff) office accessory to a shopping centre operation ggg) retail store		
PROVISION	SETBACKS (m - METERS):	REQUIRED (m)	PROVIDED (m)
6.3.2a)	MIN. LOT AREA: i) INTERIOR LOT ii) CORNER LOT	450m² 445m²	- 11,320m²
6.3.2b)	MIN. LOT FRONTAGE: i) INTERIOR LOT ii) CORNER LOT	15 16.5	- 10.3
6.3.2c)	MIN. FRONT YARD:	3	7.27
6.3.2d)	MIN. EXTERIOR SIDE YARD:	3	5.52
6.3.2e)	MIN. INTERIOR SIDE YARD:	3	13.71
6.3.2f)	MIN. REAR YARD:	4	21.39
6.3.2g)	MIN. USABLE FLOOR AREA: FOR A DWELLING UNIT IN A NON-RESIDENTIAL BLDG.	40m²	MIN. 40m²
6.3.2h)	MAX. BLDG. HEIGHT	11	30m or SIX (6) STORIES
6.3.2i)	MAX. LOT COVERAGE	35%	24%
6.3.2j)	MAX. USABLE FLOOR AREA: OF A FRUIT AND VEGETABLE OUTLET	200m²	N/A
6.3.2.k)	OUTDOOR STORAGE	PROHIBITED IN A FRONT YARD WITHIN 5M OF ANY LOT LINE ADJOINING A RESIDENTIAL ZONE	N/A
6.3.3	Outdoor Display of Goods. Outdoor display of vehicles on paved areas shall be permitted in the front yard subject to Subsection 6.3.5. Outdoor display of other non-vehicular items shall be permitted within a front yard provided such display is located on a grassed or landscaped area without surrounding fences and subject to Subsection 6.3.5.		
6.3.4	Landscaped Strip. All buildings, parking lots and parking spaces and display areas shall be setback 3 metres from the front lot line. This area shall be landscaped which may include patio pavers.		
6.3.5	Zone Provision for Convenience Store. The usable floor area of a convenience store shall not exceed 200 square metres.		
6.3.6	Zone Provisions for Dwellings. Notwithstanding the provisions in Subsection 6.3.2, all single detached dwellings shall conform to the Urban Residential Type 3 (R3) Zone provisions in Subsection 5.3. (8-2-2020) (21-2-2020)		

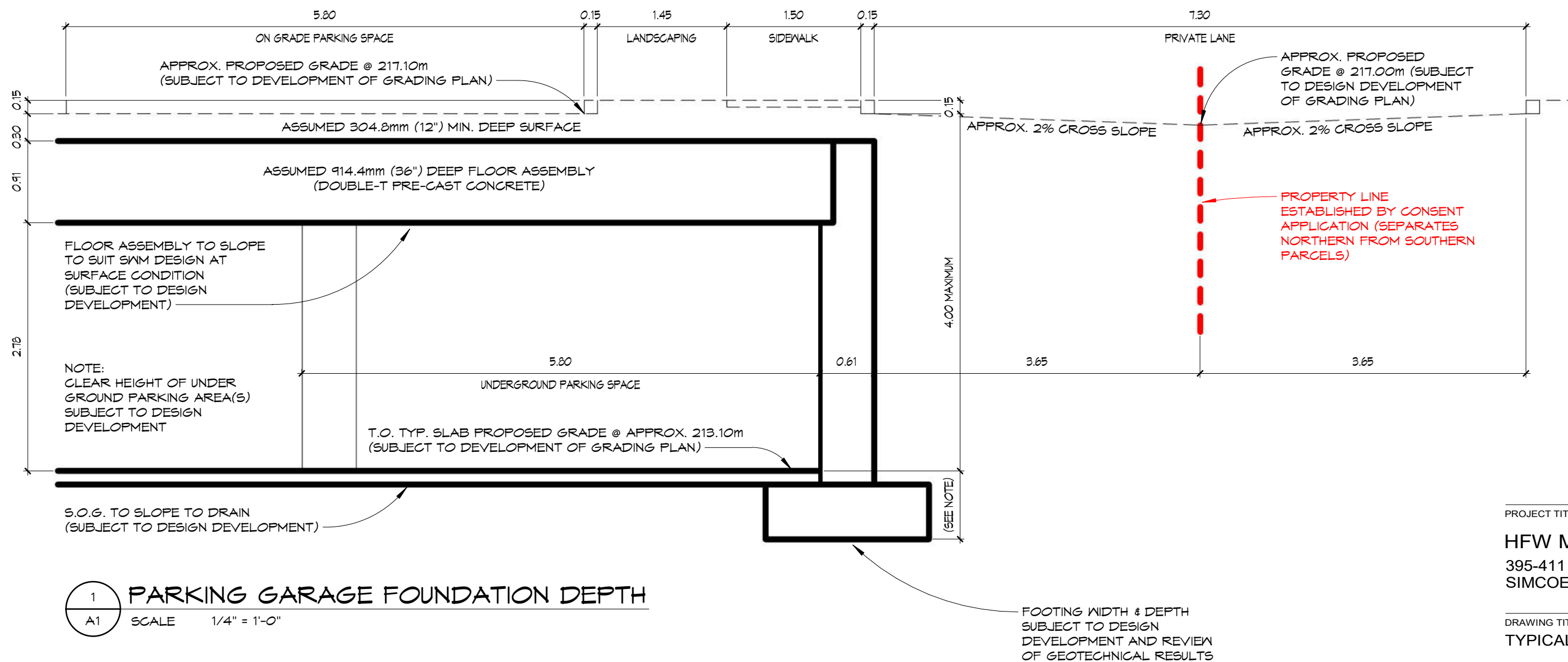
COORD. IV: ZONING BY-LAW FOR ALL OTHER ZONING REQ.'S

PARKING REQ. D MIXED USE RESIDENTIAL (CS)			
PROVISION	NUMBER OF PARKING SPACES	REQUIRED	PROVIDED
4.9b)	APARTMENT DWELLING (8-2-2011): 1.5 SPACES / DWELLING UNIT 1.5 SPACES x 72 DWELLING UNITS =	108 SPACE(S)	108 SPACE(S)
	APARTMENT DWELLING (8-2-2011): 1.25 SPACES / DWELLING UNIT 1.25 SPACES x 42 DWELLING UNITS =	53 SPACE(S)	50 SPACE(S)
PARKING REQ. D MIXED USE RESIDENTIAL - VISITOR:			
4.9f)	VISITOR PARKING: 1 SPACE / 3 DWELLING UNITS 1 SPACE x (114 / 3) = 38	38 SPACE(S)	38 SPACE(S)
PARKING REQ. D MIXED USE RESIDENTIAL TOTAL:			
	TOTAL	149 SPACE(S)	204 SPACE(S)
PARKING REQ. D MIXED USE RESIDENTIAL - BARRIER FREE (PART OF REQ. D PARKING)			
4.3.3	BARRIER FREE PARKING REQ. D: 26-50 PARKING SPACES =		
	TYPE 'A' (3.4m WIDE) PLUS 1.5m AISLE	1 SPACE(S)	3 SPACE(S)
	TYPE 'B' (2.4m WIDE) PLUS 1.5m AISLE	1 SPACE(S)	1 SPACE(S)
PARKING REQ. D MIXED USE NON-RESIDENTIAL (CS)			
PROVISION	NUMBER OF PARKING SPACES	REQUIRED	PROVIDED
4.9c)	OTHER NON-RESIDENTIAL USES: 1 SPACE / 35M ² USABLE FLOOR AREA 1 SPACE x (MAX. 3430m ² / 35m ² = 98	98 SPACE(S)	98 SPACE(S)
NOTE - THROUGH THE ZBA, A SITE SPECIFIC PROVISION IS SOUGHT THAT ALL COMMERCIAL SPACES - REGARDLESS OF TENANCY - WILL SUBJECT TO A BLANKET REQUIREMENT OF 1 PARKING SPACE FOR EVERY 35m ² OF USABLE FLOOR AREA			
PARKING REQ. D MIXED USE NON-RESIDENTIAL TOTAL:			
	TOTAL	98 SPACE(S)	98 SPACE(S)
PARKING REQ. D MIXED USE NON-RESIDENTIAL BARRIER FREE (PART OF REQ. D PARKING)			
4.3.3	BARRIER FREE PARKING REQ. D: 76-100 PARKING SPACES =		
	TYPE 'A' (3.4m WIDE) PLUS 1.5m AISLE	2 SPACE(S)	2 SPACE(S)
	TYPE 'B' (2.4m WIDE) PLUS 1.5m AISLE	2 SPACE(S)	2 SPACE(S)
4.0 OFF STREET PARKING PARKING SPACE DIMENSIONS			
4.1	PARKING SPACE DIMENSIONS		
4.1.3a)	WIDTH OF PARKING SPACE: FOR VEHICLES PARKED SIDE BY SIDE FOR VEHICLES PARKED WITH WALL OR FENCE ADJ.	3 MIN. 3.3 MIN.	3 3.3
4.1.3b)	DEPTH OF PARKING SPACE: FOR 90 DEGREE PARKING FOR PARALLEL PARKING	5.0 MIN. 7 MIN.	5.0 7
4.1.4	PARKING AISLE REQ.'S		
4.1.4b)	TWO-WAY TRAFFIC	7.3 MIN.	7.3 MIN.
4.2 LOCATION OF PARKING ON A LOT			
4.2.4	4.2.4 Other Provisions a) For tri-plex dwellings, duplex dwellings, four-plex dwellings, street townhouses, stacked townhouses, and boarding or lodging houses, required parking spaces shall be prohibited within the required front yard or required exterior side yard, except where a dwelling unit has a private garage in which case the driveway leading to the private garage may be used as a parking space subject to the size requirements herein; b) For group townhouses and apartment dwellings, no parking lot shall be located closer than 3 metres from any dwelling on the lot or of any interior lot line abutting another residential zone; c) For group townhouses and apartment dwellings, no parking lot or parking space shall be located between a dwelling and the street line, except for individual or tandem parking spaces leading directly to each townhouse dwelling unit; d) For commercial or industrial properties, no parking lot shall be located closer than 4.5 metres from any interior lot line abutting a residential zone; e) For accessory residential dwelling units, notwithstanding the foregoing, one (1) parking space dedicated for the use of the accessory residential dwelling unit, may be permitted in the front yard provided a minimum of 50 percent of the required front yard shall be maintained as landscaped open space notwithstanding such dedicated parking space.		
PARKING REQ. D - LOADING SPACES			
4.1	LOADING SPACES: 3m WIDTH x 10m DEPTH	N/A	1 PROVIDED
LANDSCAPED AREA			
2.81	"LANDSCAPE AREA" shall mean an area of land comprised of trees, shrubs, flowers, grass or other horticultural elements. Landscaping may include pervious paths, patios, walkways, or elements designed to enhance the visual amenity of a property but does not include open storage display areas, parking or loading areas, or areas covered by driveways. (8-2-2018)		
4.2.5	4.2.5 Parking and Landscape Area (7-2-2018) Within Urban Residential Type 1 to 4 Zones (R1 to R4), the following shall apply: a) A minimum of 50 percent of the front yard shall be maintained as landscape area. b) In the case of a corner lot, a minimum of 50 percent of each of the front yard and exterior side yard shall be maintained as landscape area.		

2.110	"USABLE FLOOR AREA" shall mean the total area of all floors of a building, outdoor patio or cafe, or dwelling unit including: a) a hallway, aisle, stairway and corridor within a suite or unit; b) an internal wall and partition within a suite or unit; c) a storage room and storage area within a suite or unit; d) a boat slip in the case of a boathouse; e) a habitable room or area in the basement of a dwelling. But excluding: a) an area occupied by a common area in a multi-tenant building including but not limited to a public stairwell, public or shared corridor and lobby; b) a mechanical shaft; c) an entry vestibule not within a dwelling unit; d) a garage attached to a building; e) an unfinished basement in a dwelling used for storage or laundry.
The usable floor area for a dwelling is measured from the outside face of exterior walls or to the centre-line of party or common walls. The usable floor area for all other buildings shall be measured from the inside face of exterior walls, interior common walls and firewalls.	

PROVISION		LAND USE PROPOSED (NORTHERN PORTION)			
		ZONING AMENDMENT: RESIDENTIAL ZONES			
5.0	URBAN RESIDENTIAL TYPE 4 ZONE (R4)				
5.4	PERMITTED USES				
5.4.1	In an R4 Zone, no land, building or structure shall be used except in accordance with the following uses: a) group townhouse c) street townhouse d) semi-detached, duplex, tri-plex and four-plex dwellings provided they are located on the same lot with, and in accordance with the Zone provisions of, group townhouse				
PROVISION	SETBACKS (m - METERS):	REQUIRED IN Street Frontage (or adj)	REQUIRED IN Side Frontage Street Frontage	PROVIDED (m)	
5.4.2a)	MIN. LOT AREA: i) ATTACHED GARAGE ii) CORNER LOT iii) DETACHED GARAGE	156m ² 264m ² 162m ²	195m ² 195m ² 215m ²	17,472m ² - -	
5.4.2b)	MIN. LOT FRONTAGE: i) INTERIOR LOT ii) CORNER LOT iii) CORNER LOT ACCESSED BY A REAR LANE	6.5 11 6.5	30 30 -	104.0 - -	
5.4.2c)	MIN. FRONT YARD: i) ATTACHED GARAGE ii) DETACHED GARAGE OR REAR YARD PARKING	6 1.5	6 1.5	MIN. 6 -	
5.4.2d)	MIN. EXTERIOR SIDE YARD: i) IV. A 6m FRONT YARD ii) IV. A 1.5m FRONT YARD	6 1.5	6 1.5	- -	
5.4.2e)	MIN. INTERIOR SIDE YARD	1.2	3	MIN. 3	
5.4.2f)	MIN. REAR YARD: i) ATTACHED GARAGE ii) DETACHED GARAGE ACCESSED VIA A REAR LANE INCLUDING HALF OF THE LANE iii) UNDESIGNED SITE SPECIFIC PROVISION WHERE THE SIDE ELEVATION OF A BLOCK TOWNHOUSE OR SEMI-DETACHED HOUSE FACES THE REAR YARD	7.5 13	7.5 7.5	- -	
5.4.2g)	MIN. SEPARATION BETWEEN TOWNHOUSE DWELLINGS	2	2	3	
5.4.2h)	MAX. BLDG. HEIGHT	11 (8-2-2017)	11 (8-2-2017)	MAX. 13	
5.4.3	Setback from Mutual Side Lot Line Notwithstanding the required side yards, on a mutual side lot line separating two (2) attached townhouse units, no interior side yard is required where the walls are joined, where the walls are not joined, a 1.2 metre side yard shall be required.	1.2	1.2	MIN. 1.2	
5.4.4	Maximum Units in a Townhouse Dwelling No more than eight (8) dwelling units shall be located in a townhouse dwelling.	8 UNITS	8 UNITS	5 UNITS	
COORD. IV: ZONING BY-LAW FOR ALL OTHER ZONING REQ.'S					
PARKING REQ. D RESIDENTIAL (R4)					
PROVISION	NUMBER OF PARKING SPACES	REQUIRED	PROVIDED		
4.9a)	SINGLE DETACHED, SEMI-DETACHED, DUPLEX, TRI-PLEX, FOUR-PLEX, TOWNHOUSE DWELLINGS & VACATION HOMES (8-2-2011): 2 SPACES / DWELLING UNIT 2 SPACES x 38 DWELLING UNITS = 76	76 SPACE(S)	82 SPACE(S)		
PARKING REQ. D RESIDENTIAL - VISITOR:					
4.9f)	VISITOR PARKING: 1 SPACE / 3 DWELLING UNITS 1 SPACE x (38 / 3) = 13	13 SPACE(S)	13 SPACE(S)		
PARKING REQ. D RESIDENTIAL - TOTAL:					
	TOTAL	84 SPACE(S)	95 SPACE(S)		
PARKING REQ. D RESIDENTIAL - BARRIER FREE (PART OF REQ. D PARKING)					
4.3.3	BARRIER FREE PARKING REQ. D: 1-25 PARKING SPACES =				
	TYPE 'A' (3.4m WIDE) PLUS 1.5m AISLE	1 SPACE(S)	1 SPACE(S)		
	TYPE 'B' (2.4m WIDE) PLUS 1.5m AISLE	2 SPACE(S)	2 SPACE(S)		
4.0 OFF STREET PARKING PARKING SPACE DIMENSIONS					
4.1	PARKING SPACE DIMENSIONS				
4.1.3a)	WIDTH OF PARKING SPACE: FOR VEHICLES PARKED SIDE BY SIDE FOR VEHICLES PARKED WITH WALL OR FENCE ADJ.	3 MIN. 3.3 MIN.	3 3.3		
4.1.3b)	DEPTH OF PARKING SPACE: FOR 90 DEGREE PARKING FOR PARALLEL PARKING	5.0 MIN. 7 MIN.	5.0 7		
4.1.4	PARKING AISLE REQ.'S				
4.1.4b)	TWO-WAY TRAFFIC	7.3 MIN.	7.3 MIN.		
4.2 LOCATION OF PARKING ON A LOT					
4.2.3	4.2.3 Residential Parking Area For Urban Residential Type 1 to 4 Zones (R1 to R4), the following shall apply: a) within a front yard or exterior side yard, motor vehicles shall only be parked on a driveway, in a parking space or private garage (7-2-2018); b) not more than one (1) required parking space may be located within the required front yard or required exterior side yard (7-2-2018); c) vehicles shall not be parked within any landscape area (7-2-2018);				
4.2.4	4.2.4 Other Provisions a) For tri-plex dwellings, duplex dwellings, four-plex dwellings, street townhouses, stacked townhouses, and boarding or lodging houses, required parking spaces shall be prohibited within the required front yard or required exterior side yard, except where a dwelling unit has a private garage in which case the driveway leading to the private garage may be used as a parking space subject to the size requirements herein; b) For group townhouses and apartment dwellings, no parking lot shall be located closer than 3 metres from any dwelling on the lot or of any interior lot line abutting another residential zone; c) For group townhouses and apartment dwellings, no parking lot or parking space shall be located between a dwelling and the street line, except for individual or tandem parking spaces leading directly to each townhouse dwelling unit; d) For commercial or industrial properties, no parking lot shall be located closer than 4.5 metres from any interior lot line abutting a residential zone; e) for accessory residential dwelling units, notwithstanding the foregoing, one (1) parking space dedicated for the use of the accessory residential dwelling unit, may be permitted in the front yard provided a minimum of 50 percent of the required front yard shall be maintained as landscaped open space notwithstanding such dedicated parking space.				

LANDSCAPED AREA	
2.81	"LANDSCAPE AREA" shall mean an area of land comprised of trees, shrubs, flowers, grass or other horticultural elements. Landscaping may include pervious paths, patios, walkways, or elements designed to enhance the visual amenity of a property but does not include open storage display areas, parking or loading areas, or areas covered by driveways. (8-2-2018)
4.2.5	4.2.5 Parking and Landscape Area (7-2-2018) Within Urban Residential Type 1 to 4 Zones (R1 to R4), the following shall apply: a) A minimum of 50 percent of the front yard shall be maintained as landscape area. b) In the case of a corner lot, a minimum of 50 percent of each of the front yard and exterior side yard shall be maintained as landscape area.



PROJECT TITLE:

HFW MIXED USE

395-411 QUEENSWAY WEST

SIMCOE, ONTARIO

DRAWING TITLE:
TYPICAL FOUNDATION DEPTH

DRAWING SCALE:
1/4" = 1'-0"

DATE ISSUED: 2024.01.23

PROJECT NO.:
22-013

A1

This report is intended solely for the Client named. The report is prepared based on the work has been undertaken in accordance with normally accepted geotechnical engineering practices in Ontario.

The comments and recommendations given in this report are based on information determined at the limited number of the test hole and test pit locations. The boundaries between the various strata as shown on the borehole logs are based on non-continuous sampling and represent an inferred transition between the various strata and their lateral continuation rather than a precise plane of geological change. Subsurface and groundwater conditions between and beyond the test holes and test pits may differ significantly from those encountered at the test hole and test pit locations. The benchmark and elevations used in this report are primarily to establish relative elevation differences between the test hole and test pit locations and should not be used for other purposes, such as grading, excavating, planning, development, etc.

It should be noted that the results of the chemical analysis refer only to the sample analyzed which was obtained from specific sampling location and sampling depth, which may vary between and beyond the location and depth of the sample taken. Please note that the level of chemical testing outlined herein is meant to provide a broad indication of groundwater quality based on the limited sample(s) tested. The analytical results contained in this report should not be considered a warranty with respect to the groundwater quality for any specific purpose or the acceptability of the groundwater discharge.

It should be noted that not all of the well screens and sealed in the saturated zone of unconfined aquifer, and are not necessarily screened in the same unconfined aquifer. Therefore, the groundwater table contour lines based on limited number of groundwater level measurements in limited number of monitoring wells should be considered to be very approximate.

The report reflects our best judgment based on the information available to GeoPro Consulting Limited at the time of preparation. Unless otherwise agreed in writing by GeoPro Consulting Limited, it shall not be used to express or imply warranty as to any other purposes. No portion of this report shall be used as a separate entity, it is written to be read in its entirety. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated.

The design recommendations given in this report are applicable only to the project designed and constructed completely in accordance with the details stated in this report. Otherwise, our responsibility is limited to interpreting the subsurface information at the borehole or test pit locations.

Should any comments and recommendations provided in this report be made on any construction related issues, they are intended only for the guidance of the designers. The number of test holes and test pits may not be sufficient to determine all the factors that may affect construction activities, methods and costs. Such as, the thickness of surficial topsoil or fill layers may vary significantly and unpredictably; the amount of the cobbles and boulders may vary significantly than what described in the report; unexpected water bearing zones/layers with various thickness and extent may be encountered in the fill and native soils. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and make their own conclusions as to how the subsurface conditions may affect their work and determine the proper construction methods.

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. GeoPro Consulting Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.

July 15, 2025

Reference No. G2S23138C

HFW Holdings Limited
301 Broadview Avenue
Toronto, Ontario
M4M 2G8

**Soil Infiltration Assessment
395 - 411 Queensway West
Simcoe, Ontario**

G2S Consulting Inc. (G2S) is pleased to provide the results of our soil infiltration assessment for a portion of the property located at 395 - 411 Queensway West in Simcoe, Ontario (referred to herein as the 'Site'). The Site location is depicted on Drawing 1 in Appendix A.

1. Introduction

The Site is located on the north side of Queensway West in between Hunt Street North and Park Road and covers an approximate plan area of 2.8 hectares (7.0 acres), with frontage of approximately 140 m on Queensway West and approximately 185 m on Hunt Street North. The Site is currently developed with multiple buildings, and the proposed development plan includes a change in property use from commercial use to residential use.

Development plans call for a phased development comprising a 6-storey mixed-use, future mid-rise building with underground parking, and 1 and 3-storey residential units with associated roadways and a stormwater management (SWM) pond in the northwest portion of the Site.

The purpose of this assignment was to conduct in-situ soil infiltration testing to assess the infiltration rate for the SWM pond design.

2. Scope of Work

The objectives of the study were accomplished by completing the following tasks:

1. Review of borehole logs from boreholes drilled in 2020, 2022 and 2023 as part of a separate Phase Two ESA by G2S and others. Refer to Appendix B for a copy of the logs and Table 1 below for measured groundwater levels.
2. Double ring infiltration (DRI) testing at one location near the proposed storm water management pond.
3. Grain size analysis of one sample taken from the bottom of the infiltration test pit.
4. Preparation of this report.

3. Groundwater Levels

The following table summarizes the monitoring well installation details and groundwater observations.

Table 1: Summary of Groundwater Levels

Monitoring Well I.D.	*Ground Surface Elevation	Well Depth from Ground Surface (m)	Screened Interval Elevation (m) and Depth (m bgs)	Groundwater Elevation and Depth (m bgs)			
				May 25, 2023	Sept. 17, 2023	Oct. 31, 2023	June 12, 2025
BH1/MW1	217.28	5.25	215.03 – 212.03 (2.25 – 5.25)	212.90 (4.38)	212.72 (4.56)	212.78 (4.50)	212.79 (4.49)
22-BH/MW1	217.49	6.30	214.19 – 211.19 (3.60 – 6.60)	213.15 (4.34)	212.91 (4.58)	212.92 (4.57)	213.02 (4.47)
22-BH/MW9	217.90	6.20	214.70 – 211.70 (3.20 – 6.20)	213.11 (4.79)	212.84 (5.06)	–	212.95 (4.95)
BH/MW304	217.39	6.05	214.34 – 211.34 (3.05 – 6.05)	–	–	212.93 (4.46)	213.02 (4.37)
BH/MW305	217.30	6.05	214.25 – 211.25 (3.05 – 6.05)	–	–	212.64 (4.66)	–
BH/MW306	217.71	9.10	211.61 – 208.61 (6.10 – 9.10)	–	–	212.86 (4.86)	–
BH/MW307	217.67	6.05	214.62 – 211.62 (3.05 – 6.05)	–	–	213.04 (4.63)	–
BH/MW309	217.62	6.05	214.57 – 211.57 (3.05 – 6.05)	–	–	212.83 (4.79)	–

Notes: '-' Monitoring well was inaccessible/not monitored

*Benchmark used: Groundwater monitoring well (BH2/MW2, Elev. 217.72) installed by AIMS Environmental located southwest of Wilson Truck and Trailer (401 Queensway West); based on Geodetic Survey of Canada Benchmark 72U334 (CGVD28:1978), located on the northwest end of Hunt Street bridge over Patterson Creek; Elevation: 216.163 m (geodetic)

4. Infiltrometer Testing

Infiltration testing was requested to support the design and installation of a storm water management pond on-Site. To estimate the infiltration rate of existing soil, field tests were undertaken, in conjunction with grain size analysis (sieve and hydrometer).

On December 1, 2023, G2S attended the Site to assess the surficial soil infiltration rate using a double ring infiltrometer (DRI). Test pit 1 (TP1) was excavated to an approximate depth of 2.3 m bgs using an excavation contractor (Robert M. Simon Construction Ltd.) retained by G2S to allow for the DRI to seat into the native soil. DRI testing was performed by G2S staff at one location, DRI 01-23, as shown on Drawing 1 in Appendix A.

Testing procedures followed the “Low Impact Development (LID) Stormwater Management (SWM) Planning and Design Guide, 2010” (Toronto Region Conservation Authority (TRCA) and Credit Valley Conservation (CVC). Following the methodology outlined in Appendix C of the Guide the measured infiltration rates from the DRI tests were factored.

A soil sample was also collected from the bottom of the DRI test pit and submitted to the G2S laboratory for analysis of particle size distribution (grain size). These results were then used to aid in the assessment of the soil’s hydraulic conductivity and infiltration potential.

5. Findings

5.1 Double Ring Infiltrometer Testing

The soil hydraulic conductivity and infiltration rates based on the DRI test results are provided below in the following table.

Table 2: Measured Infiltration Rate and Hydraulic Conductivity based on DRI Test

Test Pit ID	Depth of Test (m bgs)	Measured Hydraulic Conductivity (cm/s)	Measured Soil Infiltration Rate (mm/hour)	Estimated Soil Infiltration Rate – Factored* (mm/hour)
TP1 DRI 01-23	2.3	2.1×10^{-2}	193	77

Note: *The LID SWM Planning and Design Guide requires implementation a safety correction factor (SCF) to calculate “Design Infiltration Rates”. A SCF of 2.5 was used.

5.2 Grain Size Analysis Testing

The results of grain size testing for the soil sample collected from the bottom of the DRI test pit are included in Appendix C and indicated the following soil composition:

DRI 01-23 (2.3 m bgs)

- 6.9% gravel, 79.2% sand, 10.4% silt and 3.5% clay

These results were used to estimate the soil hydraulic conductivity (K) and the percolation rate (T-Time) based on the Ontario Building Code (OBC). The analysis is summarized in the following table.

Table 3: Percolation Time and Hydraulic Conductivity Based on Grain Size Analysis

Sample ID	Depth of Sample (m bgs)	Soil Type	Hydraulic Conductivity (cm/sec)	Percolation Time, T (mins/cm)
TP1 DRI 01-23	2.3	SM/SP – silty sand/sand	1×10^{-1} to 1×10^{-3}	6 - 12

The hydraulic conductivity values indicate a medium permeability and the hydraulic conductivity estimates from the grain size analysis correlate relatively well with the published ranges for major soil types (Freeze and Cherry, 1979); however, it is noted the DRI testing results (Table 1 above) suggest a higher permeability than the grain size analysis.

6. Closing Remarks

We trust this report is satisfactory for your purposes. Should you have any questions, please do not hesitate to contact this office.

Yours truly,

G2S Consulting Inc.

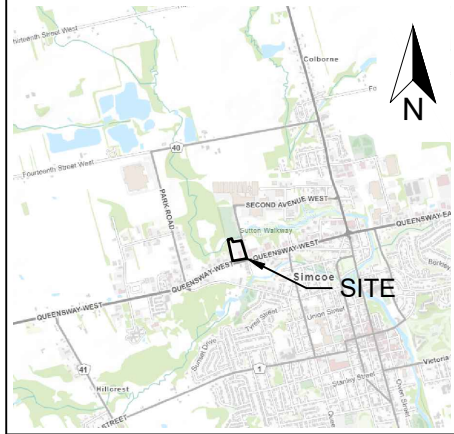
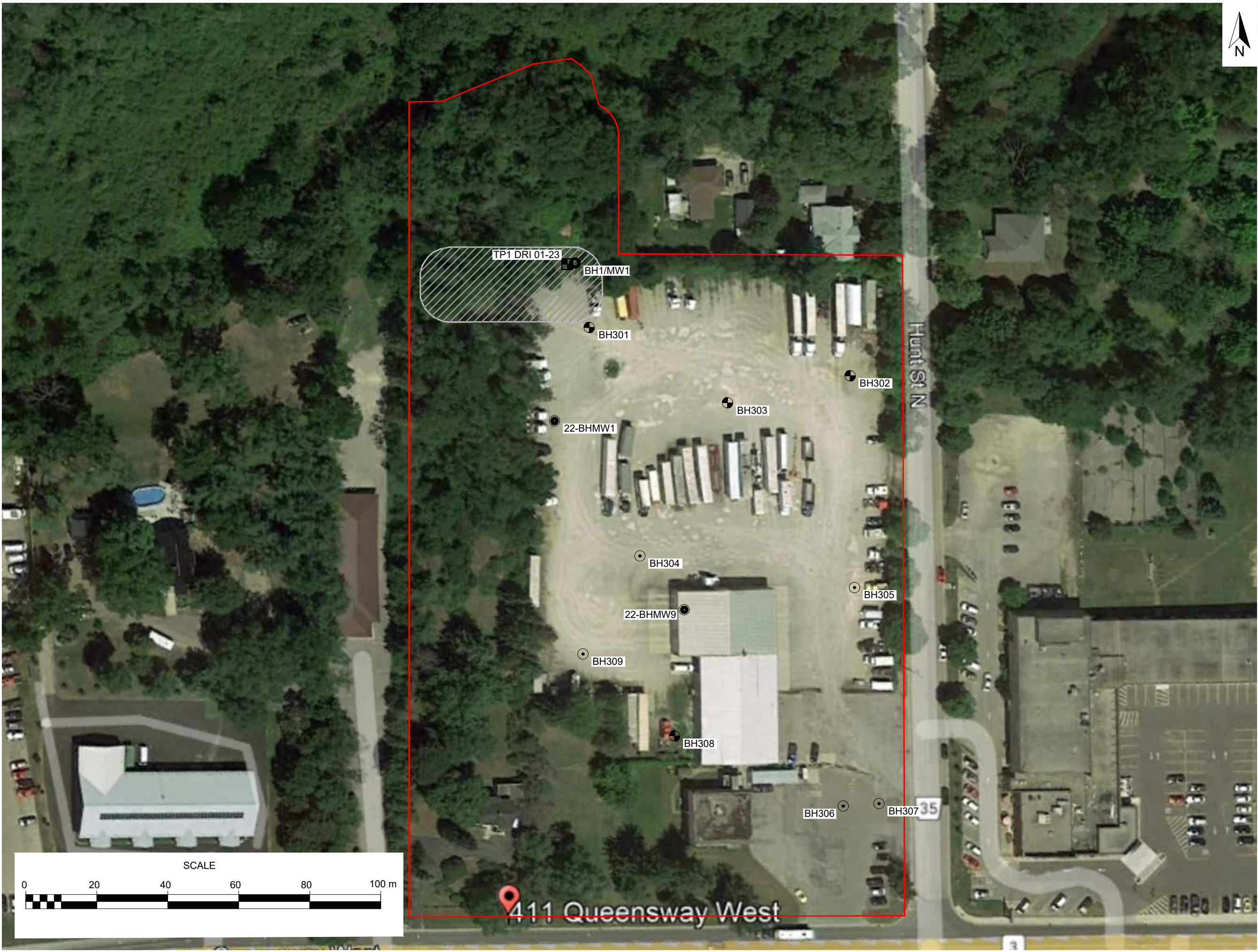


Melissa King, P.Geo., QP_{ESA}
Head of Environmental Services

Enclosures

Appendix A: Drawings
Appendix B: Borehole Logs
Appendix C: Grain Size Analysis

Appendix A: Drawings



LEGEND	
	SITE BOUNDARY
	APPROXIMATE DOUBLE RING INFILTRATOR TEST PIT LOCATION (DECEMBER 2023)
	BOREHOLE ADVANCED BY G2S (OCTOBER 2023)
	MONITORING WELL ADVANCED BY G2S (OCTOBER 2023)
	GROUNDWATER MONITORING WELL ADVANCED BY AIMS ENVIRONMENTAL (2020)
	GROUNDWATER MONITORING WELL ADVANCED BY T. HARRIS ENVIRONMENTAL MANAGEMENT (2022)
	APPROXIMATE LOCATION OF PROPOSED STORMWATER MANAGEMENT POND

REFERENCE:
DRAWING REPRODUCED FROM GOOGLE MAPS AERIAL IMAGERY

TITLE:
BOREHOLE AND MONITORING WELL LOCATION PLAN

CLIENT:
HFW HOLDINGS

LOCATION:
395, 401, 403, 405 AND 411 QUEENSWAY WEST, SIMCOE, ONTARIO

PROJECT NO.: G2S23138C

DRAWING:	1
SCALE:	AS SHOWN
DATE:	JUNE 2025
DRAWN BY:	DB
FILE NAME:	G2S23138C.dwg



Appendix B: Borehole Logs

**Note: G2S Borehole logs updated to CGVD28:78
Cosine Control Data Elevation
Borehole logs by others provided for reference purposes only.**

CLIENT HWF Holdings Limited **PROJECT NAME** Supplemental Phase Two ESA
PROJECT NUMBER G2S23138 **PROJECT LOCATION** 395 - 411 Queensway West, Simcoe, Ontario
DATE STARTED 23-10-4 **COMPLETED** 23-10-4 **GROUND ELEVATION** 217.04 m
DRILLING CONTRACTOR Elite Drilling **LOGGED BY** SP **CHECKED BY** MK
DRILLING METHOD Diedrich D50 **NOTES** _____

DEPTH (m)	MATERIAL DESCRIPTION	ELEVATION (m)	GRAPHIC LOG	NUMBER	TYPE	SOIL GAS READINGS HEX/BL (ppm)	WELL DIAGRAM
0.3	SAND AND GRAVEL: Light grey sand and gravel	216.74		S1A	SPT	0/0	
	FILL: Reddish brown silty sand, trace gravel			S1B	SPT	0/0	
1				S2	SPT	0/0	
1.5		215.52		S3	SPT	0/0	
2	SAND: Light brown to brown sand, coarse to medium sand and trace gravel			S4	SPT	0/0	
3				S5	SPT	0/0	
3.7		213.38					

Borehole terminated at 3.7 m.

CLIENT HWF Holdings Limited **PROJECT NAME** Supplemental Phase Two ESA
PROJECT NUMBER G2S23138 **PROJECT LOCATION** 395 - 411 Queensway West, Simcoe, Ontario
DATE STARTED 23-10-3 **COMPLETED** 23-10-3 **GROUND ELEVATION** 217.11 m
DRILLING CONTRACTOR Elite Drilling **LOGGED BY** SP **CHECKED BY** MK
DRILLING METHOD Diedrich D50 **NOTES** _____

DEPTH (m)	MATERIAL DESCRIPTION	ELEVATION (m)	GRAPHIC LOG	NUMBER	TYPE	SOIL GAS READINGS HEX/IBL (ppm)	WELL DIAGRAM
0.1	SAND AND GRAVEL: Light grey sand and gravel, trace silt	217.01		S1A	SPT	0/0	
	FILL: Brown silty sand, moist			S1B	SPT	0/0	
0.8		216.35					
1	SANDY SILT: Brown sandy silt, moist			S2	SPT	0/0	
2				S3	SPT	10/0	
2.3	becoming wet	214.82					
				S4	SPT	55/0	
3	trace gravel	214.06					
				S5	SPT	25/0	
3.7		213.45					

Borehole terminated at 3.7 m.

CLIENT HWF Holdings Limited **PROJECT NAME** Supplemental Phase Two ESA
PROJECT NUMBER G2S23138 **PROJECT LOCATION** 395 - 411 Queensway West, Simcoe, Ontario
DATE STARTED 23-10-3 **COMPLETED** 23-10-3 **GROUND ELEVATION** 216.98 m
DRILLING CONTRACTOR Elite Drilling **LOGGED BY** SP **CHECKED BY** MK
DRILLING METHOD Diedrich D50 **NOTES** _____

DEPTH (m)	MATERIAL DESCRIPTION	ELEVATION (m)	GRAPHIC LOG	NUMBER	TYPE	SOIL GAS READINGS HEX/IBL (ppm)	WELL DIAGRAM
0.1	SAND AND GRAVEL: Light grey sand and gravel, trace silt	216.88		S1A	SPT	25/1	
0.6	FILL: Brown sandy silt, trace gravel	216.37		S1B	SPT	15/0	
1	SILTY SAND: Brown silty sand, moist to wet			S2	SPT	0/1	
2				S3	SPT	0/1	
3				S4	SPT	0/0	
3.1	becoming grey	213.93		S5A	SPT	0/1	
3.7		213.32		S5B	SPT	0/2	

Borehole terminated at 3.7 m.

CLIENT HWF Holdings Limited **PROJECT NAME** Supplemental Phase Two ESA
PROJECT NUMBER G2S23138 **PROJECT LOCATION** 395 - 411 Queensway West, Simcoe, Ontario
DATE STARTED 23-10-4 **COMPLETED** 23-10-4 **GROUND ELEVATION** 217.39 m
DRILLING CONTRACTOR Elite Drilling **LOGGED BY** SP **CHECKED BY** MK
DRILLING METHOD Diedrich D50 **NOTES** _____

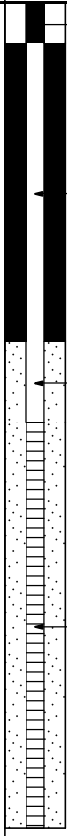
DEPTH (m)	MATERIAL DESCRIPTION	ELEVATION (m)	GRAPHIC LOG	NUMBER	TYPE	SOIL GAS READINGS HEX/IBL (ppm)	WELL DIAGRAM
0.2	SAND AND GRAVEL: Light grey sand and gravel, trace silt FILL: Reddish brown silty sand, trace to some gravel	217.19		S1A	SPT	0/1	Flushmount protective casing set in concrete
				S1B	SPT	0/0	
1				S2A	SPT	0/0	
1.1	SANDY SILT: Brown sandy silt, moist	216.29		S2B	SPT	5/0	Bentonite seal
2				S3	SPT	0/0	
2.3	SAND: Brown sand, trace silt, moist	215.10		S4	SPT	0/0	Filter sand
3				S5	SPT	0/1	3.10
4				S6A	SPT	0/1	
				S6B	SPT	0/1	
5				S7	SPT	0/1	Slotted screen
5.2	becoming wet	212.21		S8	SPT	20/0	
6				S9	SPT	20/0	6.10
6.7		210.68					

Borehole terminated at 6.7 m.

Water Level Readings:

Date	Depth (m)	Elev. (m)
2023-10-31	4.46	212.93

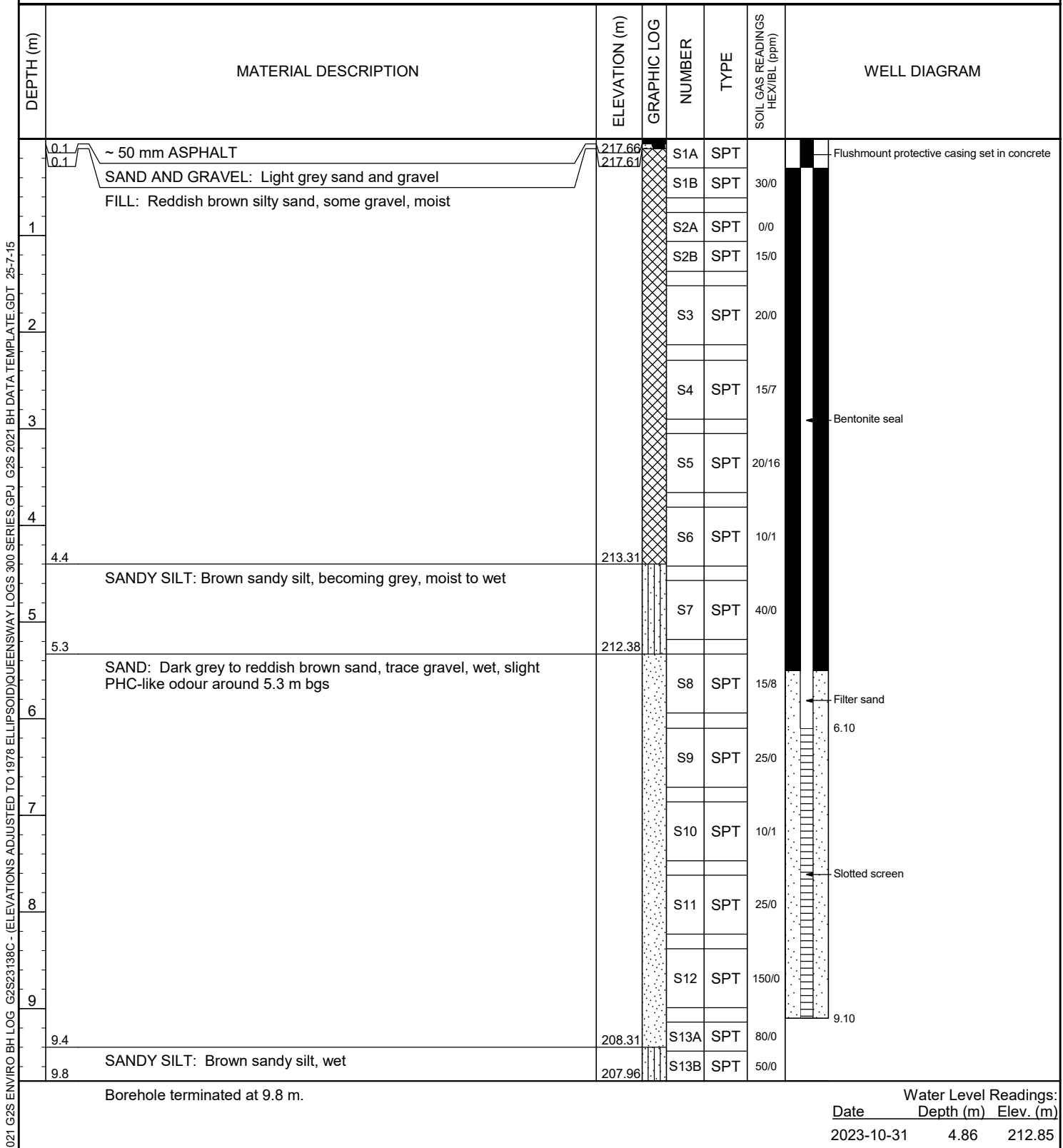
CLIENT <u>HWF Holdings Limited</u>	PROJECT NAME <u>Supplemental Phase Two ESA</u>
PROJECT NUMBER <u>G2S23138</u>	PROJECT LOCATION <u>395 - 411 Queensway West, Simcoe, Ontario</u>
DATE STARTED <u>23-10-4</u> COMPLETED <u>23-10-4</u>	GROUND ELEVATION <u>217.3 m</u>
DRILLING CONTRACTOR <u>Elite Drilling</u>	LOGGED BY <u>SP</u> CHECKED BY <u>MK</u>
DRILLING METHOD <u>Diedrich D50</u>	NOTES _____

DEPTH (m)	MATERIAL DESCRIPTION	ELEVATION (m)	GRAPHIC LOG	NUMBER	TYPE	SOIL GAS READINGS HEX/IBL (ppm)	WELL DIAGRAM
0.1	SAND AND GRAVEL: Light grey sand and gravel, trace silt	217.20		S1A	SPT	30/0	 Flushmount protective casing set in concrete Bentonite seal Filter sand 3.10 Slotted screen 6.10
	FILL: Reddish brown sand, trace silt, trace gravel			S1B	SPT	30/0	
0.8		216.54					
1	SILTY SAND: Reddish brown silty sand, moist			S2A	SPT	20/0	
				S2B	SPT	10/0	
2				S3	SPT	20/0	
				S4	SPT	15/0	
3		214.25					
3.1	becoming wet			S5	SPT	20/0	
4		213.49					
3.8	becoming grey, trace clay, wet			S6	SPT	25/0	
5				S7	SPT	25/0	
6				S8	SPT	15/0	
6.7		210.59		S9	SPT	15/0	

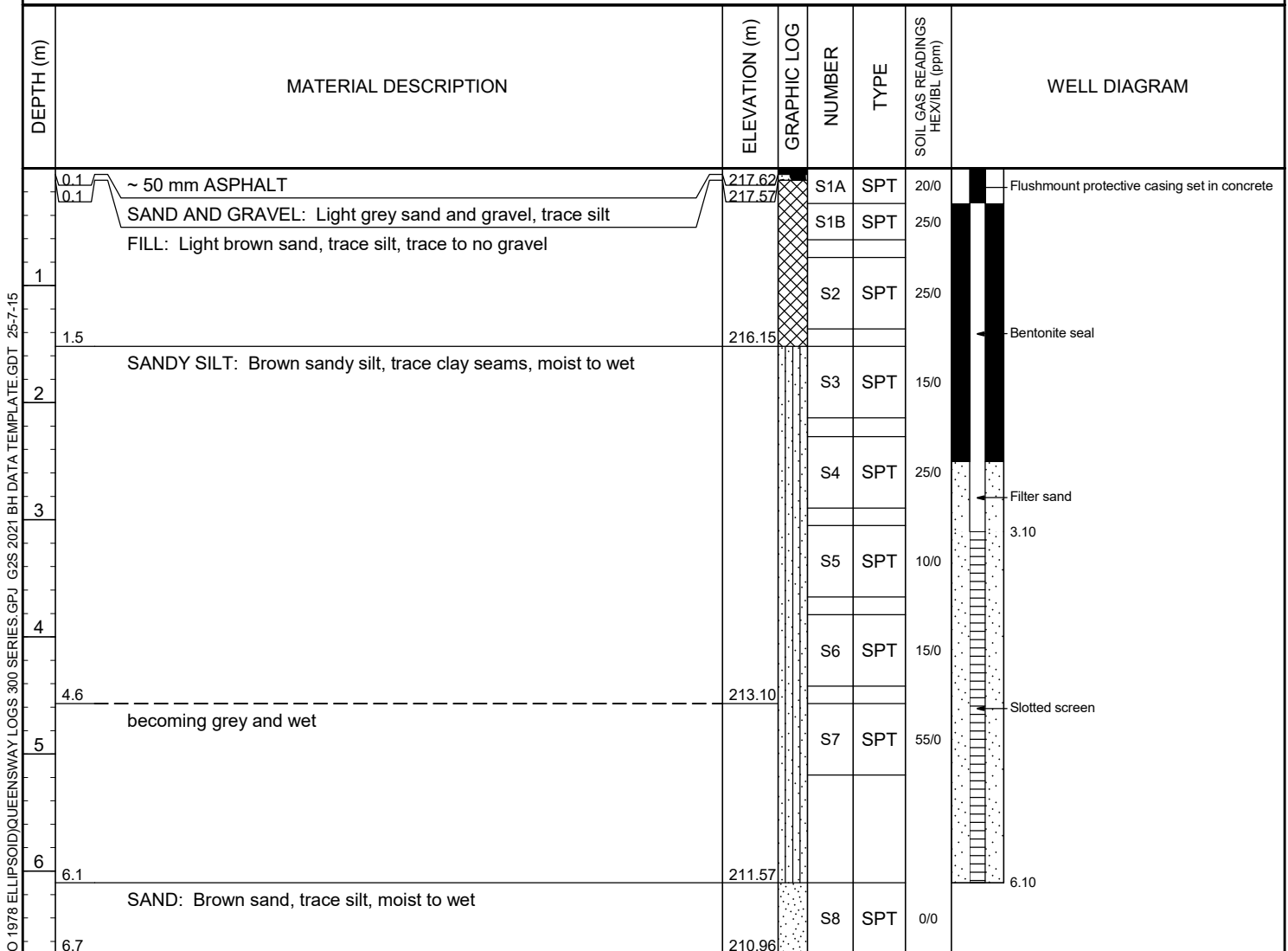
Borehole terminated at 6.7 m.

Water Level Readings:		
Date	Depth (m)	Elev. (m)
2023-10-31	4.66	212.64

CLIENT <u>HWF Holdings Limited</u>	PROJECT NAME <u>Supplemental Phase Two ESA</u>
PROJECT NUMBER <u>G2S23138</u>	PROJECT LOCATION <u>395 - 411 Queensway West, Simcoe, Ontario</u>
DATE STARTED <u>23-10-3</u> COMPLETED <u>23-10-3</u>	GROUND ELEVATION <u>217.71 m</u>
DRILLING CONTRACTOR <u>Elite Drilling</u>	LOGGED BY <u>SP</u> CHECKED BY <u>MK</u>
DRILLING METHOD <u>Diedrich D50</u>	NOTES _____



CLIENT <u>HWF Holdings Limited</u>	PROJECT NAME <u>Supplemental Phase Two ESA</u>
PROJECT NUMBER <u>G2S23138</u>	PROJECT LOCATION <u>395 - 411 Queensway West, Simcoe, Ontario</u>
DATE STARTED <u>23-10-4</u> COMPLETED <u>23-10-4</u>	GROUND ELEVATION <u>217.67 m</u>
DRILLING CONTRACTOR <u>Elite Drilling / Davis Drilling Ltd.</u>	LOGGED BY <u>SP</u> CHECKED BY <u>MK</u>
DRILLING METHOD <u>Diedrich D50</u>	NOTES _____



Borehole terminated at 6.7 m.

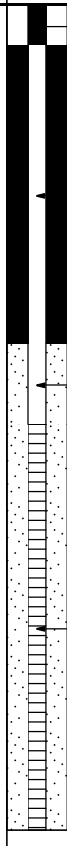
Water Level Readings:		
Date	Depth (m)	Elev. (m)
2023-10-31	4.63	213.04

CLIENT HWF Holdings Limited **PROJECT NAME** Supplemental Phase Two ESA
PROJECT NUMBER G2S23138 **PROJECT LOCATION** 395 - 411 Queensway West, Simcoe, Ontario
DATE STARTED 23-10-17 **COMPLETED** 23-10-17 **GROUND ELEVATION** 217.66 m
DRILLING CONTRACTOR Davis Drilling Ltd. **LOGGED BY** SP **CHECKED BY** MK
DRILLING METHOD CME 75 Truck **NOTES** _____

DEPTH (m)	MATERIAL DESCRIPTION	ELEVATION (m)	GRAPHIC LOG	NUMBER	TYPE	SOIL GAS READINGS HEX/BL (ppm)	WELL DIAGRAM
0.6	SAND AND GRAVEL: Brown sand and gravel, trace silt	217.05		S1A	SPT		
1	FILL: Brown silty sand, trace gravel, moist			S1B	SPT		
2				S2	SPT		
2.3		215.37		S3	SPT		
3	SAND: Brown sand, trace to no gravel			S4A	SPT		
3.1		214.61		S4B	SPT		
4	some silt seams			S5A	SPT		
5				S5B	SPT		
5.3		212.33		S6	SPT		
6	becoming grey and wet			S7	SPT		
6.7		210.95		S8	SPT		
				S9	SPT		

Borehole terminated at 6.7 m.

CLIENT <u>HWF Holdings Limited</u>	PROJECT NAME <u>Supplemental Phase Two ESA</u>
PROJECT NUMBER <u>G2S23138</u>	PROJECT LOCATION <u>395 - 411 Queensway West, Simcoe, Ontario</u>
DATE STARTED <u>23-10-17</u> COMPLETED <u>23-10-17</u>	GROUND ELEVATION <u>217.62 m</u>
DRILLING CONTRACTOR <u>Davis Drilling Ltd.</u>	LOGGED BY <u>SP</u> CHECKED BY <u>MK</u>
DRILLING METHOD <u>CME 75 Truck</u>	NOTES _____

DEPTH (m)	MATERIAL DESCRIPTION	ELEVATION (m)	GRAPHIC LOG	NUMBER	TYPE	SOIL GAS READINGS HEX/IBL (ppm)	WELL DIAGRAM
0.2	SAND AND GRAVEL: Light grey to grey sand and gravel, trace silt SAND: Reddish brown to brown sand, trace silt, trace gravel	217.42		S1A	SPT	0/0	 Flushmount protective casing set in concrete Bentonite seal Filter sand 3.10 Slotted screen 6.10
				S1B	SPT	0/0	
1				S2A	SPT	0/1	
				S2B	SPT	0/0	
2				S3	SPT	0/0	
				S4	SPT	0/0	
3				S5	SPT	0/1	
4				S6A	SPT	0/0	
				S6B	SPT	0/0	
4.6	becoming wet	213.05		S7	SPT	0/1	
5				S8	SPT	0/2	
6				S9	SPT	0/0	
6.7		210.91					

Borehole terminated at 6.7 m.

Water Level Readings:		
Date	Depth (m)	Elev. (m)
2023-10-31	4.79	212.83

Log of Borehole No. BH1/MW1

SUBSURFACE PROFILE				SAMPLE				LABORATORY		WELL DATA	
Depth	Symbol	Lithographic Description	Geodetic Elevation (m asl)	Number	Type	Vapour Screening (ppm or %LEL)	Remarks	Laboratory Analysis		Well Construction	Monitoring Data
ft m		Ground Surface	216.84			OVM		Soil	GW		
0 0		Topsoil/Sod									
		Silty Sand Fill	216.5	1	DT	0	No Odour				
2 1		with some gravel; brown Medium to Coarse Sand	216	2	DT	0	No Odour	Metals			
4 2		with some gravel and trace silt; brown	215.5								
6 2			215	3	DT	0	No Odour				
8 3			214.5	4	DT	5	No Odour				
10 3			214								
12 4			213.5	5	DT	0	No Odour				
14 4			213	6	DT	0	No Odour				
16 5			212.5								
18 6		wet	212	7	DT	0	No Odour				
20 6		Sandy Silt	211.5								
		with some clay; brown; wet grey	211	8	DT	45	No Odour				
			210.5								
		Borehole terminated at 6.1 m bgs; caved in to 5.3 m bgs prior to well installation									

Metals; VOCs

4.26 m bgs
March 26, 2020
4.31 m bgs
April 28, 2020

Drill Date: 03/24/2020

AiMS Field Supervisor: DK

Approved By: FF

Contractor: Strata Drilling Group

Borehole Ø: 60 mm

Equipment: Geoprobe 7822 Direct Push Machine with Dual Tubes

Well Ø: 32 mm

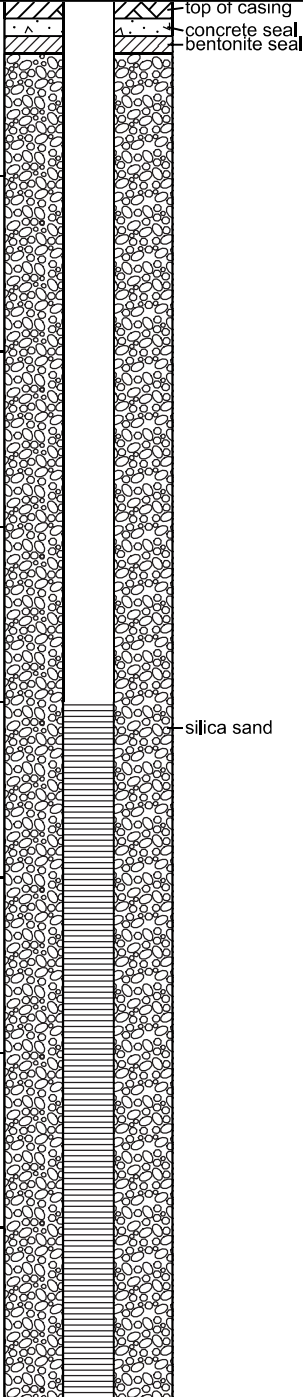
BOREHOLE LOG BHMW1

PROJECT NUMBER 18122
PROJECT NAME HFW RSC Phase II
CLIENT HFW Holdings Limited
ADDRESS 401 Queensway W. Simcoe, ON

DRILLING DATE 08/31/2022
TOTAL DEPTH 20 ft
DIAMETER 6 in
Drilled by: Triphase
Drill Method: CME55

Borehole name: BHMW1

LOGGED BY AS
CHECKED BY DH

VOC READING (ppb)	Samples	Analysed	% Recovery	Depth (ft)	Graphic Log	Moisture	Material Description	Well Diagram
0	BHMW1-1	Y		1		Dry	fill, grey/brown, low density	 top of casing concrete seal bentonite seal silica sand
0	BHMW1-2	N		2		Dry	sand, brown, low density	
0	BHMW1-3	Y		3		Damp	sand, brown, low density	
0	BHMW1-4	N		4		Dry	sand, brown, low density	
0	BHMW1-5	N		5		Dry	sand w/ gravel, brown, low density	
0	BHMW1-6	N		6		Damp	sand, brown, low density	
0	BHMW1-7	N		7		Wet	sand, brown, medium density	
0	BHMW1-8	N		8		Wet	sand, brown, medium density	
				19			End of borehole	

BOREHOLE LOG BHMW9

PROJECT NUMBER 18122
PROJECT NAME HFW RSC Phase II
CLIENT HFW Holdings Limited
ADDRESS 401 Queensway W. Simcoe, ON

DRILLING DATE 09/01/2022
TOTAL DEPTH 20 ft
DIAMETER 6 in
Drilled by: Kodiak
Drill Method: 6620DT

Borehole name: BHMW9

LOGGED BY AS
CHECKED BY DH

VOC READING (ppb)	Samples	Analysed	% Recovery	Depth (ft)	Graphic Log	Moisture	Material Description	Well Diagram
0	BHMW9-1	N		1		dry	concrete, sand, brown, low density	top of casing concrete seal bentonite seal silica sand
0	BHMW9-2	N		2		dry	sand, brown, low density	
0	BHMW9-3	N		3		wet	silt, brown, medium density	
0	BHMW9-4	Y		4		wet	silt, brown, medium density	
0	BHMW9-5	N		5		wet	silt, brown, medium density	
0	BHMW9-6	Y		6		damp	silty sand, brown low density	
0	BHMW9-7	N		7		damp	sand, brown, low density	
0	BHMW9-8	N		8		wet	sand, brown, low density	
				19			End of borehole	

Appendix C: Grain Size Analysis

Project No.: G2S23138

Lab No.: 23101

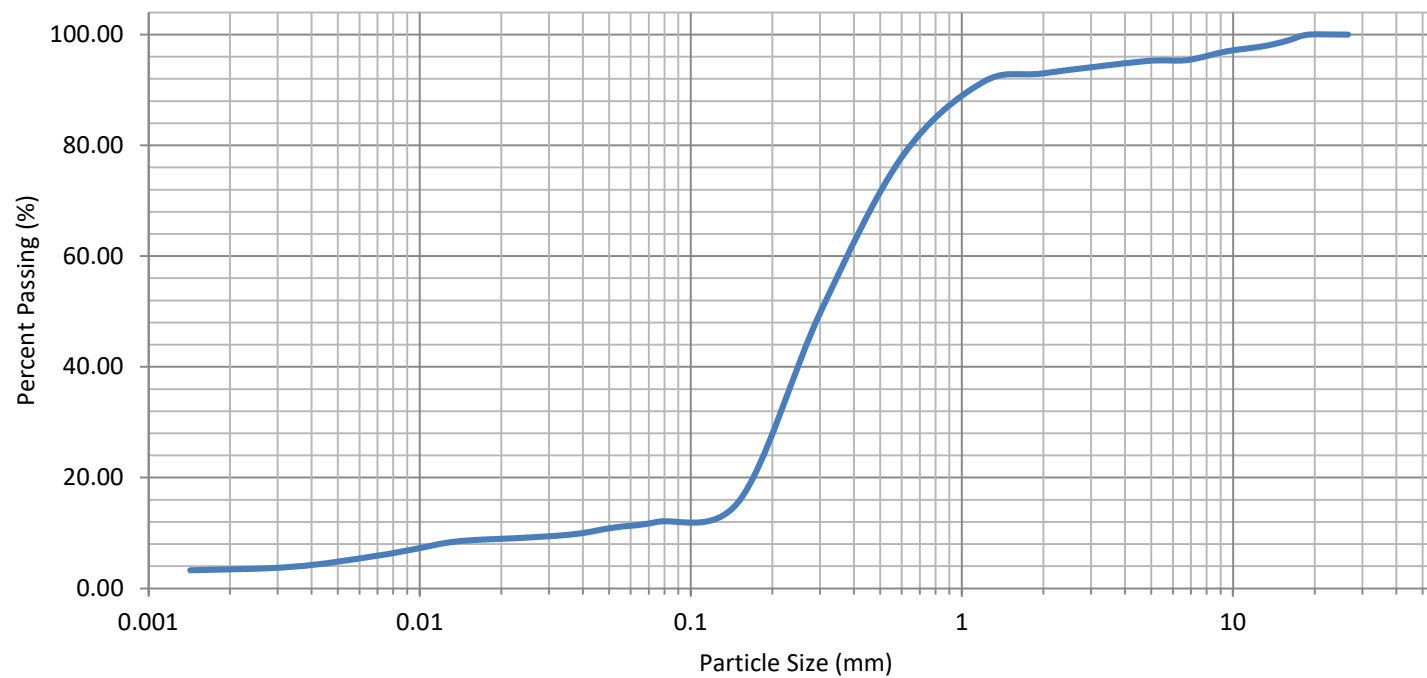
Project Name: Queensway west

Borehole/Sample No.: TP1-DR1-01-23

ISSMGE SOIL CLASSIFICATION

CLAY	SILT			SAND			GRAVEL		
	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE

SIEVE SIZE: 1 2 6 20 60#200 #100 #50 #16 #8 #4 3/8" 3/4" 2-1/2"



July 24, 2025,

Reference No.: G2S23138F

HFW Holdings Limited
301 Broadview Avenue
Toronto, Ontario
M4M 2G8

Attention: Mr. Gary Brasenell

Technical Memorandum
Comments from Norfolk County on the Stormwater Management Pond
at 395 - 411 Queensway West, Simcoe, Ontario

1. Introduction & Background

G2S Consulting Inc. (G2S) was retained by HFW Holdings Limited (the Client) to issue a technical memorandum to address the County of Norfolk comments regarding the design and construction of the proposed Storm Water Management Pond (SWMP) at the proposed residential development located at the rear (north portion) of 395-411 Queensway West, Simcoe, Ontario, hereinafter referred to as the 'Site'. The Site is located on the north side of Queensway West in between Hunt Street North and Park Road and covers an approximate plan area of 1.7 hectares (4.3 acres), with frontage of approximately 185 m on Hunt Street North. The Site is currently developed with the north portion of a commercial truck repair facility building and the remainder is vacant, gravel parking areas.

Norfolk County has raised the following concerns regarding the comments and recommendations pertinent to the design and construction of the SWMP as outlined in the submitted geotechnical and hydrogeological reports by GeoPro Consulting Limited (dated May 17, 2024, and February 1, 2024, respectively). These comments are as follows:

- *Applicant to confirm uplift pressure considerations with respect to the observed seasonally high groundwater elevation and confirm if permanent dewatering is required. Further, confirm if the SWM pond requires pond liner considerations and provide alternatives to meet site-wide water balance requirements as appropriate.*
- *Given the SWM pond quantity control is reduced by the infiltration basin's recharge potential, confirm of any hydrostatic uplift pressure that may negate this potential recharge. It is noted that the GeoPro Consulting Limited Report Section 4.2 specifies uplift resistances to be considered to be at least 2.0 m above highest groundwater table observances. Note, County requires groundwater elevation observances to be representatively high on seasonal basis.*

This technical memorandum would aim to use the provided groundwater conditions to evaluate the potential for hydrostatic uplift on the SWM pond and its components, and to confirm the long-term effectiveness of the infiltration measures put in place.

The following documents were referred to in preparation of the current memorandum:

- G2S Consulting Inc. Soil Infiltration Assessment, 395 - 411 Queensway West, Simcoe, Ontario, dated July 15, 2025.
- GeoPro Project No.: 22-4078GH, Preliminary Geotechnical Investigation, Proposed Residential Development, 395-411 Queensway West, Simcoe, Ontario, dated May 17, 2024.
- GeoPro Project No.: 22-4078H, Preliminary Hydrogeological Assessment Proposed Residential Development, 395-411 Queensway West, Simcoe, Ontario, dated February 1, 2024.
- Drawing No. C105, titled PLAN & PROFILE SWM POND AND OUTLET, dated May 15, 2024, by G. D. Vallee Limited.

Based on the geotechnical report, by GeoPro, which was provided to us by the Client, the site subsurface condition generally consists of fill materials overlying natural sand deposits. The fill, found from the surface down to depths of 1.0 m to 4.0 m, varies in composition and was found very loose to compact.

Based on Drawing No. C105, the proposed pond invert is at elevation of approximately (~Elev. 215.0 m). As per GeoPro Report No. 22-4078H, the soil at this elevation is primarily consisted of fill material. As such, the geotechnical and infiltration parameters of soil are expected to be highly variable. The available data to us has been reviewed in our assessment, including the results of the Double Ring Infiltrometer Testing, which was carried out on December 1, 2023.

Following the preparation of geotechnical report by GeoPro, G2S obtained additional water level readings. As presented in the referenced G2S Soil Infiltration Assessment report, the water level readings have remained consistent within the range of 212.64 to 213.15 m. Given this consistency as well as the extended period of groundwater observation, the 2.0 m allowance above the highest observed groundwater table is not deemed necessary. However, for the purpose of our assessment and as a conservative approach a 1.0 m increase above the highest recorded groundwater level was adequately considered an elevated groundwater condition.

2. Investigation of Failure States

2.1 Infiltration Capacity

The infiltration inside the saturated soil can be investigated by Darcy's law:

$$q=k \cdot i$$

where's

q: the discharge volume per unit area or discharge velocity (mm/hour).

K: the hydraulic conductivity of the soil (cm/s)

I: the hydraulic gradient as a ratio of difference in total head vs flow path

For demonstrating the reduction in absorption/ discharge capacity of the pond, we have compared four states of high and low groundwater levels with reference to the drawings by G.D. Vallee Ltd., at (~Elev. 214.15 m) and (~Elev. 212.35 m) combined with highest and lowest flood levels, 100-year flood level (~Elev. 216.32 m) and a dry base for pond condition (~Elev. 215.00 m).

Based on the calculation as provided in Table 1, it is shown that the infiltration capacity of the pond reduces as the water table rises beneath the pond, and declines to a zero-capacity state when the groundwater level reaches the bottom of pond.

Table 1: Summary of Discharge Capacity Calculations

Parameter	Scenario 1: Higher Flood, Higher GW	Scenario 2: Higher Flood, Lower GW	Scenario 3: Lower Flood, Lower GW	Scenario 4: Lower Flood, Higher GW
Pond Water Level (m)	216.32	216.32	215.00	215.00
Bottom of Pond (m)	215.00	215.00	215.00	215.00
Infiltration Bed Thickness* (m)	0.3	0.3	0.3	0.3
Groundwater Level (m)	214.15	212.35	212.35	214.15
Hydraulic Conductivity (cm/s)	2.1×10^{-2}	2.1×10^{-2}	2.1×10^{-2}	2.1×10^{-2}
Hydraulic Head (m)	2.17	3.97	2.65	0.85
Unsaturated Zone Thickness (m)	0.85	2.65	2.65	0.85
Hydraulic Gradient	2.55	1.50	1.00	1.00
Infiltration Rate** (mm/hour)	1930.0	1132.0	756.0	756.0
Factored Infiltration Rate (mm/hour)	643.3	377.5	252.0	252.0

*This layer likely has a very high hydraulic conductivity compared to the native soils below it. Therefore, the head loss across this 0.3 m layer might be relatively small.

**Assumed under constant water head

2.2 Uplift Potential and Pond Stability

Uplift pressure is a concern for the infiltration pond when the groundwater table rises to or above the base of the infiltration bed, which is located at elevation 214.70 m. The groundwater level assumed for uplift consideration was at approximately (~Elev. 214.15), which is below an

elevation of (~Elev. 214.70 m). Therefore, the potential for uplift under the current proposed SWMP profile is negligible. However, should the groundwater rise above (~Elev. 214.70 m), attributed to seasonal recharge, mounding effects, or changes in regional hydrogeology then hydrostatic uplift forces begin to act upward on the base of the infiltration bed. These forces act against the downward loads provided by the self-weight of the infiltration bed (0.3 m thick infiltration stone), the overlying ponded water, and any structural or geotechnical surcharge if present. The Factor of Safety (FOS) against uplift is calculated as the ratio of total resisting pressure to uplift pressure.

2.3 Basin Below Pond

The basin below the pond should include an engineered permeable layer composed of clean aggregate with carefully controlled gradation, such as gravel or crushed stone. The material selection must prioritize optimal pore space configuration to facilitate water infiltration while minimizing clay and silt content to achieve the permeability specifications determined by hydrogeological analysis. This base layer will be compacted to 95% of the Standard Proctor Maximum Dry Density (SPMDD), with the specific compaction rate subject to the geotechnical engineer of record assessment of the imported material's type, gradation, and required infiltration characteristics. The final compaction shall ensure structural stability, minimize settlement, and meet project-specific engineering requirements. The top stratum may incorporate organic materials to enhance nutrient filtration and provide additional erosion resistance. If the subsoil is prone to a high-water table or significant clay content, a segregation layer such as non-woven geotechnical geotextile fabric (e.g. Terrafix 270R or similar fabric materials) can be installed around the infiltration layer to collect excess water and prevent migration of fine particles inside the basal pond.

3. Erosion Control Measures

The faces of the embankment should have adequate protection against erosion and possible breaching due to excessive precipitation events and frost action. Riprap or other erosion protection blankets such as Maccaferri MacMat should be considered in the construction. The downstream slopes should be protected where necessary against the erosive action of runoff, seepage flows, frost and burrowing animals. Materials used for erosion protection should be hard and durable and not susceptible to breakdown. It is also recommended that the side slopes be vegetated as additional measures to stabilize the surface and reduce the risk of surficial erosion.

4. Monitoring and Maintenance

During construction, temporary erosion and sediment control measures (e.g., silt fences and sediment traps) should be monitored daily. Permanent stabilization (e.g., vegetation, riprap) shall be completed before removing temporary controls.

After the construction, a monitoring plan should be put in place to observe the groundwater level, especially following excessive precipitation or flash flooding events to monitor the performance of the dyke and erosion control measures and issue recommendations with restoration or repair plans if required.

5. Closing Remarks

Should you have any questions regarding the information contained in this memorandum, please do not hesitate to contact this office.

Yours truly,

G2S Consulting Inc.



Navid Shafiee, P.Eng.
Geotechnical Engineer



Ashraf Abass, P. Eng.
Senior Geotechnical Engineer

APPENDIX C

Hydroworks HydroDome Sizing Report
Hydroworks HydroDome Operations & Maintenance Manual
OGS Buoyancy Calculations



Hydroworks Sizing Summary

HFW Hunt Street

Simcoe

04-30-2026

Recommended Size: HydroDome HD 10

Hydroworks Sizing Program Version 5.8.5

A HydroDome HD 10 is recommended to provide 80 % annual TSS removal based on a drainage area of 2.55 (ha) with an imperviousness of 73 % and London Intl Airport, Ontario rainfall for the ETV particle size distribution.

The recommended HydroDome HD 10 treats 100 % of the annual runoff and provides 80 % annual TSS removal for the London Intl Airport rainfall records and ETV particle size distribution.

The HydroDome has a siphon which creates a discontinuity in headloss. Since a peak flow was not specified, headloss was calculated using the full pipe flow of .46 (m³/s) for the given 675 (mm) pipe diameter at .3% slope. The headloss was calculated to be 397 (mm) above the crown of the 675 (mm) outlet pipe.

This summary report provides the main parameters that were used for sizing. These parameters are shown on the summary tables and graphs provided in this report.

If you have any questions regarding this sizing summary please do not hesitate to contact Hydroworks at 888-290-7900 or email us at support@hydroworks.com.

The sizing program is for sizing purposes only and does not address any site specific parameters such as hydraulic gradeline, tailwater submergence, groundwater, soils bearing capacity, etc. Headloss calculations are not a hydraulic gradeline calculation since this requires a starting water level and an analysis of the entire system downstream of the HydroDome .

TSS Removal Sizing Summary

Hydroworks Siphon Separator Sizing Program - HydroDome

File Product Units CAD Video Help

Main Dimensions Rainfall Site TSS PSD TSS Load Site Storage By-Pass Custom CAD Video Other

Site Parameters
 Area (ha) 2.55
 Imperviousness (%) 73

Units
☐ U.S.
☒ Metric

Rainfall Station
 London Intl Airport Ontario
 1960 To 2002 Rainfall Timestep = 60 min.

Project Title
 (2 lines) HFW Hunt Street
 Simcoe

Outlet Pipe
 Diam. (mm) 675 Peak Design Flow (m3/s)
 Slope (%) .3

Lab Sizing Results ☐ Post Treatment Recharge

HydroDome Annual Sizing Results

Model #	Qlow (m3/s)	Qtot (m3/s)	Flow Capture (%)	TSS Removal (%)
Unavailable	.46	.46	100 %	45 %
HD 4	.46	.46	100 %	54 %
HD 5	.46	.46	100 %	61 %
HD 6	.46	.46	100 %	66 %
Unavailable	.46	.46	100 %	70 %
HD 8	.46	.46	100 %	73 %
HD 10	.46	.46	100 %	80 %
HD 12	.46	.46	100 %	84 %

Particle Size Distribution

Size (um)	%	SG
1	5	2.65
4	5	2.65
6	5	2.65
7	5	2.65
18	15	2.65
45	10	2.65
70	5	2.65
90	10	2.65
125	15	2.65
200	15	2.65

Note: Results vary significantly based on particle size distribution

Simulate

TSS Particle Size Distribution

Hydroworks Siphon Separator Sizing Program - HydroDome

File Product Units CAD Video Help

Main Dimensions Rainfall Site TSS PSD TSS Load Site Storage By-Pass Custom CAD Video Other

TSS Particle Size Distribution

Size (um)	%	SG
1	5	2.65
4	5	2.65
6	5	2.65
7	5	2.65
18	15	2.65
45	10	2.65
70	5	2.65
90	10	2.65
125	15	2.65
200	15	2.65
400	5	2.65
850	5	2.65
*		

Notes:

1. To change data just click a cell and type in the new value(s)
2. To add a row just go to the bottom of the table and start typing.
3. To delete a row, select the row by clicking on the first pointer column, then press delete
4. To sort the table click on one of the column headings

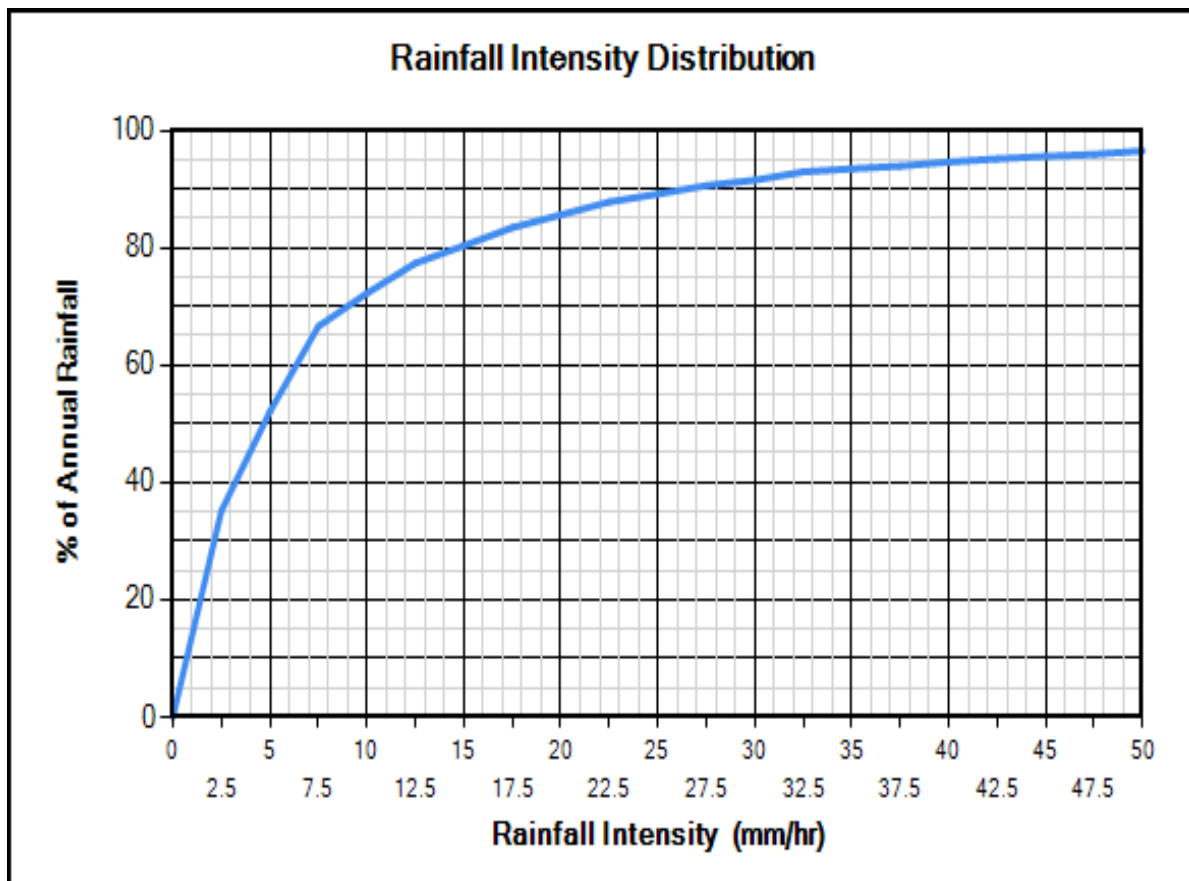
TSS Distributions

☒ ETV Canada
☐ Standard HDS Design
☐ Alden Laboratory
☐ OK110
☐ Toronto
☐ Ontario Fine
☐ ETV Canada (Calgary)
☐ Calgary Forebay
☐ Kitchener
☐ User Defined

Clear

You must select a particle size distribution for TSS to simulate TSS removal

Water Temp (C) 20



Site Physical Characteristics

Hydroworks Siphon Separator Sizing Program - HydroDome

File Product Units CAD Video Help

Main Dimensions Rainfall Site TSS PSD TSS Load Site Storage By-Pass Custom CAD Video Other

Catchment Parameters

Width (m) Imperv. Mannings n Maintenance Frequency (months)

Perv Mannings n

Slope (%) Imp. Depress. Storage (mm)

Perv. Depress. Storage (mm)

Daily Evaporation (mm/day)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	2.54	2.54	3.8100...	3.8100...	3.8100...	2.54	2.54	0	0

Infiltration

Max. Infiltration Rate (mm/hr)

Min. Infiltration Rate (mm/hr)

Infiltration Decay Rate (1/s)

Infiltration Regen. Rate (1/s)

Catch Basins

of Catch basins

Constant Baseflow

Roof Runoff (m3/s)

Dimensions And Capacities

Hydroworks Siphon Separator Sizing Program - HydroDome

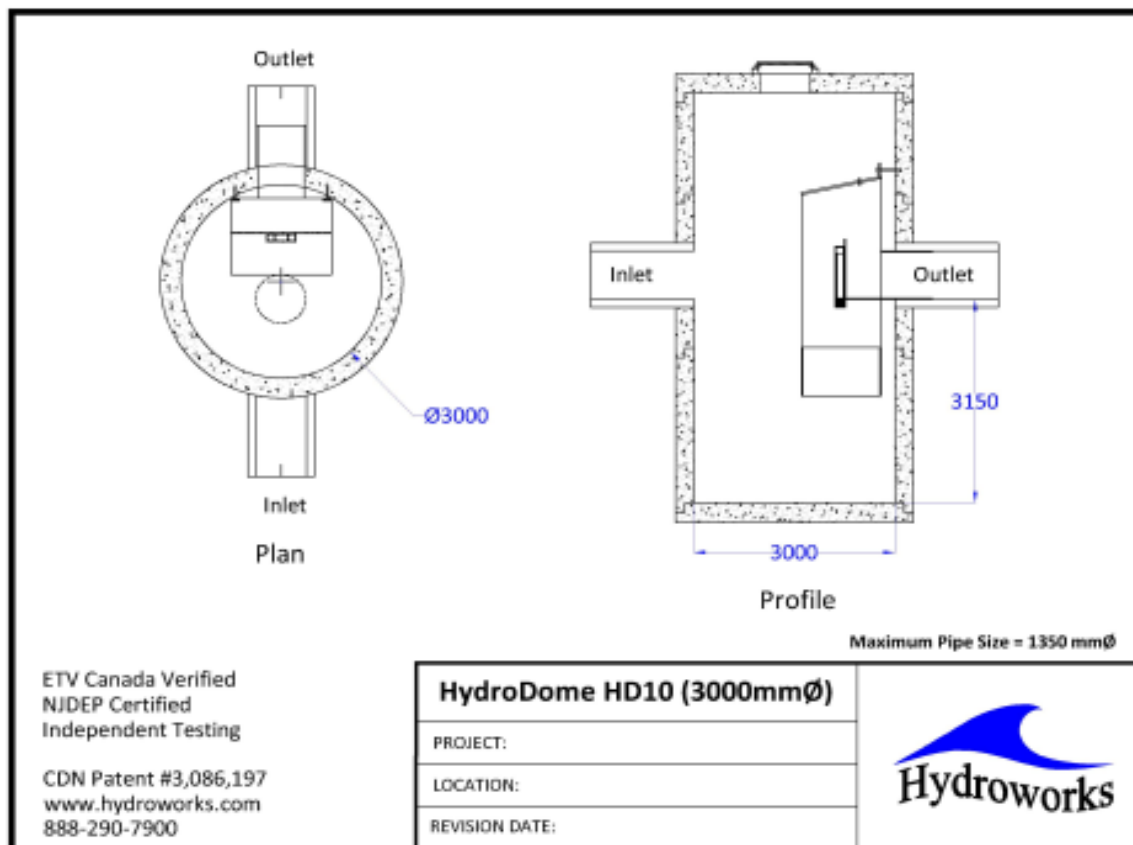
File Product Units CAD Video Help

Main Dimensions Rainfall Site TSS PSD TSS Load Site Storage By-Pass Custom CAD Video Other

Dimensions and Capacities					
Model	Diam. (m)	Depth (m)	Float. Vol. (L)	Sediment Vol. (m3)	Total Vol. (m3)
Unavailable	0.91	1.22	123	0.5	0.8
HD 4	1.22	1.37	266	0.9	1.6
HD 5	1.52	1.68	483	1.7	3.1
HD 6	1.83	1.98	803	2.9	5.2
Unavailable	2.13	2.29	1226	4.6	8.2
HD 8	2.44	2.59	1863	6.8	12.1
HD 10	3.05	3.5	3617	15.2	25.5
HD 12	3.66	3.81	6225	22.2	40

Depth = Depth from outlet invert to inside bottom of tank

Generic HD 10 CAD Drawing



TSS Buildup And Washoff

Hydroworks Siphon Separator Sizing Program - HydroDome

File Product Units CAD Video Help

Main Dimensions Rainfall Site TSS PSD TSS Load Site Storage By-Pass Custom CAD Video Other

TSS Buildup

☐ Power Linear
☒ Exponential
☐ Michaelis-Menton
☐ No Buildup Required

TSS Washoff

☒ Power-Exponential
☐ Rating Curve (no upper limit)
☐ Rating Curve (limited to buildup)
☐ Event Mean Concentration

Street Sweeping

Efficiency (%)
Start Month
Stop Month
Frequency (days)
Available Fraction

Soil Erosion

☐ Add Erosion to TSS

Reset to Default Values

TSS Buildup Parameters

Limit (kg/ha)
Coeff (kg/ha)
Exponent

TSS Washoff Parameters

Coefficient
Exponent

TSS Buildup

☒ Based on Area
☐ Based on Curb Length

Upstream Quantity Storage

Hydroworks Siphon Separator Sizing Program - HydroDome

File Product Units CAD Video Help

Main Dimensions Rainfall Site TSS PSD TSS Load Site Storage By-Pass Custom CAD Video Other

Quantity Control Storage

	Storage (m3)	Discharge (m3/s)
▶	0	0
*		

Clear

Other Parameters

Hydroworks Siphon Separator Sizing Program - HydroDome

File Product Units CAD Video Help

Main Dimensions Rainfall Site TSS PSD TSS Load Site Storage By-Pass Custom CAD Video Other

Scaling Law

☐ Peclet Scaling based on diameter x depth

☒ Peclet Scaling based on surface area (diameter x diameter)

TSS Removal Extrapolation

☒ Extrapolate TSS Removal for flows lower than tested

☐ No TSS Removal extrapolation for flows lower than tested

☐ No TSS Removal extrapolation for lower flows or inter-event periods

Lab Testing

☐ Use NJDEP Lab Testing Results

☒ Use ETV Canada Lab Testing Results

HydroDome Design

☒ High Flow Weir

☐ Flow Control (parking lot storage)
Must add Quantity Storage Table

HD Hydraulics

HD Model HD 10

☐ Custom Insert Size

TSS Removal Results

☒ Required TSS Removal

☐ Choose Model #

TSS Removal Required

TSS Removal (%) 80 Enter required TSS Removal (%)

Flagged Issues

If there is underground detention storage upstream of the HydroDome please contact Hydroworks to ensure it has been modeled correctly.

Hydroworks Sizing Program - Version 5.8.5

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1-800-290-7900

www.hydroworks.com



Hydroworks® HydroDome

Operations & Maintenance Manual

Version 1.0

Please call Hydroworks at 888-290-7900 or email us at support@hydroworks.com if you have any questions regarding the Inspection Checklist. Please email a copy of the completed checklist to Hydroworks at support@hydroworks.com for our records.

Introduction

The HydroDome (Figure 1) is a state-of-the-art hydrodynamic separator. HydroDome can be used for water quality and quantity flow control if desired.

Hydrodynamic separators remove solids, debris and lighter than water (oil, trash, floating debris) pollutants from stormwater. Hydrodynamic separators and other water quality measures are mandated by regulatory agencies (Town/City, State, Federal Government) to protect storm water quality from pollution generated by urban development (traffic, people) as part of new development permitting requirements.

As storm water treatment structures fill up with pollutants they become less and less effective in removing new pollution. Therefore, it is important that storm water treatment structures be maintained on a regular basis to ensure that they are operating at optimum performance. The HydroDome is no different in this regard and this manual has been assembled to provide the owner/operator with the necessary information to inspect and coordinate maintenance of their HydroDome.

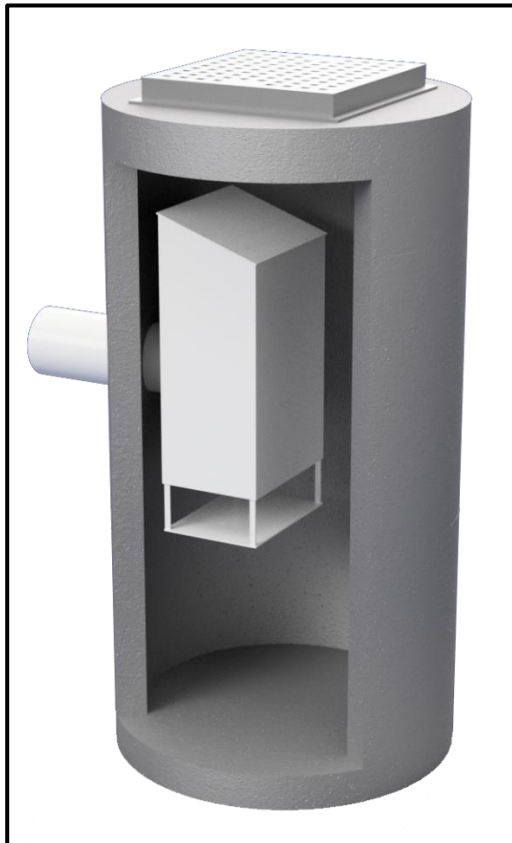


Figure 1. Hydroworks HydroDome

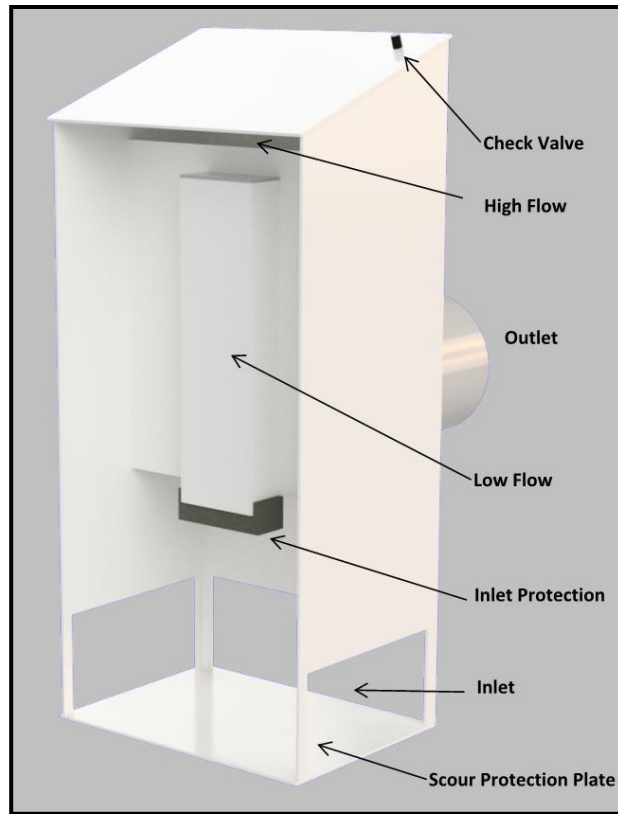


Figure 2 HydroDome Internal Components

Inspection

Procedure

Floatables

A visual inspection can be conducted for floatables by removing the cover/grate and looking down into the separator.

TSS/Sediment

Inspection for TSS build-up can be conducted using a Sludge Judge®, Core Pro®, AccuSludge® or equivalent sampling device that allows the measurement of the depth of TSS/sediment in the unit. These devices typically have a ball valve at the bottom of the tube that allows water and TSS to flow into the tube when lowering the tube into the unit. Once the unit touches the bottom of the device, it is quickly pulled upward such that the water and TSS in the tube forces the ball valve closed allowing the user to see a full core of water/TSS in the unit. Several readings (2 or 3) should be made at different locations of the structure to ensure that an accurate TSS depth measurement is recorded.

Operation

The water level during periods without rain should be near the outlet invert of the structure. If the water level remains near the top of the HydroDome this may suggest that there is an obstruction downstream of the HydroDome or that the inlet protection at the HydroDome may need to be cleaned.

Frequency

Construction Period

The HydroDome separator should be inspected every four weeks and after every large storm (over 0.5" (12.5 mm) of rain) during the construction period.

Post-Construction Period

The Hydroworks HydroDome separator should be inspected during the first year of operation for normal stabilized sites (grassed or paved areas). If the unit is subject to oil spills or runoff from unstabilized areas (storage piles, exposed soils), the HydroDome separator should be inspected more frequently (4 times per year). The initial annual inspection will indicate the required frequency of inspection and maintenance if the unit was maintained after the construction period.

Reporting

Reports should be prepared as part of each inspection and include the following information:

1. Date of inspection
2. GPS coordinates of Hydroworks unit
3. Time since last rainfall
4. Date of last inspection
5. Installation deficiencies (missing parts, incorrect installation of parts)
6. Structural deficiencies (concrete cracks, broken parts)
7. Operational deficiencies (leaks, elevated water level)
8. Presence of oil sheen or depth of oil layer
9. Estimate of depth/volume of floatables (trash, leaves) captured
10. Sediment depth measured
11. Recommendations for any repairs and/or maintenance for the unit
12. Estimation of time before maintenance is required if not required at time of inspection

A sample inspection checklist is provided at the end of this manual.



Maintenance

Procedure

The Hydroworks HydroDome unit is typically maintained using a vacuum truck. There are numerous companies that can maintain the HydroDome separator. Maintenance with a vacuum truck involves removing all of the water and sediment together. The water is then separated from the sediment on the truck or at the disposal facility.

The area around the HydroDome provides clear access to the bottom of the structure (Figure 3). This is the area where a vacuum hose would be lowered to clean the unit.

In instances where a vacuum truck is not available other maintenance methods (i.e. clamshell bucket) can be used, but they will be less effective. If a clamshell bucket is used the water must be decanted prior to cleaning since the sediment is under water and typically fine in nature.

The local municipality should be consulted for the allowable disposal options for both water and sediments prior to any maintenance operation. Once the water is decanted the sediment can be removed with the clamshell bucket.

Maintenance of a Hydroworks HydroDome unit will typically take 1 to 2 hours depending on size of unit and using a vacuum truck. Cleaning may take longer for other cleaning methods (i.e. clamshell bucket).

Inlet protection (Figure 2) is located at the inlet to the low flow opening in the HydroDome to ensure the opening does not become clogged. Although it is not anticipated that the inlet protection will have to be replaced on a regular (i.e. annual) basis since the inlet protection is protected by the submerged entrance to the HydroDome, the inlet protection should be checked each time the HydroDome is inspected or maintained. The inlet protection is removable and should be rinsed with water to ensure any debris caught on the protection is discarded. Unless damaged, the inlet protection can be reinstalled. A replacement piece can be bought through Hydroworks and/or retail stores. Hydroworks can provide information on the inlet protection and where it can be bought. A sign that the inlet protection needs cleaning/replacement would be a water level near the crown of the outlet pipe in the structure during periods with no flow.



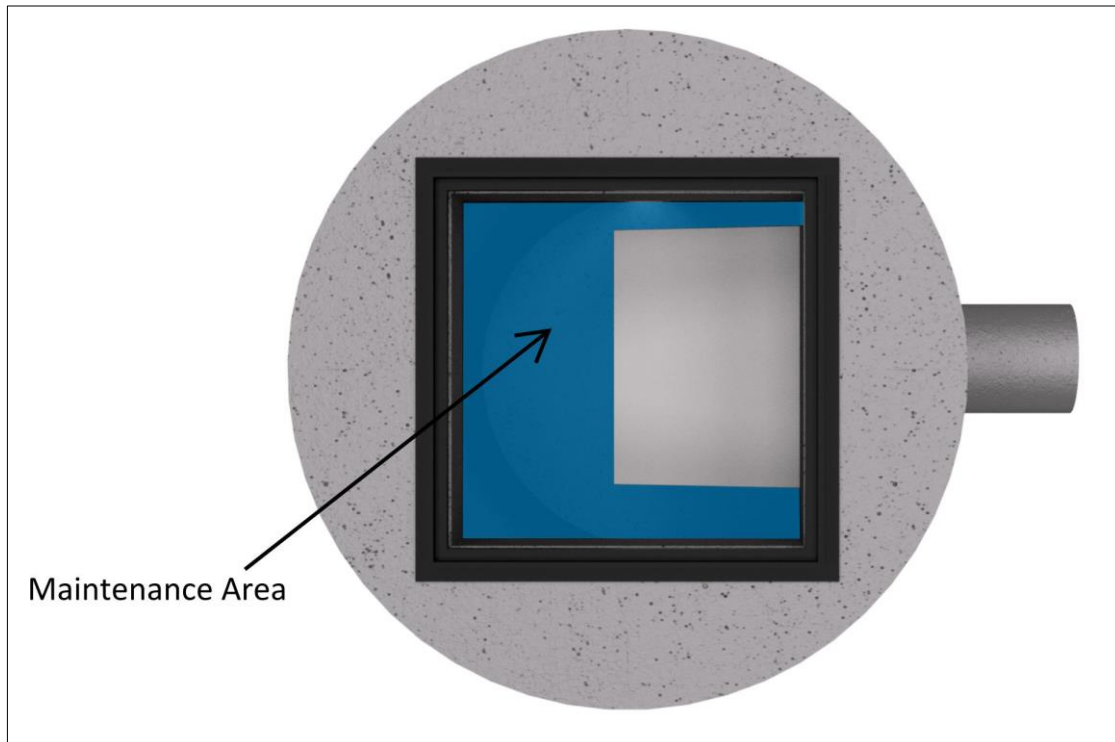


Figure 3. HydroDome Maintenance Access

Frequency

Construction Period

A HydroDome separator can fill with construction sediment quickly during the construction period. The HydroDome must be maintained during the construction period when the depth of TSS/sediment reaches 24" (600 mm). It must also be maintained during the construction period if there is an appreciable depth of oil in the unit (more than a sheen) or if floatables other than oil cover over 50% of the area of the separator

The HydroDome separator should be maintained at the end of the construction period, prior to operation for the post-construction period.

Post-Construction Period

The maintenance for sediment accumulation is required if the depth of sediment is 1 ft or greater in separators with standard water (sump) depths (Table 1).

There will be designs with increased sediment storage based on specifications or site-specific criteria. Please contact Hydroworks at 888-290-7900 to inquire whether your HydroDome was designed with extra sump depth to extend the frequency of maintenance.



The HydroDome separator must also be maintained if there is an appreciable depth of oil in the unit (more than a sheen) or if floatables other than oil cover over 75% of the water surface of the separator.

Table 1 Standard Dimensions for Hydroworks HydroDome Models

Model	Diameter ft (mm)	Maintenance Sediment Depth in (mm)
HD 3	3 (900)	12 (300)
HD 4	4 (1200)	12 (300)
HD 5	5 (1500)	12 (300)
HD 6	6 (1800)	12 (300)
HD 7	7 (2100)	12 (300)
HD 8	8 (2400)	12 (300)
HD 10	10 (3000)	12 (300)
HD 12	12 (3600)	12 (300)



HYDRODOME INSPECTION SHEET

Date _____
Date of Last Inspection _____

Site _____
City _____
State _____
Owner _____

GPS Coordinates _____

Date of last rainfall _____

Site Characteristics	Yes	No
Soil erosion evident	☐	☐
Exposed material storage on site	☐	☐
Large exposure to leaf litter (lots of trees)	☐	☐
High traffic (vehicle) area	☐	☐

HydroDome	Yes	No
Obstructions in the inlet	☐ *	☐
Damage to HydroDome (cracked, broken, loose pieces)	☐ **	☐
Improperly installed outlet pipe	☐ ***	☐
Internal component damage (cracked, broken, loose pieces)	☐ **	☐
Floating debris in the separator (oil, leaves, trash)	☐	☐
Large debris visible in the separator	☐ *	☐
Concrete cracks/deficiencies	☐ ***	☐
Exposed rebar	☐ **	☐
Raised water level (water level close to top of HydroDome)	☐ ***	☐
Water seepage (water level not at outlet pipe invert)	☐ ***	☐
Water level depth below outlet pipe invert _____"		

Routine Measurements			
Floating debris depth	< 0.5" (13mm)	☐	>0.5" 13mm) ☐ *
Floating debris coverage	< 75% of surface area	☐	> 75% surface area ☐ *
Sludge depth	< 12" (300mm)	☐	> 12" (300mm) ☐ *

* Maintenance required
** Repairs required
*** Further investigation is required

Note: Inspections should not be made within 24 hours of a storm to allow the water to drain from the structure to assess a raised water level or water level seepage





Hydroworks® HydroDome

One Year Limited Warranty

Hydroworks, LLC warrants, to the purchaser and subsequent owner(s) during the warranty period subject to the terms and conditions hereof, the Hydroworks HydroDome to be free from defects in material and workmanship under normal use and service, when properly installed, used, inspected and maintained in accordance with Hydroworks written instructions, for the period of the warranty. The standard warranty period is 1 year.

The warranty period begins once the separator has been manufactured and is available for delivery. Any components determined to be defective, either by failure or by inspection, in material and workmanship will be repaired, replaced or remanufactured at Hydroworks' option provided, however, that by doing so Hydroworks, LLC will not be obligated to replace an entire insert or concrete section, or the complete unit. This warranty does not cover shipping charges, damages, labor, any costs incurred to obtain access to the unit, any costs to repair/replace any surface treatment/cover after repair/replacement, or other charges that may occur due to product failure, repair or replacement.

This warranty does not apply to any material that has been disassembled or modified without prior approval of Hydroworks, LLC, that has been subjected to misuse, misapplication, neglect, alteration, accident or act of God, or that has not been installed, inspected, operated or maintained in accordance with Hydroworks, LLC instructions and is in lieu of all other warranties expressed or implied. Hydroworks, LLC does not authorize any representative or other person to expand or otherwise modify this limited warranty.

The owner shall provide Hydroworks, LLC with written notice of any alleged defect in material or workmanship including a detailed description of the alleged defect upon discovery of the defect. Hydroworks, LLC should be contacted at 136 Central Ave., Clark, NJ 07066 or any other address as supplied by Hydroworks, LLC. (888-290-7900).

This limited warranty is exclusive. There are no other warranties, express or implied, or merchantability or fitness for a particular purpose and none shall be created whether under the uniform commercial code, custom or usage in the industry or the course of dealings between the parties. Hydroworks, LLC will replace any goods that are defective under this warranty as the sole and exclusive remedy for breach of this warranty.

Subject to the foregoing, all conditions, warranties, terms, undertakings or liabilities (including liability as to negligence), expressed or implied, and howsoever arising, as to the condition, suitability, fitness, safety, or title to the Hydroworks HydroDome are hereby negated and excluded and Hydroworks, LLC gives and makes no such representation, warranty or undertaking except as expressly set forth herein. Under no circumstances shall Hydroworks, LLC be liable to the Purchaser or to any third party for product liability claims; claims arising from the design, shipment, or installation of the HydroDome, or the cost of other goods or services related to the purchase and installation of the HydroDome. For this Limited Warranty to apply, the HydroDome must be installed in accordance with all site conditions required by state and local codes; all other applicable laws; and Hydroworks' written installation instructions.

Hydroworks, LLC expressly disclaims liability for special, consequential or incidental damages (even if it has been advised of the possibility of the same) or breach of expressed or implied warranty. Hydroworks, LLC shall not be liable for penalties or liquidated damages, including loss of production and profits; labor and materials; overhead costs; or other loss or expense incurred by the purchaser or any third party. Specifically excluded from limited warranty coverage are damages to the HydroDome arising from ordinary wear and tear; alteration, accident, misuse, abuse or neglect; improper maintenance, failure of the product due to improper installation of the concrete sections or improper sizing; or any other event not caused by Hydroworks, LLC. This limited warranty represents Hydroworks' sole liability to the purchaser for claims related to the HydroDome, whether the claim is based upon contract, tort, or other legal basis.

Manhole Floatation Check

Manhole Details

Structure Name	OGS HD10
Material	Concrete
Nominal Manhole Diameter	3000 mm
Manhole T/G Elevation	216.88 m
Manhole Depth	4.95 m
Base of Manhole Elevation	211.93 m
Outside Diameter	3.33 m
Inside Diameter	3.00 m
Manhole Lid Diameter	0.90 m
Flat Cap thickness	0.20 m
Base thickness	0.30 m

Groundwater Details

Approx. Groundwater Elevation	213.20 m
-------------------------------	----------

Step 1: Calculate Weight of Structure, $W_{\text{STRUCTURE}}$

Unit weight concrete	23500 kN/m ³
Wall Volume	7.30 m ³
Base Volume	2.61 m ³
Cap Volume	1.61 m ³

Weight of Structure, $W_{\text{STRUCTURE}}$ **270910.8 kN**

Step 2: Calculate Buoyancy Uplift Force, F_B

Density of Water, ρ_w	9.81 kN/m ³
Depth of Groundwater Around Structure	1.27 m
Add 2.0m to account for seasonal fluctuations	3.27 m

Buoyancy Uplift, F_B **279.4 kN**

Step 3: Check Factor of Safety

$W_{\text{STRUCTURE}}$	270910.8 kN
F_B	279.4 kN
Safety Factor	970 ✓

Note: Calculations do not include the sliding resistance provided by the surrounding soil (which would increase the factor of safety further)

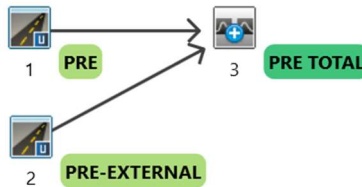
APPENDIX D

Visual OTTHYMO Outputs

22-013 HFW HUNT STREET DEVELOPMENT

PRE-DEVELOPMENT

OTTHYMO MODEL



2-YEAR STORM - PRE-DEVELOPMENT

=====										0.917	8.02	1.917	7.08	2.917	3.39	3.92	2.35						
										1.000	8.02	2.000	7.08	3.000	3.39	4.00	2.35						
V	V	I	SSSS	U	U	A	L	(v 6.2.2020)															
V	V	I	SS	U	U	A	A	L	Max.Eff.Inten.(mm/hr)=									72.24	4.34				
V	V	I	SS	U	U	AAAAA	L	over (min)=										5.00	30.00				
V	V	I	SS	U	U	A	A	L	Storage Coeff. (min)=									3.46	(ii)	28.22	(ii)		
VV	I	SSSS	UUUU	A	A	LLLL	Unit Hyd. Tpeak (min)=											5.00	30.00				
										Unit Hyd. peak (cms)=									0.26	0.04			
OOO	TTTT	TTTT	H	H	Y	Y	M	M	OOO	TM										*TOTALS*			
O	O	T	T	H	H	Y	Y	MM	MM	O	O	PEAK FLOW (cms)=									0.15	0.01	0.150 (iii)
O	O	T	T	H	H	Y	Y	M	M	O	O	TIME TO PEAK (hrs)=									1.33	2.00	1.33
OOO	T	T	H	H	Y	Y	M	M	OOO	RUNOFF VOLUME (mm)=									34.21	3.95	12.72		
Developed and Distributed by Smart City Water Inc										TOTAL RAINFALL (mm)=									35.21	35.21	35.21		
Copyright 2007 - 2022 Smart City Water Inc										RUNOFF COEFFICIENT =									0.97	0.11	0.36		

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 62.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

DATE: 04/16/2026 TIME: 02:24:25

USER:

COMMENTS: _____

CALIB	Area (ha)=	0.34
STANDHYD (0002)	Total Imp(%)=	23.00
ID= 1 DT= 5.0 min	Dir. Conn.(%)=	19.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.08	0.26
Dep. Storage (mm)=	1.00	13.60
Average Slope (%)=	1.00	2.00
Length (m)=	47.61	40.00
Mannings n	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

***** D E T A I L E D O U T P U T *****
Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voindat
Output filename: C:\Users\Natalie\AppData\Local\Civica\WH5\c399a01c-8370-442e-925a-91933bdc17fe\d0fbdcccd-27e1-4044-be50-b3ccf38a6de6\scen
Summary filename: C:\Users\Natalie\AppData\Local\Civica\WH5\c399a01c-8370-442e-925a-91933bdc17fe\d0fbdcccd-27e1-4044-be50-b3ccf38a6de6\scen
IDF curve parameters: A= 529.711
B= 4.501
C= 0.745
used in: INTENSITY = A / (t + B)^C
Duration of storm = 4.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	2.68	1.00	17.69	2.00	5.90	3.00	3.14
0.17	3.04	1.17	72.24	2.17	5.09	3.17	2.94
0.33	3.53	1.33	22.78	2.33	4.50	3.33	2.76
0.50	4.26	1.50	12.62	2.50	4.04	3.50	2.60
0.67	5.49	1.67	8.98	2.67	3.68	3.67	2.47
0.83	8.02	1.83	7.08	2.83	3.39	3.83	2.35

CALIB	Area (ha)=	2.67
STANDHYD (0001)	Total Imp(%)=	43.00
ID= 1 DT= 5.0 min	Dir. Conn.(%)=	29.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.15	1.52
Dep. Storage (mm)=	1.00	13.60
Average Slope (%)=	1.00	2.00
Length (m)=	133.42	40.00
Mannings n	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.68	1.083	17.69	2.083	5.90	3.08	3.14
0.167	2.68	1.167	17.69	2.167	5.90	3.17	3.14
0.250	3.04	1.250	72.24	2.250	5.09	3.25	2.94
0.333	3.04	1.333	72.24	2.333	5.09	3.33	2.94
0.417	3.53	1.417	22.78	2.417	4.50	3.42	2.76
0.500	3.53	1.500	22.78	2.500	4.50	3.50	2.76
0.583	4.26	1.583	12.62	2.583	4.04	3.58	2.60
0.667	4.26	1.667	12.62	2.667	4.04	3.67	2.60
0.750	5.49	1.750	8.98	2.750	3.68	3.75	2.47
0.833	5.49	1.833	8.98	2.833	3.68	3.83	2.47
0.917	8.02	1.917	7.08	2.917	3.39	3.92	2.35
1.000	8.02	2.000	7.08	3.000	3.39	4.00	2.35

Max.Eff.Inten.(mm/hr)=	72.24	2.17	
over (min)	5.00	35.00	
Storage Coeff. (min)=	1.86 (ii)	34.55 (ii)	
Unit Hyd. Tpeak (min)=	5.00	35.00	
Unit Hyd. peak (cms)=	0.32	0.03	
			TOTALS
PEAK FLOW (cms)=	0.01	0.00	0.013 (iii)
TIME TO PEAK (hrs)=	1.33	2.25	1.33
RUNOFF VOLUME (mm)=	34.21	2.92	8.80
TOTAL RAINFALL (mm)=	35.21	35.21	35.21
RUNOFF COEFFICIENT =	0.97	0.08	0.25

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 62.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0003)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0001):	2.67	0.150	1.33	12.72
+ ID2= 2 (0002):	0.34	0.013	1.33	8.80
ID = 3 (0003):	3.01	0.162	1.33	12.28

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

5-YEAR STORM - PRE-DEVELOPMENT

=====

V V I SSSS U U A L (v 6.2.2020)

V V I SS U U A A L

V V I SS U U A A A A L

V V I SS U U A A L

V V I SSSS UUUU A A LLLL

OOO TTTT TTTT H H Y Y M M OOO TM

O O T T H H Y Y M M O O

O O T T H H Y M M O O

OOO T T H H Y M M OOO

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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voindat

Output filename: C:\Users\Natalie\AppData\Local\Civica\XH5\c399a01c-8370-442e-925a-91933bdc17fe\68df8f01-0be3-4ad1-afd1-b237623e8528\scen

Summary filename: C:\Users\Natalie\AppData\Local\Civica\XH5\c399a01c-8370-442e-925a-91933bdc17fe\68df8f01-0be3-4ad1-afd1-b237623e8528\scen

DATE: 04/16/2026 TIME: 02:24:25

USER:

COMMENTS: _____

** SIMULATION : 02_5-Year Norfolk **

| CHICAGO STORM | IDF curve parameters: A= 583.017

| Ptotal= 49.03 mm | B= 3.007

C= 0.703

used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs

Storm time step = 10.00 min

Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	4.20	1.00	23.22	2.00	8.64	3.00	4.87
0.17	4.72	1.17	96.03	2.17	7.56	3.17	4.58
0.33	5.42	1.33	29.33	2.33	6.76	3.33	4.32
0.50	6.44	1.50	17.13	2.50	6.13	3.50	4.10
0.67	8.09	1.67	12.62	2.67	5.63	3.67	3.90
0.83	11.39	1.83	10.19	2.83	5.22	3.83	3.72

| CALIB |

| STANDHYD (0001) | Area (ha)= 2.67

| ID= 1 DT= 5.0 min | Total Imp(%)= 43.00 Dir. Conn.(%)= 29.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.15	1.52
Dep. Storage (mm)=	1.00	13.60
Average Slope (%)=	1.00	2.00
Length (m)=	133.42	40.00
Mannings n	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |

| STANDHYD (0002) | Area (ha)= 0.34

| ID= 1 DT= 5.0 min | Total Imp(%)= 23.00 Dir. Conn.(%)= 19.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.08	0.26
Dep. Storage (mm)=	1.00	13.60
Average Slope (%)=	1.00	2.00
Length (m)=	47.61	40.00
Mannings n	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	4.20	1.083	23.22	2.083	8.64	3.08	4.87
0.167	4.20	1.167	23.22	2.167	8.64	3.17	4.87
0.250	4.72	1.250	96.03	2.250	7.56	3.25	4.58
0.333	4.72	1.333	96.03	2.333	7.56	3.33	4.58
0.417	5.42	1.417	29.33	2.417	6.76	3.42	4.32
0.500	5.42	1.500	29.33	2.500	6.76	3.50	4.32
0.583	6.44	1.583	17.13	2.583	6.13	3.58	4.10
0.667	6.44	1.667	17.13	2.667	6.13	3.67	4.10
0.750	8.09	1.750	12.62	2.750	5.63	3.75	3.90
0.833	8.09	1.833	12.62	2.833	5.63	3.83	3.90
0.917	11.39	1.917	10.19	2.917	5.22	3.92	3.72
1.000	11.39	2.000	10.19	3.000	5.22	4.00	3.72

Max.Eff.Inten.(mm/hr)=	96.03	6.30
over (min)	5.00	25.00
Storage Coeff. (min)=	1.66 (ii)	22.99 (ii)
Unit Hyd. Tpeak (min)=	5.00	25.00
Unit Hyd. peak (cms)=	0.32	0.05
		TOTALS
PEAK FLOW (cms)=	0.02	0.00
TIME TO PEAK (hrs)=	1.33	1.83
RUNOFF VOLUME (mm)=	48.03	7.08
TOTAL RAINFALL (mm)=	49.03	49.03
RUNOFF COEFFICIENT	0.98	0.14
		0.30

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20% YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: CN* = 62.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD (0003) |

| 1 + 2 = 3 | AREA QPEAK TPEAK R.V.

(ha) (cms) (hrs) (mm)

ID1= 1 (0001): 2.67 0.205 1.33 20.25

+ ID2= 2 (0002): 0.34 0.018 1.33 14.82

=====

ID = 3 (0003): 3.01 0.222 1.33 19.64

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	4.20	1.083	23.22	2.083	8.64	3.08	4.87
0.167	4.20	1.167	23.22	2.167	8.64	3.17	4.87
0.250	4.72	1.250	96.03	2.250	7.56	3.25	4.58
0.333	4.72	1.333	96.03	2.333	7.56	3.33	4.58
0.417	5.42	1.417	29.33	2.417	6.76	3.42	4.32
0.500	5.42	1.500	29.33	2.500	6.76	3.50	4.32
0.583	6.44	1.583	17.13	2.583	6.13	3.58	4.10
0.667	6.44	1.667	17.13	2.667	6.13	3.67	4.10
0.750	8.09	1.750	12.62	2.750	5.63	3.75	3.90
0.833	8.09	1.833	12.62	2.833	5.63	3.83	3.90
0.917	11.39	1.917	10.19	2.917	5.22	3.92	3.72
1.000	11.39	2.000	10.19	3.000	5.22	4.00	3.72

Max.Eff.Inten.(mm/hr)=	96.03	10.85
over (min)	5.00	25.00
Storage Coeff. (min)=	3.09 (ii)	20.25 (ii)
Unit Hyd. Tpeak (min)=	5.00	25.00
Unit Hyd. peak (cms)=	0.27	0.05
		TOTALS
PEAK FLOW (cms)=	0.20	0.03
TIME TO PEAK (hrs)=	1.33	1.83
RUNOFF VOLUME (mm)=	48.03	8.91
TOTAL RAINFALL (mm)=	49.03	49.03
RUNOFF COEFFICIENT	0.98	0.18
		0.41

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: CN* = 62.0 Ia = Dep. Storage (Above)

10-YEAR STORM - PRE-DEVELOPMENT

=====

V V I SSSS U U A L (v 6.2.2020)

V V I SS U U A A L

V V I SS U U AAAAA L

V V I SS U U A A L

VV I SSSS UUUU A A LLLL

OOO TTTT TTTT H H Y Y M M OOO TM

O O T T H H Y Y M M O O

O O T T H H Y Y M M O O

OOO T T H H Y M M OOO

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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voindat

Output filename: C:\Users\Natalie\AppData\Local\Civica\XH5\c399a01c-8370-442e-925a-91933bdc17fe\7c4cf53c-25f6-4d99-8afb-4a5a581305be\scen

Summary filename: C:\Users\Natalie\AppData\Local\Civica\XH5\c399a01c-8370-442e-925a-91933bdc17fe\7c4cf53c-25f6-4d99-8afb-4a5a581305be\scen

DATE: 04/16/2026 TIME: 02:24:25

USER:

COMMENTS: _____

** SIMULATION : 03_10-Year Norfolk **

| CHICAGO STORM | IDF curve parameters: A= 670.324

| Ptotal= 57.94 mm | B= 3.007

C= 0.698

used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs

Storm time step = 10.00 min

Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	5.04	1.00	27.43	2.00	10.30	3.00	5.84
0.17	5.66	1.17	111.84	2.17	9.03	3.17	5.49
0.33	6.49	1.33	34.58	2.33	8.07	3.33	5.18
0.50	7.70	1.50	20.31	2.50	7.33	3.50	4.92
0.67	9.66	1.67	15.00	2.67	6.74	3.67	4.68
0.83	13.55	1.83	12.13	2.83	6.25	3.83	4.47

| CALIB |

| STANDHYD (0001) | Area (ha)= 2.67

| ID= 1 DT= 5.0 min | Total Imp(%)= 43.00 Dir. Conn.(%)= 29.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.15	1.52
Dep. Storage (mm)=	1.00	13.60
Average Slope (%)=	1.00	2.00
Length (m)=	133.42	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |

| STANDHYD (0002) | Area (ha)= 0.34

| ID= 1 DT= 5.0 min | Total Imp(%)= 23.00 Dir. Conn.(%)= 19.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.08	0.26
Dep. Storage (mm)=	1.00	13.60
Average Slope (%)=	1.00	2.00
Length (m)=	47.61	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	5.04	1.083	27.43	2.083	10.30	3.08	5.84
0.167	5.04	1.167	27.43	2.167	10.30	3.17	5.84
0.250	5.66	1.250	111.84	2.250	9.03	3.25	5.49
0.333	5.66	1.333	111.84	2.333	9.03	3.33	5.49
0.417	6.49	1.417	34.58	2.417	8.07	3.42	5.18
0.500	6.49	1.500	34.58	2.500	8.07	3.50	5.18
0.583	7.70	1.583	20.31	2.583	7.33	3.58	4.92
0.667	7.70	1.667	20.31	2.667	7.33	3.67	4.92
0.750	9.66	1.750	15.00	2.750	6.74	3.75	4.68
0.833	9.66	1.833	15.00	2.833	6.74	3.83	4.68
0.917	13.55	1.917	12.13	2.917	6.25	3.92	4.47
1.000	13.55	2.000	12.13	3.000	6.25	4.00	4.47

Max.Eff.Inten.(mm/hr)= 111.84 10.62

over (min)= 5.00 20.00

Storage Coeff. (min)= 1.57 (ii) 18.87 (ii)

Unit Hyd. Tpeak (min)= 5.00 20.00

Unit Hyd. peak (cms)= 0.33 0.06

PEAK FLOW (cms)= 0.02 0.00 *TOTALS*

TIME TO PEAK (hrs)= 1.33 1.75 0.021 (iii)

RUNOFF VOLUME (mm)= 56.94 10.50 19.29

TOTAL RAINFALL (mm)= 57.94 57.94 57.94

RUNOFF COEFFICIENT = 0.98 0.18 0.33

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20% YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
- CN* = 62.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD (0003) |

| 1 + 2 = 3 | AREA QPEAK TPEAK R.V.

(ha) (cms) (hrs) (mm)

ID1= 1 (0001): 2.67 0.246 1.33 25.64

+ ID2= 2 (0002): 0.34 0.021 1.33 19.29

=====

ID = 3 (0003): 3.01 0.267 1.33 24.92

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB |

| STANDHYD (0001) | Area (ha)= 2.67

| ID= 1 DT= 5.0 min | Total Imp(%)= 43.00 Dir. Conn.(%)= 29.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.15	1.52
Dep. Storage (mm)=	1.00	13.60
Average Slope (%)=	1.00	2.00
Length (m)=	133.42	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	5.04	1.083	27.43	2.083	10.30	3.08	5.84
0.167	5.04	1.167	27.43	2.167	10.30	3.17	5.84
0.250	5.66	1.250	111.84	2.250	9.03	3.25	5.49
0.333	5.66	1.333	111.84	2.333	9.03	3.33	5.49
0.417	6.49	1.417	34.58	2.417	8.07	3.42	5.18
0.500	6.49	1.500	34.58	2.500	8.07	3.50	5.18
0.583	7.70	1.583	20.31	2.583	7.33	3.58	4.92
0.667	7.70	1.667	20.31	2.667	7.33	3.67	4.92
0.750	9.66	1.750	15.00	2.750	6.74	3.75	4.68
0.833	9.66	1.833	15.00	2.833	6.74	3.83	4.68
0.917	13.55	1.917	12.13	2.917	6.25	3.92	4.47
1.000	13.55	2.000	12.13	3.000	6.25	4.00	4.47

Max.Eff.Inten.(mm/hr)= 111.84 17.99

over (min)= 5.00 20.00

Storage Coeff. (min)= 2.90 (ii) 16.92 (ii)

Unit Hyd. Tpeak (min)= 5.00 20.00

Unit Hyd. peak (cms)= 0.28 0.06

PEAK FLOW (cms)= 0.23 0.04 *TOTALS*

TIME TO PEAK (hrs)= 1.33 1.67 0.246 (iii)

RUNOFF VOLUME (mm)= 56.94 12.86 25.64

TOTAL RAINFALL (mm)= 57.94 57.94 57.94

RUNOFF COEFFICIENT = 0.98 0.22 0.44

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
- CN* = 62.0 Ia = Dep. Storage (Above)

25-YEAR STORM - PRE-DEVELOPMENT

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V V I SSSS U U A L (v 6.2.2020)

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V V I SS U U A A A A L

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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voindat

Output filename: C:\Users\Natalie\AppData\Local\Civica\XH5\c399a01c-8370-442e-925a-91933bdc17fe\024e83fd-0ea8-422f-894b-d2466d0f826f\scen

Summary filename: C:\Users\Natalie\AppData\Local\Civica\XH5\c399a01c-8370-442e-925a-91933bdc17fe\024e83fd-0ea8-422f-894b-d2466d0f826f\scen

DATE: 04/16/2026 TIME: 02:24:25

USER:

COMMENTS: _____

** SIMULATION : 04_25-Year Norfolk **

| CHICAGO STORM | IDF curve parameters: A= 721.533

| Ptotal= 69.38 mm | B= 2.253

C= 0.679

used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs

Storm time step = 10.00 min

Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	6.34	1.00	31.84	2.00	12.58	3.00	7.30
0.17	7.08	1.17	131.63	2.17	11.08	3.17	6.87
0.33	8.07	1.33	39.74	2.33	9.96	3.33	6.50
0.50	9.51	1.50	23.97	2.50	9.08	3.50	6.18
0.67	11.82	1.67	17.98	2.67	8.38	3.67	5.90
0.83	16.33	1.83	14.70	2.83	7.79	3.83	5.64

| CALIB |

| STANDHYD (0001) | Area (ha)= 2.67

| ID= 1 DT= 5.0 min | Total Imp(%)= 43.00 Dir. Conn.(%)= 29.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.15	1.52
Dep. Storage (mm)=	1.00	13.60
Average Slope (%)=	1.00	2.00
Length (m)=	133.42	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN

hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr

0.083 6.34 | 1.083 31.84 | 2.083 12.58 | 3.08 7.30

0.167 6.34 | 1.167 31.84 | 2.167 12.58 | 3.17 7.30

0.250 7.08 | 1.250 131.63 | 2.250 11.08 | 3.25 6.87

0.333 7.08 | 1.333 131.63 | 2.333 11.08 | 3.33 6.87

0.417 8.07 | 1.417 39.74 | 2.417 9.96 | 3.42 6.50

0.500 8.07 | 1.500 39.74 | 2.500 9.96 | 3.50 6.50

0.583 9.51 | 1.583 23.97 | 2.583 9.08 | 3.58 6.18

0.667 9.51 | 1.667 23.97 | 2.667 9.08 | 3.67 6.18

0.750 11.82 | 1.750 17.98 | 2.750 8.38 | 3.75 5.90

0.833 11.82 | 1.833 17.98 | 2.833 8.38 | 3.83 5.90

0.917 16.33 | 1.917 14.70 | 2.917 7.79 | 3.92 5.64

1.000 16.33 | 2.000 14.70 | 3.000 7.79 | 4.00 5.64

Max.Eff.Inten.(mm/hr)= 131.63 27.37

over (min)= 5.00 15.00

Storage Coeff. (min)= 2.72 (ii) 14.57 (ii)

Unit Hyd. Tpeak (min)= 5.00 15.00

Unit Hyd. peak (cms)= 0.29 0.08

TOTALS

PEAK FLOW (cms)= 0.28 0.07 0.308 (iii)

TIME TO PEAK (hrs)= 1.33 1.50 1.33

RUNOFF VOLUME (mm)= 68.38 18.63 33.05

TOTAL RAINFALL (mm)= 69.38 69.38 69.38

RUNOFF COEFFICIENT = 0.99 0.27 0.48

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN* = 62.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |

| STANDHYD (0002) | Area (ha)= 0.34

| ID= 1 DT= 5.0 min | Total Imp(%)= 23.00 Dir. Conn.(%)= 19.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.08	0.26
Dep. Storage (mm)=	1.00	13.60
Average Slope (%)=	1.00	2.00
Length (m)=	47.61	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN

hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr

0.083 6.34 | 1.083 31.84 | 2.083 12.58 | 3.08 7.30

0.167 6.34 | 1.167 31.84 | 2.167 12.58 | 3.17 7.30

0.250 7.08 | 1.250 131.63 | 2.250 11.08 | 3.25 6.87

0.333 7.08 | 1.333 131.63 | 2.333 11.08 | 3.33 6.87

0.417 8.07 | 1.417 39.74 | 2.417 9.96 | 3.42 6.50

0.500 8.07 | 1.500 39.74 | 2.500 9.96 | 3.50 6.50

0.583 9.51 | 1.583 23.97 | 2.583 9.08 | 3.58 6.18

0.667 9.51 | 1.667 23.97 | 2.667 9.08 | 3.67 6.18

0.750 11.82 | 1.750 17.98 | 2.750 8.38 | 3.75 5.90

0.833 11.82 | 1.833 17.98 | 2.833 8.38 | 3.83 5.90

0.917 16.33 | 1.917 14.70 | 2.917 7.79 | 3.92 5.64

1.000 16.33 | 2.000 14.70 | 3.000 7.79 | 4.00 5.64

Max.Eff.Inten.(mm/hr)= 131.63 17.98

over (min)= 5.00 20.00

Storage Coeff. (min)= 1.47 (ii) 15.49 (ii)

Unit Hyd. Tpeak (min)= 5.00 20.00

Unit Hyd. peak (cms)= 0.33 0.07

TOTALS

PEAK FLOW (cms)= 0.02 0.01 0.026 (iii)

TIME TO PEAK (hrs)= 1.33 1.58 1.33

RUNOFF VOLUME (mm)= 68.38 15.59 25.59

TOTAL RAINFALL (mm)= 69.38 69.38 69.38

RUNOFF COEFFICIENT = 0.99 0.22 0.37

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20% YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN* = 62.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD (0003) |

| 1 + 2 = 3 | AREA QPEAK TPEAK R.V.

(ha) (cms) (hrs) (mm)

ID1= 1 (0001): 2.67 0.308 1.33 33.05

+ ID2= 2 (0002): 0.34 0.026 1.33 25.59

=====

ID = 3 (0003): 3.01 0.333 1.33 32.21

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

50-YEAR STORM - PRE-DEVELOPMENT

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V V I SSSS U U A L (v 6.2.2020)

V V I SS U U A A L

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V V I SS U U A A L

VV I SSSS UUUU A A LLLL

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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

Output filename: C:\Users\Natalie\AppData\Local\Civica\NH5\c399a01c-8370-442e-925a-91933bdc17fe\8783dfd6-abf6-4604-937f-7b6f4e5a43de\scen

Summary filename: C:\Users\Natalie\AppData\Local\Civica\NH5\c399a01c-8370-442e-925a-91933bdc17fe\8783dfd6-abf6-4604-937f-7b6f4e5a43de\scen

DATE: 04/16/2026 TIME: 02:24:25

USER:

COMMENTS: _____

** SIMULATION : 05_50-Year Norfolk **

| CHICAGO STORM | IDF curve parameters: A= 766.038

| Ptotal= 78.32 mm | B= 1.898

C= 0.668

used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs

Storm time step = 10.00 min

Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	7.35	1.00	35.40	2.00	14.38	3.00	8.44
0.17	8.19	1.17	146.50	2.17	12.71	3.17	7.96
0.33	9.32	1.33	43.93	2.33	11.45	3.33	7.55
0.50	10.95	1.50	26.91	2.50	10.46	3.50	7.18
0.67	13.53	1.67	20.36	2.67	9.66	3.67	6.85
0.83	18.53	1.83	16.73	2.83	9.00	3.83	6.56

| CALIB |

| STANDHYD (0001) | Area (ha)= 2.67

| ID= 1 DT= 5.0 min | Total Imp(%)= 43.00 Dir. Conn.(%)= 29.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.15	1.52
Dep. Storage (mm)=	1.00	13.60
Average Slope (%)=	1.00	2.00
Length (m)=	133.42	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

RUNOFF VOLUME (mm)=	77.32	23.61	39.19
TOTAL RAINFALL (mm)=	78.32	78.32	78.32
RUNOFF COEFFICIENT =	0.99	0.30	0.50

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 62.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |

| STANDHYD (0002) | Area (ha)= 0.34

| ID= 1 DT= 5.0 min | Total Imp(%)= 23.00 Dir. Conn.(%)= 19.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.08	0.26
Dep. Storage (mm)=	1.00	13.60
Average Slope (%)=	1.00	2.00
Length (m)=	47.61	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	7.35	1.083	35.40	2.083	14.38	3.08	8.44
0.167	7.35	1.167	35.40	2.167	14.38	3.17	8.44
0.250	8.19	1.250	146.50	2.250	12.71	3.25	7.96
0.333	8.19	1.333	146.50	2.333	12.71	3.33	7.96
0.417	9.32	1.417	43.93	2.417	11.45	3.42	7.55
0.500	9.32	1.500	43.93	2.500	11.45	3.50	7.55
0.583	10.95	1.583	26.91	2.583	10.46	3.58	7.18
0.667	10.95	1.667	26.91	2.667	10.46	3.67	7.18
0.750	13.53	1.750	20.36	2.750	9.66	3.75	6.85
0.833	13.53	1.833	20.36	2.833	9.66	3.83	6.85
0.917	18.53	1.917	16.73	2.917	9.00	3.92	6.56
1.000	18.53	2.000	16.73	3.000	9.00	4.00	6.56

Max.Eff.Inten.(mm/hr)=	146.50	23.93
over (min)	5.00	15.00
Storage Coeff. (min)=	1.40 (ii)	13.91 (ii)
Unit Hyd. Tpeak (min)=	5.00	15.00
Unit Hyd. peak (cms)=	0.33	0.08
PEAK FLOW (cms)=	0.03	0.01
TIME TO PEAK (hrs)=	1.33	1.50
RUNOFF VOLUME (mm)=	77.32	20.04
TOTAL RAINFALL (mm)=	78.32	78.32
RUNOFF COEFFICIENT =	0.99	0.26
		0.39

TOTALS

PEAK FLOW (cms)= 0.031 (iii)

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20% YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 62.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD (0003) |

| 1 + 2 = 3 | AREA (ha) QPEAK (cms) TPEAK (hrs) R.V. (mm)

ID1= 1 (0001): 2.67 0.355 1.33 39.19

+ ID2= 2 (0002): 0.34 0.031 1.33 30.90

=====

ID = 3 (0003): 3.01 0.386 1.33 38.25

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	7.35	1.083	35.40	2.083	14.38	3.08	8.44
0.167	7.35	1.167	35.40	2.167	14.38	3.17	8.44
0.250	8.19	1.250	146.50	2.250	12.71	3.25	7.96
0.333	8.19	1.333	146.50	2.333	12.71	3.33	7.96
0.417	9.32	1.417	43.93	2.417	11.45	3.42	7.55
0.500	9.32	1.500	43.93	2.500	11.45	3.50	7.55
0.583	10.95	1.583	26.91	2.583	10.46	3.58	7.18
0.667	10.95	1.667	26.91	2.667	10.46	3.67	7.18
0.750	13.53	1.750	20.36	2.750	9.66	3.75	6.85
0.833	13.53	1.833	20.36	2.833	9.66	3.83	6.85
0.917	18.53	1.917	16.73	2.917	9.00	3.92	6.56
1.000	18.53	2.000	16.73	3.000	9.00	4.00	6.56

Max.Eff.Inten.(mm/hr)=	146.50	43.02
over (min)	5.00	15.00
Storage Coeff. (min)=	2.61 (ii)	12.50 (ii)
Unit Hyd. Tpeak (min)=	5.00	15.00
Unit Hyd. peak (cms)=	0.29	0.08
PEAK FLOW (cms)=	0.31	0.10
TIME TO PEAK (hrs)=	1.33	1.50
		0.355 (iii)
		1.33

TOTALS

PEAK FLOW (cms)= 0.355 (iii)

TIME TO PEAK (hrs)= 1.33

100-YEAR STORM - PRE-DEVELOPMENT

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V V I SSSS U U A L (v 6.2.2020)

V V I SS U U A A L

V V I SS U U A A A A L

V V I SS U U A A L

V V I SSSS UUUU A A LLLL

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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voindat

Output filename: C:\Users\Natalie\AppData\Local\Civica\XH5\c399a01c-8370-442e-925a-91933bdc17fe\313c2732-e9d0-43d8-b2e2-9897a841716b\scen

Summary filename: C:\Users\Natalie\AppData\Local\Civica\XH5\c399a01c-8370-442e-925a-91933bdc17fe\313c2732-e9d0-43d8-b2e2-9897a841716b\scen

DATE: 04/16/2026 TIME: 02:24:25

USER:

COMMENTS: _____

** SIMULATION : 06_100-Year Norfolk **

| CHICAGO STORM | IDF curve parameters: A= 801.041

| Ptotal= 87.09 mm | B= 1.501

C= 0.657

used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs

Storm time step = 10.00 min

Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	8.40	1.00	38.70	2.00	16.17	3.00	9.61
0.17	9.34	1.17	160.97	2.17	14.33	3.17	9.08
0.33	10.59	1.33	47.72	2.33	12.95	3.33	8.61
0.50	12.39	1.50	29.71	2.50	11.86	3.50	8.20
0.67	15.24	1.67	22.67	2.67	10.97	3.67	7.84
0.83	20.69	1.83	18.74	2.83	10.24	3.83	7.51

| CALIB |

| STANDHYD (0001) | Area (ha)= 2.67

| ID= 1 DT= 5.0 min | Total Imp(%)= 43.00 Dir. Conn.(%)= 29.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.15	1.52
Dep. Storage (mm)=	1.00	13.60
Average Slope (%)=	1.00	2.00
Length (m)=	133.42	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |

| STANDHYD (0002) | Area (ha)= 0.34

| ID= 1 DT= 5.0 min | Total Imp(%)= 23.00 Dir. Conn.(%)= 19.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.08	0.26
Dep. Storage (mm)=	1.00	13.60
Average Slope (%)=	1.00	2.00
Length (m)=	47.61	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	8.40	1.083	38.70	2.083	16.17	3.08	9.61
0.167	8.40	1.167	38.70	2.167	16.17	3.17	9.61
0.250	9.34	1.250	160.97	2.250	14.33	3.25	9.08
0.333	9.34	1.333	160.97	2.333	14.33	3.33	9.08
0.417	10.59	1.417	47.72	2.417	12.95	3.42	8.61
0.500	10.59	1.500	47.72	2.500	12.95	3.50	8.61
0.583	12.39	1.583	29.71	2.583	11.86	3.58	8.20
0.667	12.39	1.667	29.71	2.667	11.86	3.67	8.20
0.750	15.24	1.750	22.67	2.750	10.97	3.75	7.84
0.833	15.24	1.833	22.67	2.833	10.97	3.83	7.84
0.917	20.69	1.917	18.74	2.917	10.24	3.92	7.51
1.000	20.69	2.000	18.74	3.000	10.24	4.00	7.51

Max.Eff.Inten.(mm/hr)= 160.97 30.21

over (min)= 5.00 15.00

Storage Coeff. (min)= 1.35 (ii) 12.74 (ii)

Unit Hyd. Tpeak (min)= 5.00 15.00

Unit Hyd. peak (cms)= 0.33 0.08

PEAK FLOW (cms)= 0.03 0.01 0.035 (iii)

TIME TO PEAK (hrs)= 1.33 1.50 1.33

RUNOFF VOLUME (mm)= 86.09 24.76 36.39

TOTAL RAINFALL (mm)= 87.09 87.09 87.09

RUNOFF COEFFICIENT = 0.99 0.28 0.42

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20% YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
- CN* = 62.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD (0003) |

| 1 + 2 = 3 | AREA QPEAK TPEAK R.V.

(ha) (cms) (hrs) (mm)

ID1= 1 (0001): 2.67 0.403 1.33 45.44

+ ID2= 2 (0002): 0.34 0.035 1.33 36.39

=====

ID = 3 (0003): 3.01 0.438 1.33 44.42

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

=====

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.15	1.52
Dep. Storage (mm)=	1.00	13.60
Average Slope (%)=	1.00	2.00
Length (m)=	133.42	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	8.40	1.083	38.70	2.083	16.17	3.08	9.61
0.167	8.40	1.167	38.70	2.167	16.17	3.17	9.61
0.250	9.34	1.250	160.97	2.250	14.33	3.25	9.08
0.333	9.34	1.333	160.97	2.333	14.33	3.33	9.08
0.417	10.59	1.417	47.72	2.417	12.95	3.42	8.61
0.500	10.59	1.500	47.72	2.500	12.95	3.50	8.61
0.583	12.39	1.583	29.71	2.583	11.86	3.58	8.20
0.667	12.39	1.667	29.71	2.667	11.86	3.67	8.20
0.750	15.24	1.750	22.67	2.750	10.97	3.75	7.84
0.833	15.24	1.833	22.67	2.833	10.97	3.83	7.84
0.917	20.69	1.917	18.74	2.917	10.24	3.92	7.51
1.000	20.69	2.000	18.74	3.000	10.24	4.00	7.51

Max.Eff.Inten.(mm/hr)= 160.97 53.75

over (min)= 5.00 15.00

Storage Coeff. (min)= 2.51 (ii) 11.56 (ii)

Unit Hyd. Tpeak (min)= 5.00 15.00

Unit Hyd. peak (cms)= 0.29 0.09

PEAK FLOW (cms)= 0.34 0.13 0.403 (iii)

TIME TO PEAK (hrs)= 1.33 1.50 1.33

RUNOFF VOLUME (mm)= 86.09 28.84 45.44

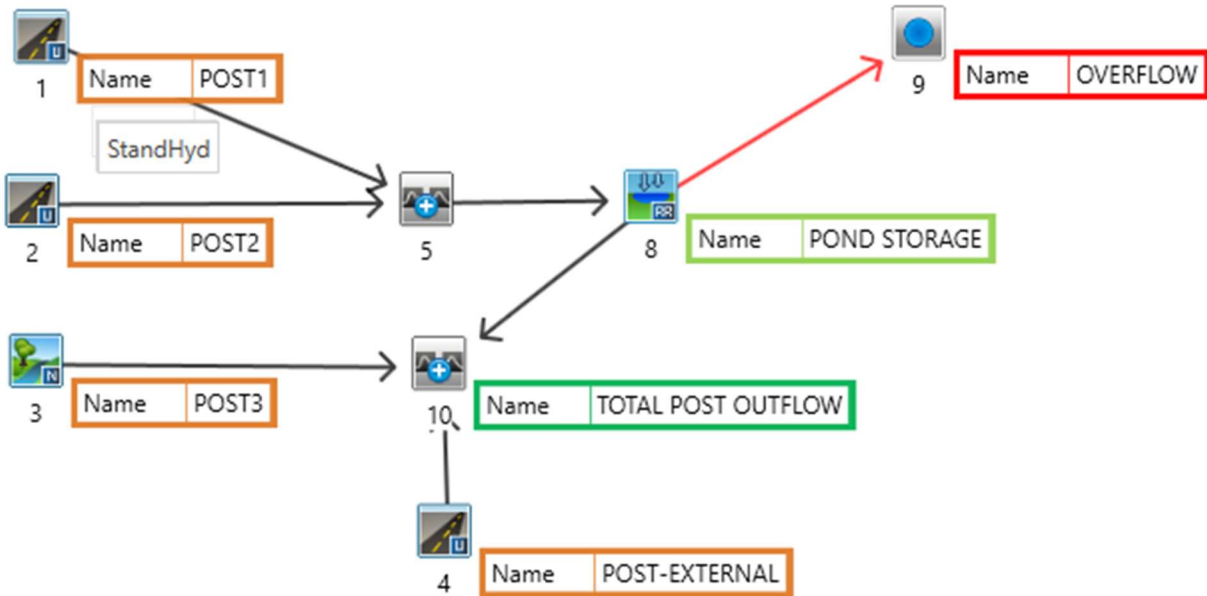
TOTAL RAINFALL (mm)= 87.09 87.09 87.09

RUNOFF COEFFICIENT = 0.99 0.33 0.52

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
- CN* = 62.0 Ia = Dep. Storage (Above)

22-013 HFW HUNT STREET DEVELOPMENT
POST-DEVELOPMENT
OTTHYMO MODEL



2-YEAR STORM - POST-DEVELOPMENT

=====									
NASHYD (0003) Area (ha)= 0.23 Curve Number (CN)= 62.0									
ID= 1 DT= 1.0 min Ia (mm)= 13.60 # of Linear Res.(N)= 3.00									
----- U.H. Tp(hrs)= 0.20 -----									
NOTE: RAINFALL WAS TRANSFORMED TO 1.0 MIN. TIME STEP.									
----- TRANSFORMED HYETOGRAPH -----									
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.017	2.68	1.017	17.69	2.017	5.90	3.02	3.14		
0.033	2.68	1.033	17.69	2.033	5.90	3.03	3.14		
0.050	2.68	1.050	17.69	2.050	5.90	3.05	3.14		
0.067	2.68	1.067	17.69	2.067	5.90	3.07	3.14		
0.083	2.68	1.083	17.69	2.083	5.90	3.08	3.14		
0.100	2.68	1.100	17.69	2.100	5.90	3.10	3.14		
0.117	2.68	1.117	17.69	2.117	5.90	3.12	3.14		
0.133	2.68	1.133	17.69	2.133	5.90	3.13	3.14		
0.150	2.68	1.150	17.69	2.150	5.90	3.15	3.14		
0.167	2.68	1.167	17.69	2.167	5.90	3.17	3.14		
0.183	3.04	1.183	72.24	2.183	5.09	3.18	2.94		
0.200	3.04	1.200	72.24	2.200	5.09	3.20	2.94		
0.217	3.04	1.217	72.24	2.217	5.09	3.22	2.94		
0.233	3.04	1.233	72.24	2.233	5.09	3.23	2.94		
0.250	3.04	1.250	72.24	2.250	5.09	3.25	2.94		
0.267	3.04	1.267	72.24	2.267	5.09	3.27	2.94		
0.283	3.04	1.283	72.24	2.283	5.09	3.28	2.94		
0.300	3.04	1.300	72.24	2.300	5.09	3.30	2.94		
0.317	3.04	1.317	72.24	2.317	5.09	3.32	2.94		
0.333	3.04	1.333	72.24	2.333	5.09	3.33	2.94		
0.350	3.53	1.350	22.78	2.350	4.50	3.35	2.76		
0.367	3.53	1.367	22.78	2.367	4.50	3.37	2.76		
0.383	3.53	1.383	22.78	2.383	4.50	3.38	2.76		
0.400	3.53	1.400	22.78	2.400	4.50	3.40	2.76		
0.417	3.53	1.417	22.78	2.417	4.50	3.42	2.76		
0.433	3.53	1.433	22.78	2.433	4.50	3.43	2.76		
0.450	3.53	1.450	22.78	2.450	4.50	3.45	2.76		
0.467	3.53	1.467	22.78	2.467	4.50	3.47	2.76		
0.483	3.53	1.483	22.78	2.483	4.50	3.48	2.76		
0.500	3.53	1.500	22.78	2.500	4.50	3.50	2.76		
0.517	4.26	1.517	12.62	2.517	4.04	3.52	2.60		
0.533	4.26	1.533	12.62	2.533	4.04	3.53	2.60		
0.550	4.26	1.550	12.62	2.550	4.04	3.55	2.60		
0.567	4.26	1.567	12.62	2.567	4.04	3.57	2.60		
0.583	4.26	1.583	12.62	2.583	4.04	3.58	2.60		
0.600	4.26	1.600	12.62	2.600	4.04	3.60	2.60		
0.617	4.26	1.617	12.62	2.617	4.04	3.62	2.60		
0.633	4.26	1.633	12.62	2.633	4.04	3.63	2.60		
0.650	4.26	1.650	12.62	2.650	4.04	3.65	2.60		
0.667	4.26	1.667	12.62	2.667	4.04	3.67	2.60		
0.683	5.49	1.683	8.98	2.683	3.68	3.68	2.47		
0.700	5.49	1.700	8.98	2.700	3.68	3.70	2.47		
0.717	5.49	1.717	8.98	2.717	3.68	3.72	2.47		
0.733	5.49	1.733	8.98	2.733	3.68	3.73	2.47		
0.750	5.49	1.750	8.98	2.750	3.68	3.75	2.47		
0.767	5.49	1.767	8.98	2.767	3.68	3.77	2.47		
0.783	5.49	1.783	8.98	2.783	3.68	3.78	2.47		
0.800	5.49	1.800	8.98	2.800	3.68	3.80	2.47		
0.817	5.49	1.817	8.98	2.817	3.68	3.82	2.47		
0.833	5.49	1.833	8.98	2.833	3.68	3.83	2.47		
0.850	8.02	1.850	7.08	2.850	3.39	3.85	2.35		
0.867	8.02	1.867	7.08	2.867	3.39	3.87	2.35		
0.883	8.02	1.883	7.08	2.883	3.39	3.88	2.35		
0.900	8.02	1.900	7.08	2.900	3.39	3.90	2.35		
0.917	8.02	1.917	7.08	2.917	3.39	3.92	2.35		
0.933	8.02	1.933	7.08	2.933	3.39	3.93	2.35		

0.950 8.02 | 1.950 7.08 | 2.950 3.39 | 3.95 2.35
0.967 8.02 | 1.967 7.08 | 2.967 3.39 | 3.97 2.35
0.983 8.02 | 1.983 7.08 | 2.983 3.39 | 3.98 2.35
1.000 8.02 | 2.000 7.08 | 3.000 3.39 | 4.00 2.35

Unit Hyd Qpeak (cms) = 0.044

PEAK FLOW (cms) = 0.001 (i)
TIME TO PEAK (hrs) = 1.717
RUNOFF VOLUME (mm) = 2.632
TOTAL RAINFALL (mm) = 35.210
RUNOFF COEFFICIENT = 0.075

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| STANDHYD (0001) | Area (ha) = 0.48
| ID= 1 DT= 1.0 min | Total Imp(%) = 100.00 Dir. Conn.(%) = 100.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha) = 0.48 0.00
Dep. Storage (mm) = 1.00 9.00
Average Slope (%) = 1.00 2.00
Length (m) = 56.57 40.00
Mannings n = 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 1.0 MIN. TIME STEP.

| CALIB |
| STANDHYD (0002) | Area (ha) = 2.07
| ID= 1 DT= 1.0 min | Total Imp(%) = 67.00 Dir. Conn.(%) = 41.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha) = 1.39 0.68
Dep. Storage (mm) = 1.00 9.00
Average Slope (%) = 1.00 2.00
Length (m) = 117.47 40.00
Mannings n = 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 1.0 MIN. TIME STEP.

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
0.017 2.68 | 1.017 17.69 | 2.017 5.90 | 3.02 3.14
0.033 2.68 | 1.033 17.69 | 2.033 5.90 | 3.03 3.14
0.050 2.68 | 1.050 17.69 | 2.050 5.90 | 3.05 3.14
0.067 2.68 | 1.067 17.69 | 2.067 5.90 | 3.07 3.14
0.083 2.68 | 1.083 17.69 | 2.083 5.90 | 3.08 3.14
0.100 2.68 | 1.100 17.69 | 2.100 5.90 | 3.10 3.14
0.117 2.68 | 1.117 17.69 | 2.117 5.90 | 3.12 3.14
0.133 2.68 | 1.133 17.69 | 2.133 5.90 | 3.13 3.14
0.150 2.68 | 1.150 17.69 | 2.150 5.90 | 3.15 3.14
0.167 2.68 | 1.167 17.69 | 2.167 5.90 | 3.17 3.14
0.183 3.04 | 1.183 72.24 | 2.183 5.09 | 3.18 2.94
0.200 3.04 | 1.200 72.24 | 2.200 5.09 | 3.20 2.94
0.217 3.04 | 1.217 72.24 | 2.217 5.09 | 3.22 2.94
0.233 3.04 | 1.233 72.24 | 2.233 5.09 | 3.23 2.94
0.250 3.04 | 1.250 72.24 | 2.250 5.09 | 3.25 2.94
0.267 3.04 | 1.267 72.24 | 2.267 5.09 | 3.27 2.94
0.283 3.04 | 1.283 72.24 | 2.283 5.09 | 3.28 2.94
0.300 3.04 | 1.300 72.24 | 2.300 5.09 | 3.30 2.94
0.317 3.04 | 1.317 72.24 | 2.317 5.09 | 3.32 2.94
0.333 3.04 | 1.333 72.24 | 2.333 5.09 | 3.33 2.94
0.350 3.53 | 1.350 22.78 | 2.350 4.50 | 3.35 2.76
0.367 3.53 | 1.367 22.78 | 2.367 4.50 | 3.37 2.76
0.383 3.53 | 1.383 22.78 | 2.383 4.50 | 3.38 2.76
0.400 3.53 | 1.400 22.78 | 2.400 4.50 | 3.40 2.76
0.417 3.53 | 1.417 22.78 | 2.417 4.50 | 3.42 2.76
0.433 3.53 | 1.433 22.78 | 2.433 4.50 | 3.43 2.76
0.450 3.53 | 1.450 22.78 | 2.450 4.50 | 3.45 2.76
0.467 3.53 | 1.467 22.78 | 2.467 4.50 | 3.47 2.76
0.483 3.53 | 1.483 22.78 | 2.483 4.50 | 3.48 2.76
0.500 3.53 | 1.500 22.78 | 2.500 4.50 | 3.50 2.76
0.517 4.26 | 1.517 12.62 | 2.517 4.04 | 3.52 2.60
0.533 4.26 | 1.533 12.62 | 2.533 4.04 | 3.53 2.60
0.550 4.26 | 1.550 12.62 | 2.550 4.04 | 3.55 2.60
0.567 4.26 | 1.567 12.62 | 2.567 4.04 | 3.57 2.60
0.583 4.26 | 1.583 12.62 | 2.583 4.04 | 3.58 2.60
0.600 4.26 | 1.600 12.62 | 2.600 4.04 | 3.60 2.60
0.617 4.26 | 1.617 12.62 | 2.617 4.04 | 3.62 2.60
0.633 4.26 | 1.633 12.62 | 2.633 4.04 | 3.63 2.60
0.650 4.26 | 1.650 12.62 | 2.650 4.04 | 3.65 2.60
0.667 4.26 | 1.667 12.62 | 2.667 4.04 | 3.67 2.60
0.683 5.49 | 1.683 8.98 | 2.683 3.68 | 3.68 2.47
0.700 5.49 | 1.700 8.98 | 2.700 3.68 | 3.70 2.47
0.717 5.49 | 1.717 8.98 | 2.717 3.68 | 3.72 2.47
0.733 5.49 | 1.733 8.98 | 2.733 3.68 | 3.73 2.47
0.750 5.49 | 1.750 8.98 | 2.750 3.68 | 3.75 2.47
0.767 5.49 | 1.767 8.98 | 2.767 3.68 | 3.77 2.47
0.783 5.49 | 1.783 8.98 | 2.783 3.68 | 3.78 2.47
0.800 5.49 | 1.800 8.98 | 2.800 3.68 | 3.80 2.47
0.817 5.49 | 1.817 8.98 | 2.817 3.68 | 3.82 2.47
0.833 5.49 | 1.833 8.98 | 2.833 3.68 | 3.83 2.47
0.850 8.02 | 1.850 7.08 | 2.850 3.39 | 3.85 2.35
0.867 8.02 | 1.867 7.08 | 2.867 3.39 | 3.87 2.35
0.883 8.02 | 1.883 7.08 | 2.883 3.39 | 3.88 2.35
0.900 8.02 | 1.900 7.08 | 2.900 3.39 | 3.90 2.35
0.917 8.02 | 1.917 7.08 | 2.917 3.39 | 3.92 2.35
0.933 8.02 | 1.933 7.08 | 2.933 3.39 | 3.93 2.35
0.950 8.02 | 1.950 7.08 | 2.950 3.39 | 3.95 2.35
0.967 8.02 | 1.967 7.08 | 2.967 3.39 | 3.97 2.35
0.983 8.02 | 1.983 7.08 | 2.983 3.39 | 3.98 2.35
1.000 8.02 | 2.000 7.08 | 3.000 3.39 | 4.00 2.35

Max.Eff.Inten.(mm/hr) = 72.24 29.01
over (min) = 5.00 11.00
Storage Coeff. (min) = 3.20 (ii) 10.57 (ii)
Unit Hyd. Tpeak (min) = 5.00 11.00
Unit Hyd. peak (cms) = 0.30 0.11

TOTALS
PEAK FLOW (cms) = 0.16 0.03 0.175 (iii)
TIME TO PEAK (hrs) = 1.33 1.50 1.35
RUNOFF VOLUME (mm) = 34.21 10.00 19.92
TOTAL RAINFALL (mm) = 35.21 35.21 35.21
RUNOFF COEFFICIENT = 0.97 0.28 0.57

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 70.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

Max.Eff.Inten.(mm/hr) = 72.24 6.59
over (min) = 5.00 3.00
Storage Coeff. (min) = 2.07 (ii) 2.10 (ii)
Unit Hyd. Tpeak (min) = 5.00 3.00
Unit Hyd. peak (cms) = 0.37 0.65
TOTALS
PEAK FLOW (cms) = 0.09 0.00 0.094 (iii)
TIME TO PEAK (hrs) = 1.33 1.35 1.33
RUNOFF VOLUME (mm) = 34.21 5.09 34.15
TOTAL RAINFALL (mm) = 35.21 35.21 35.21
RUNOFF COEFFICIENT = 0.97 0.14 0.97

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 70.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD (0005) |
| 1 + 2 = 3 | AREA (ha) QPEAK (cms) TPEAK (hrs) R.V. (mm)

ID1= 1 (0001): 0.48 0.094 1.33 34.15
+ ID2= 2 (0002): 2.07 0.175 1.35 19.92

ID = 3 (0005): 2.55 0.267 1.35 22.60

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| RESERVOIR(0008) | OVERFLOW IS ON

| IN= 2---> OUT= 1 |
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0940	0.0240
0.0000	0.0016	0.1410	0.0289
0.0280	0.0036	0.1880	0.0342
0.0390	0.0060	0.2340	0.0400
0.0480	0.0087	0.2800	0.0463
0.0550	0.0119	0.3260	0.0531
0.0620	0.0155	0.3710	0.0603
0.0680	0.0195	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0005)	2.550	0.267	1.35	22.60
OUTFLOW: ID= 1 (0008)	2.550	0.079	1.65	21.97
OVERFLOW:ID= 3 (0003)	0.000	0.000	0.00	0.00

TOTAL NUMBER OF SIMULATION OVERFLOW = 0
CUMULATIVE TIME OF OVERFLOW (HOURS) = 0.00
PERCENTAGE OF TIME OVERFLOWING (%) = 0.00

PEAK FLOW REDUCTION [Qout/Qin](%)= 29.68
TIME SHIFT OF PEAK FLOW (min)= 18.00
MAXIMUM STORAGE USED (ha.m.)= 0.0214

**** WARNING : SELECTED ROUTING TIME STEP DENIED.

| CALIB |
| STANDHYD (0004) |
ID= 1 DT= 1.0 min

Area (ha)= 0.22
Total Imp(%)= 49.00 Dir. Conn.(%)= 36.00

	IMPERVIOUS (ha)	PERVIOUS (i) (mm)
Surface Area	0.11	0.11
Dep. Storage	1.00	9.00
Average Slope	1.00	2.00
Length	38.30	40.00
Mannings n	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 1.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.017	2.68	1.017	17.69	2.017	5.90	3.02	3.14
0.033	2.68	1.033	17.69	2.033	5.90	3.03	3.14
0.050	2.68	1.050	17.69	2.050	5.90	3.05	3.14
0.067	2.68	1.067	17.69	2.067	5.90	3.07	3.14
0.083	2.68	1.083	17.69	2.083	5.90	3.08	3.14
0.100	2.68	1.100	17.69	2.100	5.90	3.10	3.14
0.117	2.68	1.117	17.69	2.117	5.90	3.12	3.14
0.133	2.68	1.133	17.69	2.133	5.90	3.13	3.14
0.150	2.68	1.150	17.69	2.150	5.90	3.15	3.14
0.167	2.68	1.167	17.69	2.167	5.90	3.17	3.14
0.183	3.04	1.183	72.24	2.183	5.09	3.18	2.94
0.200	3.04	1.200	72.24	2.200	5.09	3.20	2.94
0.217	3.04	1.217	72.24	2.217	5.09	3.22	2.94
0.233	3.04	1.233	72.24	2.233	5.09	3.23	2.94
0.250	3.04	1.250	72.24	2.250	5.09	3.25	2.94
0.267	3.04	1.267	72.24	2.267	5.09	3.27	2.94
0.283	3.04	1.283	72.24	2.283	5.09	3.28	2.94
0.300	3.04	1.300	72.24	2.300	5.09	3.30	2.94
0.317	3.04	1.317	72.24	2.317	5.09	3.32	2.94
0.333	3.04	1.333	72.24	2.333	5.09	3.33	2.94
0.350	3.53	1.350	22.78	2.350	4.50	3.35	2.76
0.367	3.53	1.367	22.78	2.367	4.50	3.37	2.76
0.383	3.53	1.383	22.78	2.383	4.50	3.38	2.76
0.400	3.53	1.400	22.78	2.400	4.50	3.40	2.76
0.417	3.53	1.417	22.78	2.417	4.50	3.42	2.76
0.433	3.53	1.433	22.78	2.433	4.50	3.43	2.76
0.450	3.53	1.450	22.78	2.450	4.50	3.45	2.76
0.467	3.53	1.467	22.78	2.467	4.50	3.47	2.76
0.483	3.53	1.483	22.78	2.483	4.50	3.48	2.76
0.500	3.53	1.500	22.78	2.500	4.50	3.50	2.76
0.517	4.26	1.517	12.62	2.517	4.04	3.52	2.60
0.533	4.26	1.533	12.62	2.533	4.04	3.53	2.60
0.550	4.26	1.550	12.62	2.550	4.04	3.55	2.60
0.567	4.26	1.567	12.62	2.567	4.04	3.57	2.60
0.583	4.26	1.583	12.62	2.583	4.04	3.58	2.60
0.600	4.26	1.600	12.62	2.600	4.04	3.60	2.60
0.617	4.26	1.617	12.62	2.617	4.04	3.62	2.60
0.633	4.26	1.633	12.62	2.633	4.04	3.63	2.60
0.650	4.26	1.650	12.62	2.650	4.04	3.65	2.60
0.667	4.26	1.667	12.62	2.667	4.04	3.67	2.60
0.683	5.49	1.683	8.98	2.683	3.68	3.68	2.47
0.700	5.49	1.700	8.98	2.700	3.68	3.70	2.47
0.717	5.49	1.717	8.98	2.717	3.68	3.72	2.47
0.733	5.49	1.733	8.98	2.733	3.68	3.73	2.47
0.750	5.49	1.750	8.98	2.750	3.68	3.75	2.47
0.767	5.49	1.767	8.98	2.767	3.68	3.77	2.47
0.783	5.49	1.783	8.98	2.783	3.68	3.78	2.47
0.800	5.49	1.800	8.98	2.800	3.68	3.80	2.47
0.817	5.49	1.817	8.98	2.817	3.68	3.82	2.47
0.833	5.49	1.833	8.98	2.833	3.68	3.83	2.47
0.850	8.02	1.850	7.08	2.850	3.39	3.85	2.35
0.867	8.02	1.867	7.08	2.867	3.39	3.87	2.35
0.883	8.02	1.883	7.08	2.883	3.39	3.88	2.35
0.900	8.02	1.900	7.08	2.900	3.39	3.90	2.35
0.917	8.02	1.917	7.08	2.917	3.39	3.92	2.35
0.933	8.02	1.933	7.08	2.933	3.39	3.93	2.35
0.950	8.02	1.950	7.08	2.950	3.39	3.95	2.35
0.967	8.02	1.967	7.08	2.967	3.39	3.97	2.35
0.983	8.02	1.983	7.08	2.983	3.39	3.98	2.35
1.000	8.02	2.000	7.08	3.000	3.39	4.00	2.35

Max.Eff.Inten. (mm/hr)=	72.24	10.22
over (min)	5.00	20.00
Storage Coeff. (min)=	1.64 (ii)	19.21 (ii)
Unit Hyd. Tpeak (min)=	5.00	20.00
Unit Hyd. peak (cms)=	0.41	0.06
		TOTALS
PEAK FLOW (cms)=	0.02	0.00
		0.016 (iii)

TIME TO PEAK (hrs)=	1.33	1.73	1.33
RUNOFF VOLUME (mm)=	34.21	6.85	16.65
TOTAL RAINFALL (mm)=	35.21	35.21	35.21
RUNOFF COEFFICIENT =	0.97	0.19	0.47

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 70.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD (0010) |
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0003):	0.23	0.001	1.72	2.63
+ ID2= 2 (0004):	0.22	0.016	1.33	16.65
=====				
ID = 3 (0010):	0.45	0.016	1.33	9.48

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD (0010) |
3 + 2 = 1

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (0010):	0.45	0.016	1.33	9.48
+ ID2= 2 (0008):	2.55	0.079	1.65	21.97
=====				
ID = 1 (0010):	3.00	0.085	1.65	20.10

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

Junction Command(0009)

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 3(0008)	0.00	0.00	0.00	0.00
OUTFLOW: ID= 2(0009)	0.00	0.00	0.00	0.00

5-YEAR STORM - POST-DEVELOPMENT

=====

V V I SSSS U U A L (v 6.2.2020)

V V I SS U U A A L

V V I SS U U AAAAA L

V V I SS U U A A L

VV I SSSS UUUU A A LLLL

OOO TTTT TTTT H H Y Y M M OOO TM

O O T T H H Y Y M M O O

O O T T H H Y M M O O

OOO T T H H Y M M OOO

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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

Output filename: C:\Users\Natalie\AppData\Local\Civica\XH5\c399a01c-8370-442e-925a-91933bdc17fe\3b57a75c-900d-4d0c-b54a-6ea8713f4b22\scen

Summary filename: C:\Users\Natalie\AppData\Local\Civica\XH5\c399a01c-8370-442e-925a-91933bdc17fe\3b57a75c-900d-4d0c-b54a-6ea8713f4b22\scen

DATE: 05/01/2026 TIME: 09:33:04

USER:

COMMENTS: _____

** SIMULATION : 02_5-Year Norfolk **

CHICAGO STORM

Ptotal= 49.03 mm

IDF curve parameters: A= 583.017

B= 3.007

C= 0.703

used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs

Storm time step = 10.00 min

Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	4.20	1.00	23.22	2.00	8.64	3.00	4.87
0.17	4.72	1.17	96.03	2.17	7.56	3.17	4.58
0.33	5.42	1.33	29.33	2.33	6.76	3.33	4.32
0.50	6.44	1.50	17.13	2.50	6.13	3.50	4.10
0.67	8.09	1.67	12.62	2.67	5.63	3.67	3.90
0.83	11.39	1.83	10.19	2.83	5.22	3.83	3.72

CALIB

NASHYD (0003)

ID= 1 DT= 1.0 min

Area (ha)= 0.23

Curve Number (CN)= 62.0

Ia (mm)= 13.60

of Linear Res. (N)= 3.00

U.H. Tp(hrs)= 0.20

NOTE: RAINFALL WAS TRANSFORMED TO 1.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.017	4.20	1.017	23.22	2.017	8.64	3.02	4.87
0.033	4.20	1.033	23.22	2.033	8.64	3.03	4.87
0.050	4.20	1.050	23.22	2.050	8.64	3.05	4.87
0.067	4.20	1.067	23.22	2.067	8.64	3.07	4.87
0.083	4.20	1.083	23.22	2.083	8.64	3.08	4.87
0.100	4.20	1.100	23.22	2.100	8.64	3.10	4.87
0.117	4.20	1.117	23.22	2.117	8.64	3.12	4.87
0.133	4.20	1.133	23.22	2.133	8.64	3.13	4.87
0.150	4.20	1.150	23.22	2.150	8.64	3.15	4.87
0.167	4.20	1.167	23.22	2.167	8.64	3.17	4.87
0.183	4.72	1.183	96.03	2.183	7.56	3.18	4.58
0.200	4.72	1.200	96.03	2.200	7.56	3.20	4.58
0.217	4.72	1.217	96.03	2.217	7.56	3.22	4.58
0.233	4.72	1.233	96.03	2.233	7.56	3.23	4.58
0.250	4.72	1.250	96.03	2.250	7.56	3.25	4.58
0.267	4.72	1.267	96.03	2.267	7.56	3.27	4.58
0.283	4.72	1.283	96.03	2.283	7.56	3.28	4.58
0.300	4.72	1.300	96.03	2.300	7.56	3.30	4.58
0.317	4.72	1.317	96.03	2.317	7.56	3.32	4.58
0.333	4.72	1.333	96.03	2.333	7.56	3.33	4.58
0.350	5.42	1.350	29.33	2.350	6.76	3.35	4.32
0.367	5.42	1.367	29.33	2.367	6.76	3.37	4.32
0.383	5.42	1.383	29.33	2.383	6.76	3.38	4.32
0.400	5.42	1.400	29.33	2.400	6.76	3.40	4.32
0.417	5.42	1.417	29.33	2.417	6.76	3.42	4.32
0.433	5.42	1.433	29.33	2.433	6.76	3.43	4.32
0.450	5.42	1.450	29.33	2.450	6.76	3.45	4.32
0.467	5.42	1.467	29.33	2.467	6.76	3.47	4.32
0.483	5.42	1.483	29.33	2.483	6.76	3.48	4.32
0.500	5.42	1.500	29.33	2.500	6.76	3.50	4.32
0.517	6.44	1.517	17.13	2.517	6.13	3.52	4.10
0.533	6.44	1.533	17.13	2.533	6.13	3.53	4.10
0.550	6.44	1.550	17.13	2.550	6.13	3.55	4.10
0.567	6.44	1.567	17.13	2.567	6.13	3.57	4.10
0.583	6.44	1.583	17.13	2.583	6.13	3.58	4.10

0.600	6.44	1.600	17.13	2.600	6.13	3.60	4.10
0.617	6.44	1.617	17.13	2.617	6.13	3.62	4.10
0.633	6.44	1.633	17.13	2.633	6.13	3.63	4.10
0.650	6.44	1.650	17.13	2.650	6.13	3.65	4.10
0.667	6.44	1.667	17.13	2.667	6.13	3.67	4.10
0.683	8.09	1.683	12.62	2.683	5.63	3.68	3.90
0.700	8.09	1.700	12.62	2.700	5.63	3.70	3.90
0.717	8.09	1.717	12.62	2.717	5.63	3.72	3.90
0.733	8.09	1.733	12.62	2.733	5.63	3.73	3.90
0.750	8.09	1.750	12.62	2.750	5.63	3.75	3.90
0.767	8.09	1.767	12.62	2.767	5.63	3.77	3.90
0.783	8.09	1.783	12.62	2.783	5.63	3.78	3.90
0.800	8.09	1.800	12.62	2.800	5.63	3.80	3.90
0.817	8.09	1.817	12.62	2.817	5.63	3.82	3.90
0.833	8.09	1.833	12.62	2.833	5.63	3.83	3.90
0.850	11.39	1.850	10.19	2.850	5.22	3.85	3.72
0.867	11.39	1.867	10.19	2.867	5.22	3.87	3.72
0.883	11.39	1.883	10.19	2.883	5.22	3.88	3.72
0.900	11.39	1.900	10.19	2.900	5.22	3.90	3.72
0.917	11.39	1.917	10.19	2.917	5.22	3.92	3.72
0.933	11.39	1.933	10.19	2.933	5.22	3.93	3.72
0.950	11.39	1.950	10.19	2.950	5.22	3.95	3.72
0.967	11.39	1.967	10.19	2.967	5.22	3.97	3.72
0.983	11.39	1.983	10.19	2.983	5.22	3.98	3.72
1.000	11.39	2.000	10.19	3.000	5.22	4.00	3.72

Unit Hyd Qpeak (cms)= 0.044

PEAK FLOW (cms)= 0.003 (i)

TIME TO PEAK (hrs)= 1.633

RUNOFF VOLUME (mm)= 6.567

TOTAL RAINFALL (mm)= 49.033

RUNOFF COEFFICIENT = 0.134

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB

STANDHYD (0002)

ID= 1 DT= 1.0 min

Area (ha)= 2.07

Total Imp(%)= 67.00

Dir. Conn.(%)= 41.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.39	0.68
Dep. Storage (mm)=	1.00	9.00
Average Slope (%)=	1.00	2.00
Length (m)=	117.47	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 1.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.017	4.20	1.017	23.22	2.017	8.64	3.02	4.87
0.033	4.20	1.033	23.22	2.033	8.64	3.03	4.87
0.050	4.20	1.050	23.22	2.050	8.64	3.05	4.87
0.067	4.20	1.067	23.22	2.067	8.64	3.07	4.87
0.083	4.20	1.083	23.22	2.083	8.64	3.08	4.87
0.100	4.20	1.100	23.22	2.100	8.64	3.10	4.87
0.117	4.20	1.117	23.22	2.117	8.64	3.12	4.87
0.133	4.20	1.133	23.22	2.133	8.64	3.13	4.87
0.150	4.20	1.150	23.22	2.150	8.64	3.15	4.87
0.167	4.20	1.167	23.22	2.167	8.64	3.17	4.87
0.183	4.72	1.183	96.03	2.183	7.56	3.18	4.58
0.200	4.72	1.200	96.03	2.200	7.56	3.20	4.58
0.217	4.72	1.217	96.03	2.217	7.56	3.22	4.58
0.233	4.72	1.233	96.03	2.233	7.56	3.23	4.58
0.250	4.72	1.250	96.03	2.250	7.56	3.25	4.58
0.267	4.72	1.267	96.03	2.267	7.56	3.27	4.58
0.283	4.72	1.283	96.03	2.283	7.56	3.28	4.58
0.300	4.72	1.300	96.03	2.300	7.56	3.30	4.58
0.317	4.72	1.317	96.03	2.317	7.56	3.32	4.58
0.333	4.72	1.333	96.03	2.333	7.56	3.33	4.58
0.350	5.42	1.350	29.33	2.350	6.76	3.35	4.32
0.367	5.42	1.367	29.33	2.367	6.76	3.37	4.32
0.383	5.42	1.383	29.33	2.383	6.76	3.38	4.32
0.400	5.42	1.400	29.33	2.400	6.76	3.40	4.32
0.417	5.42	1.417	29.33	2.417	6.76	3.42	4.32
0.433	5.42	1.433	29.33	2.433	6.76	3.43	4.32
0.450	5.42	1.450	29.33	2.450	6.76	3.45	4.32
0.467	5.42	1.467	29.33	2.467	6.76	3.47	4.32
0.483	5.42	1.483	29.33	2.483	6.76	3.48	4.32
0.500	5.42	1.500	29.33	2.500	6.76	3.50	4.32
0.517	6.44	1.517	17.13	2.517	6.13	3.52	4.10
0.533	6.44	1.533	17.13	2.533	6.13	3.53	4.10
0.550	6.44	1.550	17.13	2.550	6.13	3.55	4.10
0.567	6.44	1.567	17.13	2.567	6.13	3.57	4.10
0.583	6.44	1.583	17.13	2.583	6.13	3.58	4.10
0.600	6.44	1.600	17.13	2.600	6.13	3.60	4.10
0.617	6.44	1.617	17.13	2.617	6.13	3.62	4.10
0.633	6.44	1.633	17.13	2.633	6.13	3.63	4.10
0.650	6.44	1.650	17.13	2.650	6.13	3.65	4.10
0.667	6.44	1.667	17.13	2.667	6.13	3.67	4.10
0.683	8.09	1.683	12.62	2.683	5.63	3.68	3.90
0.700	8.09	1.700	12.62	2.700	5.63	3.70	3.90
0.717	8.09	1.717	12.62	2.717	5.63	3.72	3.90
0.733	8.09	1.733	12.62	2.733	5.63	3.73	3.90
0.750	8.09	1.750	12.62	2.750	5.63	3.75	3.90
0.767	8.09	1.767	12.62	2.767	5.63	3.77	3.90
0.783	8.09	1.783	12.62	2.783	5.63	3.78	3.90
0.800	8.09	1.800	12.62	2.800	5.63	3.80	3.90
0.817	8.09	1.817	12.62	2.817	5.63	3.82	3.90
0.833	8.09	1.833	12.62	2.833	5.63	3.83	3.90
0.850	11.39	1.850	10.19	2.850	5.22	3.85	3.72
0.867	11.39	1.867	10.19	2.867	5.22	3.87	3.72
0.883	11.39	1.883	10.19	2.883	5.22	3.88	3.72
0.900	11.39	1.900	10.19	2.900	5.22	3.90	3.72
0.917	11.39	1.917	10.19	2.917	5.22	3.92	3.72
0.933	11.39	1.933	10.19	2.933	5.22	3.93	3.72
0.950	11.39	1.950	10.19	2.950	5.22	3.95	3.72
0.967	11.39	1.967	10.19	2.967	5.22	3.97	3.72
0.983	11.39	1.983	10.19	2.983	5.22	3.98	3.72

1.000 11.39 | 2.000 10.19 | 3.000 5.22 | 4.00 3.72

Max.Eff.Inten.(mm/hr)= 96.03 55.47
over (min) 5.00 10.00
Storage Coeff. (min)= 2.86 (ii) 9.44 (ii)
Unit Hyd. Tpeak (min)= 5.00 10.00
Unit Hyd. peak (cms)= 0.32 0.12

TOTALS
PEAK FLOW (cms)= 0.21 0.07 0.256 (iii)
TIME TO PEAK (hrs)= 1.33 1.47 1.35
RUNOFF VOLUME (mm)= 48.03 18.46 30.58
TOTAL RAINFALL (mm)= 49.03 49.03 49.03
RUNOFF COEFFICIENT = 0.98 0.38 0.62

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 70.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0001) | Area (ha)= 0.48
ID= 1 DT= 1.0 min | Total Imp(%)= 100.00 Dir. Conn.(%)= 100.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 0.48 0.00
Dep. Storage (mm)= 1.00 9.00
Average Slope (%)= 1.00 2.00
Length (m)= 56.57 40.00
Mannings n = 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 1.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.017	4.20	1.017	23.22	2.017	8.64	3.02	4.87
0.033	4.20	1.033	23.22	2.033	8.64	3.03	4.87
0.050	4.20	1.050	23.22	2.050	8.64	3.05	4.87
0.067	4.20	1.067	23.22	2.067	8.64	3.07	4.87
0.083	4.20	1.083	23.22	2.083	8.64	3.08	4.87
0.100	4.20	1.100	23.22	2.100	8.64	3.10	4.87
0.117	4.20	1.117	23.22	2.117	8.64	3.12	4.87
0.133	4.20	1.133	23.22	2.133	8.64	3.13	4.87
0.150	4.20	1.150	23.22	2.150	8.64	3.15	4.87
0.167	4.20	1.167	23.22	2.167	8.64	3.17	4.87
0.183	4.72	1.183	96.03	2.183	7.56	3.18	4.58
0.200	4.72	1.200	96.03	2.200	7.56	3.20	4.58
0.217	4.72	1.217	96.03	2.217	7.56	3.22	4.58
0.233	4.72	1.233	96.03	2.233	7.56	3.23	4.58
0.250	4.72	1.250	96.03	2.250	7.56	3.25	4.58
0.267	4.72	1.267	96.03	2.267	7.56	3.27	4.58
0.283	4.72	1.283	96.03	2.283	7.56	3.28	4.58
0.300	4.72	1.300	96.03	2.300	7.56	3.30	4.58
0.317	4.72	1.317	96.03	2.317	7.56	3.32	4.58
0.333	4.72	1.333	96.03	2.333	7.56	3.33	4.58
0.350	5.42	1.350	29.33	2.350	6.76	3.35	4.32
0.367	5.42	1.367	29.33	2.367	6.76	3.37	4.32
0.383	5.42	1.383	29.33	2.383	6.76	3.38	4.32
0.400	5.42	1.400	29.33	2.400	6.76	3.40	4.32
0.417	5.42	1.417	29.33	2.417	6.76	3.42	4.32
0.433	5.42	1.433	29.33	2.433	6.76	3.43	4.32
0.450	5.42	1.450	29.33	2.450	6.76	3.45	4.32
0.467	5.42	1.467	29.33	2.467	6.76	3.47	4.32
0.483	5.42	1.483	29.33	2.483	6.76	3.48	4.32
0.500	5.42	1.500	29.33	2.500	6.76	3.50	4.32
0.517	6.44	1.517	17.13	2.517	6.13	3.52	4.10
0.533	6.44	1.533	17.13	2.533	6.13	3.53	4.10
0.550	6.44	1.550	17.13	2.550	6.13	3.55	4.10
0.567	6.44	1.567	17.13	2.567	6.13	3.57	4.10
0.583	6.44	1.583	17.13	2.583	6.13	3.58	4.10
0.600	6.44	1.600	17.13	2.600	6.13	3.60	4.10
0.617	6.44	1.617	17.13	2.617	6.13	3.62	4.10
0.633	6.44	1.633	17.13	2.633	6.13	3.63	4.10
0.650	6.44	1.650	17.13	2.650	6.13	3.65	4.10
0.667	6.44	1.667	17.13	2.667	6.13	3.67	4.10
0.683	8.09	1.683	12.62	2.683	5.63	3.68	3.90
0.700	8.09	1.700	12.62	2.700	5.63	3.70	3.90
0.717	8.09	1.717	12.62	2.717	5.63	3.72	3.90
0.733	8.09	1.733	12.62	2.733	5.63	3.73	3.90
0.750	8.09	1.750	12.62	2.750	5.63	3.75	3.90
0.767	8.09	1.767	12.62	2.767	5.63	3.77	3.90
0.783	8.09	1.783	12.62	2.783	5.63	3.78	3.90
0.800	8.09	1.800	12.62	2.800	5.63	3.80	3.90
0.817	8.09	1.817	12.62	2.817	5.63	3.82	3.90
0.833	8.09	1.833	12.62	2.833	5.63	3.83	3.90
0.850	11.39	1.850	10.19	2.850	5.22	3.85	3.72
0.867	11.39	1.867	10.19	2.867	5.22	3.87	3.72
0.883	11.39	1.883	10.19	2.883	5.22	3.88	3.72
0.900	11.39	1.900	10.19	2.900	5.22	3.90	3.72
0.917	11.39	1.917	10.19	2.917	5.22	3.92	3.72
0.933	11.39	1.933	10.19	2.933	5.22	3.93	3.72
0.950	11.39	1.950	10.19	2.950	5.22	3.95	3.72
0.967	11.39	1.967	10.19	2.967	5.22	3.97	3.72
0.983	11.39	1.983	10.19	2.983	5.22	3.98	3.72
1.000	11.39	2.000	10.19	3.000	5.22	4.00	3.72

Max.Eff.Inten.(mm/hr)= 96.03 15.02
over (min) 5.00 2.00
Storage Coeff. (min)= 1.84 (ii) 1.87 (ii)
Unit Hyd. Tpeak (min)= 5.00 2.00
Unit Hyd. peak (cms)= 0.39 0.81

TOTALS
PEAK FLOW (cms)= 0.13 0.00 0.126 (iii)
TIME TO PEAK (hrs)= 1.33 1.33 1.33
RUNOFF VOLUME (mm)= 48.03 10.76 47.91
TOTAL RAINFALL (mm)= 49.03 49.03 49.03
RUNOFF COEFFICIENT = 0.98 0.22 0.98

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 70.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0005) |
1 + 2 = 3 | AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
ID1= 1 (0001): 0.48 0.126 1.33 47.91
+ ID2= 2 (0002): 2.07 0.256 1.35 30.58
ID = 3 (0005): 2.55 0.379 1.35 33.84

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR (0008) | OVERFLOW IS ON
IN= 2---> OUT= 1 |
DT= 5.0 min |

OUTFLOW	STORAGE	OUTFLOW	STORAGE
(cms)	(ha.m.)	(cms)	(ha.m.)
0.0000	0.0000	0.0940	0.0240
0.0000	0.0016	0.1410	0.0289
0.0280	0.0036	0.1880	0.0342
0.0390	0.0060	0.2340	0.0400
0.0480	0.0087	0.2800	0.0463
0.0550	0.0119	0.3260	0.0531
0.0620	0.0155	0.3710	0.0603
0.0680	0.0195	0.0000	0.0000

AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
INFLOW : ID= 2 (0005) 2.550 0.379 1.35 33.84
OUTFLOW: ID= 1 (0008) 2.550 0.141 1.58 33.21
OVERFLOW:ID= 3 (0003) 0.000 0.000 0.00 0.00

TOTAL NUMBER OF SIMULATION OVERFLOW = 0
CUMULATIVE TIME OF OVERFLOW (HOURS) = 0.00
PERCENTAGE OF TIME OVERFLOWING (%) = 0.00

PEAK FLOW REDUCTION [Qout/Qin](%)= 37.10
TIME SHIFT OF PEAK FLOW (min)= 14.00
MAXIMUM STORAGE USED (ha.m.)= 0.0289

**** WARNING : SELECTED ROUTING TIME STEP DENIED.

CALIB
STANDHYD (0004) | Area (ha)= 0.22
ID= 1 DT= 1.0 min | Total Imp(%)= 49.00 Dir. Conn.(%)= 36.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 0.11 0.11
Dep. Storage (mm)= 1.00 9.00
Average Slope (%)= 1.00 2.00
Length (m)= 38.30 40.00
Mannings n = 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 1.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.017	4.20	1.017	23.22	2.017	8.64	3.02	4.87
0.033	4.20	1.033	23.22	2.033	8.64	3.03	4.87
0.050	4.20	1.050	23.22	2.050	8.64	3.05	4.87
0.067	4.20	1.067	23.22	2.067	8.64	3.07	4.87
0.083	4.20	1.083	23.22	2.083	8.64	3.08	4.87
0.100	4.20	1.100	23.22	2.100	8.64	3.10	4.87
0.117	4.20	1.117	23.22	2.117	8.64	3.12	4.87
0.133	4.20	1.133	23.22	2.133	8.64	3.13	4.87
0.150	4.20	1.150	23.22	2.150	8.64	3.15	4.87
0.167	4.20	1.167	23.22	2.167	8.64	3.17	4.87
0.183	4.72	1.183	96.03	2.183	7.56	3.18	4.58
0.200	4.72	1.200	96.03	2.200	7.56	3.20	4.58
0.217	4.72	1.217	96.03	2.217	7.56	3.22	4.58
0.233	4.72	1.233	96.03	2.233	7.56	3.23	4.58
0.250	4.72	1.250	96.03	2.250	7.56	3.25	4.58
0.267	4.72	1.267	96.03	2.267	7.56	3.27	4.58
0.283	4.72	1.283	96.03	2.283	7.56	3.28	4.58
0.300	4.72	1.300	96.03	2.300	7.56	3.30	4.58
0.317	4.72	1.317	96.03	2.317	7.56	3.32	4.58
0.333	4.72	1.333	96.03	2.333	7.56	3.33	4.58
0.350	5.42	1.350	29.33	2.350	6.76	3.35	4.32
0.367	5.42	1.367	29.33	2.367	6.76	3.37	4.32
0.383	5.42	1.383	29.33	2.383	6.76	3.38	4.32
0.400	5.42	1.400	29.33	2.400	6.76	3.40	4.32
0.417	5.42	1.417	29.33	2.417	6.76	3.42	4.32
0.433	5.42	1.433	29.33	2.433	6.76	3.43	4.32
0.450	5.42	1.450	29.33	2.450	6.76	3.45	4.32
0.467	5.42	1.467	29.33	2.467	6.76	3.47	4.32
0.483	5.42	1.483	29.33	2.483	6.76	3.48	4.32
0.500	5.42	1.500	29.33	2.500	6.76	3.50	4.32
0.517	6.44	1.517	17.13	2.517	6.13	3.52	4.10
0.533	6.44	1.533	17.13	2.533	6.13	3.53	4.10
0.550	6.44	1.550	17.13	2.550	6.13	3.55	4.10
0.567	6.44	1.567	17.13	2.567	6.13	3.57	4.10
0.583	6.44	1.583	17.13	2.583	6.13	3.58	4.10
0.600	6.44	1.600	17.13	2.600	6.13	3.60	4.10
0.617	6.44	1.617	17.13	2.617	6.13	3.62	4.10
0.633	6.44	1.633	17.13	2.633	6.13	3.63	4.10
0.650	6.44	1.650	17.13	2.650	6.13	3.65	4.10
0.667	6.44	1.667	17.13	2.667	6.13	3.67	4.10
0.683	8.09	1.683	12.62	2.683	5.63	3.68	3.90
0.700	8.09	1.700	12.62	2.700	5.63	3.70	3.90
0.717	8.09	1.717	12.62	2.717	5.63	3.72	3.90
0.733	8.09	1.733	12.62	2.733	5.63	3.73	3.90
0.750	8.09	1.750	12.62	2.750	5.63	3.75	3.90
0.767	8.09	1.767	12.62	2.767	5.63	3.77	3.90
0.783	8.09	1.783	12.62	2.783	5.63	3.78	3.90

0.800	8.09	1.800	12.62	2.800	5.63	3.80	3.90
0.817	8.09	1.817	12.62	2.817	5.63	3.82	3.90
0.833	8.09	1.833	12.62	2.833	5.63	3.83	3.90
0.850	11.39	1.850	10.19	2.850	5.22	3.85	3.72
0.867	11.39	1.867	10.19	2.867	5.22	3.87	3.72
0.883	11.39	1.883	10.19	2.883	5.22	3.88	3.72
0.900	11.39	1.900	10.19	2.900	5.22	3.90	3.72
0.917	11.39	1.917	10.19	2.917	5.22	3.92	3.72
0.933	11.39	1.933	10.19	2.933	5.22	3.93	3.72
0.950	11.39	1.950	10.19	2.950	5.22	3.95	3.72
0.967	11.39	1.967	10.19	2.967	5.22	3.97	3.72
0.983	11.39	1.983	10.19	2.983	5.22	3.98	3.72
1.000	11.39	2.000	10.19	3.000	5.22	4.00	3.72

Max.Eff.Inten.(mm/hr)=	96.03	25.91	
over (min)	5.00	10.00	
Storage Coeff. (min)=	1.46 (ii)	9.71 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.42	0.12	
TOTALS			
PEAK FLOW (cms)=	0.02	0.01	0.024 (iii)
TIME TO PEAK (hrs)=	1.33	1.47	1.33
RUNOFF VOLUME (mm)=	48.03	13.63	25.99
TOTAL RAINFALL (mm)=	49.03	49.03	49.03
RUNOFF COEFFICIENT =	0.98	0.28	0.53

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 70.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0010) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
-----
ID1= 1 ( 0003):    0.23    0.003      1.63      6.57
+ ID2= 2 ( 0004):    0.22    0.024      1.33     25.99
=====
ID = 3 ( 0010):    0.45    0.024      1.35     16.06
-----

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0010) |
| 3 + 2 = 1 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
-----
ID1= 3 ( 0010):    0.45    0.024      1.35     16.06
+ ID2= 2 ( 0008):    2.55    0.141      1.58     33.21
=====
ID = 1 ( 0010):    3.00    0.153      1.57     30.64
-----

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| Junction Command(0009) |
-----

```

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 3(0008)	0.00	0.00	0.00	0.00
OUTFLOW: ID= 2(0009)	0.00	0.00	0.00	0.00

10-YEAR STORM - POST-DEVELOPMENT

=====

V V I SSSS U U A L (v 6.2.2020)

V V I SS U U A A L

V V I SS U U AAAAA L

V V I SS U U A A L

VV I SSSS UUUU A A LLLL

OOO TTTT TTTT H H Y Y M M OOO TM

O O T T H H Y Y M M O O

O O T T H H Y M M O O

OOO T T H H Y M M OOO

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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

Output filename: C:\Users\Natalie\AppData\Local\Civica\XH5\c399a01c-8370-442e-925a-91933bdc17fe\ca75fdf5-9ed3-47b8-bbce-16a110076703\scen

Summary filename: C:\Users\Natalie\AppData\Local\Civica\XH5\c399a01c-8370-442e-925a-91933bdc17fe\ca75fdf5-9ed3-47b8-bbce-16a110076703\scen

DATE: 05/01/2026 TIME: 09:33:04

USER:

COMMENTS: _____

** SIMULATION : 03_10-Year Norfolk **

CHICAGO STORM

Ptotal= 57.94 mm

IDF curve parameters: A= 670.324

B= 3.007

C= 0.698

used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs

Storm time step = 10.00 min

Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	5.04	1.00	27.43	2.00	10.30	3.00	5.84
0.17	5.66	1.17	111.84	2.17	9.03	3.17	5.49
0.33	6.49	1.33	34.58	2.33	8.07	3.33	5.18
0.50	7.70	1.50	20.31	2.50	7.33	3.50	4.92
0.67	9.66	1.67	15.00	2.67	6.74	3.67	4.68
0.83	13.55	1.83	12.13	2.83	6.25	3.83	4.47

CALIB

NASHYD (0003)

ID= 1 DT= 1.0 min

Area (ha)= 0.23

Curve Number (CN)= 62.0

Ia (mm)= 13.60

of Linear Res. (N)= 3.00

U.H. Tp(hrs)= 0.20

NOTE: RAINFALL WAS TRANSFORMED TO 1.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.017	5.04	1.017	27.43	2.017	10.30	3.02	5.84
0.033	5.04	1.033	27.43	2.033	10.30	3.03	5.84
0.050	5.04	1.050	27.43	2.050	10.30	3.05	5.84
0.067	5.04	1.067	27.43	2.067	10.30	3.07	5.84
0.083	5.04	1.083	27.43	2.083	10.30	3.08	5.84
0.100	5.04	1.100	27.43	2.100	10.30	3.10	5.84
0.117	5.04	1.117	27.43	2.117	10.30	3.12	5.84
0.133	5.04	1.133	27.43	2.133	10.30	3.13	5.84
0.150	5.04	1.150	27.43	2.150	10.30	3.15	5.84
0.167	5.04	1.167	27.43	2.167	10.30	3.17	5.84
0.183	5.66	1.183	111.84	2.183	9.03	3.18	5.49
0.200	5.66	1.200	111.84	2.200	9.03	3.20	5.49
0.217	5.66	1.217	111.84	2.217	9.03	3.22	5.49
0.233	5.66	1.233	111.84	2.233	9.03	3.23	5.49
0.250	5.66	1.250	111.84	2.250	9.03	3.25	5.49
0.267	5.66	1.267	111.84	2.267	9.03	3.27	5.49
0.283	5.66	1.283	111.84	2.283	9.03	3.28	5.49
0.300	5.66	1.300	111.84	2.300	9.03	3.30	5.49
0.317	5.66	1.317	111.84	2.317	9.03	3.32	5.49
0.333	5.66	1.333	111.84	2.333	9.03	3.33	5.49
0.350	6.49	1.350	34.58	2.350	8.07	3.35	5.18
0.367	6.49	1.367	34.58	2.367	8.07	3.37	5.18
0.383	6.49	1.383	34.58	2.383	8.07	3.38	5.18
0.400	6.49	1.400	34.58	2.400	8.07	3.40	5.18
0.417	6.49	1.417	34.58	2.417	8.07	3.42	5.18
0.433	6.49	1.433	34.58	2.433	8.07	3.43	5.18
0.450	6.49	1.450	34.58	2.450	8.07	3.45	5.18
0.467	6.49	1.467	34.58	2.467	8.07	3.47	5.18
0.483	6.49	1.483	34.58	2.483	8.07	3.48	5.18
0.500	6.49	1.500	34.58	2.500	8.07	3.50	5.18
0.517	7.70	1.517	20.31	2.517	7.33	3.52	4.92
0.533	7.70	1.533	20.31	2.533	7.33	3.53	4.92
0.550	7.70	1.550	20.31	2.550	7.33	3.55	4.92
0.567	7.70	1.567	20.31	2.567	7.33	3.57	4.92
0.583	7.70	1.583	20.31	2.583	7.33	3.58	4.92

0.600	7.70	1.600	20.31	2.600	7.33	3.60	4.92
0.617	7.70	1.617	20.31	2.617	7.33	3.62	4.92
0.633	7.70	1.633	20.31	2.633	7.33	3.63	4.92
0.650	7.70	1.650	20.31	2.650	7.33	3.65	4.92
0.667	7.70	1.667	20.31	2.667	7.33	3.67	4.92
0.683	9.66	1.683	15.00	2.683	6.74	3.68	4.68
0.700	9.66	1.700	15.00	2.700	6.74	3.70	4.68
0.717	9.66	1.717	15.00	2.717	6.74	3.72	4.68
0.733	9.66	1.733	15.00	2.733	6.74	3.73	4.68
0.750	9.66	1.750	15.00	2.750	6.74	3.75	4.68
0.767	9.66	1.767	15.00	2.767	6.74	3.77	4.68
0.783	9.66	1.783	15.00	2.783	6.74	3.78	4.68
0.800	9.66	1.800	15.00	2.800	6.74	3.80	4.68
0.817	9.66	1.817	15.00	2.817	6.74	3.82	4.68
0.833	9.66	1.833	15.00	2.833	6.74	3.83	4.68
0.850	13.55	1.850	12.13	2.850	6.25	3.85	4.47
0.867	13.55	1.867	12.13	2.867	6.25	3.87	4.47
0.883	13.55	1.883	12.13	2.883	6.25	3.88	4.47
0.900	13.55	1.900	12.13	2.900	6.25	3.90	4.47
0.917	13.55	1.917	12.13	2.917	6.25	3.92	4.47
0.933	13.55	1.933	12.13	2.933	6.25	3.93	4.47
0.950	13.55	1.950	12.13	2.950	6.25	3.95	4.47
0.967	13.55	1.967	12.13	2.967	6.25	3.97	4.47
0.983	13.55	1.983	12.13	2.983	6.25	3.98	4.47
1.000	13.55	2.000	12.13	3.000	6.25	4.00	4.47

Unit Hyd Qpeak (cms)= 0.044

PEAK FLOW (cms)= 0.005 (i)

TIME TO PEAK (hrs)= 1.600

RUNOFF VOLUME (mm)= 9.829

TOTAL RAINFALL (mm)= 57.945

RUNOFF COEFFICIENT = 0.170

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	Area (ha)= 2.07
STANDHYD (0002)	Total Imp(%)= 67.00
ID= 1 DT= 1.0 min	Dir. Conn.(%)= 41.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.39	0.68
Dep. Storage (mm)=	1.00	9.00
Average Slope (%)=	1.00	2.00
Length (m)=	117.47	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 1.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.017	5.04	1.017	27.43	2.017	10.30	3.02	5.84
0.033	5.04	1.033	27.43	2.033	10.30	3.03	5.84
0.050	5.04	1.050	27.43	2.050	10.30	3.05	5.84
0.067	5.04	1.067	27.43	2.067	10.30	3.07	5.84
0.083	5.04	1.083	27.43	2.083	10.30	3.08	5.84
0.100	5.04	1.100	27.43	2.100	10.30	3.10	5.84
0.117	5.04	1.117	27.43	2.117	10.30	3.12	5.84
0.133	5.04	1.133	27.43	2.133	10.30	3.13	5.84
0.150	5.04	1.150	27.43	2.150	10.30	3.15	5.84
0.167	5.04	1.167	27.43	2.167	10.30	3.17	5.84
0.183	5.66	1.183	111.84	2.183	9.03	3.18	5.49
0.200	5.66	1.200	111.84	2.200	9.03	3.20	5.49
0.217	5.66	1.217	111.84	2.217	9.03	3.22	5.49
0.233	5.66	1.233	111.84	2.233	9.03	3.23	5.49
0.250	5.66	1.250	111.84	2.250	9.03	3.25	5.49
0.267	5.66	1.267	111.84	2.267	9.03	3.27	5.49
0.283	5.66	1.283	111.84	2.283	9.03	3.28	5.49
0.300	5.66	1.300	111.84	2.300	9.03	3.30	5.49
0.317	5.66	1.317	111.84	2.317	9.03	3.32	5.49
0.333	5.66	1.333	111.84	2.333	9.03	3.33	5.49
0.350	6.49	1.350	34.58	2.350	8.07	3.35	5.18
0.367	6.49	1.367	34.58	2.367	8.07	3.37	5.18
0.383	6.49	1.383	34.58	2.383	8.07	3.38	5.18
0.400	6.49	1.400	34.58	2.400	8.07	3.40	5.18
0.417	6.49	1.417	34.58	2.417	8.07	3.42	5.18
0.433	6.49	1.433	34.58	2.433	8.07	3.43	5.18
0.450	6.49	1.450	34.58	2.450	8.07	3.45	5.18
0.467	6.49	1.467	34.58	2.467	8.07	3.47	5.18
0.483	6.49	1.483	34.58	2.483	8.07	3.48	5.18
0.500	6.49	1.500	34.58	2.500	8.07	3.50	5.18
0.517	7.70	1.517	20.31	2.517	7.33	3.52	4.92
0.533	7.70	1.533	20.31	2.533	7.33	3.53	4.92
0.550	7.70	1.550	20.31	2.550	7.33	3.55	4.92
0.567	7.70	1.567	20.31	2.567	7.33	3.57	4.92
0.583	7.70	1.583	20.31	2.583	7.33	3.58	4.92
0.600	7.70	1.600	20.31	2.600	7.33	3.60	4.92
0.617	7.70	1.617	20.31	2.617	7.33	3.62	4.92
0.633	7.70	1.633	20.31	2.633	7.33	3.63	4.92
0.650	7.70	1.650	20.31	2.650	7.33	3.65	4.92
0.667	7.70	1.667	20.31	2.667	7.33	3.67	4.92
0.683	9.66	1.683	15.00	2.683	6.74	3.68	4.68
0.700	9.66	1.700	15.00	2.700	6.74	3.70	4.68
0.717	9.66	1.717	15.00	2.717	6.74	3.72	4.68
0.733	9.66	1.733	15.00	2.733	6.74	3.73	4.68
0.750	9.66	1.750	15.00	2.750	6.74	3.75	4.68
0.767	9.66	1.767	15.00	2.767	6.74	3.77	4.68
0.783	9.66	1.783	15.00	2.783	6.74	3.78	4.68
0.800	9.66	1.800	15.00	2.800	6.74	3.80	4.68
0.817	9.66	1.817	15.00	2.817	6.74	3.82	4.68
0.833	9.66	1.833	15.00	2.833	6.74	3.83	4.68
0.850	13.55	1.850	12.13	2.850	6.25	3.85	4.47
0.867	13.55	1.867	12.13	2.867	6.25	3.87	4.47
0.883	13.55	1.883	12.13	2.883	6.25	3.88	4.47
0.900	13.55	1.900	12.13	2.900	6.25	3.90	4.47
0.917	13.55	1.917	12.13	2.917	6.25	3.92	4.47
0.933	13.55	1.933	12.13	2.933	6.25	3.93	4.47
0.950	13.55	1.950	12.13	2.950	6.25	3.95	4.47
0.967	13.55	1.967	12.13	2.967	6.25	3.97	4.47
0.983	13.55	1.983	12.13	2.983	6.25	3.98	4.47

1.000 13.55 | 2.000 12.13 | 3.000 6.25 | 4.00 4.47

Max.Eff.Inten.(mm/hr)= 111.84 75.57
over (min) 5.00 9.00
Storage Coeff. (min)= 2.69 (ii) 8.88 (ii)
Unit Hyd. Tpeak (min)= 5.00 9.00
Unit Hyd. peak (cms)= 0.33 0.13

TOTALS
PEAK FLOW (cms)= 0.25 0.10 0.319 (iii)
TIME TO PEAK (hrs)= 1.33 1.45 1.35
RUNOFF VOLUME (mm)= 56.94 24.60 37.86
TOTAL RAINFALL (mm)= 57.94 57.94 57.94
RUNOFF COEFFICIENT = 0.98 0.42 0.65

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 70.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0001) | Area (ha)= 0.48
ID= 1 DT= 1.0 min | Total Imp(%)= 100.00 Dir. Conn.(%)= 100.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 0.48 0.00
Dep. Storage (mm)= 1.00 9.00
Average Slope (%)= 1.00 2.00
Length (m)= 56.57 40.00
Mannings n = 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 1.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.017	5.04	1.017	27.43	2.017	10.30	3.02	5.84
0.033	5.04	1.033	27.43	2.033	10.30	3.03	5.84
0.050	5.04	1.050	27.43	2.050	10.30	3.05	5.84
0.067	5.04	1.067	27.43	2.067	10.30	3.07	5.84
0.083	5.04	1.083	27.43	2.083	10.30	3.08	5.84
0.100	5.04	1.100	27.43	2.100	10.30	3.10	5.84
0.117	5.04	1.117	27.43	2.117	10.30	3.12	5.84
0.133	5.04	1.133	27.43	2.133	10.30	3.13	5.84
0.150	5.04	1.150	27.43	2.150	10.30	3.15	5.84
0.167	5.04	1.167	27.43	2.167	10.30	3.17	5.84
0.183	5.66	1.183	111.84	2.183	9.03	3.18	5.49
0.200	5.66	1.200	111.84	2.200	9.03	3.20	5.49
0.217	5.66	1.217	111.84	2.217	9.03	3.22	5.49
0.233	5.66	1.233	111.84	2.233	9.03	3.23	5.49
0.250	5.66	1.250	111.84	2.250	9.03	3.25	5.49
0.267	5.66	1.267	111.84	2.267	9.03	3.27	5.49
0.283	5.66	1.283	111.84	2.283	9.03	3.28	5.49
0.300	5.66	1.300	111.84	2.300	9.03	3.30	5.49
0.317	5.66	1.317	111.84	2.317	9.03	3.32	5.49
0.333	5.66	1.333	111.84	2.333	9.03	3.33	5.49
0.350	6.49	1.350	34.58	2.350	8.07	3.35	5.18
0.367	6.49	1.367	34.58	2.367	8.07	3.37	5.18
0.383	6.49	1.383	34.58	2.383	8.07	3.38	5.18
0.400	6.49	1.400	34.58	2.400	8.07	3.40	5.18
0.417	6.49	1.417	34.58	2.417	8.07	3.42	5.18
0.433	6.49	1.433	34.58	2.433	8.07	3.43	5.18
0.450	6.49	1.450	34.58	2.450	8.07	3.45	5.18
0.467	6.49	1.467	34.58	2.467	8.07	3.47	5.18
0.483	6.49	1.483	34.58	2.483	8.07	3.48	5.18
0.500	6.49	1.500	34.58	2.500	8.07	3.50	5.18
0.517	7.70	1.517	20.31	2.517	7.33	3.52	4.92
0.533	7.70	1.533	20.31	2.533	7.33	3.53	4.92
0.550	7.70	1.550	20.31	2.550	7.33	3.55	4.92
0.567	7.70	1.567	20.31	2.567	7.33	3.57	4.92
0.583	7.70	1.583	20.31	2.583	7.33	3.58	4.92
0.600	7.70	1.600	20.31	2.600	7.33	3.60	4.92
0.617	7.70	1.617	20.31	2.617	7.33	3.62	4.92
0.633	7.70	1.633	20.31	2.633	7.33	3.63	4.92
0.650	7.70	1.650	20.31	2.650	7.33	3.65	4.92
0.667	7.70	1.667	20.31	2.667	7.33	3.67	4.92
0.683	9.66	1.683	15.00	2.683	6.74	3.68	4.68
0.700	9.66	1.700	15.00	2.700	6.74	3.70	4.68
0.717	9.66	1.717	15.00	2.717	6.74	3.72	4.68
0.733	9.66	1.733	15.00	2.733	6.74	3.73	4.68
0.750	9.66	1.750	15.00	2.750	6.74	3.75	4.68
0.767	9.66	1.767	15.00	2.767	6.74	3.77	4.68
0.783	9.66	1.783	15.00	2.783	6.74	3.78	4.68
0.800	9.66	1.800	15.00	2.800	6.74	3.80	4.68
0.817	9.66	1.817	15.00	2.817	6.74	3.82	4.68
0.833	9.66	1.833	15.00	2.833	6.74	3.83	4.68
0.850	13.55	1.850	12.13	2.850	6.25	3.85	4.47
0.867	13.55	1.867	12.13	2.867	6.25	3.87	4.47
0.883	13.55	1.883	12.13	2.883	6.25	3.88	4.47
0.900	13.55	1.900	12.13	2.900	6.25	3.90	4.47
0.917	13.55	1.917	12.13	2.917	6.25	3.92	4.47
0.933	13.55	1.933	12.13	2.933	6.25	3.93	4.47
0.950	13.55	1.950	12.13	2.950	6.25	3.95	4.47
0.967	13.55	1.967	12.13	2.967	6.25	3.97	4.47
0.983	13.55	1.983	12.13	2.983	6.25	3.98	4.47
1.000	13.55	2.000	12.13	3.000	6.25	4.00	4.47

Max.Eff.Inten.(mm/hr)= 111.84 22.14
over (min) 5.00 2.00
Storage Coeff. (min)= 1.74 (ii) 1.76 (ii)
Unit Hyd. Tpeak (min)= 5.00 2.00
Unit Hyd. peak (cms)= 0.40 0.82

TOTALS
PEAK FLOW (cms)= 0.15 0.00 0.147 (iii)
TIME TO PEAK (hrs)= 1.33 1.33 1.33
RUNOFF VOLUME (mm)= 56.94 15.18 56.80
TOTAL RAINFALL (mm)= 57.94 57.94 57.94
RUNOFF COEFFICIENT = 0.98 0.26 0.98

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 70.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0005) |
1 + 2 = 3 | AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
ID1= 1 (0001): 0.48 0.147 1.33 56.80
+ ID2= 2 (0002): 2.07 0.319 1.35 37.86
ID= 3 (0005): 2.55 0.462 1.35 41.42

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR (0008) | OVERFLOW IS ON
IN= 2---> OUT= 1 |
DT= 5.0 min |

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0940	0.0240
0.0000	0.0016	0.1410	0.0289
0.0280	0.0036	0.1880	0.0342
0.0390	0.0060	0.2340	0.0400
0.0480	0.0087	0.2800	0.0463
0.0550	0.0119	0.3260	0.0531
0.0620	0.0155	0.3710	0.0603
0.0680	0.0195	0.0000	0.0000

AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
INFLOW : ID= 2 (0005) 2.550 0.462 1.35 41.42
OUTFLOW: ID= 1 (0008) 2.550 0.185 1.57 40.79
OVERFLOW:ID= 3 (0003) 0.000 0.000 0.00 0.00

TOTAL NUMBER OF SIMULATION OVERFLOW = 0
CUMULATIVE TIME OF OVERFLOW (HOURS) = 0.00
PERCENTAGE OF TIME OVERFLOWING (%) = 0.00

PEAK FLOW REDUCTION [Qout/Qin](%)= 40.09
TIME SHIFT OF PEAK FLOW (min)= 13.00
MAXIMUM STORAGE USED (ha.m.)= 0.0339

**** WARNING : SELECTED ROUTING TIME STEP DENIED.

CALIB
STANDHYD (0004) | Area (ha)= 0.22
ID= 1 DT= 1.0 min | Total Imp(%)= 49.00 Dir. Conn.(%)= 36.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 0.11 0.11
Dep. Storage (mm)= 1.00 9.00
Average Slope (%)= 1.00 2.00
Length (m)= 38.30 40.00
Mannings n = 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 1.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.017	5.04	1.017	27.43	2.017	10.30	3.02	5.84
0.033	5.04	1.033	27.43	2.033	10.30	3.03	5.84
0.050	5.04	1.050	27.43	2.050	10.30	3.05	5.84
0.067	5.04	1.067	27.43	2.067	10.30	3.07	5.84
0.083	5.04	1.083	27.43	2.083	10.30	3.08	5.84
0.100	5.04	1.100	27.43	2.100	10.30	3.10	5.84
0.117	5.04	1.117	27.43	2.117	10.30	3.12	5.84
0.133	5.04	1.133	27.43	2.133	10.30	3.13	5.84
0.150	5.04	1.150	27.43	2.150	10.30	3.15	5.84
0.167	5.04	1.167	27.43	2.167	10.30	3.17	5.84
0.183	5.66	1.183	111.84	2.183	9.03	3.18	5.49
0.200	5.66	1.200	111.84	2.200	9.03	3.20	5.49
0.217	5.66	1.217	111.84	2.217	9.03	3.22	5.49
0.233	5.66	1.233	111.84	2.233	9.03	3.23	5.49
0.250	5.66	1.250	111.84	2.250	9.03	3.25	5.49
0.267	5.66	1.267	111.84	2.267	9.03	3.27	5.49
0.283	5.66	1.283	111.84	2.283	9.03	3.28	5.49
0.300	5.66	1.300	111.84	2.300	9.03	3.30	5.49
0.317	5.66	1.317	111.84	2.317	9.03	3.32	5.49
0.333	5.66	1.333	111.84	2.333	9.03	3.33	5.49
0.350	6.49	1.350	34.58	2.350	8.07	3.35	5.18
0.367	6.49	1.367	34.58	2.367	8.07	3.37	5.18
0.383	6.49	1.383	34.58	2.383	8.07	3.38	5.18
0.400	6.49	1.400	34.58	2.400	8.07	3.40	5.18
0.417	6.49	1.417	34.58	2.417	8.07	3.42	5.18
0.433	6.49	1.433	34.58	2.433	8.07	3.43	5.18
0.450	6.49	1.450	34.58	2.450	8.07	3.45	5.18
0.467	6.49	1.467	34.58	2.467	8.07	3.47	5.18
0.483	6.49	1.483	34.58	2.483	8.07	3.48	5.18
0.500	6.49	1.500	34.58	2.500	8.07	3.50	5.18
0.517	7.70	1.517	20.31	2.517	7.33	3.52	4.92
0.533	7.70	1.533	20.31	2.533	7.33	3.53	4.92
0.550	7.70	1.550	20.31	2.550	7.33	3.55	4.92
0.567	7.70	1.567	20.31	2.567	7.33	3.57	4.92
0.583	7.70	1.583	20.31	2.583	7.33	3.58	4.92
0.600	7.70	1.600	20.31	2.600	7.33	3.60	4.92
0.617	7.70	1.617	20.31	2.617	7.33	3.62	4.92
0.633	7.70	1.633	20.31	2.633	7.33	3.63	4.92
0.650	7.70	1.650	20.31	2.650	7.33	3.65	4.92
0.667	7.70	1.667	20.31	2.667	7.33	3.67	4.92
0.683	9.66	1.683	15.00	2.683	6.74	3.68	4.68
0.700	9.66	1.700	15.00	2.700	6.74	3.70	4.68
0.717	9.66	1.717	15.00	2.717	6.74	3.72	4.68
0.733	9.66	1.733	15.00	2.733	6.74	3.73	4.68
0.750	9.66	1.750	15.00	2.750	6.74	3.75	4.68
0.767	9.66	1.767	15.00	2.767	6.74	3.77	4.68
0.783	9.66	1.783	15.00	2.783	6.74	3.78	4.68

0.800	9.66	1.800	15.00	2.800	6.74	3.80	4.68
0.817	9.66	1.817	15.00	2.817	6.74	3.82	4.68
0.833	9.66	1.833	15.00	2.833	6.74	3.83	4.68
0.850	13.55	1.850	12.13	2.850	6.25	3.85	4.47
0.867	13.55	1.867	12.13	2.867	6.25	3.87	4.47
0.883	13.55	1.883	12.13	2.883	6.25	3.88	4.47
0.900	13.55	1.900	12.13	2.900	6.25	3.90	4.47
0.917	13.55	1.917	12.13	2.917	6.25	3.92	4.47
0.933	13.55	1.933	12.13	2.933	6.25	3.93	4.47
0.950	13.55	1.950	12.13	2.950	6.25	3.95	4.47
0.967	13.55	1.967	12.13	2.967	6.25	3.97	4.47
0.983	13.55	1.983	12.13	2.983	6.25	3.98	4.47
1.000	13.55	2.000	12.13	3.000	6.25	4.00	4.47

Max.Eff.Inten.(mm/hr)=	111.84	36.92	
over (min)	5.00	10.00	
Storage Coeff. (min)=	1.37 (ii)	9.13 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.43	0.12	
TOTALS			
PEAK FLOW (cms)=	0.02	0.01	0.029 (iii)
TIME TO PEAK (hrs)=	1.33	1.47	1.33
RUNOFF VOLUME (mm)=	56.94	18.75	32.47
TOTAL RAINFALL (mm)=	57.94	57.94	57.94
RUNOFF COEFFICIENT =	0.98	0.32	0.56

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 70.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0010) |
| 1 + 2 = 3 |
-----
ID1= 1 ( 0003): 0.23 0.005 1.60 9.83
+ ID2= 2 ( 0004): 0.22 0.029 1.33 32.47
=====
ID = 3 ( 0010): 0.45 0.030 1.35 20.90

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0010) |
| 3 + 2 = 1 |
-----
ID1= 3 ( 0010): 0.45 0.030 1.35 20.90
+ ID2= 2 ( 0008): 2.55 0.185 1.57 40.79
=====
ID = 1 ( 0010): 3.00 0.203 1.55 37.81

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| Junction Command(0009) |
-----

```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 3(0008)	0.00	0.00	0.00	0.00
OUTFLOW: ID= 2(0009)	0.00	0.00	0.00	0.00

```

=====
V   V   I   SSSSS U   U   A   L   (v 6.2.2020)
V   V   I   SS    U   U   AA  L
V   V   I   SS    U   U   AAAAA L
V   V   I   SS    U   U   A   L
VV    I   SSSSS UUUUU A   LLLLL

    OOO   TTTT   TTTT   H   H   Y   Y   M   M   OOO   TM
O   O   T   T   H   H   Y   Y   MM MM   O   O
O   O   T   T   H   H   Y   Y   M   M   O   O
    OOO   T   T   H   H   Y   Y   M   M   OOO

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***** D E T A I L E D   O U T P U T *****

Input  filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
Output filename: C:\Users\Natalie\AppData\Local\Civica\XH5\c399a01c-8370-
442e-925a-91933bdc17fe\21680dcf-a94c-4aa0-b476-6fb4d2031cc8\scen
Summary filename: C:\Users\Natalie\AppData\Local\Civica\XH5\c399a01c-8370-
442e-925a-91933bdc17fe\21680dcf-a94c-4aa0-b476-6fb4d2031cc8\scen

Unit Hyd Qpeak (cms)= 0.044

PEAK FLOW (cms)= 0.007 (i)
TIME TO PEAK (hrs)= 1.583
RUNOFF VOLUME (mm)= 14.711
TOTAL RAINFALL (mm)= 69.379
RUNOFF COEFFICIENT = 0.212

DATE: 05/01/2026 TIME: 09:33:04

USER:

COMMENTS: _____

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-----
| CALIB |
| STANHYD ( 0002) | Area (ha)= 2.07
|ID= 1 DT= 1.0 min | Total Imp(%)= 67.00 Dir. Conn.(%)= 41.00

-----
IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 1.39 0.68
Dep. Storage (mm)= 1.00 9.00
Average Slope (%)= 1.00 2.00
Length (m)= 117.47 40.00
Mannings n = 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 1.0 MIN. TIME STEP.

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN |
hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr |
0.00 6.34 | 1.00 31.84 | 2.00 12.58 | 3.00 7.30
0.17 7.08 | 1.17 131.63 | 2.17 11.08 | 3.17 6.87
0.33 8.07 | 1.33 39.74 | 2.33 9.96 | 3.33 6.50
0.50 9.51 | 1.50 23.97 | 2.50 9.08 | 3.50 6.18
0.67 11.82 | 1.67 17.98 | 2.67 8.38 | 3.67 5.90
0.83 16.33 | 1.83 14.70 | 2.83 7.79 | 3.83 5.64

-----
| CALIB |
| NASHYD ( 0003) | Area (ha)= 0.23 Curve Number (CN)= 62.0
|ID= 1 DT= 1.0 min | Ia (mm)= 13.60 # of Linear Res. (N)= 3.00
U.H. Tp(hrs)= 0.20

NOTE: RAINFALL WAS TRANSFORMED TO 1.0 MIN. TIME STEP.

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN |
hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr |
0.017 6.34 | 1.017 31.84 | 2.017 12.58 | 3.02 7.30
0.033 6.34 | 1.033 31.84 | 2.033 12.58 | 3.03 7.30
0.050 6.34 | 1.050 31.84 | 2.050 12.58 | 3.05 7.30
0.067 6.34 | 1.067 31.84 | 2.067 12.58 | 3.07 7.30
0.083 6.34 | 1.083 31.84 | 2.083 12.58 | 3.08 7.30
0.100 6.34 | 1.100 31.84 | 2.100 12.58 | 3.10 7.30
0.117 6.34 | 1.117 31.84 | 2.117 12.58 | 3.12 7.30
0.133 6.34 | 1.133 31.84 | 2.133 12.58 | 3.13 7.30
0.150 6.34 | 1.150 31.84 | 2.150 12.58 | 3.15 7.30
0.167 6.34 | 1.167 31.84 | 2.167 12.58 | 3.17 7.30
0.183 7.08 | 1.183 131.62 | 2.183 11.08 | 3.18 6.87
0.200 7.08 | 1.200 131.63 | 2.200 11.08 | 3.20 6.87
0.217 7.08 | 1.217 131.63 | 2.217 11.08 | 3.22 6.87
0.233 7.08 | 1.233 131.63 | 2.233 11.08 | 3.23 6.87
0.250 7.08 | 1.250 131.63 | 2.250 11.08 | 3.25 6.87
0.267 7.08 | 1.267 131.63 | 2.267 11.08 | 3.27 6.87
0.283 7.08 | 1.283 131.63 | 2.283 11.08 | 3.28 6.87
0.300 7.08 | 1.300 131.63 | 2.300 11.08 | 3.30 6.87
0.317 7.08 | 1.317 131.63 | 2.317 11.08 | 3.32 6.87
0.333 7.08 | 1.333 131.63 | 2.333 11.08 | 3.33 6.87
0.350 8.07 | 1.350 39.74 | 2.350 9.96 | 3.35 6.50
0.367 8.07 | 1.367 39.74 | 2.367 9.96 | 3.37 6.50
0.383 8.07 | 1.383 39.74 | 2.383 9.96 | 3.38 6.50
0.400 8.07 | 1.400 39.74 | 2.400 9.96 | 3.40 6.50
0.417 8.07 | 1.417 39.74 | 2.417 9.96 | 3.42 6.50
0.433 8.07 | 1.433 39.74 | 2.433 9.96 | 3.43 6.50
0.450 8.07 | 1.450 39.74 | 2.450 9.96 | 3.45 6.50
0.467 8.07 | 1.467 39.74 | 2.467 9.96 | 3.47 6.50
0.483 8.07 | 1.483 39.74 | 2.483 9.96 | 3.48 6.50
0.500 8.07 | 1.500 39.74 | 2.500 9.96 | 3.50 6.50
0.517 9.51 | 1.517 23.97 | 2.517 9.08 | 3.52 6.18
0.533 9.51 | 1.533 23.97 | 2.533 9.08 | 3.53 6.18
0.550 9.51 | 1.550 23.97 | 2.550 9.08 | 3.55 6.18
0.567 9.51 | 1.567 23.97 | 2.567 9.08 | 3.57 6.18
0.583 9.51 | 1.583 23.97 | 2.583 9.08 | 3.58 6.18
0.600 9.51 | 1.600 23.97 | 2.600 9.08 | 3.60 6.18
0.617 9.51 | 1.617 23.97 | 2.617 9.08 | 3.62 6.18
0.633 9.51 | 1.633 23.97 | 2.633 9.08 | 3.63 6.18
0.650 9.51 | 1.650 23.97 | 2.650 9.08 | 3.65 6.18
0.667 9.51 | 1.667 23.97 | 2.667 9.08 | 3.67 6.18
0.683 11.82 | 1.683 17.98 | 2.683 8.38 | 3.68 5.90
0.700 11.82 | 1.700 17.98 | 2.700 8.38 | 3.70 5.90
0.717 11.82 | 1.717 17.98 | 2.717 8.38 | 3.72 5.90
0.733 11.82 | 1.733 17.98 | 2.733 8.38 | 3.73 5.90
0.750 11.82 | 1.750 17.98 | 2.750 8.38 | 3.75 5.90
0.767 11.82 | 1.767 17.98 | 2.767 8.38 | 3.77 5.90
0.783 11.82 | 1.783 17.98 | 2.783 8.38 | 3.78 5.90
0.800 11.82 | 1.800 17.98 | 2.800 8.38 | 3.80 5.90
0.817 11.82 | 1.817 17.98 | 2.817 8.38 | 3.82 5.90
0.833 11.82 | 1.833 17.98 | 2.833 8.38 | 3.83 5.90
0.850 16.33 | 1.850 14.70 | 2.850 7.79 | 3.85 5.64
0.867 16.33 | 1.867 14.70 | 2.867 7.79 | 3.87 5.64
0.883 16.33 | 1.883 14.70 | 2.883 7.79 | 3.88 5.64
0.900 16.33 | 1.900 14.70 | 2.900 7.79 | 3.90 5.64
0.917 16.33 | 1.917 14.70 | 2.917 7.79 | 3.92 5.64
0.933 16.33 | 1.933 14.70 | 2.933 7.79 | 3.93 5.64

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0.950 16.33 | 1.950 14.70 | 2.950 7.79 | 3.95 5.64
0.967 16.33 | 1.967 14.70 | 2.967 7.79 | 3.97 5.64
0.983 16.33 | 1.983 14.70 | 2.983 7.79 | 3.98 5.64
1.000 16.33 | 2.000 14.70 | 3.000 7.79 | 4.00 5.64

Max.Eff.Inten.(mm/hr)= 131.63 103.17
over (min) 5.00 9.00
Storage Coeff. (min)= 2.52 (ii) 8.32 (ii)
Unit Hyd. Tpeak (min)= 5.00 9.00
Unit Hyd. peak (cms)= 0.34 0.13

TOTALS
PEAK FLOW (cms)= 0.30 0.13 0.396 (iii)
TIME TO PEAK (hrs)= 1.33 1.43 1.35
RUNOFF VOLUME (mm)= 68.38 33.06 47.54
TOTAL RAINFALL (mm)= 69.38 69.38 69.38
RUNOFF COEFFICIENT = 0.99 0.48 0.69

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 70.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RUNOFF COEFFICIENT = 0.99 0.31 0.98

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 70.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD (0005) |
1 + 2 = 3
ID1= 1 (0001): 0.48 0.174 1.33 68.20
+ ID2= 2 (0002): 2.07 0.396 1.35 47.54
=====

ID = 3 (0005): 2.55 0.564 1.35 51.43

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| RESERVOIR(0008) | OVERFLOW IS ON
| IN= 2--> OUT= 1 |
DT= 5.0 min
OUTFLOW STORAGE | OUTFLOW STORAGE
(cms) (ha.m.) | (cms) (ha.m.)
0.0000 0.0000 | 0.0940 0.0240
0.0000 0.0016 | 0.1410 0.0289
0.0280 0.0036 | 0.1880 0.0342
0.0390 0.0060 | 0.2340 0.0400
0.0480 0.0087 | 0.2800 0.0463
0.0550 0.0119 | 0.3260 0.0531
0.0620 0.0155 | 0.3710 0.0603
0.0680 0.0195 | 0.0000 0.0000

AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
INFLOW : ID= 2 (0005) 2.550 0.564 1.35 51.43
OUTFLOW: ID= 1 (0008) 2.550 0.235 1.55 50.80
OVERFLOW: ID= 3 (0003) 0.000 0.000 0.00 0.00

TOTAL NUMBER OF SIMULATION OVERFLOW = 0
CUMULATIVE TIME OF OVERFLOW (HOURS) = 0.00
PERCENTAGE OF TIME OVERFLOWING (%) = 0.00

PEAK FLOW REDUCTION [Qout/Qin](%) = 41.72
TIME SHIFT OF PEAK FLOW (min) = 12.00
MAXIMUM STORAGE USED (ha.m.) = 0.0402

**** WARNING : SELECTED ROUTING TIME STEP DENIED.

| CALIB |
| STANDHYD (0004) | Area (ha)= 0.22
| ID= 1 DT= 1.0 min | Total Imp(%)= 49.00 Dir. Conn.(%)= 36.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 0.11 0.11
Dep. Storage (mm)= 1.00 9.00
Average Slope (%)= 1.00 2.00
Length (m)= 38.30 40.00
Mannings n = 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 1.0 MIN. TIME STEP.

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN | TIME RAIN | ' TIME RAIN | TIME RAIN
hrs mm/hr | hrs mm/hr | ' hrs mm/hr | hrs mm/hr
0.017 6.34 | 1.017 31.84 | 2.017 12.58 | 3.02 7.30
0.033 6.34 | 1.033 31.84 | 2.033 12.58 | 3.03 7.30
0.050 6.34 | 1.050 31.84 | 2.050 12.58 | 3.05 7.30
0.067 6.34 | 1.067 31.84 | 2.067 12.58 | 3.07 7.30
0.083 6.34 | 1.083 31.84 | 2.083 12.58 | 3.08 7.30
0.100 6.34 | 1.100 31.84 | 2.100 12.58 | 3.10 7.30
0.117 6.34 | 1.117 31.84 | 2.117 12.58 | 3.12 7.30
0.133 6.34 | 1.133 31.84 | 2.133 12.58 | 3.13 7.30
0.150 6.34 | 1.150 31.84 | 2.150 12.58 | 3.15 7.30
0.167 6.34 | 1.167 31.84 | 2.167 12.58 | 3.17 7.30
0.183 7.08 | 1.183 131.62 | 2.183 11.08 | 3.18 6.87
0.200 7.08 | 1.200 131.63 | 2.200 11.08 | 3.20 6.87
0.217 7.08 | 1.217 131.63 | 2.217 11.08 | 3.22 6.87
0.233 7.08 | 1.233 131.63 | 2.233 11.08 | 3.23 6.87
0.250 7.08 | 1.250 131.63 | 2.250 11.08 | 3.25 6.87
0.267 7.08 | 1.267 131.63 | 2.267 11.08 | 3.27 6.87
0.283 7.08 | 1.283 131.63 | 2.283 11.08 | 3.28 6.87
0.300 7.08 | 1.300 131.63 | 2.300 11.08 | 3.30 6.87
0.317 7.08 | 1.317 131.63 | 2.317 11.08 | 3.32 6.87
0.333 7.08 | 1.333 131.63 | 2.333 11.08 | 3.33 6.87
0.350 8.07 | 1.350 39.74 | 2.350 9.96 | 3.35 6.50
0.367 8.07 | 1.367 39.74 | 2.367 9.96 | 3.37 6.50
0.383 8.07 | 1.383 39.74 | 2.383 9.96 | 3.38 6.50
0.400 8.07 | 1.400 39.74 | 2.400 9.96 | 3.40 6.50
0.417 8.07 | 1.417 39.74 | 2.417 9.96 | 3.42 6.50
0.433 8.07 | 1.433 39.74 | 2.433 9.96 | 3.43 6.50
0.450 8.07 | 1.450 39.74 | 2.450 9.96 | 3.45 6.50
0.467 8.07 | 1.467 39.74 | 2.467 9.96 | 3.47 6.50
0.483 8.07 | 1.483 39.74 | 2.483 9.96 | 3.48 6.50
0.500 8.07 | 1.500 39.74 | 2.500 9.96 | 3.50 6.50
0.517 9.51 | 1.517 23.97 | 2.517 9.08 | 3.52 6.18
0.533 9.51 | 1.533 23.97 | 2.533 9.08 | 3.53 6.18
0.550 9.51 | 1.550 23.97 | 2.550 9.08 | 3.55 6.18
0.567 9.51 | 1.567 23.97 | 2.567 9.08 | 3.57 6.18
0.583 9.51 | 1.583 23.97 | 2.583 9.08 | 3.58 6.18
0.600 9.51 | 1.600 23.97 | 2.600 9.08 | 3.60 6.18
0.617 9.51 | 1.617 23.97 | 2.617 9.08 | 3.62 6.18
0.633 9.51 | 1.633 23.97 | 2.633 9.08 | 3.63 6.18
0.650 9.51 | 1.650 23.97 | 2.650 9.08 | 3.65 6.18
0.667 9.51 | 1.667 23.97 | 2.667 9.08 | 3.67 6.18
0.683 11.82 | 1.683 17.98 | 2.683 8.38 | 3.68 5.90
0.700 11.82 | 1.700 17.98 | 2.700 8.38 | 3.70 5.90
0.717 11.82 | 1.717 17.98 | 2.717 8.38 | 3.72 5.90
0.733 11.82 | 1.733 17.98 | 2.733 8.38 | 3.73 5.90
0.750 11.82 | 1.750 17.98 | 2.750 8.38 | 3.75 5.90
0.767 11.82 | 1.767 17.98 | 2.767 8.38 | 3.77 5.90
0.783 11.82 | 1.783 17.98 | 2.783 8.38 | 3.78 5.90
0.800 11.82 | 1.800 17.98 | 2.800 8.38 | 3.80 5.90
0.817 11.82 | 1.817 17.98 | 2.817 8.38 | 3.82 5.90
0.833 11.82 | 1.833 17.98 | 2.833 8.38 | 3.83 5.90
0.850 16.33 | 1.850 14.70 | 2.850 7.79 | 3.85 5.64
0.867 16.33 | 1.867 14.70 | 2.867 7.79 | 3.87 5.64
0.883 16.33 | 1.883 14.70 | 2.883 7.79 | 3.88 5.64
0.900 16.33 | 1.900 14.70 | 2.900 7.79 | 3.90 5.64
0.917 16.33 | 1.917 14.70 | 2.917 7.79 | 3.92 5.64
0.933 16.33 | 1.933 14.70 | 2.933 7.79 | 3.93 5.64
0.950 16.33 | 1.950 14.70 | 2.950 7.79 | 3.95 5.64
0.967 16.33 | 1.967 14.70 | 2.967 7.79 | 3.97 5.64
0.983 16.33 | 1.983 14.70 | 2.983 7.79 | 3.98 5.64
1.000 16.33 | 2.000 14.70 | 3.000 7.79 | 4.00 5.64

Max.Eff.Inten.(mm/hr)= 131.63 32.61
over (min) 5.00 2.00
Storage Coeff. (min)= 1.63 (ii) 1.65 (ii)
Unit Hyd. Tpeak (min)= 5.00 2.00
Unit Hyd. peak (cms)= 0.41 0.83

TOTALS
PEAK FLOW (cms)= 0.17 0.00 0.174 (iii)
TIME TO PEAK (hrs)= 1.33 1.33 1.33
RUNOFF VOLUME (mm)= 68.38 21.54 68.20
TOTAL RAINFALL (mm)= 69.38 69.38 69.38

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN | TIME RAIN | ' TIME RAIN | TIME RAIN
hrs mm/hr | hrs mm/hr | ' hrs mm/hr | hrs mm/hr
0.017 6.34 | 1.017 31.84 | 2.017 12.58 | 3.02 7.30
0.033 6.34 | 1.033 31.84 | 2.033 12.58 | 3.03 7.30
0.050 6.34 | 1.050 31.84 | 2.050 12.58 | 3.05 7.30
0.067 6.34 | 1.067 31.84 | 2.067 12.58 | 3.07 7.30
0.083 6.34 | 1.083 31.84 | 2.083 12.58 | 3.08 7.30
0.100 6.34 | 1.100 31.84 | 2.100 12.58 | 3.10 7.30
0.117 6.34 | 1.117 31.84 | 2.117 12.58 | 3.12 7.30
0.133 6.34 | 1.133 31.84 | 2.133 12.58 | 3.13 7.30
0.150 6.34 | 1.150 31.84 | 2.150 12.58 | 3.15 7.30
0.167 6.34 | 1.167 31.84 | 2.167 12.58 | 3.17 7.30
0.183 7.08 | 1.183 131.62 | 2.183 11.08 | 3.18 6.87
0.200 7.08 | 1.200 131.63 | 2.200 11.08 | 3.20 6.87
0.217 7.08 | 1.217 131.63 | 2.217 11.08 | 3.22 6.87
0.233 7.08 | 1.233 131.63 | 2.233 11.08 | 3.23 6.87
0.250 7.08 | 1.250 131.63 | 2.250 11.08 | 3.25 6.87
0.267 7.08 | 1.267 131.63 | 2.267 11.08 | 3.27 6.87
0.283 7.08 | 1.283 131.63 | 2.283 11.08 | 3.28 6.87
0.300 7.08 | 1.300 131.63 | 2.300 11.08 | 3.30 6.87
0.317 7.08 | 1.317 131.63 | 2.317 11.08 | 3.32 6.87
0.333 7.08 | 1.333 131.63 | 2.333 11.08 | 3.33 6.87
0.350 8.07 | 1.350 39.74 | 2.350 9.96 | 3.35 6.50
0.367 8.07 | 1.367 39.74 | 2.367 9.96 | 3.37 6.50
0.383 8.07 | 1.383 39.74 | 2.383 9.96 | 3.38 6.50
0.400 8.07 | 1.400 39.74 | 2.400 9.96 | 3.40 6.50
0.417 8.07 | 1.417 39.74 | 2.417 9.96 | 3.42 6.50
0.433 8.07 | 1.433 39.74 | 2.433 9.96 | 3.43 6.50
0.450 8.07 | 1.450 39.74 | 2.450 9.96 | 3.45 6.50
0.467 8.07 | 1.467 39.74 | 2.467 9.96 | 3.47 6.50
0.483 8.07 | 1.483 39.74 | 2.483 9.96 | 3.48 6.50
0.500 8.07 | 1.500 39.74 | 2.500 9.96 | 3.50 6.50
0.517 9.51 | 1.517 23.97 | 2.517 9.08 | 3.52 6.18
0.533 9.51 | 1.533 23.97 | 2.533 9.08 | 3.53 6.18
0.550 9.51 | 1.550 23.97 | 2.550 9.08 | 3.55 6.18
0.567 9.51 | 1.567 23.97 | 2.567 9.08 | 3.57 6.18
0.583 9.51 | 1.583 23.97 | 2.583 9.08 | 3.58 6.18
0.600 9.51 | 1.600 23.97 | 2.600 9.08 | 3.60 6.18
0.617 9.51 | 1.617 23.97 | 2.617 9.08 | 3.62 6.18
0.633 9.51 | 1.633 23.97 | 2.633 9.08 | 3.63 6.18
0.650 9.51 | 1.650 23.97 | 2.650 9.08 | 3.65 6.18
0.667 9.51 | 1.667 23.97 | 2.667 9.08 | 3.67 6.18
0.683 11.82 | 1.683 17.98 | 2.683 8.38 | 3.68 5.90
0.700 11.82 | 1.700 17.98 | 2.700 8.38 | 3.70 5.90
0.717 11.82 | 1.717 17.98 | 2.717 8.38 | 3.72 5.90
0.733 11.82 | 1.733 17.98 | 2.733 8.38 | 3.73 5.90

0.750	11.82	1.750	17.98	2.750	8.38	3.75	5.90
0.767	11.82	1.767	17.98	2.767	8.38	3.77	5.90
0.783	11.82	1.783	17.98	2.783	8.38	3.78	5.90
0.800	11.82	1.800	17.98	2.800	8.38	3.80	5.90
0.817	11.82	1.817	17.98	2.817	8.38	3.82	5.90
0.833	11.82	1.833	17.98	2.833	8.38	3.83	5.90
0.850	16.33	1.850	14.70	2.850	7.79	3.85	5.64
0.867	16.33	1.867	14.70	2.867	7.79	3.87	5.64
0.883	16.33	1.883	14.70	2.883	7.79	3.88	5.64
0.900	16.33	1.900	14.70	2.900	7.79	3.90	5.64
0.917	16.33	1.917	14.70	2.917	7.79	3.92	5.64
0.933	16.33	1.933	14.70	2.933	7.79	3.93	5.64
0.950	16.33	1.950	14.70	2.950	7.79	3.95	5.64
0.967	16.33	1.967	14.70	2.967	7.79	3.97	5.64
0.983	16.33	1.983	14.70	2.983	7.79	3.98	5.64
1.000	16.33	2.000	14.70	3.000	7.79	4.00	5.64

```

Max.Eff.Inten.(mm/hr)= 131.63      52.73
over (min)           5.00      9.00
Storage Coeff. (min)= 1.29 (ii)    8.56 (ii)
Unit Hyd. Tpeak (min)= 5.00      9.00
Unit Hyd. peak (cms)= 0.44      0.13

                                *TOTALS*
PEAK FLOW (cms)= 0.03      0.01      0.036 (iii)
TIME TO PEAK (hrs)= 1.33      1.45      1.35
RUNOFF VOLUME (mm)= 68.38      25.98      41.22
TOTAL RAINFALL (mm)= 69.38      69.38      69.38
RUNOFF COEFFICIENT = 0.99      0.37      0.59

```

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 70.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0010) |
| 1 + 2 = 3 |
-----
          AREA   QPEAK   TPEAK   R.V.
          (ha)   (cms)   (hrs)   (mm)
ID1= 1 ( 0003): 0.23  0.007  1.58  14.71
+ ID2= 2 ( 0004): 0.22  0.036  1.35  41.22
=====
ID = 3 ( 0010): 0.45  0.039  1.35  27.67

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0010) |
| 3 + 2 = 1 |
-----
          AREA   QPEAK   TPEAK   R.V.
          (ha)   (cms)   (hrs)   (mm)
ID1= 3 ( 0010): 0.45  0.039  1.35  27.67
+ ID2= 2 ( 0008): 2.55  0.235  1.55  50.80
=====
ID = 1 ( 0010): 3.00  0.260  1.53  47.33

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| Junction Command(0009) |
-----

```

```

          AREA   QPEAK   TPEAK   R.V.
          (ha)   (cms)   (hrs)   (mm)
INFLOW : ID= 3( 0008) 0.00  0.00  0.00  0.00
OUTFLOW: ID= 2( 0009) 0.00  0.00  0.00  0.00

```

50-YEAR STORM - POST-DEVELOPMENT

=====

V V I SSSS U U A L (v 6.2.2020)

V V I SS U U A A L

V V I SS U U AAAAA L

V V I SS U U A A L

VV I SSSS UUUU A A LLLLL

OOO TTTT TTTT H H Y Y M M OOO TM

O O T T H H Y Y M M O O

O O T T H H Y M M O O

OOO T T H H Y M M OOO

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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

Output filename: C:\Users\Natalie\AppData\Local\Civica\XH5\c399a01c-8370-442e-925a-91933bdc17fe\1529c3bb-7441-4c78-a8b1-3b5485807451\scen

Summary filename: C:\Users\Natalie\AppData\Local\Civica\XH5\c399a01c-8370-442e-925a-91933bdc17fe\1529c3bb-7441-4c78-a8b1-3b5485807451\scen

DATE: 05/01/2026

TIME: 09:33:55

USER:

COMMENTS: _____

** SIMULATION : 05 50-Year Norfolk 4hr **

CHICAGO STORM

Ptotal= 78.32 mm

IDF curve parameters: A= 766.038

B= 1.898

C= 0.668

used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs

Storm time step = 10.00 min

Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	7.35	1.00	35.40	2.00	14.38	3.00	8.44
0.17	8.19	1.17	146.50	2.17	12.71	3.17	7.96
0.33	9.32	1.33	43.93	2.33	11.45	3.33	7.55
0.50	10.95	1.50	26.91	2.50	10.46	3.50	7.18
0.67	13.53	1.67	20.36	2.67	9.66	3.67	6.85
0.83	18.53	1.83	16.73	2.83	9.00	3.83	6.56

CALIB

NASHYD (0003)

ID= 1 DT= 1.0 min

Area (ha)= 0.23

Curve Number (CN)= 62.0

Ia (mm)= 13.60

of Linear Res. (N)= 3.00

U.H. Tp(hrs)= 0.20

NOTE: RAINFALL WAS TRANSFORMED TO 1.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.017	7.35	1.017	35.40	2.017	14.38	3.02	8.44
0.033	7.35	1.033	35.40	2.033	14.38	3.03	8.44
0.050	7.35	1.050	35.40	2.050	14.38	3.05	8.44
0.067	7.35	1.067	35.40	2.067	14.38	3.07	8.44
0.083	7.35	1.083	35.40	2.083	14.38	3.08	8.44
0.100	7.35	1.100	35.40	2.100	14.38	3.10	8.44
0.117	7.35	1.117	35.40	2.117	14.38	3.12	8.44
0.133	7.35	1.133	35.40	2.133	14.38	3.13	8.44
0.150	7.35	1.150	35.40	2.150	14.38	3.15	8.44
0.167	7.35	1.167	35.40	2.167	14.38	3.17	8.44
0.183	8.19	1.183	146.50	2.183	12.71	3.18	7.96
0.200	8.19	1.200	146.50	2.200	12.71	3.20	7.96
0.217	8.19	1.217	146.50	2.217	12.71	3.22	7.96
0.233	8.19	1.233	146.50	2.233	12.71	3.23	7.96
0.250	8.19	1.250	146.50	2.250	12.71	3.25	7.96
0.267	8.19	1.267	146.50	2.267	12.71	3.27	7.96
0.283	8.19	1.283	146.50	2.283	12.71	3.28	7.96
0.300	8.19	1.300	146.50	2.300	12.71	3.30	7.96
0.317	8.19	1.317	146.50	2.317	12.71	3.32	7.96
0.333	8.19	1.333	146.50	2.333	12.71	3.33	7.96
0.350	9.32	1.350	43.94	2.350	11.45	3.35	7.55
0.367	9.32	1.367	43.93	2.367	11.45	3.37	7.55
0.383	9.32	1.383	43.93	2.383	11.45	3.38	7.55
0.400	9.32	1.400	43.93	2.400	11.45	3.40	7.55
0.417	9.32	1.417	43.93	2.417	11.45	3.42	7.55
0.433	9.32	1.433	43.93	2.433	11.45	3.43	7.55
0.450	9.32	1.450	43.93	2.450	11.45	3.45	7.55
0.467	9.32	1.467	43.93	2.467	11.45	3.47	7.55
0.483	9.32	1.483	43.93	2.483	11.45	3.48	7.55
0.500	9.32	1.500	43.93	2.500	11.45	3.50	7.55
0.517	10.95	1.517	26.91	2.517	10.46	3.52	7.18
0.533	10.95	1.533	26.91	2.533	10.46	3.53	7.18
0.550	10.95	1.550	26.91	2.550	10.46	3.55	7.18
0.567	10.95	1.567	26.91	2.567	10.46	3.57	7.18
0.583	10.95	1.583	26.91	2.583	10.46	3.58	7.18

0.600	10.95	1.600	26.91	2.600	10.46	3.60	7.18
0.617	10.95	1.617	26.91	2.617	10.46	3.62	7.18
0.633	10.95	1.633	26.91	2.633	10.46	3.63	7.18
0.650	10.95	1.650	26.91	2.650	10.46	3.65	7.18
0.667	10.95	1.667	26.91	2.667	10.46	3.67	7.18
0.683	13.53	1.683	20.36	2.683	9.66	3.68	6.85
0.700	13.53	1.700	20.36	2.700	9.66	3.70	6.85
0.717	13.53	1.717	20.36	2.717	9.66	3.72	6.85
0.733	13.53	1.733	20.36	2.733	9.66	3.73	6.85
0.750	13.53	1.750	20.36	2.750	9.66	3.75	6.85
0.767	13.53	1.767	20.36	2.767	9.66	3.77	6.85
0.783	13.53	1.783	20.36	2.783	9.66	3.78	6.85
0.800	13.53	1.800	20.36	2.800	9.66	3.80	6.85
0.817	13.53	1.817	20.36	2.817	9.66	3.82	6.85
0.833	13.53	1.833	20.36	2.833	9.66	3.83	6.85
0.850	18.53	1.850	16.73	2.850	9.00	3.85	6.56
0.867	18.53	1.867	16.73	2.867	9.00	3.87	6.56
0.883	18.53	1.883	16.73	2.883	9.00	3.88	6.56
0.900	18.53	1.900	16.73	2.900	9.00	3.90	6.56
0.917	18.53	1.917	16.73	2.917	9.00	3.92	6.56
0.933	18.53	1.933	16.73	2.933	9.00	3.93	6.56
0.950	18.53	1.950	16.73	2.950	9.00	3.95	6.56
0.967	18.53	1.967	16.73	2.967	9.00	3.97	6.56
0.983	18.53	1.983	16.73	2.983	9.00	3.98	6.56
1.000	18.53	2.000	16.73	3.000	9.00	4.00	6.56

Unit Hyd Qpeak (cms)= 0.044

PEAK FLOW (cms)= 0.010 (i)

TIME TO PEAK (hrs)= 1.567

RUNOFF VOLUME (mm)= 19.003

TOTAL RAINFALL (mm)= 78.320

RUNOFF COEFFICIENT = 0.243

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB

STANDHYD (0002)

ID= 1 DT= 1.0 min

Area (ha)= 2.07

Total Imp(%)= 67.00

Dir. Conn.(%)= 41.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.39	0.68
Dep. Storage (mm)=	1.00	9.00
Average Slope (%)=	1.00	2.00
Length (m)=	117.47	40.00
Mannings n	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 1.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.017	7.35	1.017	35.40	2.017	14.38	3.02	8.44
0.033	7.35	1.033	35.40	2.033	14.38	3.03	8.44
0.050	7.35	1.050	35.40	2.050	14.38	3.05	8.44
0.067	7.35	1.067	35.40	2.067	14.38	3.07	8.44
0.083	7.35	1.083	35.40	2.083	14.38	3.08	8.44
0.100	7.35	1.100	35.40	2.100	14.38	3.10	8.44
0.117	7.35	1.117	35.40	2.117	14.38	3.12	8.44
0.133	7.35	1.133	35.40	2.133	14.38	3.13	8.44
0.150	7.35	1.150	35.40	2.150	14.38	3.15	8.44
0.167	7.35	1.167	35.40	2.167	14.38	3.17	8.44
0.183	8.19	1.183	146.50	2.183	12.71	3.18	7.96
0.200	8.19	1.200	146.50	2.200	12.71	3.20	7.96
0.217	8.19	1.217	146.50	2.217	12.71	3.22	7.96
0.233	8.19	1.233	146.50	2.233	12.71	3.23	7.96
0.250	8.19	1.250	146.50	2.250	12.71	3.25	7.96
0.267	8.19	1.267	146.50	2.267	12.71	3.27	7.96
0.283	8.19	1.283	146.50	2.283	12.71	3.28	7.96
0.300	8.19	1.300	146.50	2.300	12.71	3.30	7.96
0.317	8.19	1.317	146.50	2.317	12.71	3.32	7.96
0.333	8.19	1.333	146.50	2.333	12.71	3.33	7.96
0.350	9.32	1.350	43.94	2.350	11.45	3.35	7.55
0.367	9.32	1.367	43.93	2.367	11.45	3.37	7.55
0.383	9.32	1.383	43.93	2.383	11.45	3.38	7.55
0.400	9.32	1.400	43.93	2.400	11.45	3.40	7.55
0.417	9.32	1.417	43.93	2.417	11.45	3.42	7.55
0.433	9.32	1.433	43.93	2.433	11.45	3.43	7.55
0.450	9.32	1.450	43.93	2.450	11.45	3.45	7.55
0.467	9.32	1.467	43.93	2.467	11.45	3.47	7.55
0.483	9.32	1.483	43.93	2.483	11.45	3.48	7.55
0.500	9.32	1.500	43.93	2.500	11.45	3.50	7.55
0.517	10.95	1.517	26.91	2.517	10.46	3.52	7.18
0.533	10.95	1.533	26.91	2.533	10.46	3.53	7.18
0.550	10.95	1.550	26.91	2.550	10.46	3.55	7.18
0.567	10.95	1.567	26.91	2.567	10.46	3.57	7.18
0.583	10.95	1.583	26.91	2.583	10.46	3.58	7.18
0.600	10.95	1.600	26.91	2.600	10.46	3.60	7.18
0.617	10.95	1.617	26.91	2.617	10.46	3.62	7.18
0.633	10.95	1.633	26.91	2.633	10.46	3.63	7.18
0.650	10.95	1.650	26.91	2.650	10.46	3.65	7.18
0.667	10.95	1.667	26.91	2.667	10.46	3.67	7.18
0.683	13.53	1.683	20.36	2.683	9.66	3.68	6.85
0.700	13.53	1.700	20.36	2.700	9.66	3.70	6.85
0.717	13.53	1.717	20.36	2.717	9.66	3.72	6.85
0.733	13.53	1.733	20.36	2.733	9.66	3.73	6.85
0.750	13.53	1.750	20.36	2.750	9.66	3.75	6.85
0.767	13.53	1.767	20.36	2.767	9.66	3.77	6.85
0.783	13.53	1.783	20.36	2.783	9.66	3.78	6.85
0.800	13.53	1.800	20.36	2.800	9.66	3.80	6.85
0.817	13.53	1.817	20.36	2.817	9.66	3.82	6.85
0.833	13.53	1.833	20.36	2.833	9.66	3.83	6.85
0.850	18.53	1.850	16.73	2.850	9.00	3.85	6.56
0.867	18.53	1.867	16.73	2.867	9.00	3.87	6.56
0.883	18.53	1.883	16.73	2.883	9.00	3.88	6.56
0.900	18.53	1.900	16.73	2.900	9.00	3.90	6.56
0.917	18.53	1.917	16.73	2.917	9.00	3.92	6.56
0.933	18.53	1.933	16.73	2.933	9.00	3.93	6.56

0.950	18.53	1.950	16.73	2.950	9.00	3.95	6.56
0.967	18.53	1.967	16.73	2.967	9.00	3.97	6.56
0.983	18.53	1.983	16.73	2.983	9.00	3.98	6.56
1.000	18.53	2.000	16.73	3.000	9.00	4.00	6.56

Max.Eff.Inten.(mm/hr)=	146.50	125.60
over (min)	5.00	8.00
Storage Coeff. (min)=	2.42 (ii)	7.97 (ii)
Unit Hyd. Tpeak (min)=	5.00	8.00
Unit Hyd. peak (cms)=	0.34	0.14

			TOTALS
PEAK FLOW (cms)=	0.33	0.17	0.466 (iii)
TIME TO PEAK (hrs)=	1.33	1.42	1.35
RUNOFF VOLUME (mm)=	77.32	40.03	55.32
TOTAL RAINFALL (mm)=	78.32	78.32	78.32
RUNOFF COEFFICIENT =	0.99	0.51	0.71

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 70.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RUNOFF COEFFICIENT = 0.99 0.34 0.98

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 70.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0005)	AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0001):	0.48	0.194	1.33	77.12
+ ID2= 2 (0002):	2.07	0.466	1.35	55.32
ID = 3 (0005):	2.55	0.654	1.35	59.42

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0008)	OUTFLOW	STORAGE	OUTFLOW	STORAGE
IN= 2--> OUT= 1	(cms)	(ha.m.)	(cms)	(ha.m.)
DT= 5.0 min	0.0000	0.0000	0.0910	0.0214
	0.0000	0.0000	0.1380	0.0263
	0.0180	0.0010	0.1850	0.0316
	0.0330	0.0034	0.2310	0.0374
	0.0430	0.0061	0.2770	0.0437
	0.0510	0.0093	0.3230	0.0505
	0.0580	0.0129	0.3690	0.0577
	0.0640	0.0169	0.0000	0.0000

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0005)	2.550	0.654	1.35	59.42
OUTFLOW: ID= 1 (0008)	2.550	0.279	1.55	59.42
OVERFLOW: ID= 3 (0003)	0.000	0.000	0.00	0.00

TOTAL NUMBER OF SIMULATION OVERFLOW = 0
CUMULATIVE TIME OF OVERFLOW (HOURS) = 0.00
PERCENTAGE OF TIME OVERFLOWING (%) = 0.00
PEAK FLOW REDUCTION [Qout/Qin](%) = 42.59
TIME SHIFT OF PEAK FLOW (min) = 12.00
MAXIMUM STORAGE USED (ha.m.) = 0.0440

**** WARNING : SELECTED ROUTING TIME STEP DENIED.

CALIB	Area (ha)=	0.22
STANDHYD (0004)	Total Imp(%)=	49.00
ID= 1 DT= 1.0 min	Dir. Conn.(%)=	36.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.11	0.11
Dep. Storage (mm)=	1.00	9.00
Average Slope (%)=	1.00	2.00
Length (m)=	38.30	40.00
Mannings n	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 1.0 MIN. TIME STEP.

	TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.017	7.35	1.017	35.40	2.017	14.38	3.02	8.44	
0.033	7.35	1.033	35.40	2.033	14.38	3.03	8.44	
0.050	7.35	1.050	35.40	2.050	14.38	3.05	8.44	
0.067	7.35	1.067	35.40	2.067	14.38	3.07	8.44	
0.083	7.35	1.083	35.40	2.083	14.38	3.08	8.44	
0.100	7.35	1.100	35.40	2.100	14.38	3.10	8.44	
0.117	7.35	1.117	35.40	2.117	14.38	3.12	8.44	
0.133	7.35	1.133	35.40	2.133	14.38	3.13	8.44	
0.150	7.35	1.150	35.40	2.150	14.38	3.15	8.44	
0.167	7.35	1.167	35.40	2.167	14.38	3.17	8.44	
0.183	8.19	1.183	146.50	2.183	12.71	3.18	7.96	
0.200	8.19	1.200	146.50	2.200	12.71	3.20	7.96	
0.217	8.19	1.217	146.50	2.217	12.71	3.22	7.96	
0.233	8.19	1.233	146.50	2.233	12.71	3.23	7.96	
0.250	8.19	1.250	146.50	2.250	12.71	3.25	7.96	
0.267	8.19	1.267	146.50	2.267	12.71	3.27	7.96	
0.283	8.19	1.283	146.50	2.283	12.71	3.28	7.96	
0.300	8.19	1.300	146.50	2.300	12.71	3.30	7.96	
0.317	8.19	1.317	146.50	2.317	12.71	3.32	7.96	
0.333	8.19	1.333	146.50	2.333	12.71	3.33	7.96	
0.350	9.32	1.350	43.94	2.350	11.45	3.35	7.55	
0.367	9.32	1.367	43.93	2.367	11.45	3.37	7.55	
0.383	9.32	1.383	43.93	2.383	11.45	3.38	7.55	
0.400	9.32	1.400	43.93	2.400	11.45	3.40	7.55	
0.417	9.32	1.417	43.93	2.417	11.45	3.42	7.55	
0.433	9.32	1.433	43.93	2.433	11.45	3.43	7.55	
0.450	9.32	1.450	43.93	2.450	11.45	3.45	7.55	
0.467	9.32	1.467	43.93	2.467	11.45	3.47	7.55	
0.483	9.32	1.483	43.93	2.483	11.45	3.48	7.55	
0.500	9.32	1.500	43.93	2.500	11.45	3.50	7.55	
0.517	10.95	1.517	26.91	2.517	10.46	3.52	7.18	
0.533	10.95	1.533	26.91	2.533	10.46	3.53	7.18	
0.550	10.95	1.550	26.91	2.550	10.46	3.55	7.18	
0.567	10.95	1.567	26.91	2.567	10.46	3.57	7.18	
0.583	10.95	1.583	26.91	2.583	10.46	3.58	7.18	
0.600	10.95	1.600	26.91	2.600	10.46	3.60	7.18	
0.617	10.95	1.617	26.91	2.617	10.46	3.62	7.18	
0.633	10.95	1.633	26.91	2.633	10.46	3.63	7.18	
0.650	10.95	1.650	26.91	2.650	10.46	3.65	7.18	
0.667	10.95	1.667	26.91	2.667	10.46	3.67	7.18	
0.683	13.53	1.683	20.36	2.683	9.66	3.68	6.85	
0.700	13.53	1.700	20.36	2.700	9.66	3.70	6.85	
0.717	13.53	1.717	20.36	2.717	9.66	3.72	6.85	
0.733	13.53	1.733	20.36	2.733	9.66	3.73	6.85	
0.750	13.53	1.750	20.36	2.750	9.66	3.75	6.85	
0.767	13.53	1.767	20.36	2.767	9.66	3.77	6.85	
0.783	13.53	1.783	20.36	2.783	9.66	3.78	6.85	
0.800	13.53	1.800	20.36	2.800	9.66	3.80	6.85	
0.817	13.53	1.817	20.36	2.817	9.66	3.82	6.85	
0.833	13.53	1.833	20.36	2.833	9.66	3.83	6.85	
0.850	18.53	1.850	16.73	2.850	9.00	3.85	6.56	
0.867	18.53	1.867	16.73	2.867	9.00	3.87	6.56	
0.883	18.53	1.883	16.73	2.883	9.00	3.88	6.56	
0.900	18.53	1.900	16.73	2.900	9.00	3.90	6.56	
0.917	18.53	1.917	16.73	2.917	9.00	3.92	6.56	
0.933	18.53	1.933	16.73	2.933	9.00	3.93	6.56	
0.950	18.53	1.950	16.73	2.950	9.00	3.95	6.56	
0.967	18.53	1.967	16.73	2.967	9.00	3.97	6.56	
0.983	18.53	1.983	16.73	2.983	9.00	3.98	6.56	
1.000	18.53	2.000	16.73	3.000	9.00	4.00	6.56	

Max.Eff.Inten.(mm/hr)=	146.50	41.69
over (min)	5.00	2.00
Storage Coeff. (min)=	1.56 (ii)	1.58 (ii)
Unit Hyd. Tpeak (min)=	5.00	2.00
Unit Hyd. peak (cms)=	0.41	0.84

			TOTALS
PEAK FLOW (cms)=	0.19	0.00	0.194 (iii)
TIME TO PEAK (hrs)=	1.33	1.33	
RUNOFF VOLUME (mm)=	77.32	26.97	77.12
TOTAL RAINFALL (mm)=	78.32	78.32	78.32

0.750	13.53	1.750	20.36	2.750	9.66	3.75	6.85
0.767	13.53	1.767	20.36	2.767	9.66	3.77	6.85
0.783	13.53	1.783	20.36	2.783	9.66	3.78	6.85
0.800	13.53	1.800	20.36	2.800	9.66	3.80	6.85
0.817	13.53	1.817	20.36	2.817	9.66	3.82	6.85
0.833	13.53	1.833	20.36	2.833	9.66	3.83	6.85
0.850	18.53	1.850	16.73	2.850	9.00	3.85	6.56
0.867	18.53	1.867	16.73	2.867	9.00	3.87	6.56
0.883	18.53	1.883	16.73	2.883	9.00	3.88	6.56
0.900	18.53	1.900	16.73	2.900	9.00	3.90	6.56
0.917	18.53	1.917	16.73	2.917	9.00	3.92	6.56
0.933	18.53	1.933	16.73	2.933	9.00	3.93	6.56
0.950	18.53	1.950	16.73	2.950	9.00	3.95	6.56
0.967	18.53	1.967	16.73	2.967	9.00	3.97	6.56
0.983	18.53	1.983	16.73	2.983	9.00	3.98	6.56
1.000	18.53	2.000	16.73	3.000	9.00	4.00	6.56

Max.Eff.Inten.(mm/hr)=	146.50	65.92	
over (min)	5.00	9.00	
Storage Coeff. (min)=	1.23 (ii)	8.20 (ii)	
Unit Hyd. Tpeak (min)=	5.00	9.00	
Unit Hyd. peak (cms)=	0.45	0.13	
			TOTALS
PEAK FLOW (cms)=	0.03	0.01	0.042 (iii)
TIME TO PEAK (hrs)=	1.33	1.43	1.35
RUNOFF VOLUME (mm)=	77.32	32.06	48.33
TOTAL RAINFALL (mm)=	78.32	78.32	78.32
RUNOFF COEFFICIENT =	0.99	0.41	0.62

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 70.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-----
| ADD HYD ( 0010) |
| 1 + 2 = 3 |
-----
          AREA   QPEAK   TPEAK   R.V.
          (ha)   (cms)   (hrs)   (mm)
ID1= 1 ( 0003):  0.23  0.010  1.57  19.00
+ ID2= 2 ( 0004):  0.22  0.042  1.35  48.33
=====
ID = 3 ( 0010):  0.45  0.046  1.35  33.34

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NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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-----
| ADD HYD ( 0010) |
| 3 + 2 = 1 |
-----
          AREA   QPEAK   TPEAK   R.V.
          (ha)   (cms)   (hrs)   (mm)
ID1= 3 ( 0010):  0.45  0.046  1.35  33.34
+ ID2= 2 ( 0008):  2.55  0.279  1.55  59.42
=====
ID = 1 ( 0010):  3.00  0.309  1.52  55.50

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NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| Junction Command(0009) |
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	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 3(0008)	0.00	0.00	0.00	0.00
OUTFLOW: ID= 2(0009)	0.00	0.00	0.00	0.00

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.017	8.40	1.017	38.70	2.017	16.17	3.02	9.61
0.033	8.40	1.033	38.70	2.033	16.17	3.03	9.61
0.050	8.40	1.050	38.70	2.050	16.17	3.05	9.61
0.067	8.40	1.067	38.70	2.067	16.17	3.07	9.61
0.083	8.40	1.083	38.70	2.083	16.17	3.08	9.61
0.100	8.40	1.100	38.70	2.100	16.17	3.10	9.61
0.117	8.40	1.117	38.70	2.117	16.17	3.12	9.61
0.133	8.40	1.133	38.70	2.133	16.17	3.13	9.61
0.150	8.40	1.150	38.70	2.150	16.17	3.15	9.61
0.167	8.40	1.167	38.70	2.167	16.17	3.17	9.61
0.183	9.34	1.183	160.97	2.183	14.33	3.18	9.08
0.200	9.34	1.200	160.97	2.200	14.33	3.20	9.08
0.217	9.34	1.217	160.97	2.217	14.33	3.22	9.08
0.233	9.34	1.233	160.97	2.233	14.33	3.23	9.08
0.250	9.34	1.250	160.97	2.250	14.33	3.25	9.08
0.267	9.34	1.267	160.97	2.267	14.33	3.27	9.08
0.283	9.34	1.283	160.97	2.283	14.33	3.28	9.08
0.300	9.34	1.300	160.97	2.300	14.33	3.30	9.08
0.317	9.34	1.317	160.97	2.317	14.33	3.32	9.08
0.333	9.34	1.333	160.97	2.333	14.33	3.33	9.08
0.350	10.59	1.350	47.72	2.350	12.95	3.35	8.61
0.367	10.59	1.367	47.72	2.367	12.95	3.37	8.61
0.383	10.59	1.383	47.72	2.383	12.95	3.38	8.61
0.400	10.59	1.400	47.72	2.400	12.95	3.40	8.61
0.417	10.59	1.417	47.72	2.417	12.95	3.42	8.61
0.433	10.59	1.433	47.72	2.433	12.95	3.43	8.61
0.450	10.59	1.450	47.72	2.450	12.95	3.45	8.61
0.467	10.59	1.467	47.72	2.467	12.95	3.47	8.61
0.483	10.59	1.483	47.72	2.483	12.95	3.48	8.61
0.500	10.59	1.500	47.72	2.500	12.95	3.50	8.61
0.517	12.39	1.517	29.71	2.517	11.86	3.52	8.20
0.533	12.39	1.533	29.71	2.533	11.86	3.53	8.20
0.550	12.39	1.550	29.71	2.550	11.86	3.55	8.20
0.567	12.39	1.567	29.71	2.567	11.86	3.57	8.20
0.583	12.39	1.583	29.71	2.583	11.86	3.58	8.20

----- TRANSFORMED HYETOGRAPH -----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.017	8.40	1.017	38.70	2.017	16.17	3.02	9.61
0.033	8.40	1.033	38.70	2.033	16.17	3.03	9.61
0.050	8.40	1.050	38.70	2.050	16.17	3.05	9.61
0.067	8.40	1.067	38.70	2.067	16.17	3.07	9.61
0.083	8.40	1.083	38.70	2.083	16.17	3.08	9.61
0.100	8.40	1.100	38.70	2.100	16.17	3.10	9.61
0.117	8.40	1.117	38.70	2.117	16.17	3.12	9.61
0.133	8.40	1.133	38.70	2.133	16.17	3.13	9.61
0.150	8.40	1.150	38.70	2.150	16.17	3.15	9.61
0.167	8.40	1.167	38.70	2.167	16.17	3.17	9.61
0.183	9.34	1.183	160.97	2.183	14.33	3.18	9.08
0.200	9.34	1.200	160.97	2.200	14.33	3.20	9.08
0.217	9.34	1.217	160.97	2.217	14.33	3.22	9.08
0.233	9.34	1.233	160.97	2.233	14.33	3.23	9.08
0.250	9.34	1.250	160.97	2.250	14.33	3.25	9.08
0.267	9.34	1.267	160.97	2.267	14.33	3.27	9.08
0.283	9.34	1.283	160.97	2.283	14.33	3.28	9.08
0.300	9.34	1.300	160.97	2.300	14.33	3.30	9.08
0.317	9.34	1.317	160.97	2.317	14.33	3.32	9.08
0.333	9.34	1.333	160.97	2.333	14.33	3.33	9.08
0.350	10.59	1.350	47.73	2.350	12.95	3.35	8.61
0.367	10.59	1.367	47.72	2.367	12.95	3.37	8.61
0.383	10.59	1.383	47.72	2.383	12.95	3.38	8.61
0.400	10.59	1.400	47.72	2.400	12.95	3.40	8.61
0.417	10.59	1.417	47.72	2.417	12.95	3.42	8.61
0.433	10.59	1.433	47.72	2.433	12.95	3.43	8.61
0.450	10.59	1.450	47.72	2.450	12.95	3.45	8.61
0.467	10.59	1.467	47.72	2.467	12.95	3.47	8.61
0.483	10.59	1.483	47.72	2.483	12.95	3.48	8.61
0.500	10.59	1.500	47.72	2.500	12.95	3.50	8.61
0.517	12.39	1.517	29.72	2.517	11.86	3.52	8.20
0.533	12.39	1.533	29.71	2.533	11.86	3.53	8.20
0.550	12.39	1.550	29.71	2.550	11.86	3.55	8.20
0.567	12.39	1.567	29.71	2.567	11.86	3.57	8.20
0.583	12.39	1.583	29.71	2.583	11.86	3.58	8.20
0.600	12.39	1.600	29.71	2.600	11.86	3.60	8.20
0.617	12.39	1.617	29.71	2.617	11.86	3.62	8.20
0.633	12.39	1.633	29.71	2.633	11.86	3.63	8.20
0.650	12.39	1.650	29.71	2.650	11.86	3.65	8.20
0.667	12.39	1.667	29.71	2.667	11.86	3.67	8.20
0.683	15.24	1.683	22.68	2.683	10.97	3.68	7.84
0.700	15.24	1.700	22.67	2.700	10.97	3.70	7.84
0.717	15.24	1.717	22.67	2.717	10.97	3.72	7.84
0.733	15.24	1.733	22.67	2.733	10.97	3.73	7.84
0.750	15.24	1.750	22.67	2.750	10.97	3.75	7.84
0.767	15.24	1.767	22.67	2.767	10.97	3.77	7.84
0.783	15.24	1.783	22.67	2.783	10.97	3.78	7.84
0.800	15.24	1.800	22.67	2.800	10.97	3.80	7.84
0.817	15.24	1.817	22.67	2.817	10.97	3.82	7.84
0.833	15.24	1.833	22.67	2.833	10.97	3.83	7.84
0.850	20.69	1.850	18.74	2.850	10.24	3.85	7.51
0.867	20.69	1.867	18.74	2.867	10.24	3.87	7.51
0.883	20.69	1.883	18.74	2.883	10.24	3.88	7.51
0.900	20.69	1.900	18.74	2.900	10.24	3.90	7.51
0.917	20.69	1.917	18.74	2.917	10.24	3.92	7.51
0.933	20.69	1.933	18.74	2.933	10.24	3.93	7.51

0.950 20.69 | 1.950 18.74 | 2.950 10.24 | 3.95 7.51
0.967 20.69 | 1.967 18.74 | 2.967 10.24 | 3.97 7.51
0.983 20.69 | 1.983 18.74 | 2.983 10.24 | 3.98 7.51
1.000 20.69 | 2.000 18.74 | 3.000 10.24 | 4.00 7.51

Max.Eff.Inten.(mm/hr)= 160.97 148.35
over (min) 5.00 8.00
Storage Coeff. (min)= 2.33 (ii) 7.67 (ii)
Unit Hyd. Tpeak (min)= 5.00 8.00
Unit Hyd. peak (cms)= 0.35 0.15

TOTALS
PEAK FLOW (cms)= 0.37 0.20 0.529 (iii)
TIME TO PEAK (hrs)= 1.33 1.42 1.35
RUNOFF VOLUME (mm)= 86.09 47.10 63.09
TOTAL RAINFALL (mm)= 87.09 87.09 87.09
RUNOFF COEFFICIENT = 0.99 0.54 0.72

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 70.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RUNOFF COEFFICIENT = 0.99 0.37 0.99

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 70.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD (0005) |
1 + 2 = 3
ID1= 1 (0001): 0.48 0.213 1.33 86.03
+ ID2= 2 (0002): 2.07 0.529 1.35 63.09
=====

ID = 3 (0005): 2.55 0.736 1.35 67.40

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| RESERVOIR(0008) |
| IN= 2--> OUT= 1 |
DT= 5.0 min
OVERFLOW IS ON
OUTFLOW STORAGE | OUTFLOW STORAGE
(cms) (ha.m.) | (cms) (ha.m.)
0.0000 0.0000 | 0.0550 0.0065
0.0000 0.0000 | 0.1060 0.0114
0.0000 0.0000 | 0.1560 0.0167
0.0000 0.0000 | 0.2050 0.0225
0.0000 0.0000 | 0.2530 0.0288
0.0000 0.0000 | 0.3000 0.0356
0.0000 0.0000 | 0.3470 0.0428
0.0200 0.0020 | 0.0000 0.0000

AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
INFLOW : ID= 2 (0005) 2.550 0.736 1.35 67.40
OUTFLOW: ID= 1 (0008) 2.550 0.342 1.52 67.40
OVERFLOW: ID= 3 (0003) 0.000 0.000 0.00 0.00

TOTAL NUMBER OF SIMULATION OVERFLOW = 0
CUMULATIVE TIME OF OVERFLOW (HOURS) = 0.00
PERCENTAGE OF TIME OVERFLOWING (%) = 0.00

PEAK FLOW REDUCTION [Qout/Qin](%)= 46.50
TIME SHIFT OF PEAK FLOW (min)= 10.00
MAXIMUM STORAGE USED (ha.m.)= 0.0421

**** WARNING : SELECTED ROUTING TIME STEP DENIED.

| CALIB |
| STANDHYD (0004) |
ID= 1 DT= 1.0 min
Area (ha)= 0.22
Total Imp(%)= 49.00 Dir. Conn.(%)= 36.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 0.11 0.11
Dep. Storage (mm)= 1.00 9.00
Average Slope (%)= 1.00 2.00
Length (m)= 38.30 40.00
Mannings n = 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 1.0 MIN. TIME STEP.

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN | TIME RAIN | ' TIME RAIN | TIME RAIN
hrs mm/hr | hrs mm/hr | ' hrs mm/hr | hrs mm/hr
0.017 8.40 | 1.017 38.70 | 2.017 16.17 | 3.02 9.61
0.033 8.40 | 1.033 38.70 | 2.033 16.17 | 3.03 9.61
0.050 8.40 | 1.050 38.70 | 2.050 16.17 | 3.05 9.61
0.067 8.40 | 1.067 38.70 | 2.067 16.17 | 3.07 9.61
0.083 8.40 | 1.083 38.70 | 2.083 16.17 | 3.08 9.61
0.100 8.40 | 1.100 38.70 | 2.100 16.17 | 3.10 9.61
0.117 8.40 | 1.117 38.70 | 2.117 16.17 | 3.12 9.61
0.133 8.40 | 1.133 38.70 | 2.133 16.17 | 3.13 9.61
0.150 8.40 | 1.150 38.70 | 2.150 16.17 | 3.15 9.61
0.167 8.40 | 1.167 38.70 | 2.167 16.17 | 3.17 9.61
0.183 9.34 | 1.183 160.97 | 2.183 14.33 | 3.18 9.08
0.200 9.34 | 1.200 160.97 | 2.200 14.33 | 3.20 9.08
0.217 9.34 | 1.217 160.97 | 2.217 14.33 | 3.22 9.08
0.233 9.34 | 1.233 160.97 | 2.233 14.33 | 3.23 9.08
0.250 9.34 | 1.250 160.97 | 2.250 14.33 | 3.25 9.08
0.267 9.34 | 1.267 160.97 | 2.267 14.33 | 3.27 9.08
0.283 9.34 | 1.283 160.97 | 2.283 14.33 | 3.28 9.08
0.300 9.34 | 1.300 160.97 | 2.300 14.33 | 3.30 9.08
0.317 9.34 | 1.317 160.97 | 2.317 14.33 | 3.32 9.08
0.333 9.34 | 1.333 160.97 | 2.333 14.33 | 3.33 9.08
0.350 10.59 | 1.350 47.73 | 2.350 12.95 | 3.35 8.61
0.367 10.59 | 1.367 47.72 | 2.367 12.95 | 3.37 8.61
0.383 10.59 | 1.383 47.72 | 2.383 12.95 | 3.38 8.61
0.400 10.59 | 1.400 47.72 | 2.400 12.95 | 3.40 8.61
0.417 10.59 | 1.417 47.72 | 2.417 12.95 | 3.42 8.61
0.433 10.59 | 1.433 47.72 | 2.433 12.95 | 3.43 8.61
0.450 10.59 | 1.450 47.72 | 2.450 12.95 | 3.45 8.61
0.467 10.59 | 1.467 47.72 | 2.467 12.95 | 3.47 8.61
0.483 10.59 | 1.483 47.72 | 2.483 12.95 | 3.48 8.61
0.500 10.59 | 1.500 47.72 | 2.500 12.95 | 3.50 8.61
0.517 12.39 | 1.517 29.72 | 2.517 11.86 | 3.52 8.20
0.533 12.39 | 1.533 29.71 | 2.533 11.86 | 3.53 8.20
0.550 12.39 | 1.550 29.71 | 2.550 11.86 | 3.55 8.20
0.567 12.39 | 1.567 29.71 | 2.567 11.86 | 3.57 8.20
0.583 12.39 | 1.583 29.71 | 2.583 11.86 | 3.58 8.20
0.600 12.39 | 1.600 29.71 | 2.600 11.86 | 3.60 8.20
0.617 12.39 | 1.617 29.71 | 2.617 11.86 | 3.62 8.20
0.633 12.39 | 1.633 29.71 | 2.633 11.86 | 3.63 8.20
0.650 12.39 | 1.650 29.71 | 2.650 11.86 | 3.65 8.20
0.667 12.39 | 1.667 29.71 | 2.667 11.86 | 3.67 8.20
0.683 15.24 | 1.683 22.68 | 2.683 10.97 | 3.68 7.84
0.700 15.24 | 1.700 22.67 | 2.700 10.97 | 3.70 7.84
0.717 15.24 | 1.717 22.67 | 2.717 10.97 | 3.72 7.84
0.733 15.24 | 1.733 22.67 | 2.733 10.97 | 3.73 7.84
0.750 15.24 | 1.750 22.67 | 2.750 10.97 | 3.75 7.84
0.767 15.24 | 1.767 22.67 | 2.767 10.97 | 3.77 7.84
0.783 15.24 | 1.783 22.67 | 2.783 10.97 | 3.78 7.84
0.800 15.24 | 1.800 22.67 | 2.800 10.97 | 3.80 7.84
0.817 15.24 | 1.817 22.67 | 2.817 10.97 | 3.82 7.84
0.833 15.24 | 1.833 22.67 | 2.833 10.97 | 3.83 7.84
0.850 20.69 | 1.850 18.74 | 2.850 10.24 | 3.85 7.51
0.867 20.69 | 1.867 18.74 | 2.867 10.24 | 3.87 7.51
0.883 20.69 | 1.883 18.74 | 2.883 10.24 | 3.88 7.51
0.900 20.69 | 1.900 18.74 | 2.900 10.24 | 3.90 7.51
0.917 20.69 | 1.917 18.74 | 2.917 10.24 | 3.92 7.51
0.933 20.69 | 1.933 18.74 | 2.933 10.24 | 3.93 7.51
0.950 20.69 | 1.950 18.74 | 2.950 10.24 | 3.95 7.51
0.967 20.69 | 1.967 18.74 | 2.967 10.24 | 3.97 7.51
0.983 20.69 | 1.983 18.74 | 2.983 10.24 | 3.98 7.51
1.000 20.69 | 2.000 18.74 | 3.000 10.24 | 4.00 7.51

Max.Eff.Inten.(mm/hr)= 160.97 51.19
over (min) 5.00 2.00
Storage Coeff. (min)= 1.50 (ii) 1.87 (ii)
Unit Hyd. Tpeak (min)= 5.00 2.00
Unit Hyd. peak (cms)= 0.42 0.58

TOTALS
PEAK FLOW (cms)= 0.21 0.00 0.213 (iii)
TIME TO PEAK (hrs)= 1.33 1.33 1.33
RUNOFF VOLUME (mm)= 86.09 32.62 86.03
TOTAL RAINFALL (mm)= 87.09 87.09 87.09

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN | TIME RAIN | ' TIME RAIN | TIME RAIN
hrs mm/hr | hrs mm/hr | ' hrs mm/hr | hrs mm/hr
0.017 8.40 | 1.017 38.70 | 2.017 16.17 | 3.02 9.61
0.033 8.40 | 1.033 38.70 | 2.033 16.17 | 3.03 9.61
0.050 8.40 | 1.050 38.70 | 2.050 16.17 | 3.05 9.61
0.067 8.40 | 1.067 38.70 | 2.067 16.17 | 3.07 9.61
0.083 8.40 | 1.083 38.70 | 2.083 16.17 | 3.08 9.61
0.100 8.40 | 1.100 38.70 | 2.100 16.17 | 3.10 9.61
0.117 8.40 | 1.117 38.70 | 2.117 16.17 | 3.12 9.61
0.133 8.40 | 1.133 38.70 | 2.133 16.17 | 3.13 9.61
0.150 8.40 | 1.150 38.70 | 2.150 16.17 | 3.15 9.61
0.167 8.40 | 1.167 38.70 | 2.167 16.17 | 3.17 9.61
0.183 9.34 | 1.183 160.97 | 2.183 14.33 | 3.18 9.08
0.200 9.34 | 1.200 160.97 | 2.200 14.33 | 3.20 9.08
0.217 9.34 | 1.217 160.97 | 2.217 14.33 | 3.22 9.08
0.233 9.34 | 1.233 160.97 | 2.233 14.33 | 3.23 9.08
0.250 9.34 | 1.250 160.97 | 2.250 14.33 | 3.25 9.08
0.267 9.34 | 1.267 160.97 | 2.267 14.33 | 3.27 9.08
0.283 9.34 | 1.283 160.97 | 2.283 14.33 | 3.28 9.08
0.300 9.34 | 1.300 160.97 | 2.300 14.33 | 3.30 9.08
0.317 9.34 | 1.317 160.97 | 2.317 14.33 | 3.32 9.08
0.333 9.34 | 1.333 160.97 | 2.333 14.33 | 3.33 9.08
0.350 10.59 | 1.350 47.73 | 2.350 12.95 | 3.35 8.61
0.367 10.59 | 1.367 47.72 | 2.367 12.95 | 3.37 8.61
0.383 10.59 | 1.383 47.72 | 2.383 12.95 | 3.38 8.61
0.400 10.59 | 1.400 47.72 | 2.400 12.95 | 3.40 8.61
0.417 10.59 | 1.417 47.72 | 2.417 12.95 | 3.42 8.61
0.433 10.59 | 1.433 47.72 | 2.433 12.95 | 3.43 8.61
0.450 10.59 | 1.450 47.72 | 2.450 12.95 | 3.45 8.61
0.467 10.59 | 1.467 47.72 | 2.467 12.95 | 3.47 8.61
0.483 10.59 | 1.483 47.72 | 2.483 12.95 | 3.48 8.61
0.500 10.59 | 1.500 47.72 | 2.500 12.95 | 3.50 8.61
0.517 12.39 | 1.517 29.72 | 2.517 11.86 | 3.52 8.20
0.533 12.39 | 1.533 29.71 | 2.533 11.86 | 3.53 8.20
0.550 12.39 | 1.550 29.71 | 2.550 11.86 | 3.55 8.20
0.567 12.39 | 1.567 29.71 | 2.567 11.86 | 3.57 8.20
0.583 12.39 | 1.583 29.71 | 2.583 11.86 | 3.58 8.20
0.600 12.39 | 1.600 29.71 | 2.600 11.86 | 3.60 8.20
0.617 12.39 | 1.617 29.71 | 2.617 11.86 | 3.62 8.20
0.633 12.39 | 1.633 29.71 | 2.633 11.86 | 3.63 8.20
0.650 12.39 | 1.650 29.71 | 2.650 11.86 | 3.65 8.20
0.667 12.39 | 1.667 29.71 | 2.667 11.86 | 3.67 8.20
0.683 15.24 | 1.683 22.68 | 2.683 10.97 | 3.68 7.84
0.700 15.24 | 1.700 22.67 | 2.700 10.97 | 3.70 7.84
0.717 15.24 | 1.717 22.67 | 2.717 10.97 | 3.72 7.84
0.733 15.24 | 1.733 22.67 | 2.733 10.97 | 3.73 7.84

0.750	15.24	1.750	22.67	2.750	10.97	3.75	7.84
0.767	15.24	1.767	22.67	2.767	10.97	3.77	7.84
0.783	15.24	1.783	22.67	2.783	10.97	3.78	7.84
0.800	15.24	1.800	22.67	2.800	10.97	3.80	7.84
0.817	15.24	1.817	22.67	2.817	10.97	3.82	7.84
0.833	15.24	1.833	22.67	2.833	10.97	3.83	7.84
0.850	20.69	1.850	18.74	2.850	10.24	3.85	7.51
0.867	20.69	1.867	18.74	2.867	10.24	3.87	7.51
0.883	20.69	1.883	18.74	2.883	10.24	3.88	7.51
0.900	20.69	1.900	18.74	2.900	10.24	3.90	7.51
0.917	20.69	1.917	18.74	2.917	10.24	3.92	7.51
0.933	20.69	1.933	18.74	2.933	10.24	3.93	7.51
0.950	20.69	1.950	18.74	2.950	10.24	3.95	7.51
0.967	20.69	1.967	18.74	2.967	10.24	3.97	7.51
0.983	20.69	1.983	18.74	2.983	10.24	3.98	7.51
1.000	20.69	2.000	18.74	3.000	10.24	4.00	7.51

```

Max.Eff.Inten.(mm/hr)= 160.97      79.54
                        over (min)  5.00      8.00
Storage Coeff. (min)= 1.19 (ii)    7.89 (ii)
Unit Hyd. Tpeak (min)= 5.00      8.00
Unit Hyd. peak (cms)= 0.45      0.14

                        *TOTALS*
PEAK FLOW (cms)= 0.04      0.02      0.048 (iii)
TIME TO PEAK (hrs)= 1.33      1.42      1.35
RUNOFF VOLUME (mm)= 86.09     38.32     55.50
TOTAL RAINFALL (mm)= 87.09     87.09     87.09
RUNOFF COEFFICIENT = 0.99      0.44      0.64

```

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 70.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0010) |
| 1 + 2 = 3 |
-----
          AREA    QPEAK    TPEAK    R.V.
          (ha)    (cms)    (hrs)    (mm)
ID1= 1 ( 0003):  0.23  0.012  1.57  23.56
+ ID2= 2 ( 0004):  0.22  0.048  1.35  55.50
=====
ID = 3 ( 0010):  0.45  0.054  1.35  39.18

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0010) |
| 3 + 2 = 1 |
-----
          AREA    QPEAK    TPEAK    R.V.
          (ha)    (cms)    (hrs)    (mm)
ID1= 3 ( 0010):  0.45  0.054  1.35  39.18
+ ID2= 2 ( 0008):  2.55  0.342  1.52  67.40
=====
ID = 1 ( 0010):  3.00  0.379  1.50  63.16

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| Junction Command(0009) |
-----

```

```

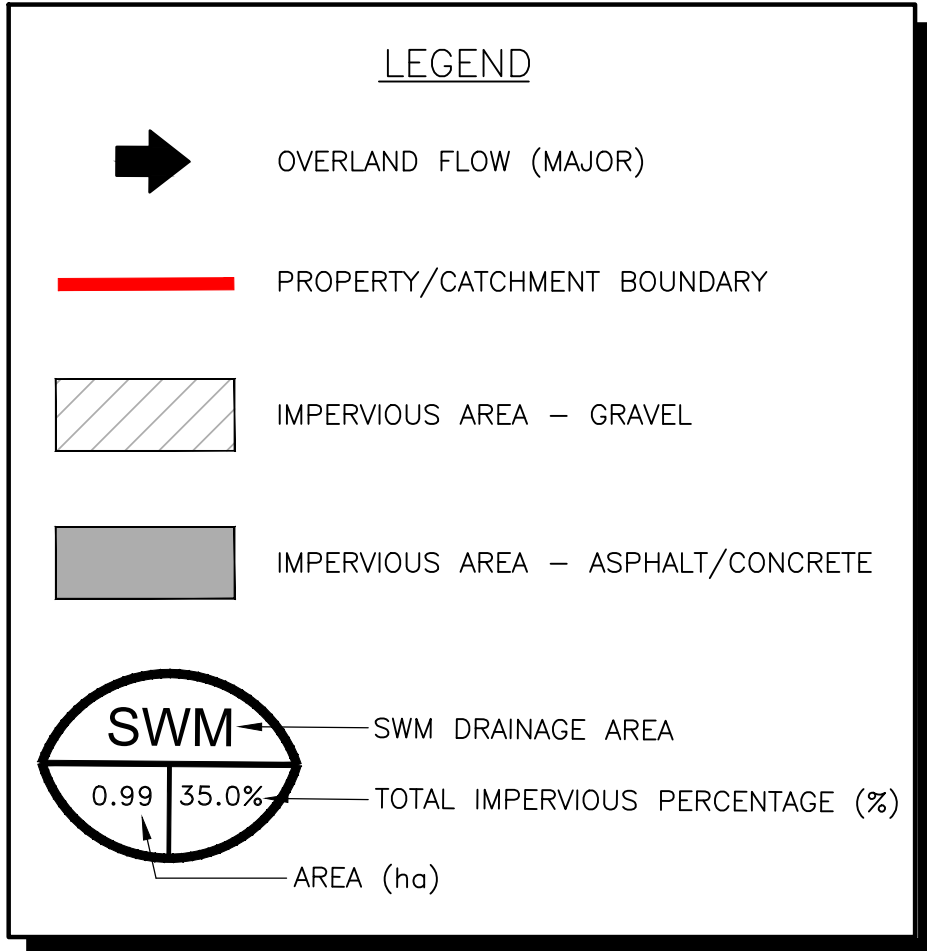
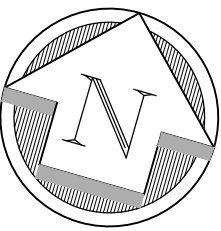
          AREA    QPEAK    TPEAK    R.V.
          (ha)    (cms)    (hrs)    (mm)
INFLOW : ID= 3( 0008)  0.00  0.00  0.00  0.00
OUTFLOW: ID= 2( 0009)  0.00  0.00  0.00  0.00

```

FINISH

APPENDIX E

DWG PRE – Pre-Development Drainage Areas
DWG POST – Post-Development Drainage Areas

[illegible]

SCALE:

10 20

HORIZONTAL : 1:500

DO NOT SCALE DRAWINGS, CALL FOR ANY
CLARIFICATIONS THAT ARE REQUIRED, FIELD
VERIFY AT ALL BUILT CONDITIONS

ALL DRAWINGS ARE TO BE READ IN COLOUR
ORIGINAL PAGE SIZE ARCH'D: 24" x 36"

ALL DRAWINGS ARE TO BE READ IN COLOUR
ORIGINAL PAGE SIZE ARCH 'D' - 24" x 36"



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(519) 426-6270

Stamp

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NOT TO BE USED
FOR CONSTRUCTION

Project Title

**HFV HUNT STREET
RESIDENTIAL DEVELOPMENT
SIMCOE - NORFOLK COUNTY**

Drawing Title

PRE-DEVELOPMENT SWM AREAS

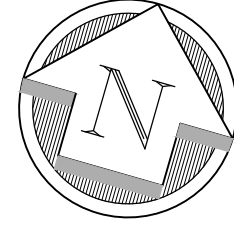
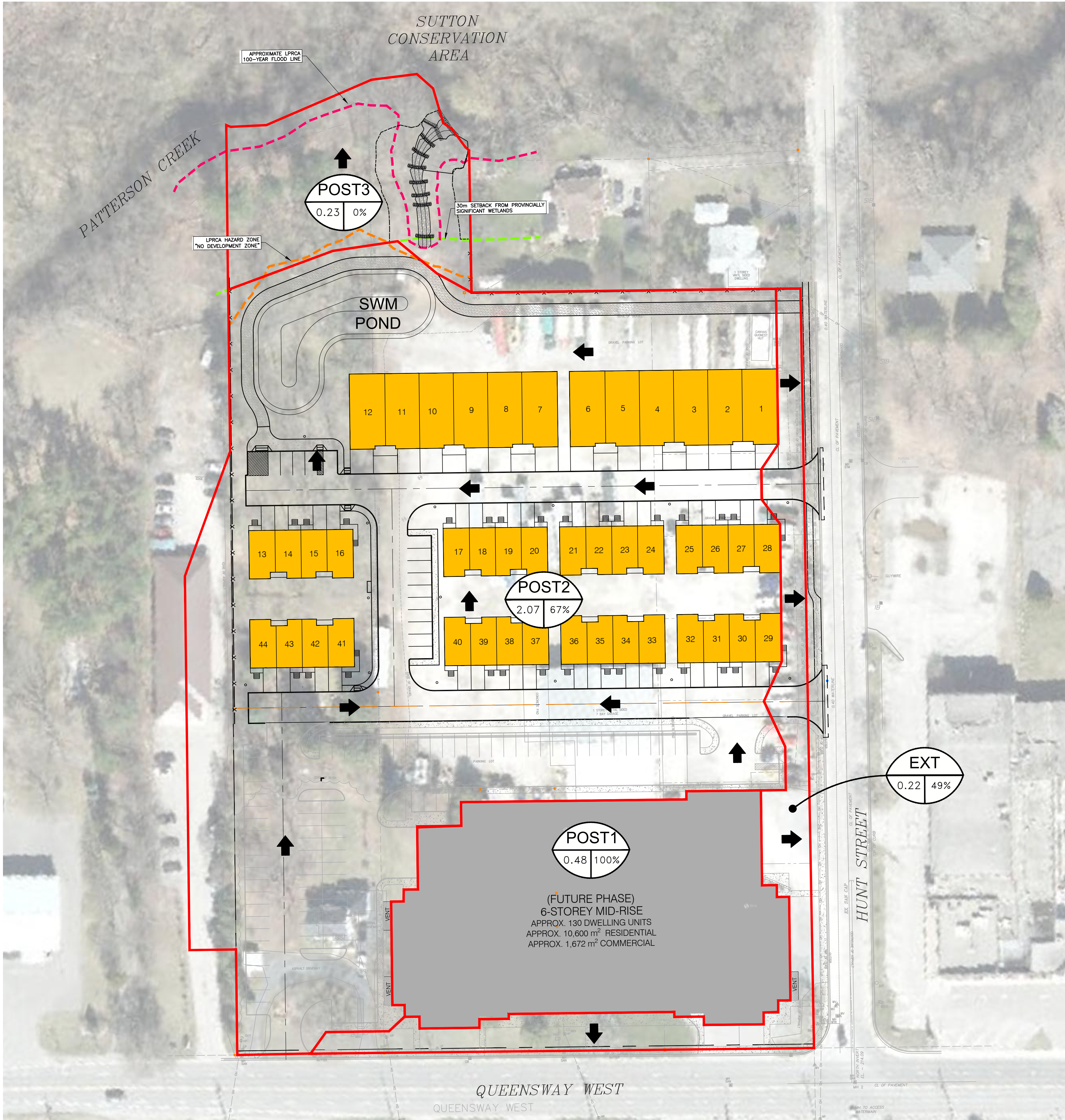
Designed by : NLB	Drawn By : NL
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Checked by :	Date Started :
Jl	JAN 202

Drawing Scale :	Drawing No.
1:500	DDF

Project No. 22-013

DATE PLOTTED 4/30/2026 1:13 PM PROJECT NUMBER & NAME: 25-013 - HFW HUNT STREET FILE PATH: H:\PROJECTS\2022-22-013 HFW HOLDINGS HUNT ST RESIDENTIAL\DRAWINGS\CIVIL\PRODUCTION\DRAWINGS\25-013 POST SWM AREAS.DWG



LEGEND

→

OVERLAND FLOW (MAJOR)

—

PROPERTY/CATCHMENT BOUNDARY

SWM

0.9935.0%

1

SWM DRAINAGE AREA

TOTAL IMPERVIOUS PERCENTAGE (%)

AREA (ha)

REV. No.	DATE	REVISION

SCALE:
HORIZONTAL : 1:500

DO NOT SCALE DRAWINGS. CALL FOR ANY CLARIFICATIONS THAT ARE REQUIRED. FIELD VERIFY AT ALL BUILT CONDITIONS

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Project Title

HFW HUNT STREET
RESIDENTIAL DEVELOPMENT
SIMCOE - NORFOLK COUNTY

Drawing Title

POST-DEVELOPMENT SWM AREAS

Designed by :
NLB

Drawn By :
NLB

Checked by :
JL

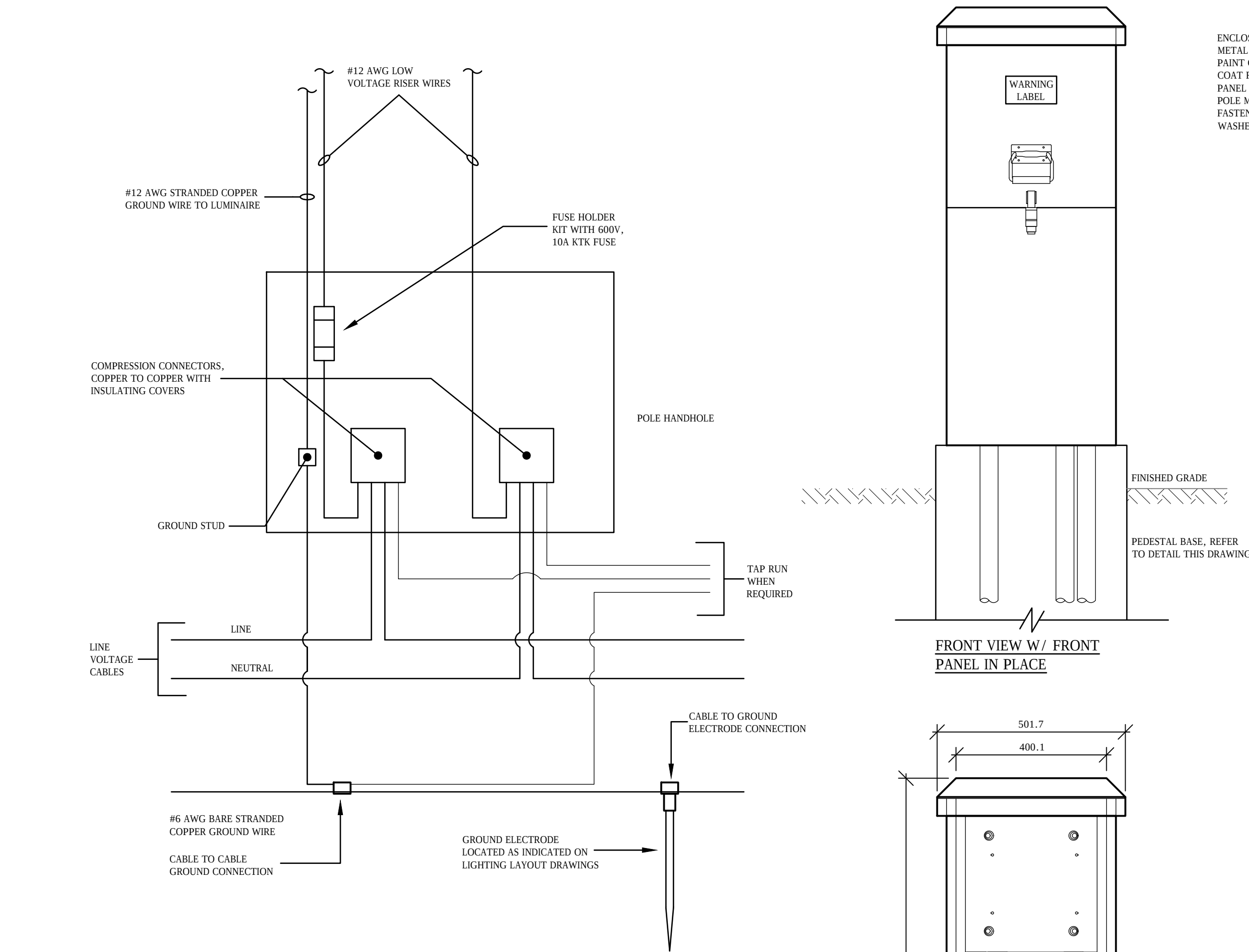
Date Started :
JAN 2023

Drawing Scale :
1:500

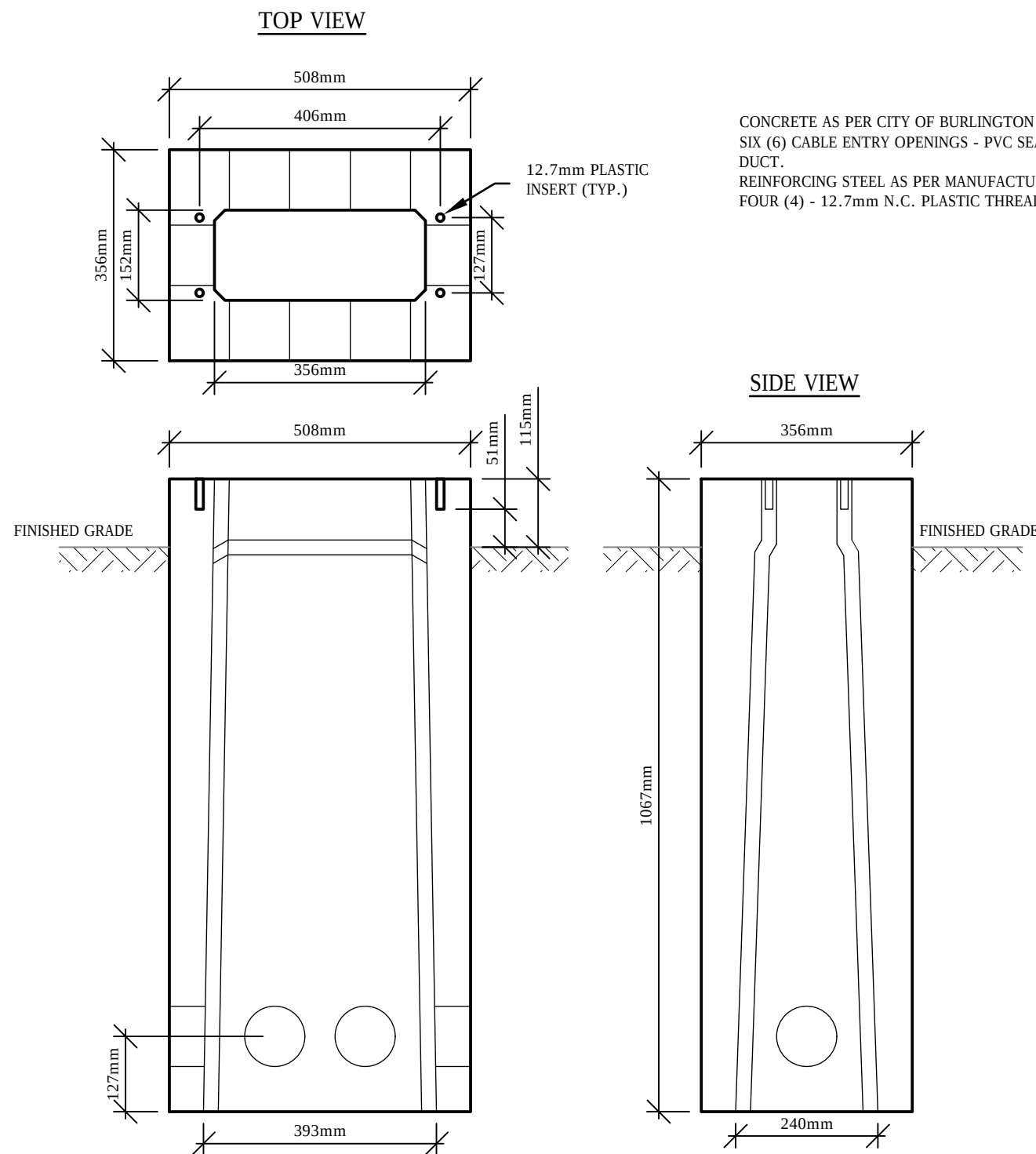
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Project No.
22-013

POST

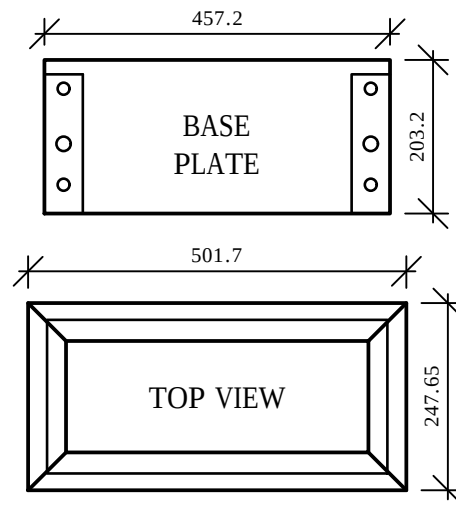


TYPICAL POLE WIRING DIAGRAM (120V) - OPSP 2255.010
SCALE: N.T.S.



TYPICAL POWER PEDESTAL BASE (CONCRETE) DETAIL
SCALE: N.T.S.

ENCLOSURE MATERIAL - 14 GAUGE THICK ZINC COATED (GALVANIZED) SHEET
METAL PAINT COLOUR - BYERS-BUSH JET KOTE 88510GR ELECTROSTATIC POWDER COAT FINISH
PANEL - 12cct, 2P, 3W COMBINATION SERVICE ENTRANCE PANEL C/W 60A 2 POLE MAIN BREAKER (22KA RATING) AND LOAD BREAKERS AS PER SCHEDULE.
FASTENERS - 4 PLATED HEX HEAD BOLTS, GRADE 2 OR BETTER C/W FLAT WASHERS, LOCK WASHERS FOR MOUNTING INTO CONCRETE MOUNTING BASE.



TYPICAL POWER PEDESTAL (STREETLIGHTING) DETAIL
SCALE: N.T.S.

LIGHTING FIXTURES	
	SINGLE POLE MOUNTED LIGHT FIXTURE
	TWIN POLE MOUNTED LIGHT FIXTURES TYPES AS PER DRAWINGS
	TRIPLE POLE MOUNTED LIGHT FIXTURE TYPES AND ORIENTATION AS PER DRAWINGS
	QUAD POLE MOUNTED LIGHT FIXTURES REFER TO DRAWINGS FOR TYPES
	POST TOP MOUNTED AREA LIGHT FIXTURES. LETTER DENOTES TYPE.
	WALL OR COLUMN MOUNTED LIGHTING FIXTURES. LETTER DENOTES TYPE.
B-1-2	LIGHTING CIRCUITING NOTE. B-PANELBOARD I.D., 1-BRANCH CIRCUIT, 2-LOCAL (SWITCH) CIRCUIT.

LEGEND	
THIS LEGEND REPRESENTS THE SYMBOLS COMMONLY USED. NOT ALL SYMBOLS MAY APPEAR ON THE DRAWINGS. SHOULD A SYMBOL BE FOUND ON THE DRAWING AND NOT APPEARING ON THE LEGEND, THE CONTRACTOR SHALL SUBMIT A QUESTION TO HAVE THE SYMBOL CLARIFIED IN AN ADDENDUM PRIOR TO SUBMITTING A BID.	
ABBREVIATIONS	
AE	APPROVED EQUAL
AFB	ABOVE FINISHED FLOOR
CB	CIRCUIT BREAKER
ER	EXISTING TO BE RELOCATED
EX	EXISTING TO REMAIN
JB	JUNCTION BOX
REL	RELOCATED ITEM IN NEW LOCATION
REM	EXISTING TO BE REMOVED IN ITS ENTIRETY
UNO	UNLESS NOTED OTHERWISE

SITE LIGHTING FIXTURE SCHEDULE			
1.	THE LIGHTING FIXTURES, BALLASTS AND LAMPS FOR THIS PROJECT HAVE BEEN SPECIFIED TO ENSURE THAT SPECIFIC AESTHETIC AND PERFORMANCE REQUIREMENTS WILL BE SATISFIED.		
2.	THE SPECIFIED LIGHTING FIXTURES ARE IES APPROVED DARK-SKY FRIENDLY FIXTURES AND CONSISTENT WITH LEED GOALS & GREEN GLOBES CRITERIA FOR LIGHT POLLUTION REDUCTION. DIRECT GLARE WILL NOT BE OBSERVABLE (OUTSIDE THE ORIGINATING PROPERTY LIMITS) AT AN ANGLE GREATER THAN 85° FROM NAOR OF THE VERTICAL AXIS OF THE LIGHT SOURCE.		
3.	ALL ALTERNATE FIXTURES TO THE PROPOSED FIXTURES SHALL HAVE IES FILES FOR FIXTURES FROM A REPUTABLE LAB WITH IES LAB CERTIFICATION. SHOULD A PROPOSED FIXTURE PERFORMANCE FAIL TO MEET THE MINIMUM REQUIREMENTS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING ANY ADDITIONAL EQUIPMENT TO BRING THE LIGHTING LEVELS UP TO THE REQUIRED VALUES.		
4.	INSTALLATION OF LIGHT FIXTURES SHALL BE ACCORDING TO MANUFACTURER'S RECOMMENDATION AND ACCORDING TO CODE REQUIREMENTS.		
5.	POLES LISTED BELOW ARE BASED ON STRESSCRETE DECORATIVE DIRECT BURIED POLES (THE TRADITIONAL - NON-FLUTED) FOR EXAMPLE PURPOSES. POLES SHALL BE SUBMITTED FOR ENGINEERS REVIEW C/W ENGINEERS STAMP. ALL POLES SHALL BE MOUNTED ON CONCRETE BASES AS NOTED IN SCHEDULE BELOW.		
TYPE	DESCRIPTION	LAMP/ WATTAGE	VOLTAGE
P1-T4	SINGLE, STANDARD ARM POLE MOUNTED, FULL CUT-OFF, LED AREA LIGHT, TYPE IV DISTRIBUTION PATTERN OPTICS (C/W HOUSE SIDE SHIELD - INTERNAL), 0-10V ELECTRONIC DIMMING DRIVER STANDARD, DRIVER MOUNTED TO DIE-CAST ALUMINUM BACK HOUSING SUITABLE FOR -40° C TO 40° C ENVIRONMENTS. CONSTRUCTED OF DIE-CAST ALUMINUM. PRECISE OPTICS FOR EFFICIENT LIGHT OUTPUT. FIXTURE TO BE MOUNTED ON 18'-0", 4" DIRECT BURIED ROUND POLE FOR A TOTAL MOUNTING HEIGHT OF 18'-0" (5.5m) A.F.G. FIXTURE B.U.G. RATING TO BE B2-U0-G2 OR BETTER. FIXTURE FINISH TO BE SELECTED BY OWNER/ARCHITECT. INCLUDE FOR EXTERNAL HOUSE SIDE SHIELD FOR FIELD INSTALL AS NEEDED OR AS INSTRUCTED ON SITE POST FIXTURE INSTALL.	8,700 NOMINAL LUMEN OUTPUT 53W INPUT 3000K	**120V (FIXTURE VOLTAGE TO BE SELECTED DURING BUILDING DESIGN AND SERVICING STAGE)
P1-T2B	SINGLE, STANDARD ARM POLE MOUNTED, FULL CUT-OFF, LED AREA LIGHT, TYPE II DISTRIBUTION PATTERN OPTICS (C/W HOUSE SIDE SHIELD - INTERNAL), 0-10V ELECTRONIC DIMMING DRIVER STANDARD, DRIVER MOUNTED TO DIE-CAST ALUMINUM BACK HOUSING SUITABLE FOR -40° C TO 40° C ENVIRONMENTS. CONSTRUCTED OF DIE-CAST ALUMINUM. PRECISE OPTICS FOR EFFICIENT LIGHT OUTPUT. FIXTURE TO BE MOUNTED ON 18'-0", 4" DIRECT BURIED ROUND POLE FOR A TOTAL MOUNTING HEIGHT OF 18'-0" (5.5m) A.F.G. FIXTURE B.U.G. RATING TO BE B1-U0-G1 OR BETTER. FIXTURE FINISH TO BE SELECTED BY OWNER/ARCHITECT. INCLUDE FOR EXTERNAL HOUSE SIDE SHIELD FOR FIELD INSTALL AS NEEDED OR AS INSTRUCTED ON SITE POST FIXTURE INSTALL.	4,000 NOMINAL LUMEN OUTPUT 23W INPUT 3000K	**120V (FIXTURE VOLTAGE TO BE SELECTED DURING BUILDING DESIGN AND SERVICING STAGE)
P1-T2C	SINGLE, STANDARD ARM POLE MOUNTED, FULL CUT-OFF, LED AREA LIGHT, TYPE II DISTRIBUTION PATTERN OPTICS (C/W HOUSE SIDE SHIELD - INTERNAL), 0-10V ELECTRONIC DIMMING DRIVER STANDARD, DRIVER MOUNTED TO DIE-CAST ALUMINUM BACK HOUSING SUITABLE FOR -40° C TO 40° C ENVIRONMENTS. CONSTRUCTED OF DIE-CAST ALUMINUM. PRECISE OPTICS FOR EFFICIENT LIGHT OUTPUT. FIXTURE TO BE MOUNTED ON 18'-0", 4" DIRECT BURIED ROUND POLE FOR A TOTAL MOUNTING HEIGHT OF 18'-0" (5.5m) A.F.G. FIXTURE B.U.G. RATING TO BE B2-U0-G2 OR BETTER. FIXTURE FINISH TO BE SELECTED BY OWNER/ARCHITECT. INCLUDE FOR EXTERNAL HOUSE SIDE SHIELD FOR FIELD INSTALL AS NEEDED OR AS INSTRUCTED ON SITE POST FIXTURE INSTALL.	6,400 NOMINAL LUMEN OUTPUT 30W INPUT 3000K	**120V (FIXTURE VOLTAGE TO BE SELECTED DURING BUILDING DESIGN AND SERVICING STAGE)
P1-T3	SINGLE, STANDARD ARM POLE MOUNTED, FULL CUT-OFF, LED AREA LIGHT, TYPE III DISTRIBUTION PATTERN OPTICS (C/W HOUSE SIDE SHIELD - INTERNAL), 0-10V ELECTRONIC DIMMING DRIVER STANDARD, DRIVER MOUNTED TO DIE-CAST ALUMINUM BACK HOUSING SUITABLE FOR -40° C TO 40° C ENVIRONMENTS. CONSTRUCTED OF DIE-CAST ALUMINUM. PRECISE OPTICS FOR EFFICIENT LIGHT OUTPUT. FIXTURE TO BE MOUNTED ON 18'-0", 4" DIRECT BURIED ROUND POLE FOR A TOTAL MOUNTING HEIGHT OF 18'-0" (5.5m) A.F.G. FIXTURE B.U.G. RATING TO BE B1-U0-G1 OR BETTER. FIXTURE FINISH TO BE SELECTED BY OWNER/ARCHITECT. INCLUDE FOR EXTERNAL HOUSE SIDE SHIELD FOR FIELD INSTALL AS NEEDED OR AS INSTRUCTED ON SITE POST FIXTURE INSTALL.	4,000 NOMINAL LUMEN OUTPUT 23W INPUT 3000K	**120V (FIXTURE VOLTAGE TO BE SELECTED DURING BUILDING DESIGN AND SERVICING STAGE)
P1-T3B	SINGLE, STANDARD ARM POLE MOUNTED, FULL CUT-OFF, LED AREA LIGHT, TYPE III DISTRIBUTION PATTERN OPTICS (C/W HOUSE SIDE SHIELD - INTERNAL), 0-10V ELECTRONIC DIMMING DRIVER STANDARD, DRIVER MOUNTED TO DIE-CAST ALUMINUM BACK HOUSING SUITABLE FOR -40° C TO 40° C ENVIRONMENTS. CONSTRUCTED OF DIE-CAST ALUMINUM. PRECISE OPTICS FOR EFFICIENT LIGHT OUTPUT. FIXTURE TO BE MOUNTED ON 18'-0", 4" DIRECT BURIED ROUND POLE FOR A TOTAL MOUNTING HEIGHT OF 18'-0" (5.5m) A.F.G. FIXTURE B.U.G. RATING TO BE B2-U0-G2 OR BETTER. FIXTURE FINISH TO BE SELECTED BY OWNER/ARCHITECT. INCLUDE FOR EXTERNAL HOUSE SIDE SHIELD FOR FIELD INSTALL AS NEEDED OR AS INSTRUCTED ON SITE POST FIXTURE INSTALL.	8,800 NOMINAL LUMEN OUTPUT 53W INPUT 3000K	**120V (FIXTURE VOLTAGE TO BE SELECTED DURING BUILDING DESIGN AND SERVICING STAGE)

DRAWING LIST TABLE	
NUMBER	DRAWING TITLE/DESCRIPTION
ES001	GENERAL NOTES, DRAWING LIST, LEGEND AND FIXTURE SCHEDULE
ES050	ELECTRICAL SPECIFICATIONS, PANEL SCHEDULE AND SINGLE LINE DIAGRAM
ES100	ELECTRICAL SITE PLAN LAYOUT - PHOTOMETRIC CALCULATIONS

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Notes:

No.	Revision	Date	By
2	UPDATES SERVICING LAYOUT	2026.07.13	J.R.
1	ISSUED FOR PRICING	2026.05.28	J.R.

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Title
ELECTRICAL GENERAL NOTES
LEGENDS AND SCHEDULES

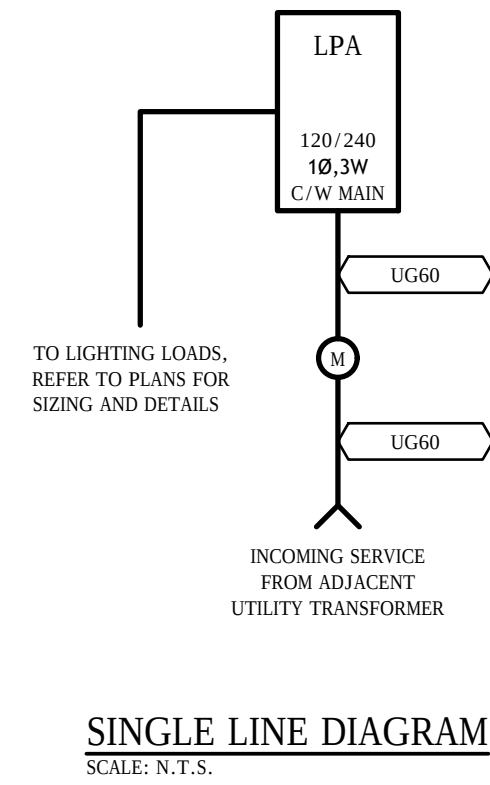
Drawn By: J.R.	Designed By: J.R.	Approved By: K.S.	Date: April 2026
Project No. 26-064	Scale AS NOTED		
Drawing No. ES001	Sheet	Revision 2	

1. GENERAL
- 1.1. THIS SPECIFICATION SHALL APPLY TO AND GOVERN ALL WORK OF DIVISION 16. THE ELECTRICAL CONTRACTOR SHALL BE A SUBCONTRACTOR TO THE GENERAL CONTRACTOR AND HIS BID SHALL BE TENDERED DIRECTLY TO THE GENERAL CONTRACTOR. THE CONTRACTOR MAY ONLY BE DRAWN WHEN ALL REQUIRED SHOP DRAWINGS HAVE BEEN REVIEWED BY THE CONSULTANT
- 1.16. **REVISIONS TO CONTRACT:**
- 1.16.1. PROVIDE ITEMIZED LISTS OF MATERIALS/ASSOCIATED COSTS, LABOUR RATE/LABOUR FOR EACH ITEM, COPY OF MANUFACTURERS INVOICE, IF REQUESTED, FOR EACH ITEM GIVEN CHANGE NOTICE.
- 1.17. **ROOF AND WALL OPENINGS:**
- 1.17.1. LOCATION OF CONDUITS PASSING THROUGH ROOF AND WALLS TO BE COORDINATED WITH DIVISION 15. ALL OPENINGS TO BE MADE WATER TIGHT.
- 1.18. **SCHEDULE OF CONSTRUCTION:**
- 1.18.1. CONSULT GENERAL DIVISION FOR SCHEDULE OF CONSTRUCTION BEFORE COMMENCING WORK AND COORDINATE DETAILS WITH ENGINEER, OWNER AND ALL TRADES DURING CONSTRUCTION.
- 1.19. **DIRECTORIES AND LABELLING:**
- 1.19.1. IDENTIFY ALL ELECTRICAL EQUIPMENT. IDENTIFICATION SHALL CONSIST OF ENGRAVED LAMACOID NAMEPLATES HAVING BLACK BACKGROUND WITH WHITE LETTERS. FASTEN NAMEPLATES TO DEVICE USING SELF-TAPPING, COUNTERSINK SCREWS. TAPE-TYPE NAMEPLATES WILL NOT BE ACCEPTED.
- 1.19.2. ALL RECEPTACLE COVER PLATES SHALL BE LABELED WITH TAPE-TYPE NAMEPLATES. THE LABEL SHALL INDICATE THE PANEL DESIGNATION AND CIRCUIT NUMBER. (IE A19). TAPE SHALL BE NEATLY TRIMMED ON EACH END AND PLACED PLUMB AND LEVEL ON THE FACE PLATE. LABELS SHALL HAVE A NEAT, CLEAN AND PROFESSIONAL APPEARANCE. LABELS NOT TRIMMED OR POORLY POSITIONED WILL NOT BE ACCEPTED.
- 1.19.3. ALL PANELS WITH CIRCUITS ADDED OR REMOVED SHALL HAVE NEW COMPUTER GENERATED PANEL SCHEDULES PLACED IN THEM. SCHEDULE SHALL INDICATE PANEL DESIGNATION, WHERE PANEL IS FED FROM, VOLTAGE, PHASE, BRANCH CIRCUIT NUMBERS, BREAKER AMPERAGE AND CIRCUIT DESCRIPTION.
- 1.20. **GROUNDING:**
- 1.20.1. GROUND ALL EQUIPMENT IN ACCORDANCE WITH CODE REQUIREMENTS AND AS INDICATED.
- 1.20.2. GROUNDING CONDUCTORS: COPPER, INSULATED (GREEN); SIZE PER CODE.
- 1.20.3. GROUNDING LUGS, CONNECTORS: APPROVED GROUNDING TYPE.
- 1.20.4. ALL GROUND CONDUCTORS #8AWG OR SMALLER SHALL BE RUN IN EMT.
- 1.21. **FIREPROOFING:**
- 1.21.1. WHERE CABLES PASS THROUGH FLOORS OR FIRE RATED WALLS, PACK SPACE BETWEEN WIRING AND SLEEVE FULL WITH APPROVED RATED FIRE STOPS AND SEAL WITH CAULKING COMPOUND CONFORMING TO CGSB 19-GP-9M4.
- 1.22. **MOUNTING HEIGHTS:**
- 1.22.1. MOUNTING HEIGHT OF EQUIPMENT IS FROM FINISHED FLOOR TO CENTRELINE OF EQUIPMENT UNLESS SPECIFIED OR INDICATED OTHERWISE.
- 1.22.2. IF MOUNTING HEIGHT OF EQUIPMENT IS NOT SPECIFIED OR INDICATED, VERIFY BEFORE PROCEEDING WITH INSTALLATION
- 1.22.3. INSTALL ELECTRICAL EQUIPMENT AS SPECIFIED IN THE OBC FOR BARRIER FREE DESIGN. IF NOT NOTED, INSTALL AT FOLLOWING CENTERLINE HEIGHTS:
- 1.22.3.1. LOCAL SWITCHES: 3'-5" (1050mm).
- 1.22.3.2. WALL RECEPTACLES:
- 1.22.3.2.1. GENERAL: 1'-6" (450mm).
- 1.22.3.2.2. ABOVE TOP OF CONTINUOUS BASEBOARD HEATER: 10" (250mm).
- 1.22.3.2.3. ABOVE TOP OF COUNTERS OR COUNTER SLASH BACKS: 6" (150mm).
- 1.22.3.2.4. MECHANICAL ROOMS: 3'-5" (1050mm).
- 1.22.3.3. PANELBOARDS: AS REQUIRED BY CODE OR AS INDICATED.
- 1.22.3.4. TELEPHONE AND INTERPHONE OUTLETS: 1'-6" (450mm).
- 1.22.3.5. TELEVISION OUTLETS: 1'-6" (450mm).
- 1.22.3.6. FIRE ALARM PULL STATIONS: 3'-9" (1150mm).
- 1.23. **LOAD BALANCE:**
- 1.23.1. MEASURE PHASE CURRENT TO PANELBOARDS WITH NORMAL LOADS (LIGHTING) OPERATING AT TIME OF ACCEPTANCE. ADJUST BRANCH CIRCUIT CONNECTIONS AS REQUIRED TO OBTAIN BEST VOLTAGE OF CURRENT BETWEEN PHASES AND RECORD CHANGES.
- 1.23.2. MEASURE PHASE VOLTAGES AT LOADS AND ADJUST TRANSFORMER TAPS TO WITHIN 2% OF RATED VOLTAGE OF EQUIPMENT.
- 1.23.3. SUBMIT, AT COMPLETION OF WORK, REPORT LISTING PHASE AND NEUTRAL CURRENTS ON PANELBOARDS, DRY-CORE TRANSFORMERS AND MOTOR CONTROL CENTRES, OPERATING UNDER NORMAL LOAD. STATE HOUR AND DATE ON WHICH EACH LOAD WAS MEASURED, AND VOLTAGE AT TIME OF TEST.
- 1.24. **CONDUIT AND CABLE INSTALLATION:**
- 1.24.1. INSTALL CONDUIT AND SLEEVES PRIOR TO POURING OF CONCRETE. SLEEVES THROUGH CONCRETE, SCHEDULE 40 STEEL PIPE, SIZED FOR FREE PASSAGE OF CONDUIT, AND PROTRUDING 2" (50mm).
- 1.24.2. IF PLASTIC SLEEVES ARE USED IN FIRE RATED WALLS OR FLOORS, REMOVE BEFORE CONDUIT INSTALLATION.
- 1.24.3. INSTALL CABLES, CONDUITS AND FITTINGS TO BE EMBEDDED OR PLASTERED OVER, NEATLY AND CLOSE TO BUILDING STRUCTURE SO FURRING CAN BE KEPT TO MINIMUM.
- 1.25. **DEFINITIONS:**
- 1.25.1. THE FOLLOWING ARE DEFINITIONS OF WORDS FOUND IN THE SPECIFICATION AND ON ASSOCIATED DRAWINGS:
- 1.25.1.1. "CONCEALED" - HIDDEN FROM NORMAL SIGHT IN FURRED IN SPACES, SHAFTS, CEILING SPACES, WALLS, UNDERFLOOR AND PARTITIONS.
- 1.25.1.2. "EXPOSED" - ALL ELECTRICAL WORK EXPOSED TO BUILDING OCCUPANTS, WIRE AND CABLEING SHALL BE IN CONDUIT UNLESS SPECIFICALLY NOTED OTHERWISE.
- 1.25.1.3. "PROVIDE" (AND ALL TENSES OF "PROVIDE") SUPPLY, INSTALL, WIRE AND CONNECT COMPLETE.
- 1.25.1.4. "INSTALL" (AND ALL TENSES OF "INSTALL") INSTALL WIRE AND CONNECT COMPLETE, PRODUCTS AND SERVICES SPECIFIED.
- 1.25.1.5. "SUPPLY" SUPPLY ONLY
- 1.25.1.6. "OR APPROVED EQUAL" MATERIAL OR EQUIPMENT PROPOSED BY THE CONTRACTOR IN LIEU OF THAT SPECIFIED AS APPROVED BY THE CONSULTANT. MATERIAL OR EQUIPMENT SHALL MEET OR EXCEED THE SAME QUALITY, MATERIAL, EFFICIENCY, ETC AS THE SPECIFIED PRODUCTS.
- 1.25.1.7. "AS INDICATED" AS SHOWN ON DRAWINGS AND/OR NOTED IN SPECIFICATIONS.
- 1.26. **PHASING**
- 1.26.1. THE CONTRACTOR SHALL REVIEW THE PHASING AS INDICATED ON ALL PLANS. THIS INCLUDES ARCHITECTURAL, MECHANICAL PLANS ETC IN THE ENTIRE DRAWING PACKAGE.
- 1.26.2. THE CONTRACTOR SHALL INCLUDE FOR TEMPORARY CONNECTIONS AS REQUIRED TO FACILITATE THE WORK.
- 1.26.3. THE CONTRACTOR SHALL INCLUDE FOR ALL WEEKEND AND PREMIUM TIME REQUIRED TO FACILITATE THE PHASING AS INDICATED IN THE PLANS PACKAGE.
2. **PRODUCTS**
- 2.1. ELECTRICAL EQUIPMENT
- 2.1.1. EQUIPMENT SHALL HAVE 1.0m (39") CLEARANCE IN FRONT OF SAID EQUIPMENT
- 2.1.2. ELECTRICAL EQUIPMENT RATED AT 1200A AND OVER SHALL HAVE 1.5m (59") CLEARANCE IN FRONT OF SAID EQUIPMENT.
- 2.1.3. ALL EQUIPMENT INSTALLED IN SPRINKLERED AREAS ARE TO BE COMPLETE WITH DRIP SHIELDS.
- 2.2. **PANEL BOARDS**
- 2.2.1. PANEL BOARDS: TO C.S.A. C22.2, NO. 29. LOADCENTRES ARE NOT ACCEPTABLE.
- 2.2.2. PANEL BOARDS ARE TO BE THE PRODUCT OF ONE (1) MANUFACTURER
- 2.2.3. 120/208V-3 PHASE-4 WIRE PANEL BOARDS: BUS AND BREAKERS RATED FOR MINIMUM 10,000 SYMMETRICAL INTERRUPTING CAPACITY OR AS INDICATED ON THE DRAWINGS.
- 2.2.4. MAIN BREAKER SHALL OCCUPY A SEPARATE COMPARTMENT FROM BRANCH BREAKERS. PANELS WITH MAIN BREAKERS IN BRANCH BREAKER COMPARTMENT WILL NOT BE ACCEPTED.
- 2.2.5. SEQUENCE PHASE BUSSING WITH ODD NUMBERED BREAKERS ON LEFT AND EVEN ON RIGHT, WITH EACH BREAKER IDENTIFIED BY PERMANENT NUMBER IDENTIFICATION AS TO CIRCUIT NUMBER.
- 2.2.6. PANEL BOARDS: MAINS, NUMBER OF CIRCUITS, AND NUMBER AND SIZE OF BRANCH CIRCUIT BREAKERS AS INDICATED
- 2.2.7. TWO (2) KEYS FOR EACH PANEL BOARD AND KEY PANEL BOARDS ALIKE.
- 2.2.8. COPPER BUS WITH FULL SIZE COPPER MAINS AND NEUTRAL.
- 2.2.9. MAINS FOR BOLT-ON BREAKERS.
- 2.2.10. FINISH TRIM AND DOOR BAKED GRAY ENAMEL. PAINT TUB SAME AS DOOR.
- 2.2.11. COMPLETE CIRCUIT DIRECTORY WITH TYPEWRITTEN LEGEND SHOWING CIRCUIT LABEL, AMPERAGE AND PANEL LOCATION UNDER PLASTIC COVER.
- 2.2.12. EATON CUTLER HAMMER, SQUARE D, SIEMENS CANADA MANUFACTURE.
- 2.3. **BREAKERS GENERAL**
- 2.3.1. BOLT-ON MOLDED CASE CIRCUIT BREAKER, FULL MODULE (I.E., 1" MINIMUM WIDTH), QUICK-MAKE, QUICK-BREAK TYPE, FOR MANUAL AND AUTOMATIC OPERATION WITH TEMPERATURE COMPENSATION FOR 400C AMBIENT. (MINI-BREAKERS NOT ACCEPTABLE)
- 2.3.2. MAGNETIC INSTANTANEOUS TRIP ELEMENTS IN CIRCUIT BREAKERS, TO OPERATE ONLY WHEN THE VALUE OF CURRENT REACHES SETTING.

- 2.4. **DISCONNECT SWITCHES FUSED AND UNFUSED**
- 2.4.1. ENCLOSED MANUAL AIR BREAK SWITCHES IN NON-HAZARDOUS LOCATIONS: TO C.S.A. C22.2 NO. 4.
- 2.4.2. FUSE HOLDER ASSEMBLIES TO C.S.A. C22.2 NO. 39.
- 2.4.3. FUSIBLE AND NON-FUSIBLE DISCONNECT SWITCHES AS INDICATED.
- 2.4.4. PROVISION FOR PADLOCKING IN ON/OFF SWITCH POSITION BY THREE LOCKS
- 2.4.5. MECHANICALLY-INTERLOCKED DOOR TO PREVENT OPENING WHEN HANDLE IN "ON" POSITION
- 2.4.6. QUICK-MAKE, QUICK-BREAK ACTION.
- 2.4.7. ON/OFF SWITCH POSITION INDICATION ON SWITCH ENCLOSURE COVER.
- 2.4.8. C.S.A. ENCLOSURE 1 UNLESS NOTED OTHERWISE.
- 2.4.9. EATON CUTLER HAMMER, SQUARE D, SIEMENS CANADA MANUFACTURE.
- 2.5. **CONDUCTORS**
- 2.5.1. ALL CONDUCTORS SHALL BE COPPER UNLESS INDICATED OTHERWISE.
- 2.5.2. CONDUCTORS #10 AWG AND SMALLER SHALL BE SOLID. CONDUCTORS #8 AND LARGER SHALL BE STRANDED.
- 2.5.3. CONDUCTORS SHALL BE SIZED #12 AWG MINIMUM, EXCEPT FOR CONTROL CIRCUITS WHERE #14 AWG MINIMUM SIZE IS PERMITTED. FEEDER SIZES AS INDICATED.
- 2.5.4. PANEL FEEDER LENGTHS SHALL BE CONTRACTOR VERIFIED FOR LENGTH OF PROPOSED INSTALLATION PATH SO AS NOT TO EXCEED 3% VOLTAGE DROP ON INSTALLATION. FEEDERS EXCEEDING THE LENGTH OF THE ALLOWABLE AMPACITY SHALL BE BROUGHT TO THE ENGINEERS ATTENTION PRIOR TO BEGINNING ANY ROUGH-INS.
- 2.5.5. SIZE CONDUCTORS FOR A 2% MAXIMUM VOLTAGE DROP FROM OVERCURRENT DEVICE TO FARTHEST OUTLET.
- 2.5.6. CONDUCTOR INSULATION RATED FOR 600V MINIMUM UNLESS STATED OTHERWISE.
- 2.5.7. CONDUCTOR TYPES:
- 2.5.7.1. TW75, TWU TO C.S.A. #C22.2 NO. 75
- 2.5.7.2. RW90, RWU90 (XLPE) TO C.S.A. #C22.2 NO. 38
- 2.5.7.3. TW75, RW90 (XLPE) - INSIDE BUILDING.
- 2.5.7.4. TWU, RWU90 (XLPE) - CONDUCTORS DIRECT BURIED OR IN CONDUIT OUTSIDE BUILDING.
- 2.5.7.5. BX (ARMORED CABLE) - NOT PERMITTED
- 2.6. **FASTENINGS AND SUPPORTS**
- 2.6.1. SUPPORT EQUIPMENT, CONDUIT OR CABLES USING CLIPS, SPRING-LOADED BOLTS, CABLE CLAMPS DESIGNED AS ACCESSORIES TO BASIC CHANNEL MEMBERS.
- 2.6.2. INSTALL FASTENINGS AND SUPPORTS AS REQUIRED FOR EACH TYPE OF EQUIPMENT CABLES AND CONDUIT AND IN ACCORDANCE WITH MANUFACTURERS INSTALLATION.
- 2.7. **CONDUITS**
- 2.7.1. RIGID, GALVANIZED STEEL THREADED CONDUIT TO C.S.A. C22.2, NO. 45, SIZE AS INDICATED.
- 2.7.2. ELECTRICAL METALLIC TUBING (EMT) WITH COUPLINGS AND EXPANDED ENDS AS REQUIRED, TO C.S.A. C22.2, NO. 83, SIZE AS INDICATED.
- 2.7.3. RIGID PVC (UNPLASTICIZED) CONDUIT FOR EXPOSED, ABOVE GROUND WORK, TO C.S.A. C22.2, NO. 211.2, SIZE AS INDICATED. FLEXIBLE PVC IS NOT PERMITTED.
- 2.7.4. FLEXIBLE METAL CONDUIT AND LIQUID-TIGHT FLEXIBLE METAL CONDUIT TO C.S.A. C22.2, NO. 56.
- 2.7.5. EMT CONDUIT FITTINGS, IE. CONNECTORS, COUPLINGS, TO C.S.A. C22.2, NO. 18, ZINC-PLATED STEEL/MAILLEABLE IRON CONSTRUCTION. ALL CONNECTIONS AND COUPLINGS TO BE SET SCREW-TYPE, IE. CONCRETE TIGHT.
- 2.7.6. CONDUIT SIZES SHALL BE A MINIMUM OF 3/4" AND CONFORM TO ELECTRICAL SAFETY CODE. WHERE SIZES ARE INDICATED AND THEY EXCEED CODE, THEY SHALL NOT BE REDUCED.
- 2.7.7. USE RIGID, GALVANIZED STEEL, THREADED CONDUIT WHERE CONDUIT IS SUBJECT TO MECHANICAL INJURY.
- 2.7.8. RUN PARALLEL OR PERPENDICULAR TO BUILDING LINES.
- 2.7.9. USE EMT FOR ALL WIRING FROM OUTLET BOX TO SOURCE.
- 2.7.10. INSTALL NYLON FISH WIRE IN EMPTY CONDUITS AND TERMINATE UNDER SCREW LEAVING 12" SLACK. TAG FISH WIRE IDENTIFYING SYSTEM.
- 2.7.11. DO NOT LOCATE CONDUITS LESS THAN 3" (75 MM) PARALLEL TO STEAM OR HOT WATER LINES WITH A MINIMUM OF 1" (25 MM) AT CROSS-OVERS.
- 2.7.12. IN-SLAB CONDUIT: LOCATE TO SUIT REINFORCING STEEL. INSTALL IN CENTRE 1/2 OF SLAB.
- 2.8. **JUNCTION AND PULL BOXES**
- 2.8.1. WELDED STEEL CONSTRUCTION WIRE SCREW-ON FLAT COVERS FOR SURFACE MOUNTING.
- 2.8.2. COVERS WITH 1" (25 MM) MINIMUM EXTENSION ALL AROUND, FOR FLUSH-MOUNTED PULL AND JUNCTION BOXES.
- 2.8.3. INSTALL PULL BOXES IN CONDUIT RUNS SO AS NOT TO EXCEED 30 M OF CONDUIT RUN OR THE EQUIVALENT OF TWO (2) 90° BENDS BETWEEN PULL BOXES.
- 2.8.4. IN GRAD PULL BOXES SHALL BE QUARTZITE OR SIMILAR.
- 2.9. **OUTLET AND CONDUIT BOXES:**
- 2.9.1. ALL LIGHTING FIXTURES, RECEPTACLES AND OTHER WIRING DEVICES FOR ANY CONDUIT SYSTEM SHOWN SHALL BE PROVIDED WITH AN OUTLET BOX.
- 2.9.2. 4" (102 MM) OCTAGON OR SQUARE OUTLET BOXES OR LARGER, COMPLETE WITH FITTINGS FOR LIGHTING FIXTURES AND AS REQUIRED FOR SPECIAL DEVICES.
- 2.9.3. WALL OUTLET BOXES SHALL BE:
- 2.9.3.1. NO. 1104 SERIES, FLUSH MOUNTED IN DRYWALL PARTITIONS, U.N.O.
- 2.9.3.2. MBS SERIES MASONRY BOXES (GALVANIZED STEEL) FLUSH MOUNTED IN MASONRY WALLS (BLOCK WALLS).
- 2.9.3.3. GANG BOXES SHALL BE USED AT LOCATIONS WHERE DEVICES ARE GROUPED. PROVIDE BARRIERS AS REQUIRED.
- 2.9.3.4. BLANK COVER PLATES FOR BOXES WITHOUT WIRING DEVICES.
3. **LIGHTING**
- 3.1. **MANUFACTURER'S OPERATIONAL TESTS:**
- 3.1.1. TEST FIXTURE FOR ACCEPTANCE OF LAMP MADE TO MAXIMUM TOLERANCE AS REQUIRED IN A.N.S.I. STANDARDS.
- 3.1.1.1. TEST FIXTURES WITH RATED LAMPS FOR STARTING AND OPERATION.
- 3.1.1.2. CHECK WIRING FOR AGREEMENT WITH DESIGN CIRCUIT.
- 3.1.1.3. TEST FOR SHORT CIRCUITS AND IMPROPER GROUNDS.
- 3.2. **HANGERS AND FITTINGS**
- 3.2.1. SUPPORT FIXTURES AS SHOWN ON THE DRAWINGS, LEVEL, PLUMB AND TRUE WITH THE STRUCTURE AND OTHER EQUIPMENT, AND IN A HORIZONTAL OR VERTICAL POSITION AS INTENDED.
- 3.2.2. WALL OR SIDE BRACKET MOUNTED FIXTURE HOUSINGS SHALL BE RIGIDLY INSTALLED AND ADJUSTED TO GIVE A NEAT FLUSH FIT TO THE SURFACE ON WHICH IT IS MOUNTED.
- 3.3. **SUPPORTS:**
- 3.3.1. SUPPORT FIXTURES BY HANGERS AND MOUNTING ARRANGEMENTS WHICH WILL NOT CAUSE THE FIXTURE FRAME, HOUSING, SIDES OR LENS FRAME TO BE DISTORTED; OR PREVENT COMPLETE ALIGNMENT OF SEVERAL FIXTURES IN A ROW.
- 3.3.2. MOUNTING METHODS FOR FIXTURES ON OR IN SUSPENDED CEILINGS ARE TO BE AS FOLLOWS:
- 3.3.3. WHERE LIGHTING FIXTURES ARE RECESSED INTO SUSPENDED CEILINGS, THESE FIXTURES ARE TO BE SUPPORTED INDEPENDENTLY OF THE CEILING USING #12 JACK CHAIN HANGERS. EACH CHAIN IS TO BE SECURED SEPARATELY TO THE STRUCTURE ABOVE SO THAT NO WEIGHT FALLS ON THE CEILING SUSPENSION SYSTEM.
- 3.3.4. IN NO CASE WILL REINFORCEMENT OF THE CEILING SUSPENSION SYSTEM BE CONSIDERED TO BE ADEQUATE SUPPORT FOR THE LIGHTING FIXTURES.
- 3.3.5. WHERE CROSS MEMBER SUPPORTS ARE REQUIRED ABOVE THE CEILING TO PROVIDE SUPPORT POINTS, THESE ARE TO BE STEEL CHANNELS OR ANGLES.
- 3.4. **INSTALLATION:**
- 3.4.1. INSTALLATION OF ALL LIGHTING EQUIPMENT SHALL COMPLY WITH THE RELEVANT SECTIONS OF THE ONTARIO ELECTRICAL SAFETY CODE.
- 3.4.2. CLUSTER OR RECESSED FIXTURES SHALL BE WIRED WITH R90 OR R90 WIRE IN FLEXIBLE STEEL CONDUIT TO ADJACENT OUTLET BOXES PLACED ABOVE THE FINISHED CEILING; WITHIN REACH OF THE FIXTURE HOLES. MAIN HOME RUNS TO BE EMT FROM JUNCTION BOX AT CLUSTER OF FIXTURES TO PANEL.
- 3.4.3. AT THE COMPLETION OF CONSTRUCTION AND ACCEPTANCE OF WORK, ALL LIGHTING FIXTURES SHALL BE CLEAN, COMPLETE WITH ALL NECESSARY ACCESSORIES AND PROVIDED WITH THE REQUIRED OPERATING LAMPS).
- 3.4.4. FIXTURES AS SHOWN ON THE ELECTRICAL DRAWINGS ARE APPROXIMATE LOCATIONS ONLY. INSTALLATION OF FIXTURES SHALL BE IN ACCORDANCE WITH REFLECTED CEILING PLANS, DETAILS AND/OR FIELD INSTRUCTIONS ISSUED BY THE ARCHITECT.
- 3.4.5. ALL 347V FIXTURES TO HAVE LOCAL DISCONNECT TO COMPLY WITH THE ONTARIO ELECTRICAL SAFETY CODE.
- 3.4.6. UPON COMPLETION CLEAN LIGHTING REFLECTORS, LENSES AND OTHER LIGHTING SURFACES THAT HAVE BEEN EXPOSED TO CONSTRUCTION DUST AND DIRT.
- 3.4.7. THE MOUNTING HEIGHTS OF BUILDING MOUNTED FIXTURES SHALL BE CONFIRMED PRIOR TO ROUGH-IN. REVIEW ARCHITECTURAL PLANS/ELEVATIONS. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY DISCREPANCIES BETWEEN PLANS AND INDICATED MOUNTING HEIGHTS IN SCHEDULES/PLANS BETWEEN METRIC AND IMPERIAL DESIGNATED HEIGHTS.
4. **GROUND FAULT CIRCUIT INTERRUPTERS - CLASS 'A'**
- 4.1. **GENERAL**
- 4.1.1. COMPONENTS COMPRISING GROUND FAULT PROTECTIVE SYSTEM TO BE OF SAME

- MANUFACTURER.
- 4.2. **BREAKER TYPE GROUND FAULT INTERRUPTER**
- 4.2.1. SINGLE POLE GROUND FAULT CIRCUIT INTERRUPTER FOR 15A, 120V, 1 PHASE CIRCUIT C/W TEST AND RESET FACILITIES.
- 4.2.2. SINGLE POLE GROUND FAULT CIRCUIT INTERRUPTER FOR 30A, 120V, 1 PHASE CIRCUIT C/W TEST AND RESET FACILITIES.
- 4.3. **INSTALLATION:**
- 4.3.1. DO NOT GROUND NEUTRAL ON LOAD SIDE OF GROUND FAULT RELAY.
- 4.3.2. PASS PHASE CONDUCTORS INCLUDING NEUTRAL THROUGH ZERO SEQUENCE TRANSFORMERS.
- 4.3.3. CONNECT SUPPLY AND LOAD WIRING TO EQUIPMENT IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
- 4.4. **FIELD QUALITY CONTROL:**
- 4.4.1. PERFORM TESTS IN ACCORDANCE WITH SECTION 16010 - ELECTRICAL GENERAL REQUIREMENTS.
- 4.4.2. ARRANGE AND PAY FOR FIELD TESTING OF GROUND FAULT EQUIPMENT BY INDEPENDENT TESTING LABORATORY GROUND FAULT EQUIPMENT MANUFACTURER CONTRACTOR BEFORE COMMISSIONING SERVICE.
- 4.4.3. SUBMIT REPORT OF TESTS TO CONSULTANT AND A CERTIFICATE THAT SYSTEM AS INSTALLED MEETS CRITERIA SPECIFIED HEREIN.
- 4.4.4. DEMONSTRATE SIMULATED GROUND FAULT TESTS.
5. **COMPUTER/TELECOM CABLEING SYSTEM**
- 5.1. **SCOPE OF WORK**
- 5.1.1.

UNDERGROUND AND SERVICE FEEDERS WIRE AND CONDUIT SCHEDULE		
TYPE/SYMBOL	FEEDER DESCRIPTION	CONDUIT DESCRIPTION
UG60	3 CONDUCTOR #6 AWG CU + GND	IN 2" RIGID PVC CONDUIT AS PER D11-1, OR IN 2" DB2 CONDUITS AS NOTED
UG60N	4 CONDUCTOR #6 AWG CU + GND	IN 2" RIGID PVC CONDUIT AS PER D11-1, OR IN 2" DB2 CONDUITS AS NOTED
UG60N-AL	4 CONDUCTOR #4 AWG AL + GND	IN 2" RIGID PVC CONDUIT AS PER D11-1, OR IN 2" DB2 CONDUITS AS NOTED
UG100	3 CONDUCTOR #3 CU + GND	IN 2" RIGID PVC CONDUIT AS PER D11-1, OR IN 2" DB2 CONDUITS AS NOTED
UG100N	4 CONDUCTOR #3 CU + GND	IN 2" RIGID PVC CONDUIT AS PER D11-1, OR IN 2" DB2 CONDUITS AS NOTED
UG100N-AL	4 CONDUCTOR #1 AL + GND	IN 2" RIGID PVC CONDUIT AS PER D11-1, OR IN 2" DB2 CONDUITS AS NOTED
UG200	3 CONDUCTOR #2/0 CU + GND	IN 2-1/2" RIGID PVC CONDUIT AS PER D11-1, OR IN 2-1/2" DB2 CONDUITS AS NOTED
UG200N	4 CONDUCTOR #2/0 CU + GND	IN 2-1/2" RIGID PVC CONDUIT AS PER D11-1, OR IN 2-1/2" DB2 CONDUITS AS NOTED
UG200N-AL	4 CONDUCTOR #4/0 CU + GND	IN 3" RIGID PVC CONDUIT AS PER D11-1, OR IN 3" DB2 CONDUITS AS NOTED



PANEL 'LPA'					
LOAD	DESCRIPTION	CCT	BREAKER	PHASE	DESCRIPTION
	SITE LIGHTING	1	20A	A	20A 2 SPARE
	SITE LIGHTING	3	20A	B	20A 4 SPARE
		5	A	A	6
		7	B	B	8
		9	A	A	10
		11	B	B	12
0					0
					AMPS
240	VOLTAGE		PHASE A		0
1	PHASE		PHASE B		0
60A	MAIN BREAKER				0
125A	MAIN BUS		TOTAL		0

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Notes:

No.	Revision	Date	By
2	UPDATES SERVICING LAYOUT	2026.07.13	J.R.
1	ISSUED FOR PRICING	2026.05.28	J.R.

SEI

12 Argyle Street N., Caledonia, ON, N3W 1B6
www.sei-ee.com

Seal

TENDER

DRAWINGS NOT TO BE USED FOR CONSTRUCTION PURPOSES UNTIL ALL CITY COMMENTS FROM PERMIT APPLICATION ARE INCORPORATED

Project

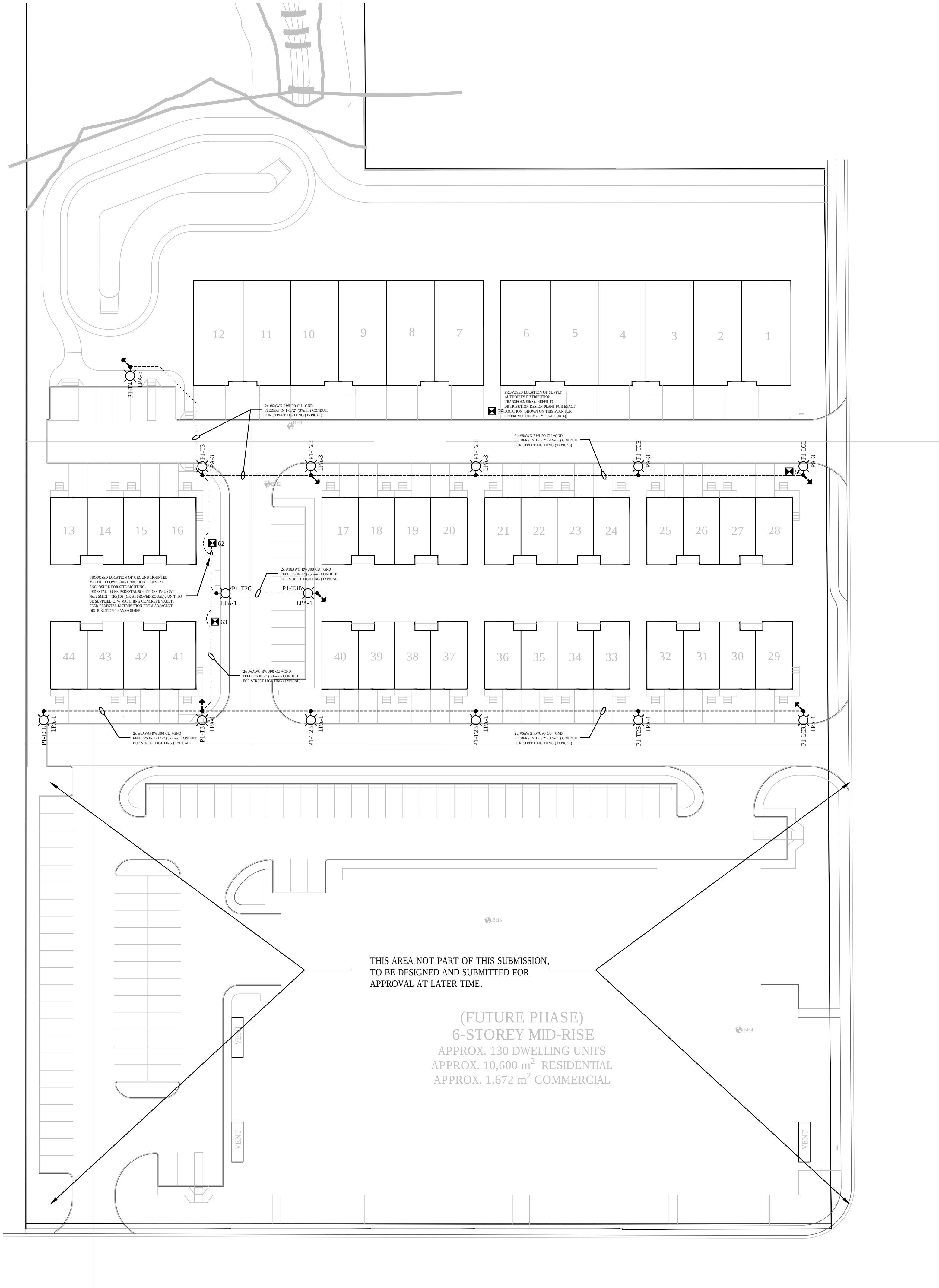
HFW MIXED USE

395-411 QUEENSWAY WEST

SIMCOE, ONTARIO

SIMCOE, ON

Title			
ELECTRICAL SPECIFICATIONS AND PANEL SCHEDULE			
Drawn By:	Designed By:	Approved By:	Date:
J.R.	J.R.	K.S.	April 2026
Project No.	Scale		
26-064	AS NOTED		
Drawing No.	Sheet	Revision	
ES050		2	



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Notes:

No.	Revision	Date	By
2	UPDATES SERVICING LAYOUT	2026.07.13	J.R.
1	ISSUED FOR PRICING	2026.05.28	J.R.



Seal

TENDER
DRAWINGS NOT TO BE USED FOR CONSTRUCTION PURPOSES UNTIL ALL CITY COMMENTS FROM PERMIT APPLICATION ARE INCORPORATED

Project
HFW MIXED USE
395-411 QUEENSWAY WEST
SIMCOE, ONTARIO
SIMCOE, ON

Title			
ELECTRICAL SITE PLAN LIGHTING LAYOUT			
Drawn By: J.R.	Designed By: J.R.	Approved By: K.S.	Date: April 2026
Project No. 26-064		Scale AS NOTED	
Drawing No. ES100		Sheet	Revision 2

HFW RESIDENTIAL DEVELOPMENT - PHASE 1

SIMCOE, NORFOLK COUNTY

Estimated Cost and Securities

Rev0 - 2024-05-15

Rev1 - 2025-12-02

Rev2 - 2026-08-20

Project #22-013

ITEM	DESCRIPTION	UNIT	APPROX. QUANTITY	UNIT PRICE	AMOUNT	SECURITY %	SECURITY AMOUNT
A. SANITARY SEWERS							
1	Connect new sanitary to sanitary stub on Hunt Street.	L.S.	1	\$3,000	\$3,000	100%	\$3,000
2	Supply and install 125mm dia. sanitary services including all fittings and marker 1m from proposed building within development site.	Each.	44	\$1,000	\$44,000	10%	\$4,400
3	Supply and install 200mm PVC sanitary sewers.						
	a) SAMH1 to SAMH2	metre	101.5	\$200.00	\$20,300	10%	\$2,030
	b) SAMH2 to SAMH3	metre	29.5	\$200.00	\$5,900	10%	\$590
	c) SAMH2 to SAMH4	metre	48.3	\$200.00	\$9,660	10%	\$966
	d) SAMH4 to SAMH5	metre	28.2	\$200.00	\$5,640	10%	\$564
	e) SAMH1 to SAMH6	metre	48.3	\$200.00	\$9,660	10%	\$966
	f) SAMH6 to SAMH7	metre	94.6	\$200.00	\$18,920	10%	\$1,892
4	Supply and install 1200mm diameter precast concrete maintenance holes complete with benching.						
	a) SAMH1	L.S.	1	\$7,000	\$7,000	10%	\$700
	b) SAMH2	L.S.	1	\$7,000	\$7,000	10%	\$700
	c) SAMH3	L.S.	1	\$7,000	\$7,000	10%	\$700
	d) SAMH4	L.S.	1	\$7,000	\$7,000	10%	\$700
	e) SAMH5	L.S.	1	\$7,000	\$7,000	10%	\$700
	f) SAMH6	L.S.	1	\$7,000	\$7,000	10%	\$700
	g) SAMH7	L.S.	1	\$7,000	\$7,000	10%	\$700
5	Flush and CCTV Video Sanitary System.	L.S.	1	\$3,500	\$3,500	10%	\$350
TOTAL SANITARY SEWERS					\$169,580		\$19,658
B. WATERMAINS							
1	Connect new 200mm watermain to 200MM watermain stub on Hunt Street.	L.S.	1	\$5,000	\$5,000	100%	\$5,000
3	Supply and install 200mm dia. water main including all fittings and anodes within development site.	metre	325	\$170.00	\$55,250	10%	\$5,525
4	Supply and install 200mm dia. water main including all fittings and anodes within County ROW.	metre	5	\$170.00	\$850	100%	\$850
5	Supply and install 25mm PEX water services including all fittings and anodes within development site.	each	44	\$1,000.00	\$44,000	10%	\$4,400
6	Supply and install hydrant set complete with valve within development site.	each	2	\$5,000.00	\$10,000	10%	\$1,000
7	Supply and install backflow preventer complete with chamber.	each	1	\$55,000.00	\$55,000	10%	\$5,500
TOTAL WATERMAIN					\$170,100		\$22,275

ITEM	DESCRIPTION	UNIT	APPROX. QUANTITY	UNIT PRICE	AMOUNT	SECURITY %	SECURITY AMOUNT
C. STORM SEWERS							
1	Supply and install 200mm dia. storm sewers. a) CBMH8 to HW2	metre	2.7	\$100.00	\$270	10%	\$27
2	Supply and install 300mm dia. storm sewers. a) CBMH5 to CBMH4	metre	60.5	\$150.00	\$9,075	10%	\$908
	b) CBMH2 to CBMH3	metre	27.6	\$150.00	\$4,140	10%	\$414
	c) CBMH1 to STMH1	metre	12.6	\$150.00	\$1,890	10%	\$189
3	Supply and install 450mm dia. storm sewers. a) HW3 to CBMH7	metre	8.8	\$250.00	\$2,200	10%	\$220
4	Supply and install 525mm dia. storm sewers. a) CBMH2 to CBMH1	metre	60.5	\$300.00	\$18,150	10%	\$1,815
5	Supply and install 600mm dia. storm sewers. a) CBMH6 to CBMH5	metre	22.4	\$350.00	\$7,840	10%	\$784
	b) CBMH5 to CBMH2	metre	53.3	\$350.00	\$18,655	10%	\$1,866
6	Supply and install 675mm dia. storm sewers. a) HW1 to OGS HD10	metre	6.2	\$450.00	\$2,790	10%	\$279
	b) OGS HD10 to CBMH6	metre	16.4	\$450.00	\$7,380	10%	\$738
7	Supply and install 1200mm dia. precast concrete maintenance holes complete with benching. a) CBMH1	L.S.	1	\$7,000	\$7,000	10%	\$700
	b) CBMH2	L.S.	1	\$7,000	\$7,000	10%	\$700
	c) CBMH3	L.S.	1	\$7,000	\$7,000	10%	\$700
	d) CBMH4	L.S.	1	\$7,000	\$7,000	10%	\$700
	e) CBMH5	L.S.	1	\$7,000	\$7,000	10%	\$700
	f) CBMH6	L.S.	1	\$7,000	\$7,000	10%	\$700
	g) CBMH7	L.S.	1	\$7,000	\$7,000	10%	\$700
	h) STMH1	L.S.	1	\$7,000	\$7,000	10%	\$700
8	Construct Headwalls per OPSD 804.030.	each	3	\$5,500.00	\$16,500	10%	\$1,650
9	Construct proposed stormwater management pond.	L.S.	1	\$150,000.00	\$150,000	10%	\$15,000
10	Supply and place rip rap at stormwater pond inlets and outlet.	L.S.	1	\$5,000.00	\$5,000	10%	\$500
11	Construct proposed stormwater outfall channel.	L.S.	1	\$50,000.00	\$50,000	10%	\$5,000
12	Supply and install oil and grit separator Hydroworks HD10 or approved equivalent	L.S.	1	\$40,000.00	\$40,000	10%	\$4,000
13	Flush and CCTV video storm system			\$3,500.00	\$3,500	10%	\$350
TOTAL STORM SEWER					\$393,120		\$39,312

ITEM	DESCRIPTION	UNIT	APPROX. QUANTITY	UNIT PRICE	AMOUNT	SECURITY %	SECURITY AMOUNT
D. ROAD CONSTRUCTION							
1	Sub-excavation to below finish grade for proposed asphalt areas.	L.S.	1	\$25,000	\$25,000	10%	\$2,500
2	Supply, place and compact 300mm Granular 'B' Type 2 100% crushed limestone for light-duty asphalt area.	tonne	2360	\$15.00	\$35,400	10%	\$3,540
3	Supply, place and compact 150mm Granular 'A' 100% crushed limestone for asphalt area.	tonne	1090	\$20.00	\$21,800	10%	\$2,180
4	Supply, place and compact 80mm of HL8 base asphalt pavement for asphalt area.	tonne	610	\$100.00	\$61,000	10%	\$6,100
5	Supply, place and compact 40mm of HL3 top asphalt pavement for asphalt area.	tonne	300	\$110.00	\$33,000	10%	\$3,300
6	Supply, place and compact 150mm Granular 'A' 100% crushed limestone for Driveways	tonne	400	\$20.00	\$8,000	10%	\$800
7	Supply, place and compact 40mm of HL3 top asphalt pavement for Driveways	tonne	110	\$110.00	\$12,100	10%	\$1,210
8	Construct concrete sidewalk within development site.	sqm	165	\$85.00	\$14,025	10%	\$1,403
9	Construct concrete sidewalk within County ROW.	sqm	130	\$85.00	\$11,050	100%	\$11,050
10	Construct limestone screenings pathway within development site.	sqm	530	\$50.00	\$26,500	10%	\$2,650
11	Construct curb and gutter per OPSD 600.110 within development site.	m	620	\$75.00	\$46,500	10%	\$4,650
12	Adjust manholes to base asphalt.	each	15	\$350.00	\$5,250	10%	\$525
13	Adjust manholes to surface asphalt.	each	15	\$350.00	\$5,250	10%	\$525
14	Construct curb and gutter per OPSD 600.040 within County ROW.	m	110	\$75.00	\$8,250	100%	\$8,250
15	Supply and install line painting for cross walks, stop bars, and parking spaces.	L.S.	1	\$5,000	\$5,000	10%	\$500
16	Supply and install all signage per site plan.	L.S.	1	\$2,000	\$2,000	10%	\$200
TOTAL ROAD CONSTRUCTION					\$313,125		\$48,683

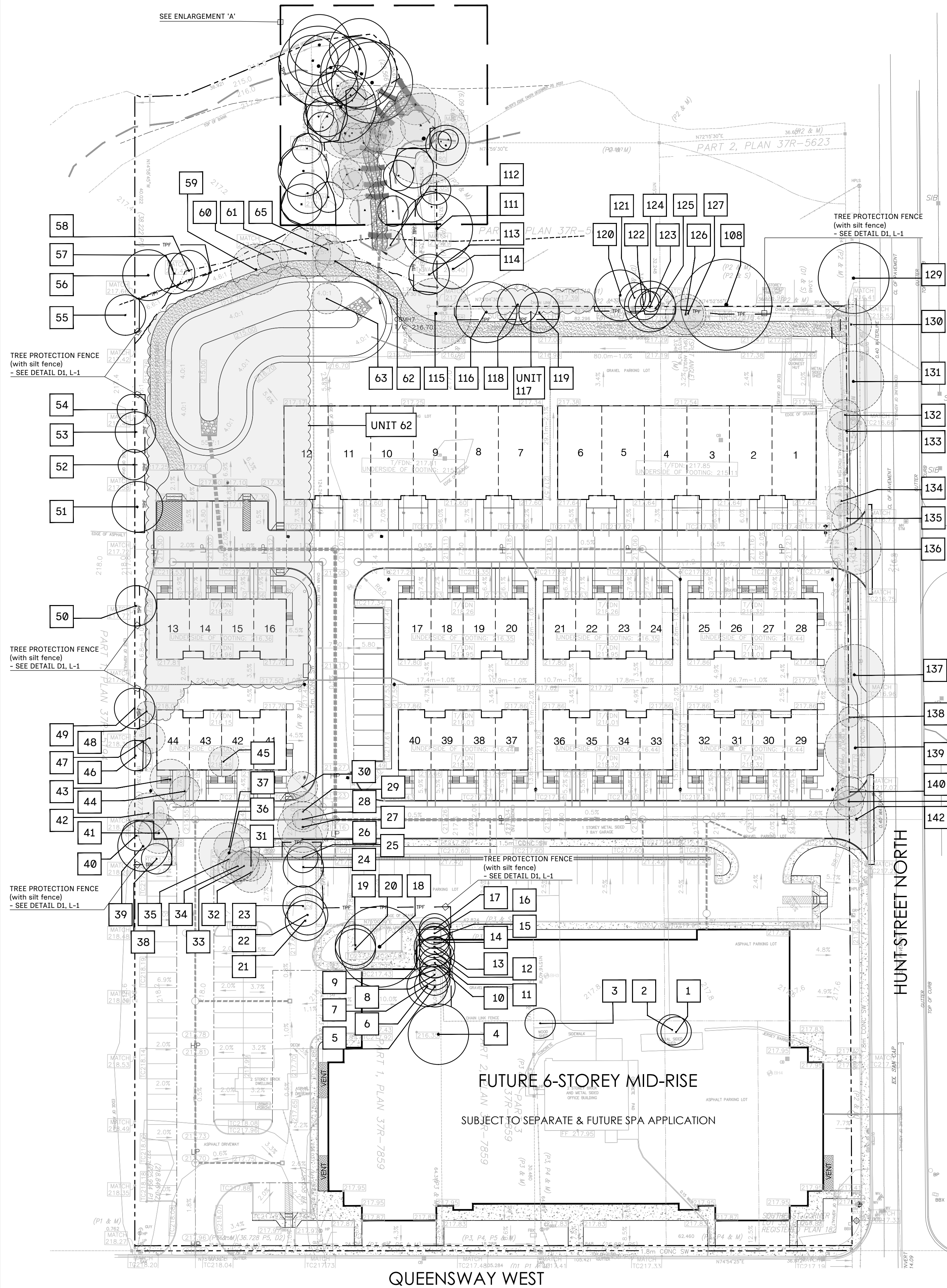
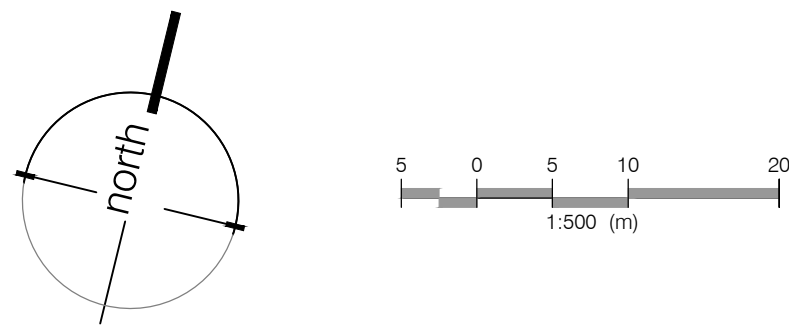
ITEM	DESCRIPTION	UNIT	APPROX. QUANTITY	UNIT PRICE	AMOUNT	SECURITY %	SECURITY AMOUNT
E. LANDSCAPING							
1	Supply and install 1.8m high wood privacy fence	m	245	\$100.00	\$24,500	10%	\$2,450
2	Supply and install 150mm topsoil, fine grade and sod.	sqm	4050	\$20.00	\$81,000	10%	\$8,100
3	Supply and install 150mm topsoil, fine grade and sod within county ROW.	sqm	170	\$20.00	\$3,400	100%	\$3,400
4	Supply and install 150mm topsoil, fine grade and seed.	sqm	705	\$10.00	\$7,050	10%	\$705
5	Supply and install deciduous trees (50mm cal.).	ea	39	\$700.00	\$27,300	10%	\$2,730
6	Supply and install coniferous trees (200cm ht.).	ea	19	\$400.00	\$7,600	10%	\$760
7	Supply and install coniferous trees (250cm ht.).	ea	3	\$450.00	\$1,350	10%	\$135
8	Supply and install deciduous/coniferous shrubs (60cm).	ea	96	\$60.00	\$5,760	10%	\$576
9	Supply and install deciduous/coniferous shrubs (50cm).	ea	90	\$45.00	\$4,050	10%	\$405
9	Supply and install deciduous/coniferous shrubs (45cm).	ea	51	\$40.00	\$2,040	10%	\$204
11	Supply and install grasses, perennials and ground cover.	ea	177	\$20.00	\$3,540	10%	\$354
TOTAL LANDSCAPING					\$167,590		\$19,819
F. STREET LIGHTING							
1	Supply and install street lights including poles, mast arms and fixtures.	ea	14	\$2,000.00	\$28,000	10%	\$2,800
2	Supply and install street light pedestal.	ea	1	\$1,000.00	\$1,000	10%	\$100
3	Supply and install street light conduit.	m	330	\$50.00	\$16,500	10%	\$1,650
4	Supply and install street light conductor.	m	400	\$50.00	\$20,000	10%	\$2,000
TOTAL STREET LIGHTING					\$65,500		\$6,550
G. RECORD DRAWINGS							
1	Complete record drawings for development site and work within county ROW.	L.S.	1	\$4,000.00	\$4,000	100%	\$4,000
TOTAL RECORD DRAWINGS					\$4,000		\$4,000

ITEM	DESCRIPTION	UNIT	APPROX. QUANTITY	UNIT PRICE	AMOUNT	SECURITY %	SECURITY AMOUNT
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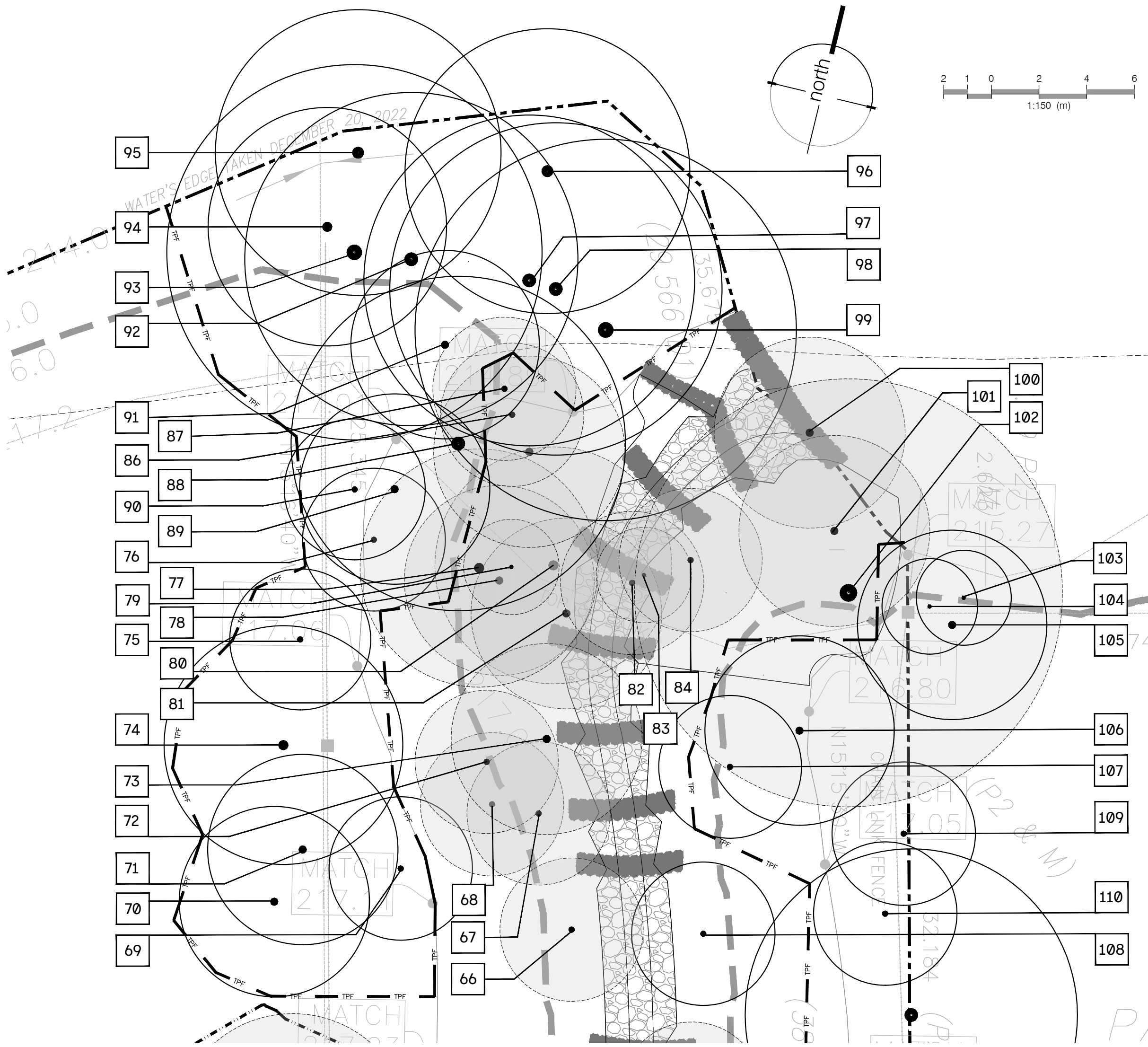
SECURITY SUMMARY

A.	SANITARY SEWERS						<u>\$19,658</u>
B.	WATERMAIN						<u>\$22,275</u>
C.	STORM SEWERS						<u>\$39,312</u>
D.	ROAD CONSTRUCTION						<u>\$48,683</u>
E.	LANDSCAPING						<u>\$19,819</u>
F.	STREET LIGHTING						<u>\$6,550</u>
G.	RECORD DRAWINGS						<u>\$4,000</u>

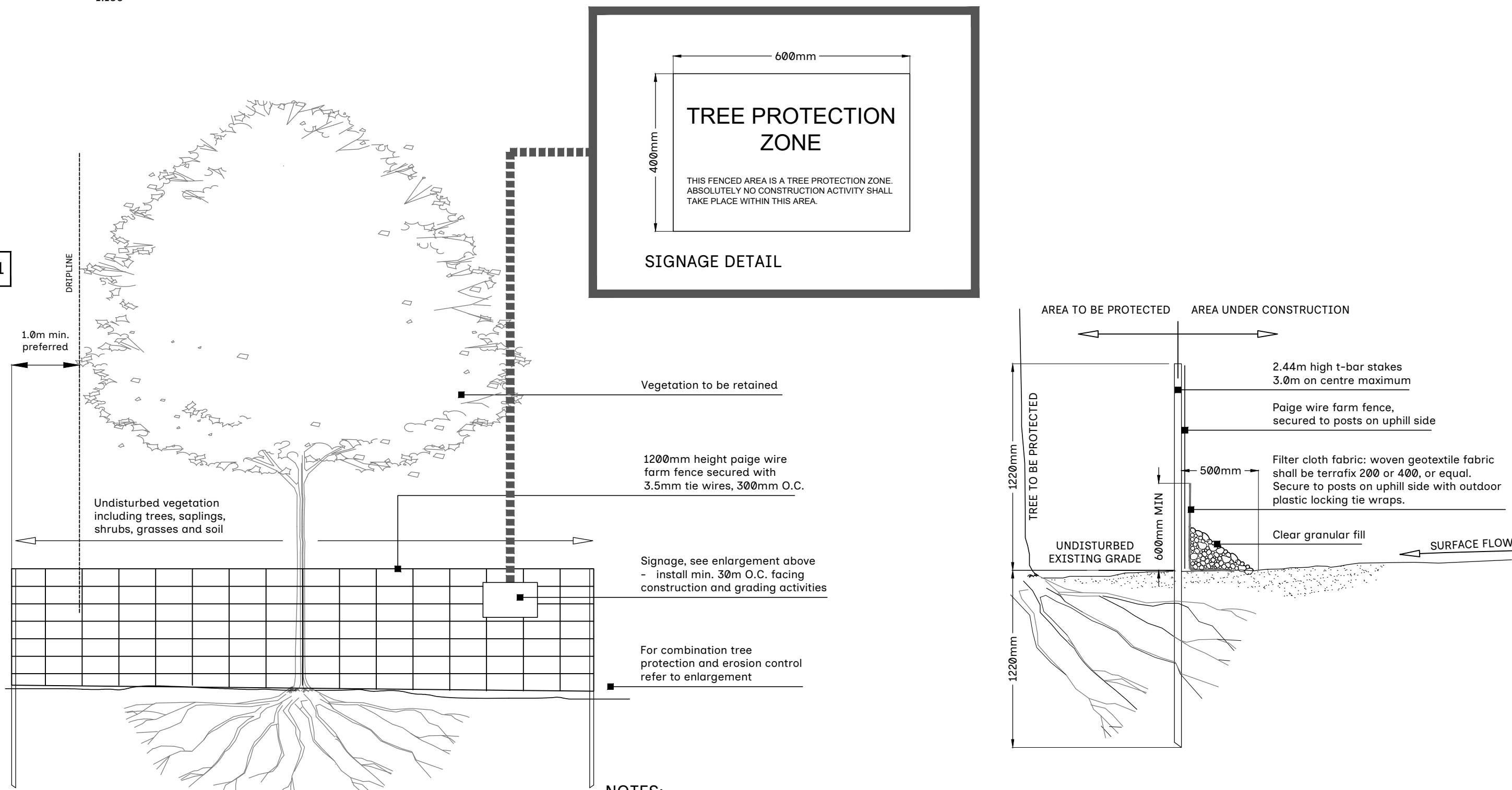
GRAND TOTAL **\$160,297**



TREE PROTECTION FENCE (WITH SILT FENCE)
N.T.S.



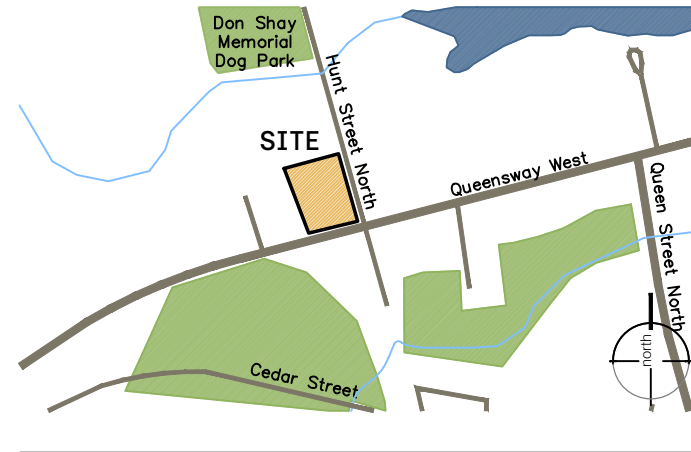
ENLARGEMENT 'A'
1:150



NOTES:

1. The area within the dripline of all existing trees shall be properly protected with temporary fencing.
2. The area within the protective fencing shall remain undisturbed with no construction activity, grade changes, surface treatment, compaction, or excavation. Area shall not be used for the storage of building materials or equipment access/storage or project related garbage.
3. Tree protection measures shall be installed prior to any demolition, tree removal or construction and shall remain until the completion of fine grading and sodding or seeding.
4. Prune all trees for dead, diseased, weak or hazardous branches only. Also trim back branches which will interfere with construction, prune for structural restoration where necessary.
5. No stockpiles and/or excavated material shall be placed within the tree preservation area.
6. No rigging cable shall be wrapped around or installed to trees.
7. Where root systems of protected trees are exposed directly adjacent to or damaged by construction work they are to be root pruned and the area back filled with topsoil to prevent root desiccation. An Arborist is required to be on site for any injury or cutting to the root system or surface roots of a protected tree.
8. Any fine grading within the preservation area is to be done by hand, no heavy equipment is permitted within the preservation zone.
9. Sediment accumulations to be removed by subdivider/builder when sediment deposits reach within 150mm of top of filter fabric barrier.
10. A copy of the approved and signed Vegetation Management Plan will be on site for the duration of construction and available upon request.
11. This detail does not represent any particular tree species.

KEY MAP - SIMCOE
N.T.S.



LEGEND

- property line
- UNIT 2
- 2
- existing tree number (refer to chart)
- existing vegetation to remain
- existing vegetation to be removed
- existing elevations
- proposed elevations
- tree protection fence (with silt fence) - see detail D1, L-2

NOT FOR CONSTRUCTION
ISSUED FOR REVIEW & COMMENTS ONLY

NOTE:
Vegetation inventory undertaken by Jeremy Jackson,
ISA Certified Arborist (ON-1089A) on April 01, 2026.

REVISIONS/ SUBMISSIONS

#	DATE	DESCRIPTION
1	2025-12-05	Issued for SPA 1
2	2026-06-12	Issued for SPA 2
3	2026-08-24	Re-issued for SPA 2

STAMP



CLIENT
HFW Holdings Limited
MUNICIPALITY
Norkfolk County

PROJECT
411 Queensway West
Simcoe, Ontario

MUNICIPAL FILE NUMBER

SHEET
Tree Protection Plan

L-1

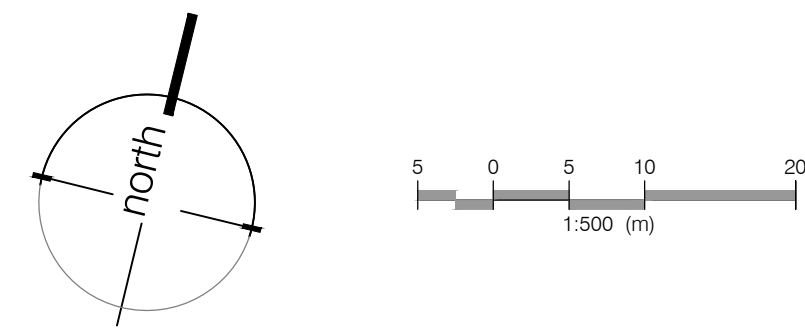
adesso

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www.adessodesigninc.ca

EXISTING VEGETATION IDENTIFICATION TABLE

Tree #	Common Name	Scientific Name	DBH	TI	CS	CV	Con.	DL	Location	Comments	Action	Reason
1	White Mulberry	Morus alba	14	F	F	G	F	3	Subject Property	Union at 1.6 m, sweep	TO REMAIN	
2	Siberian Elm	Ulmus pumila	12	FG	G	G	FG	3	Subject Property	Union at 2 m	TO REMAIN	
3	Manitoba Maple	Acer negundo	13, 13	P	F	F	P	3	Subject Property	Union at ground with included bark, grapevine competition, included wire fence at flare	TO REMAIN	
4	Manitoba Maple	Acer negundo	34, 19	F	FG	G	F	6	Subject Property	Union at 1.2 m, lean south	TO REMAIN	
5	Eastern White Cedar	Thuja occidentalis	45, 26, 9	F	F	G	F	4	Subject Property	Unions, stem wound	TO REMAIN	
6	Eastern Redcedar	Juniperus virginiana	47	G	FG	FG	FG	4	Subject Property	Shading	TO REMAIN	
7	Eastern White Cedar	Thuja occidentalis	17	G	PF	PF	PF	3	Subject Property	Shading	TO REMAIN	
8	Eastern White Cedar	Thuja occidentalis	28	FG	FG	G	FG	3	Subject Property	Union at 1.6 m	TO REMAIN	
9	Eastern White Cedar	Thuja occidentalis	22	G	G	G	G	3	Subject Property		TO REMAIN	
10	Eastern White Cedar	Thuja occidentalis	12	FG	F	F	F	3	Subject Property	Shading	TO REMAIN	
11	Eastern Cottonwood	Populus deltoides	32, 13, 14	F	F	G	F	4	Subject Property	Union at 8.7 m	TO REMAIN	
12	Eastern White Cedar	Thuja occidentalis	24	FG	FG	FG	FG	3	Subject Property	Union at 2 m	TO REMAIN	
13	Eastern White Cedar	Thuja occidentalis	22	G	FG	FG	FG	4	Subject Property	Shading	TO REMAIN	
14	Eastern White Cedar	Thuja occidentalis	18	G	FG	FG	FG	3	Subject Property	Shading	TO REMAIN	
15	Eastern White Cedar	Thuja occidentalis	19	G	G	G	G	3	Subject Property		TO REMAIN	
16	Eastern White Cedar	Thuja occidentalis	28, 18	F	F	G	F	3	Subject Property	Union at 8.5 m	TO REMAIN	
17	Eastern White Cedar	Thuja occidentalis	35	F	F	G	F	3	Subject Property	Union at 2 m with crack	TO REMAIN	
18	Silver Maple	Acer saccharinum	55	F	F	G	F	8	Subject Property	Union at 2 m	TO REMAIN	
19	Norway Spruce	Picea abies	44	FG	FG	G	FG	4	Subject Property	Union at 3 m	TO REMAIN	
20	Norway Spruce	Picea abies	35	F	FG	G	F	4	Subject Property	Union at 1.8 m	TO REMAIN	
21	Eastern Redbud	Cercis canadensis	15, 13	F	FG	G	F	4	Subject Property	Union at ground	TO REMAIN	
22	Eastern Redbud	Cercis canadensis	18	F	F	FG	F	4	Subject Property	Bowed east	TO REMAIN	
23	Manitoba Maple	Acer negundo	18	FG	G	G	FG	4	Subject Property	Lean east	TO REMAIN	
24	White Spruce	Picea glauca	58	G	G	G	G	4	Subject Property	1 vertical scaffold limb	TO REMAIN	
25	White Spruce	Picea glauca	24	G	FG	FG	FG	3	Subject Property	Shading	TO REMAIN	
26	White Spruce	Picea glauca	48	G	FG	FG	FG	4	Subject Property	Shading	REMOVE	Conflicts with proposed road
27	White Spruce	Picea glauca	61	F	F	G	F	5	Subject Property	Union at 1.1, diameter measured at 8.75 m due to union	REMOVE	Conflicts with proposed road
28	White Spruce	Picea glauca	23	F	F	F	F	2	Subject Property	Stem wound/shading	REMOVE	Conflicts with proposed road
29	White Spruce	Picea glauca	44	F	G	G	F	4	Subject Property	Stem wound, damaged roots	REMOVE	Conflicts with proposed road
30	White Spruce	Picea glauca	28, 27	F	F	FG	F	3	Subject Property	Union at 8.9 m	REMOVE	Conflicts with proposed parking
31	White Spruce	Picea glauca	25	G	F	F	F	3	Subject Property		REMOVE	Conflicts with proposed parking
32	White Spruce	Picea glauca	33	G	FG	FG	FG	4	Subject Property	Union in crown	REMOVE	Conflicts with proposed parking
33	White Spruce	Picea glauca	28	G	F	F	F	3	Subject Property	Shading	REMOVE	Conflicts with proposed parking
34	White Spruce	Picea glauca	19	G	FG	FG	FG	3	Subject Property		REMOVE	Conflicts with proposed parking
35	White Spruce	Picea glauca	14	G	F	F	F	2	Subject Property	Large live crown ratio	REMOVE	Conflicts with proposed parking
36	White Spruce	Picea glauca	52	G	FG	G	FG	6	Subject Property		REMOVE	Conflicts with proposed parking
37	White Spruce	Picea glauca	26	G	F	F	F	3	Subject Property	Understorey	REMOVE	Conflicts with proposed parking
38	White Mulberry	Morus alba	18	G	G	G	G	3	Subject Property		TO REMAIN	
39	Siberian Elm	Ulmus pumila	36	F	F	G	F	5	Subject Property	Union at 1.6 m	TO REMAIN	
40	Norway Maple	Acer platanoides	15, 18, 8.6	F	F	G	F	3	Subject Property	Union at ground	TO REMAIN	
41	White Pine	Pinus strobus	33	G	F	G	F	4	Subject Property	Stem wound, broken branches	REMOVE	Conflicts with proposed driveway
42	Black Walnut	Juglans nigra	38	G	G	G	G	4	Subject Property		REMOVE	Conflicts with proposed grading
43	White Pine	Pinus strobus	49	G	G	G	G	4	Subject Property	Broken branches	REMOVE	Conflicts with proposed building
44	Sassafras	Sassafras albidum	15	G	G	G	G	3	Subject Property	Stem wound	REMOVE	Conflicts with proposed building
45	Black Locust	Robinia pseudoacacia	23	PF	FG	FG	PF	3	Subject Property	Union at 2.2 m, damaged roots, stem wounds	REMOVE	Conflicts with proposed building
46	Hackberry	Celtis occidentalis	19	PF	G	G	PF	3	Boundary	Damaged structural roots	TO REMAIN	
47	Black Walnut	Juglans nigra	22	G	G	G	G	3	Subject Property		REMOVE	Conflicts with proposed grading
48	Black Walnut	Juglans nigra	17	G	G	G	G	2	Subject Property	Stem wound	REMOVE	Conflicts with proposed grading
49	White Mulberry	Morus alba	38	PF	P	P	P	4	Boundary	Lean east, crack, 58% crown dieback, broken branches	TO REMAIN	
50	Black Locust	Robinia pseudoacacia	24	G	G	F	F	4	Boundary		TO REMAIN	
51	Hackberry	Celtis occidentalis	36	G	G	G	G	5	Subject Property		TO REMAIN	
52	White Spruce	Picea glauca	36	F	PF	PF	PF	3	Boundary	1.1m from new asphalt, 38% crown dieback	TO REMAIN	
53	Black Walnut	Juglans nigra	17	G	FG	G	FG	4	Boundary	Crown bowed west, 2.2 m from asphalt	TO REMAIN	
54	White Spruce	Picea glauca	33, 31	F	P	P	P	3	Neighbouring	Union at ground, 58% crown dieback	TO REMAIN	
55	Black Walnut	Juglans nigra	31	G	G	FG	FG	4	Neighbouring		TO REMAIN	
56	Black Walnut	Juglans nigra	24, 37	FG	FG	G	FG	5	Subject Property	Union at ground	TO REMAIN	
57	Black Walnut	Juglans nigra	26	G	G	G	G	4	Subject Property		TO REMAIN	
58	Black Walnut	Juglans nigra	37	G	G	G	G	4	Subject Property		TO REMAIN	
59	Black Walnut	Juglans nigra	48	G	G	G	G	5	Subject Property		REMOVE	Conflicts with proposed grading
60	White Mulberry	Morus alba	28	G	F	F	F	3	Subject Property	Stem rubbing on neighbouring dead tree	REMOVE	Conflicts with proposed grading
61	Manitoba Maple	Acer negundo	38	F	PF	PF	PF	5	Subject Property	Lean south, 38% crown dieback	REMOVE	Conflicts with proposed grading
62	Refer to tree unit tally sheet for complete tree inventory information.								Subject Property		REMOVE	Conflicts with proposed grading
63	White Mulberry	Morus alba	12, 8, 8	F	FG	G	F	3	Subject Property	Union at 1 m	REMOVE	Conflicts with proposed grading
64	Black Walnut	Juglans nigra	18	G	G	G	G	4	Subject Property		REMOVE	Conflicts with proposed grading
65	Black Walnut	Juglans nigra	15	G	G	G	G	3	Subject Property		REMOVE	Conflicts with proposed grading
66	Black Walnut	Juglans nigra	18	G	G	G	G	3	Subject Property		REMOVE	Conflicts with proposed grading
67	Black Walnut	Juglans nigra	28	G	G	G	G	3	Subject Property		REMOVE	Conflicts with proposed grading
68	Black Walnut	Juglans nigra	21	G	G	G	G	3	Subject Property		TO REMAIN	
69	Manitoba Maple	Acer negundo	14	G	FG	FG	FG	8	Subject Property	Grapevine competition	TO REMAIN	
70	Manitoba Maple	Acer negundo	-31, 16	P	P	P	P	4	Subject Property	16 cm stem failed and lying on fence, broken branches	TO REMAIN	
71	Black Locust	Robinia pseudoacacia	-41	F	P	P	P	4	Subject Property	Stem wound, 50% crown dieback	TO REMAIN	
72	Black Walnut	Juglans nigra	13	G	G	G	G	3	Subject Property		REMOVE	Conflicts with proposed grading
73	Black Walnut	Juglans nigra	18	G	G	G	G	4	Subject Property		REMOVE	Conflicts with proposed grading
74	Manitoba Maple	Acer negundo	-15	P	P	F	P	5	Subject Property	Heavy lean east - snag resting on crown	TO REMAIN	
75	Manitoba Maple	Acer negundo	-25, 11	P	P	P	P	3	Subject Property	25 cm stem failed and resting on fence	TO REMAIN	
76	Black Cherry	Prunus serotina	17	G	G	G	G	3	Subject Property	Understorey	TO REMAIN	
77	Black Locust	Robinia pseudoacacia	38	F	F	F	F	5	Subject Property	Decaying stem at flare, 28% crown dieback	REMOVE	Conflicts with proposed grading
78	Black Walnut	Juglans nigra	13	G	FG	FG	FG	4	Subject Property	Crown bowed south - understorey	REMOVE	Conflicts with proposed grading
79	Black Walnut	Juglans nigra	11	G	G	G	G	2	Subject Property	Understorey	REMOVE	Conflicts with proposed grading
80	Black Locust	Robinia pseudoacacia	27	G	F	F	F	5	Subject Property	28% crown dieback	REMOVE	Conflicts with proposed grading
81	Black Walnut	Juglans nigra	21	G	G	G	G	4	Subject Property		REMOVE	Conflicts with proposed grading
82	Manitoba Maple	Acer negundo	12	F	F	F	F	3	Subject Property	Lean south, understorey	REMOVE	Conflicts with proposed grading
83	Manitoba Maple	Acer negundo	15	P	P	P	P	2	Subject Property	Heavy lean southeast, 88% crown dieback	REMOVE	Conflicts with proposed grading
84	Black Cherry	Prunus serotina	11	G	G	G	G	3	Subject Property	Understorey	REMOVE	Conflicts with proposed grading
85	Basswood	Tilia americana	27, 12	F	F	F	F	4	Subject Property	Union at ground, canker lesions	REMOVE	Conflicts with proposed grading
86	White Elm	Ulmus americana	14	G	G	G	G	3	Subject Property	Understorey	REMOVE	Conflicts with proposed grading
87	White Elm	Ulmus americana	11	G	G	G	G	3	Subject Property	Understorey	REMOVE	Conflicts with proposed grading
88	Red Oak	Quercus rubra	53	G	G	G	G	7	Subject Property		TO REMAIN	
89	Black Locust	Robinia pseudoacacia	23	P	P	P	P	4	Subject Property	Peeling bark, 58% crown dieback, fruiting bodies on stem	TO REMAIN	
90	Black Cherry	Prunus serotina	14	G	G	G	G	3	Subject Property	Vine competition	TO REMAIN	
91	Bur Oak	Quercus macrocarpa	31	G	F	F	F	4	Subject Property	Epicormic branching	TO REMAIN	
92	Basswood	Tilia americana	51	G	G	FG	FG	7	Subject Property		TO REMAIN	
93	Red Oak	Quercus rubra	71	G	G	G	G	8	Subject Property		TO REMAIN	
94	Basswood	Tilia americana	23, 51	F	F	FG	F	5	Subject Property	Canker wound with heart rot	TO REMAIN	
95	Red Oak	Quercus rubra	36, 18	F	G	G	F	6	Subject Property	Union at 8.7 m, lean north	TO REMAIN	
96	White Elm	Ulmus americana	25	G	G	G	G	6	Subject Property		TO REMAIN	
97	Basswood	Tilia americana	41	F	F	F	F	7	Subject Property	Canker lesions, crown bowed north, understorey	TO REMAIN	
98	Basswood	Tilia americana	38, 15	F	F	F	F	7	Subject Property	Union at ground, canker lesions, crown bowed north, understorey	TO REMAIN	
99	Basswood	Tilia americana	56, 26	F	FG	G	F	6	Subject Property	Union at ground	TO REMAIN	
100	Manitoba Maple	Acer negundo	-18	P	PF	F	P	4	Subject Property	Stem failed - resting in a stump	REMOVE	Conflicts with proposed grading
101	Manitoba Maple	Acer negundo	16	PF	PF	F	PF	4	Subject Property	Heavy lean west	REMOVE	Conflicts with proposed grading
102	Red Oak	Quercus rubra	76, 66	FG	G	G	FG	9	Subject Property	Union at ground	REMOVE	Conflicts with proposed grading
103	Norway Maple	Acer platanoides	-12	G	G	G	G	2	Neighbouring		TO REMAIN	
104	Manitoba Maple	Acer negundo	-13	G	G	G	G	2	Neighbouring	Understorey	TO REMAIN	
105	Black Locust	Robinia pseudoacacia	-28	G	FG	FG	FG	4	Neighbouring	Understorey	TO REMAIN	
106	Black Walnut	Juglans nigra	21	G	G	G	G	4	Subject Property		TO REMAIN	
107	Black Walnut	Juglans nigra	12	G	G	G	G	3	Subject Property		TO REMAIN	
108	Black Walnut	Juglans nigra	19	G	G	G	G	3	Subject Property		TO REMAIN	
109	White Elm	Ulmus americana	11	F	F	F	F	3	Boundary	Included wire fence, grapevine competition	TO REMAIN	

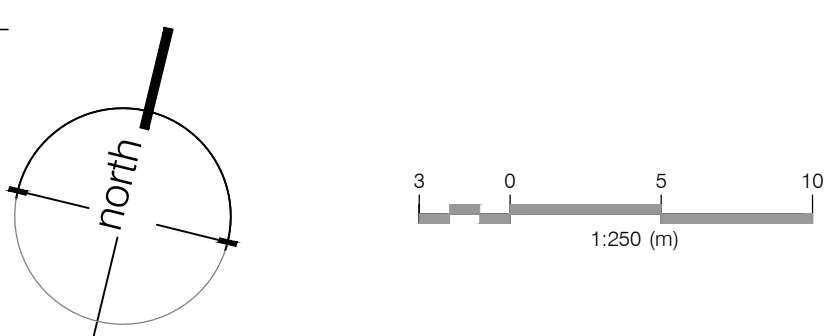
Tree #	Common Name	Scientific Name	DBH	TI	CS	CV	Con.	DL	Location	Comments	Action	Reason
110	White Elm	Ulmus americana	16, 12	F	F	G	F	3	Subject Property	Union at 8.2 m with Included bark, grapevine competition	TO REMAIN	
111	Basswood	Tilia americana	-35, 75	F	F	FG	F	7	Boundary	Unions at ground and 1.6 m	TO REMAIN	
112	Black Walnut	Juglans nigra	18	G	G	G	G	3	Subject Property		REMOVE	Conflicts with proposed grading
113	Black Walnut	Juglans nigra	23	G	G	G	G	4	Subject Property		TO REMAIN	
114	Little-leaf Linden	Tilia cordata	-35	G	G	G	G	4	Neighbouring		TO REMAIN	
115	Black Locust	Robinia pseudoacacia	35, 36	F	F	FG	F	7	Subject Property	Union at ground, broken branches	REMOVE	Condition
116	Black Locust	Robinia pseudoacacia	38	G	G	G	G	6	Subject Property		TO REMAIN	
U117	Eastern White Cedar	Thuja occidentalis	18-28, org: 19	F	F	G	F	2	Neighbouring	Cedar hedge, 12 trees > 18 cm DBH	TO REMAIN	
118	Cherry species	Prunus spp.	14	F	FG	G	F	4	Boundary	Included wire fence, lean through fence	TO REMAIN	
119	Black Walnut	Juglans nigra	18	G	G	G	G	4	Subject Property		TO REMAIN	
120	Little-leaf Linden	Tilia cordata	-45	FG	G	G	FG	5	Neighbouring	Union at base of crown with included bark	TO REMAIN	
121	White Spruce	Picea glauca	-18	G	FG	FG	FG	3	Neighbouring	Shading	TO REMAIN	
122	Basswood	Tilia americana	-18	G	G	G	G	3	Neighbouring		TO REMAIN	
123	Black Walnut	Juglans nigra	39	F	G	G	F	5	Boundary	Included wire fence, stem wound - rubbing on fence top rail	TO REMAIN	
124	White Spruce	Picea glauca	-12	G	F	F	F	2	Neighbouring	Understorey - shading	TO REMAIN	
125	Black Walnut	Juglans nigra	17	G	G	G	G	4	Subject Property		TO REMAIN	
126	White Mulberry	Morus alba	24, 12	F	FG	G	F	4	Subject Property	Union at 1.2 m, bacterial wetwood	REMOVE	Conflicts with proposed grading
127	Siberian Elm	Ulmus pumila	11	G	G	G	G	3	Subject Property		REMOVE	Conflicts with proposed grading
128	Siberian Elm	Ulmus pumila	95	F	F	FG	F	9	Boundary	Union at 2 m	TO REMAIN	
129	Norway Maple	Acer platanoides	71	F	F	F	F	6	Town ROW	Union at 2 m with stem wound, pruning wounds - hydro	TO REMAIN	
130	Manitoba Maple	Acer negundo	29, 23, 28, 18	PF	PF	F	PF	4	Town ROW	Union at 8.5 m, pruning wounds - hydro, cavity with heart rot	REMOVE	Conflicts with trail access & Condition
131	Norway Maple	Acer platanoides	61	F	F	FG	F	6	Town ROW	Union at 2 m, pruning wounds	TO REMAIN	Conflicts with proposed sidewalk
132	Siberian Elm	Ulmus pumila	16	G	G	G	G	3	Subject Property		REMOVE	Low value species
133	Siberian Elm	Ulmus pumila	23, 17	F	F	F	F	4	Subject Property	Union at ground, 23 cm stem top cut at 2 m, bowed west	REMOVE	Low value species
134	Black Locust	Robinia pseudoacacia	17	G	G	G	G	3	Subject Property		REMOVE	Low value species
135	Black Walnut	Juglans nigra	15	F	G	G	F	3	Subject Property	Included wire fence	REMOVE	Condition
136	Norway Maple	Acer platanoides	63	F	F	F	F	5	Town ROW	Union at 1.6 m, broken branches	REMOVE	Condition
137	Norway Maple	Acer platanoides	55	F	F	FG	F	6	Town ROW	Union at 2 m with pruning wounds	REMOVE	Conflicts with proposed sidewalk & Condition
138	Siberian Elm	Ulmus pumila	10	F	G	G	F	2	Subject Property	Lean west	REMOVE	Low value species
139	Norway Maple	Acer platanoides	54	F	G	F	F	6	Town ROW	Union at 1.6 m, pruning wounds - hydro	REMOVE	Conflicts with proposed sidewalk
140	Siberian Elm	Ulmus pumila	17	F	G	G	F	3	Town ROW	Included wire fence	REMOVE	Low value species
141	Siberian Elm	Ulmus pumila	16	F	G	G	F	3	Subject Property	Included wire fence	REMOVE	Conflicts with proposed driveway
142	Norway Maple	Acer platanoides	59	F	F	FG	F	6	Town ROW	Union at 1.6 m, pruning wounds - hydro	REMOVE	Conflicts with proposed driveway



NOTE:
For all grading refer to civil plans.

PLANT SCHEDULE STREETSCAPE PLANTING

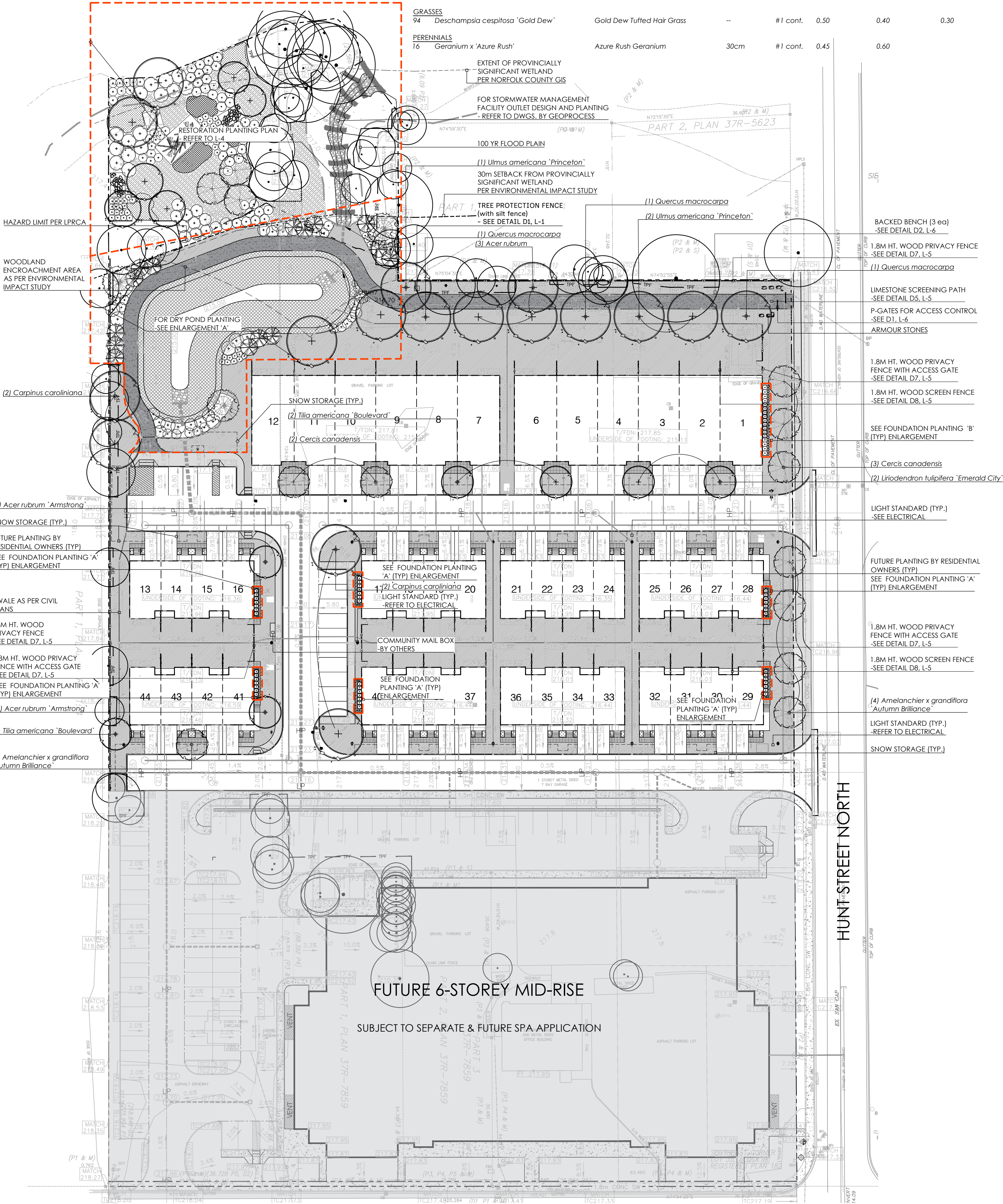
QTY	BOTANICAL NAME	COMMON NAME	SIZE	COND.	MATURE HT. (M)	MATURE SPR. (M)	O.C. (M)	REMARKS
TREES								
3	<i>Acer rubrum</i>	Red Maple	50mm Cal.	W.B.	15.0	12.0		As Shown
2	<i>Acer rubrum</i> 'Armstrong'	Armstrong Red Maple	50mm Cal.	W.B.	16.0	7.0		As Shown
5	<i>Amelanchier x grandiflora</i> 'Autumn Brilliance'	Autumn Brilliance Apple Serviceberry	50mm Cal.	W.B.	9.0	7.0		As Shown
4	<i>Carpinus caroliniana</i>	American Hornbeam	50mm Cal.	W.B.	9.0	10.0		As Shown
5	<i>Cercis canadensis</i>	Eastern Redbud	50mm Cal.	W.B.	9.0	7.0		As Shown
2	<i>Liriodendron tulipifera</i> 'Emerald City'	Emerald City Tulip Poplar	50mm Cal.	W.B.	15.0	7.0		As Shown
3	<i>Quercus macrocarpa</i>	Burr Oak	50mm Cal.	W.B.	20.0	13.0		As Shown
3	<i>Tilia americana</i> 'Boulevard'	Boulevard Linden	50mm Cal.	W.B.	14.0	7.0		As Shown
3	<i>Ulmus americana</i> 'Princeton'	American Elm	50mm Cal.	W.B.	18.0	12.0		As Shown
SHRUBS								
8	<i>Diervilla lonicera</i>	Bush Honeysuckle	60cm	#3 cont.	1.0	1.0	0.90	Native to Ontario
51	<i>Taxus x media</i> 'Wardii'	Ward's Yew	40cm	#3 cont.	1.25	1.25	1.1	
GRASSES								
94	<i>Deschampsia cespitosa</i> 'Gold Dew'	Gold Dew Tufted Hair Grass	—	#1 cont.	0.50	0.40	0.30	
PERENNIALS								
16	<i>Geranium x 'Azure Rush'</i>	Azure Rush Geranium	30cm	#1 cont.	0.45	0.60		



PLANT SCHEDULE DRY POND PLANTING

QTY	BOTANICAL NAME	COMMON NAME	SIZE	COND.	MATURE HT. (M)	MATURE SPR. (M)	O.C. (M)	REMARKS
TREES								
2	<i>Carpinus caroliniana</i>	American Hornbeam	50mm Cal.	W.B.	9.0	10.0		As Shown
3	<i>Pinus strobus</i>	White Pine	200cm Ht.	W.B.	22.0	7.0		As Shown
16	<i>Thuja occidentalis</i>	Eastern White Cedar	200cm Ht.	W.B.	10.0	4.0		As Shown
SHRUBS								
8	<i>Cornus racemosa</i>	Gray Dogwood	60cm	#3 cont.	3.0	3.0		Native to Ontario
13	<i>Rhus typhina</i>	Staghorn Sumac	60cm	#3 cont.	3.0	3.0	2.0	Native to Ontario
19	<i>Rubus odoratus</i>	Flowering Raspberry	50cm	#2 cont.	1.5	1.25	1.0	Native to Ontario
15	<i>Sambucus canadensis</i>	Elderberry	60cm	#3 cont.	2.5	1.25	1.75	Native to Ontario

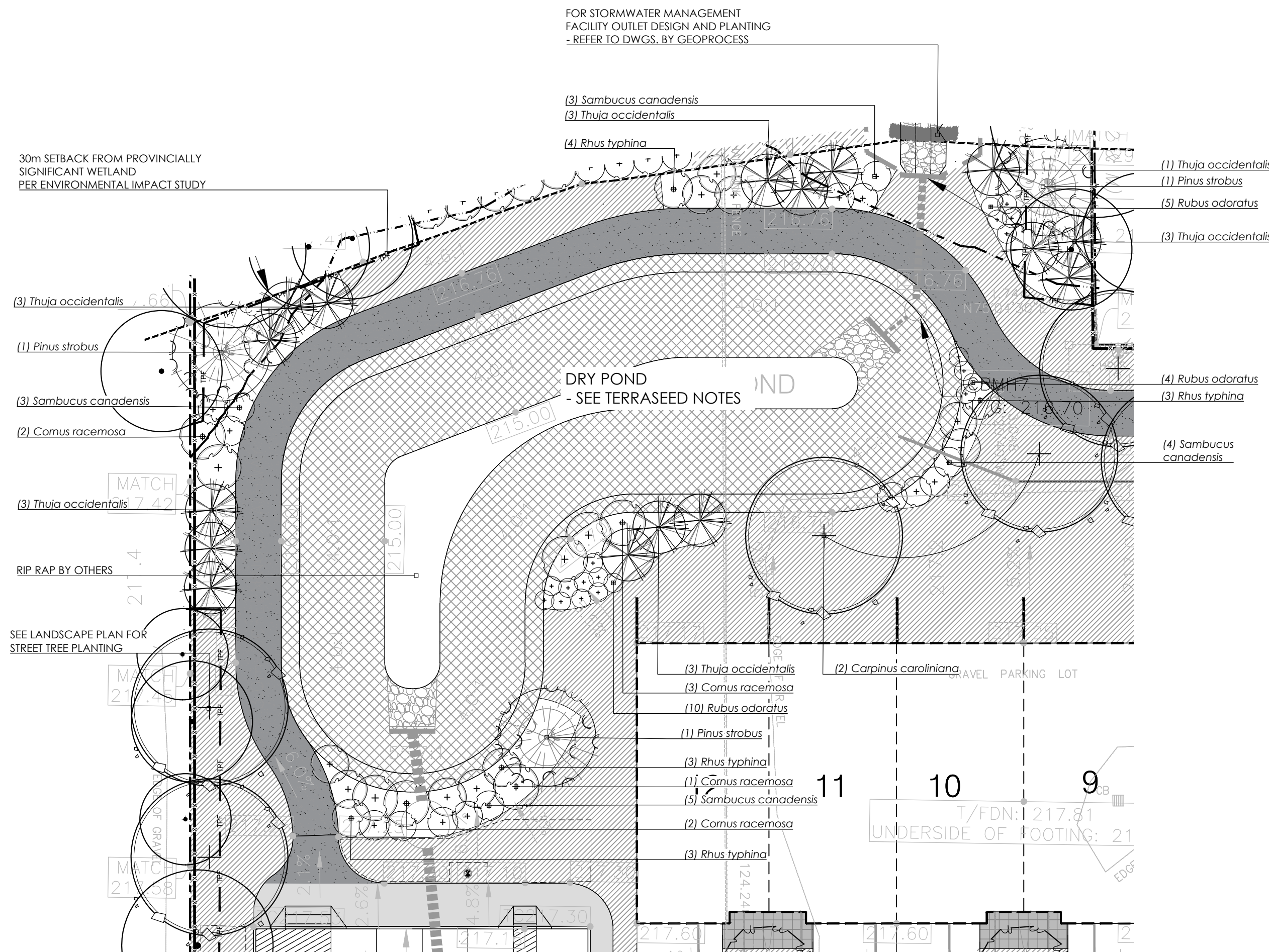
FOR STORMWATER MANAGEMENT
FACILITY OUTLET DESIGN AND PLANTING
- REFER TO DWGS. BY GEOPROCESS



STREETSCAPE PLAN

SCALE 1:500

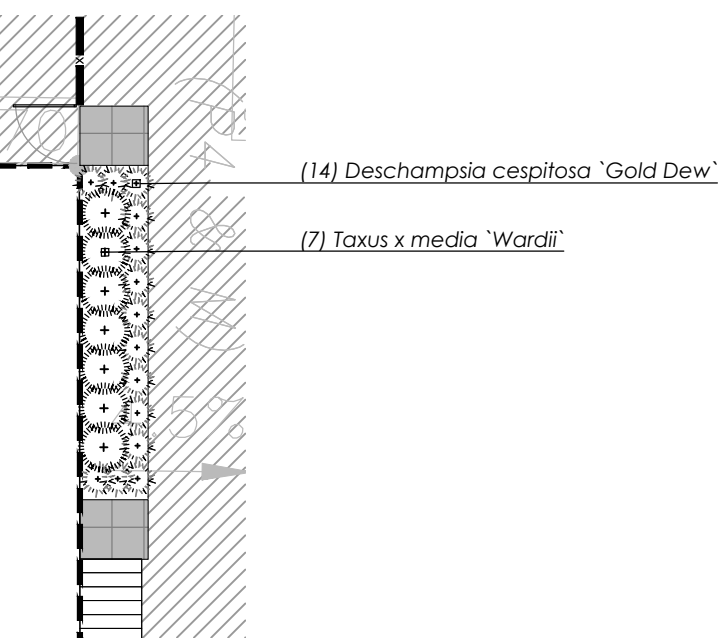
QUEENSWAY WEST



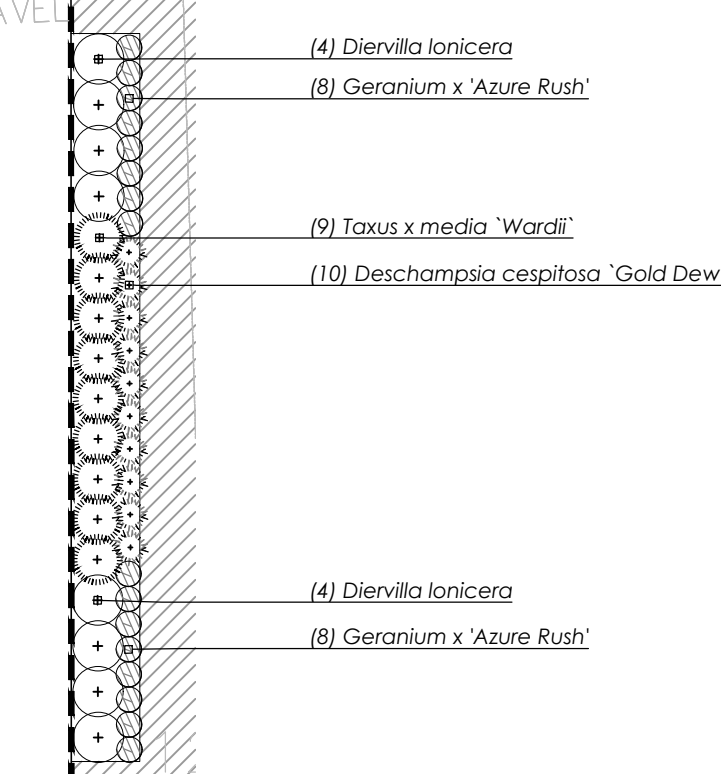
ENLARGEMENT 'A' - DRY POND PLANTING

SCALE 1:250

FOUNDATION PLANTING 'A' ENLARGEMENT



FOUNDATION PLANTING 'B' ENLARGEMENT



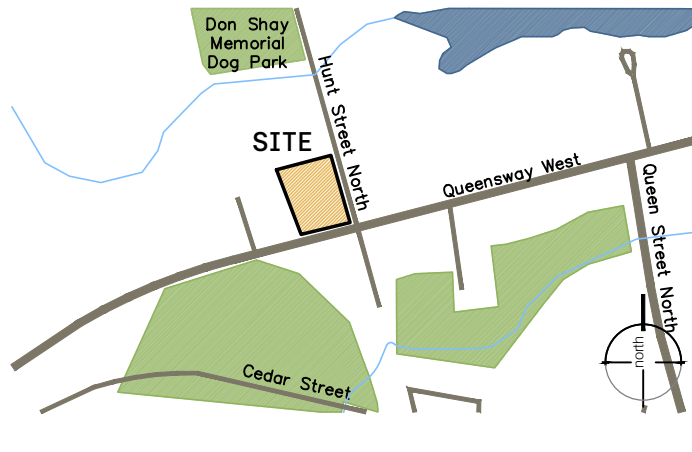
LANDSCAPE NOTES:

- All work to be carried out in accordance with by-laws and codes having jurisdiction over site location.
- Complete all work to the satisfaction of the Landscape Architect.
- Report any changes, discrepancies or substitutions to the Landscape Architect for review. Obtain approval from the Landscape Architect before proceeding.
- It is the contractor's responsibility to determine existing service locations.
- Exact locations of plant material will be determined by placement of site services such as hydro vaults, meters, utilities roof rain water leaders, driveways, light standards, etc.
- All plant material locations to be staked or marked out and approved by Landscape Architect prior to installation.
- Supply all plant material in accordance with the Canadian Standards for Nursery Stock (Bm ed.).
- Supply and place mulch in accordance with Canadian Landscape Standard (Section 10, Mulching). Disturbed soil areas around trees and shrubs are to be covered with shredded cork bark mulch such as 'Cedar Bark Mulch' by All Treat Farms or 'Classic Cedar Mulch' by Gro-Bark, or approved equivalent. Alternative mulches must be approved by the Landscape Architect.
- Contractor to utilize layout dimensions where provided.
- Provide planting bed area as noted on the drawing or to accommodate mature size of plant material.
- All support systems must be removed by the contractor at time of final acceptance. No extras will be paid to complete this work.
- Supply and place topsoil in accordance with Canadian Landscape Standard (Section 4, Grading & Drainage and Section 6, Growing Medium) to a minimum depth of 150mm unless otherwise specified.
- Supply and place sod in accordance with Canadian Landscape Standard (Section 7, Lawns & Grass and Section 8, Turfgrass).
- Supply and place seed in accordance with Canadian Landscape Standard (Section 4, Grading & Drainage and Section 6, Growing Medium) unless otherwise specified. All 3:1 or greater slopes to be seeded with topsoil. Contractor to provide necessary erosion control protection as required to ensure soil stabilization and proper seed germination.
- All dimensions in meters unless otherwise noted.
- If discrepancies arise between plant material count shown on drawing and plant list, the drawing shall be considered correct.
- Contractor to provide minimum one (1) year warranty (including trees on municipal property) from date accepted on all work unless otherwise specified.
- Any site plan or grading and servicing shown is for information only. Refer to approved drawings.
- Not for construction unless stamped, signed and dated by Landscape Architect.
- Drawings not to be reproduced without written consent from Landscape Architect.
- Approval of landscape plan to be obtained from municipality.
- All plant material to be planted a minimum of 1.0m from any swales or ditches.
- For grading and servicing information refer to the consulting Engineer's drawings.
- For lighting information and power distribution refer to the electrical consultant's drawings.

TERRASEED NOTES:

- Areas to be terraseeded with naturalization mix shall receive an application of naturalization seed at the rate of 25 kg/hectare or 2 kg/100m² for spot applications, in the following mixture:
Early Succession Wet Meadow Native Seed Mixture 8170
Awl Sedge (*Carex stipata*)
Big Bluestem (*Andropogon gerardi*)
Burnt Broom Sedge (*Carex scoparia*)
Flat Topped White Aster (*Aster umbellatus*)
Fox Sedge (*Carex vulpinoidea*)
Fringed Sedge (*Carex cinerea*)
Great Blue Lobelia (*Lobelia siphilatica*)
New England Aster (*Aster novae-angliae*)
Path Rush (*Juncus tenuis*)
Showy Tick Trefoil (*Desmodium canadense*)
Soft Rush (*Juncus effusus*)
Tall Manna Grass (*Glyceria grandis*)
Virginia Wild Rye (*Elymus virginicus*)
Wild Bergamot (*Monarda fistulosa*)
- *apply with Annual Oats (*Avena sativa*) nursecrop at 22kg/hectare.
- Supplied by:
OSC (or approved equal)
P: (519) 886-0557 or 1-800-465-3849
W: www.oscseeds.com
E: info@oscseeds.com
- Contractor responsible for soil test to determine fertilizer rates. Results of soil test shall be provided to the Landscape Architect for review and approval.
- Hydraulic mulch to be approved by the Landscape Architect shall be applied at the rate of 2100kg per hectare.
- The contractor shall not carry out the work under adverse weather conditions such as high wind, frozen ground or ground covered with snow, ice or standing water.
- Grade sub-grade, eliminate uneven areas and low spots, ensure positive drainage. Remove debris, roots, branches, stones in excess of 50mm diameter and other deleterious materials. Remove subsoil that has been contaminated with oil, gasoline or calcium chloride, dispose of removed material as directed by Landscape Architect.
- Grade seed bed for terraseeding to a uniform surface and remove vegetation which may interfere with seeding operations. Loosen soil to depth of 25mm minimum and remove stones and foreign material which protrude more than 75mm above the surface.
- All areas to be terraseeded to receive 150mm of topsoil.
- Seeded areas to be maintained by contractor ensuring adequate water, fertilizer, maintenance and repair until seeded areas are properly established. Areas seeded in fall will be accepted in following spring, one month after start of growing season provided acceptance conditions are fulfilled.

KEY MAP - SIMCOE
N.T.S.



LEGEND

- property line
- existing tree to remain
- proposed deciduous tree
- proposed shrub
- min. 150mm topsoil, fine grade & sod
- min. 150mm topsoil, fine grade & seed mix
- C.I.P. concrete
- precast concrete unit pavers -see D5, L-5
- limestone screening path -see D4, L-5
- proposed light standard -see electrical
- 1.8m HT. wood privacy screen -see D8, L-5
- 1.8m HT. wood privacy fence -see D7, L-5
- existing elevations
- proposed elevations

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STAMP



CLIENT
HFW Holdings Limited
MUNICIPALITY
Norkfolk County

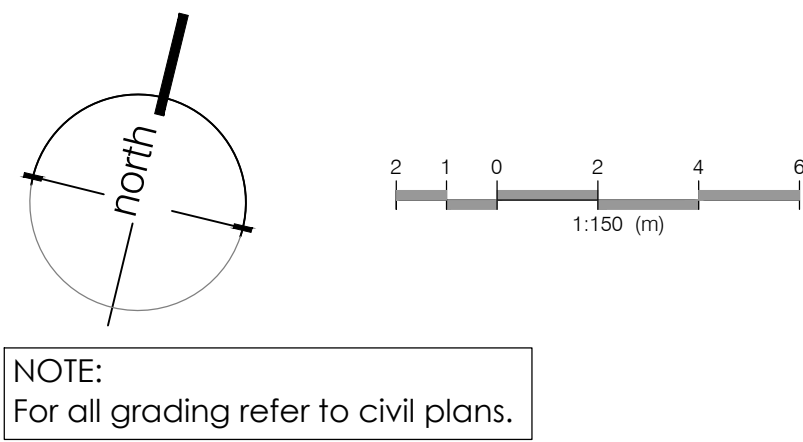
PROJECT
411 Queensway West
Simcoe, Ontario

MUNICIPAL FILE NUMBER

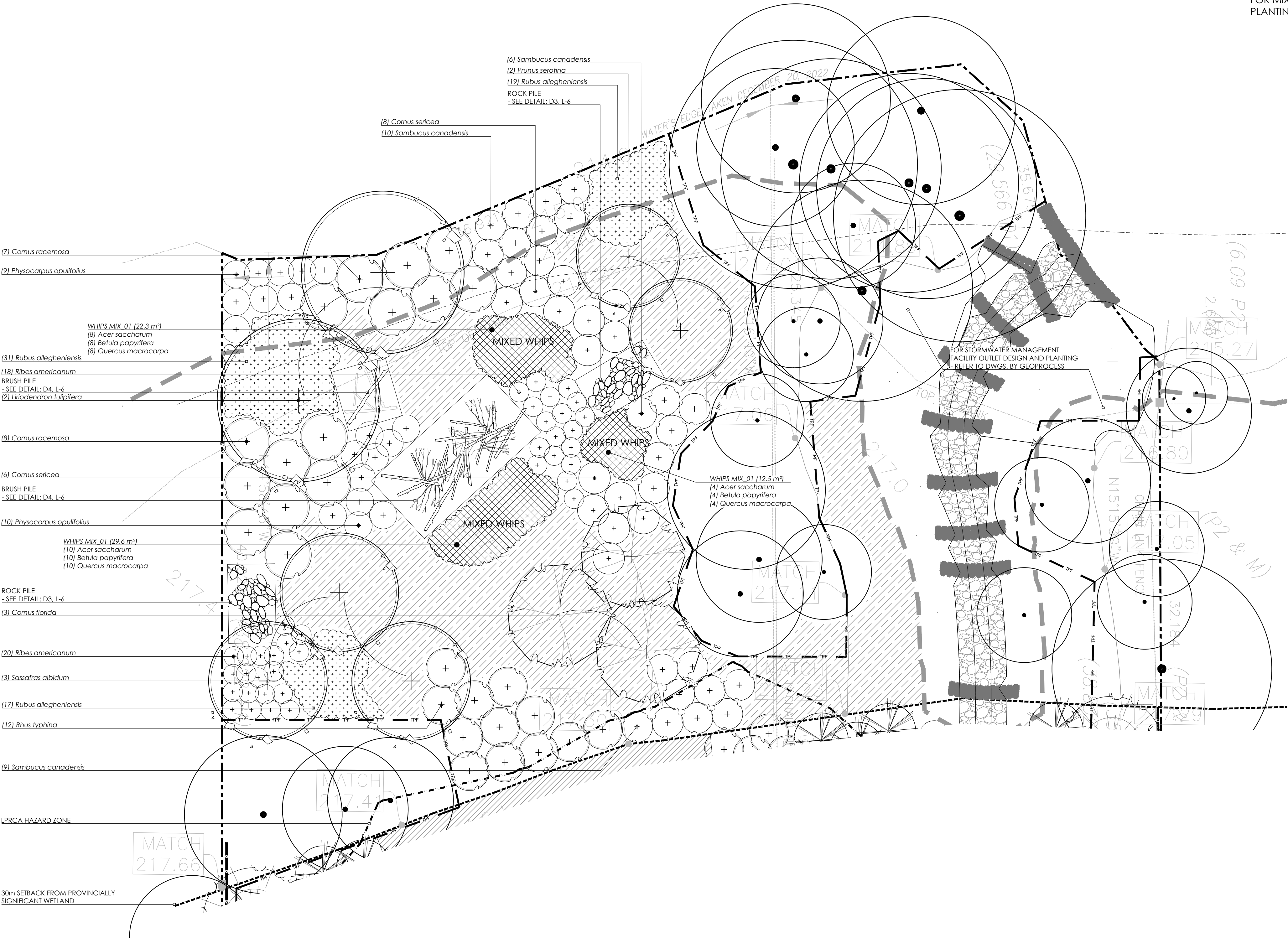
SHEET
Landscape Plan

adesso

69 John Street South, Suite 250
Hamilton, ON L8N 2B9
t: 905.525.8876
e: info@adessodesigninc.ca
www.adessodesigninc.ca



NOTE:
For all grading refer to civil plans.



PLANT SCHEDULE RESTORATION AREA

QTY	BOTANICAL NAME	COMMON NAME	SIZE	COND.	MATURE HT. (M)	MATURE SPR. (M)	O.C. (M)	REMARKS
TREES								
3	<i>Cornus florida</i>	White Flowering Dogwood	250cm Ht.	W.B.	7.0	8.0	As Shown	Multi-stem form
2	<i>Liriodendron tulipifera</i>	Tulip Poplar	50mm Cal.	W.B.	22.0	12.0	As Shown	Native to Ontario
2	<i>Prunus serotina</i>	Black Cherry	50mm Cal.	W.B.	20.0	8.0	As Shown	Native to Ontario
3	<i>Sassafras albidum</i>	Sassafras	50mm Cal.	W.B.	15.0	12.0		Native to Ontario
SHRUBS								
15	<i>Cornus racemosa</i>	Gray Dogwood	60cm	#3 cont.	3.0	3.0	2.5	Native to Ontario
14	<i>Cornus sericea</i>	Red Osier Dogwood	50cm	#3 cont.	1.75	2.0	1.75	Native to Ontario
19	<i>Physocarpus opulifolius</i>	Common Ninebark	50cm	#3 cont.	1.75	1.75	1.6	Native to Ontario
12	<i>Rhus typhina</i>	Staghorn Sumac	60cm	#3 cont.	3.0	3.0	2.0	Native to Ontario
38	<i>Ribes americanum</i>	American Black Currant	50cm	#3 cont.	1.5	1.75	1.75	
25	<i>Sambucus canadensis</i>	Elderberry	60cm	#3 cont.	2.5	2.0	1.75	Native to Ontario
GROUND COVERS								
67	<i>Rubus allegheniensis</i>	Allegheny Blackberry	30cm	#2 cont.	1.0	1.5	1.25	Native to Ontario

NOTE:
FOR MIXED WHIP PLANTING QUANTITIES SEE PLANTING CALLOUTS

NOTE:

INVASIVE SPECIES REMOVAL:

- The following invasive species will be removed:
 - Garlic Mustard
 - Black Locust
 - Autumn Olive
 - Periwinkle
 - White Mulberry
 - Goutweed
 - Tartarian Honeysuckle
- All garbage and fill dumped in this area will be removed and disposed of.
- The stormwater outfall design by Geoprocess (DWG. No. 04) dated September 25, 2025, proposes the following plantings:
 - 35 trees
 - 90 shrubs
 - 72 shrubs (veg. bullheads)
 - Naturalization seed mix

LANDSCAPE NOTES:

- All work to be carried out in accordance with by-laws and codes having jurisdiction over site location.
- Complete all work to the satisfaction of the Landscape Architect.
- Report any changes, discrepancies or substitutions to the Landscape Architect for review. Obtain approval from the Landscape Architect before proceeding.
- It is the contractor's responsibility to determine existing service locations.
- Exact locations of plant material will be determined by placement of site services such as hydro vaults, meters, utilities roof rain water leaders, driveways, light standards, etc.
- All plant material locations to be staked or marked out and approved by Landscape Architect prior to installation.
- Supply all plant material in accordance with the Canadian Standards for Nursery Stock (8th ed.).
- Install plant material according to details shown.
- Supply and place mulch in accordance with Canadian Landscape Standard (Section 10, Mulching). Disturbed soil areas around trees and shrubs are to be covered with shredded corflite bark mulch such as 'Cedar Bark Mulch' by All Treat Farms or 'Classic Cedar Mulch' by Gro-Bark, or approved equivalent. Alternative mulches must be approved by the Landscape Architect.
- Contractor to utilize layout dimensions where provided.
- Provide planting bed area as noted on the drawing or to accommodate mature size of plant material.
- All support systems must be removed by the contractor at time of final acceptance. No extras will be paid to complete this work.
- Supply and place topsoil in accordance with Canadian Landscape Standard (Section 4, Grading & Drainage and Section 6, Growing Medium) to a minimum depth of 150mm unless otherwise specified.
- Supply and place sod in accordance with Canadian Landscape Standard (Section 7, Lawns & Grass and Section 8, Turfgrass Sod) unless otherwise specified.
- Supply and place seed in accordance with Canadian Landscape Standard (Section 4, Grading & Drainage and Section 6, Growing Medium) unless otherwise specified. All 5:1 or greater slopes to be seeded with facier. Contractor to provide necessary erosion control protection as required to ensure soil stabilization and proper seed germination.
- All dimensions in meters unless otherwise noted.
- If discrepancies arise between plant material count shown on drawing and plant list, the drawing shall be considered correct.
- Contractor to provide minimum one (1) year warranty (including trees on municipal property) from date accepted on all work unless otherwise specified.
- Any site plan or grading and servicing shown is for information only. Refer to approved drawing.
- Not for construction unless stamped, signed and dated by Landscape Architect.
- Drawings not to be reproduced without written consent from Landscape Architect.
- Approval of landscape plan to be obtained from municipality.
- All plant material to be planted a minimum of 1.0m from any swales or ditches.
- For grading and servicing information refer to the consulting Engineer's drawings.
- For lighting information and power distribution refer to the electrical consultant's drawings.

TERRASEED NOTES:

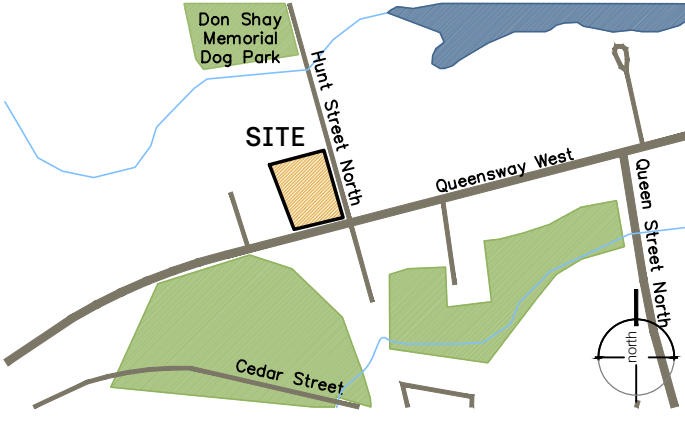
- Areas to be terraseeded with naturalization mix shall receive an application of naturalization seed at the rate of 25 kg/hectare or 2 kg/100m² for spot applications, in the following mixture:

Base Restoration Native Seed Mixture
Virginia Wild Rye (*Elymus virginicus*)
Indian Grass (*Sorghastrum nutans*)
Riverbank Wild Rye (*Elymus riparius*)
Switch Grass (*Panicum virgatum*)
Common Milkweed (*Asclepias syriaca*)
Foxglove Beard-Tongue (*Penstemon digitalis*)
Hairy Beard-Tongue (*Penstemon hirsutus*)
Upland White Aster (*Solidago ptarmicoides*)
Flat-Topped Aster (*Doellingeria umbellata*)
Slender Wheat Grass (*Elymus trachycaulis*)
Tall Cinquefoil (*Potentilla arguta*)
Black-Eyed Susan (*Rudbeckia hirta*)
Tall Dropseed (*Sporobolus asper*)
Sand Dropseed (*Sporobolus cryptandrus*)
Smooth Aster (*Symphoricarpos laevis*)
Tall Coreopsis (*Coreopsis tripteris*)
Virginia Mountain Mint (*Pycnanthemum virginianum*)
Common Evening Primrose (*Oenothera biennis*)
Gray Goldenrod (*Solidago nemoralis*)

*apply with Annual Oats (*Avena sativa*) nursecrop at 22kg/hectare.

- Supplied by:
St. Williams Nursery (or approved equal)
P: (519) 886-0557 or 1-800-465-5849
W: www.osceeds.com
E: info@osceeds.com
- Contractor responsible for soil test to determine fertilizer rates. Results of soil test shall be provided to the Landscape Architect for review and approval.
 - Hydraulic mulch to be approved by the Landscape Architect shall be applied at the rate of 2100kg per hectare.
 - The contractor shall not carry out the work under adverse weather conditions such as high wind, frozen ground or ground covered with snow, ice or standing water.
 - Grade sub-grade, eliminate uneven areas and low spots, ensure positive drainage. Remove debris, roots, branches, stones in excess of 50mm diameter and other deleterious materials. Remove subsoil that has been contaminated with oil, gasoline or calcium chloride, dispose of removed material as directed by Landscape Architect.
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KEY MAP - SIMCOE N.T.S.



LEGEND

- property line
- existing tree to remain
- proposed deciduous tree
- proposed shrub
- min. 150mm topsoil, fine grade & sod
- min. 150mm topsoil, fine grade & seed mix - base restoration mix
- 1.8m HT. wood privacy screen -see D8, L-2
- 1.8m HT. wood privacy fence -see D7, L-2
- existing elevations
- proposed elevations

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Norkfolk County

PROJECT
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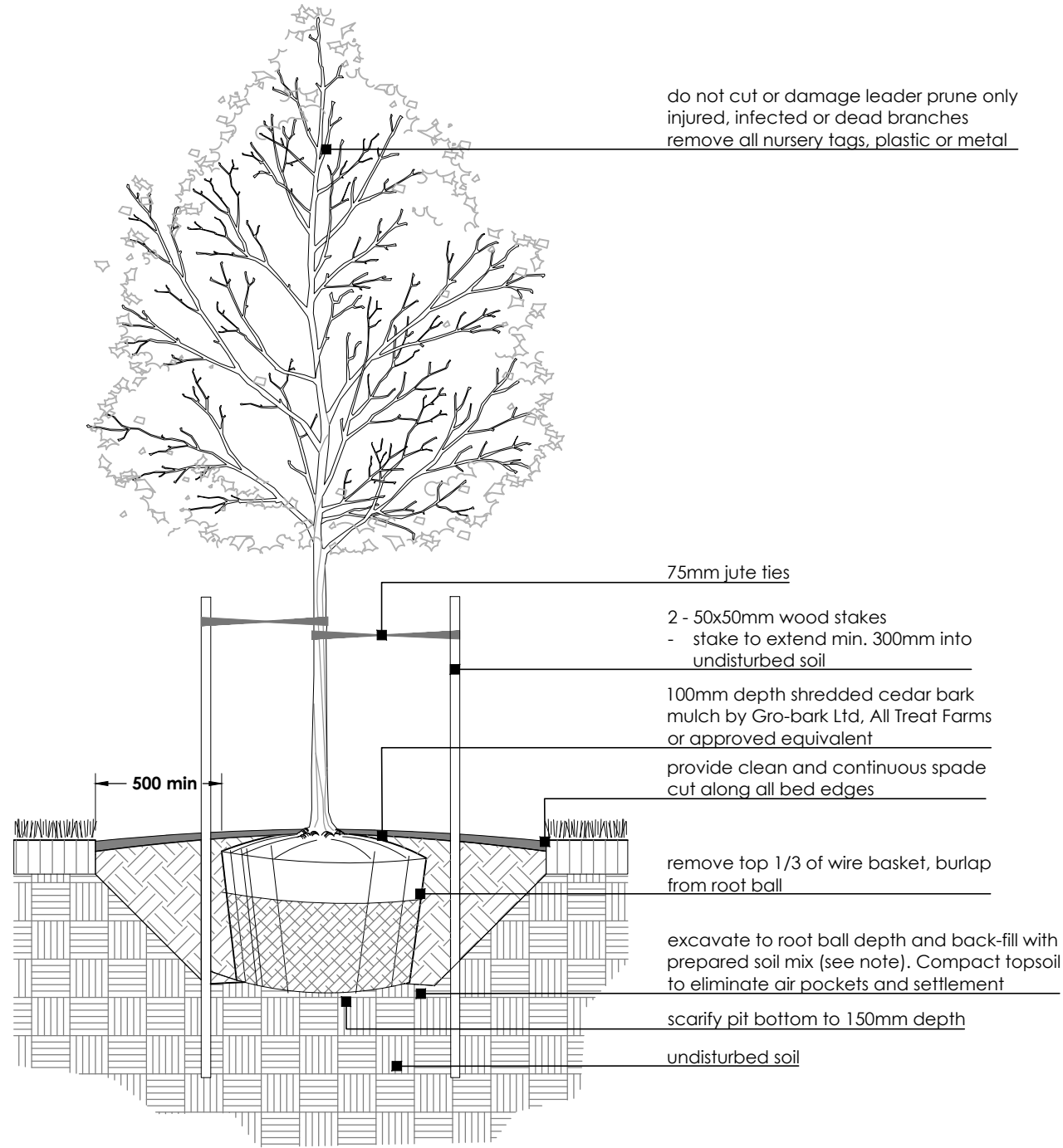
MUNICIPAL FILE NUMBER

SHEET
Restoration Planting
Plan

L-4



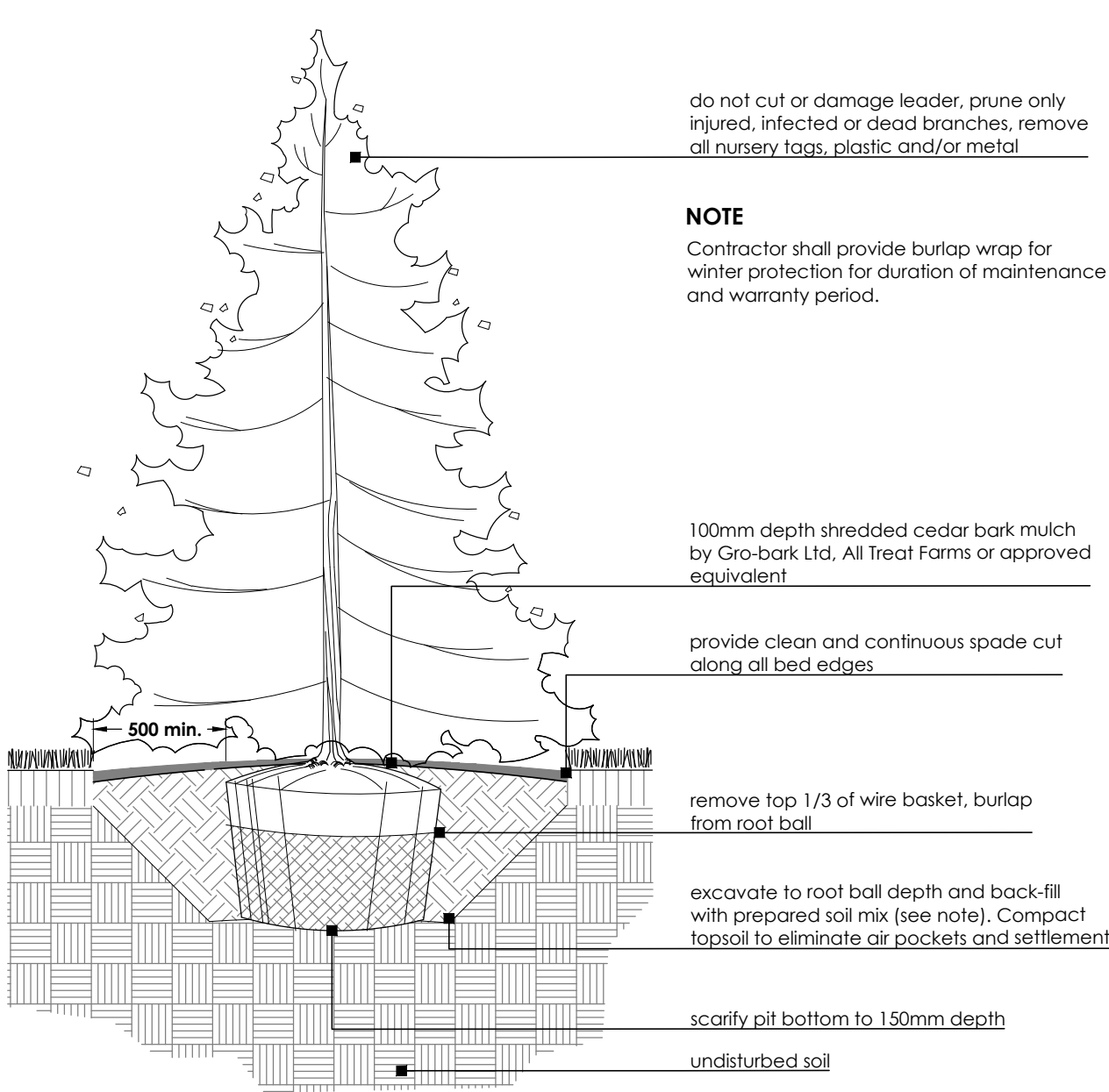
69 John Street South, Suite 250
Hamilton, ON L8N 2B9
t: 905.526.8876
e: info@adessodesigninc.ca
www.adessodesigninc.ca



BALLED AND BURLAP /WIRE BASKET DECIDUOUS TREE

N.T.S

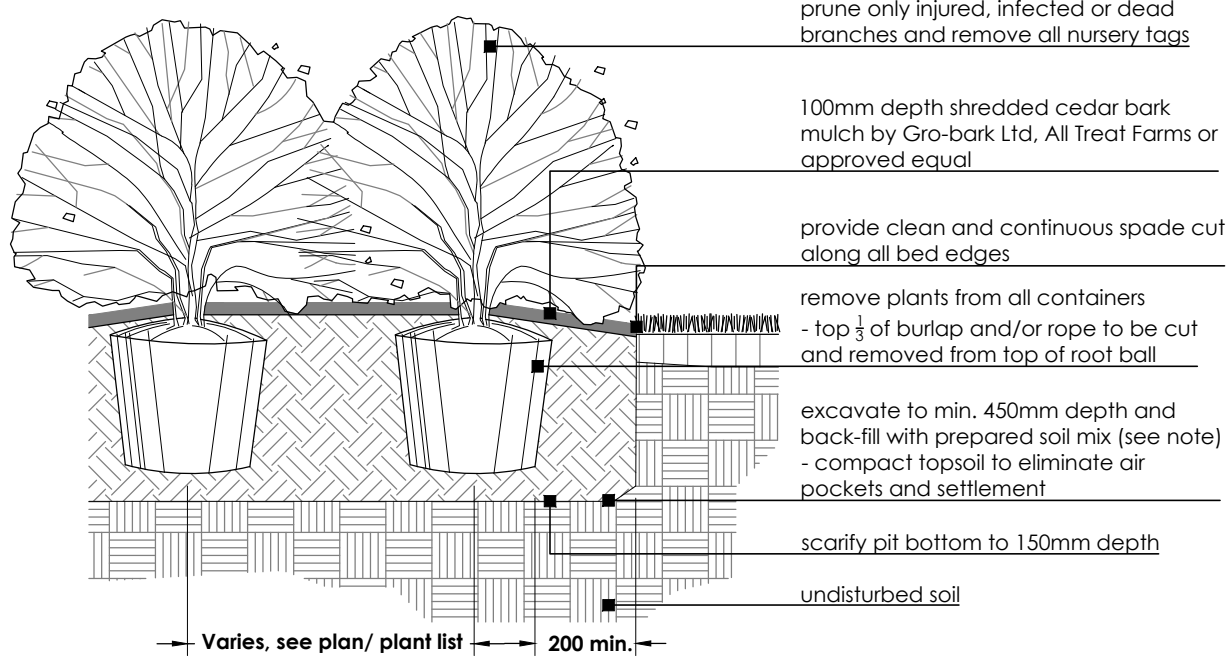
1
L-5



BALLED AND BURLAP/WIRE BASKET CONIFEROUS TREE

N.T.S

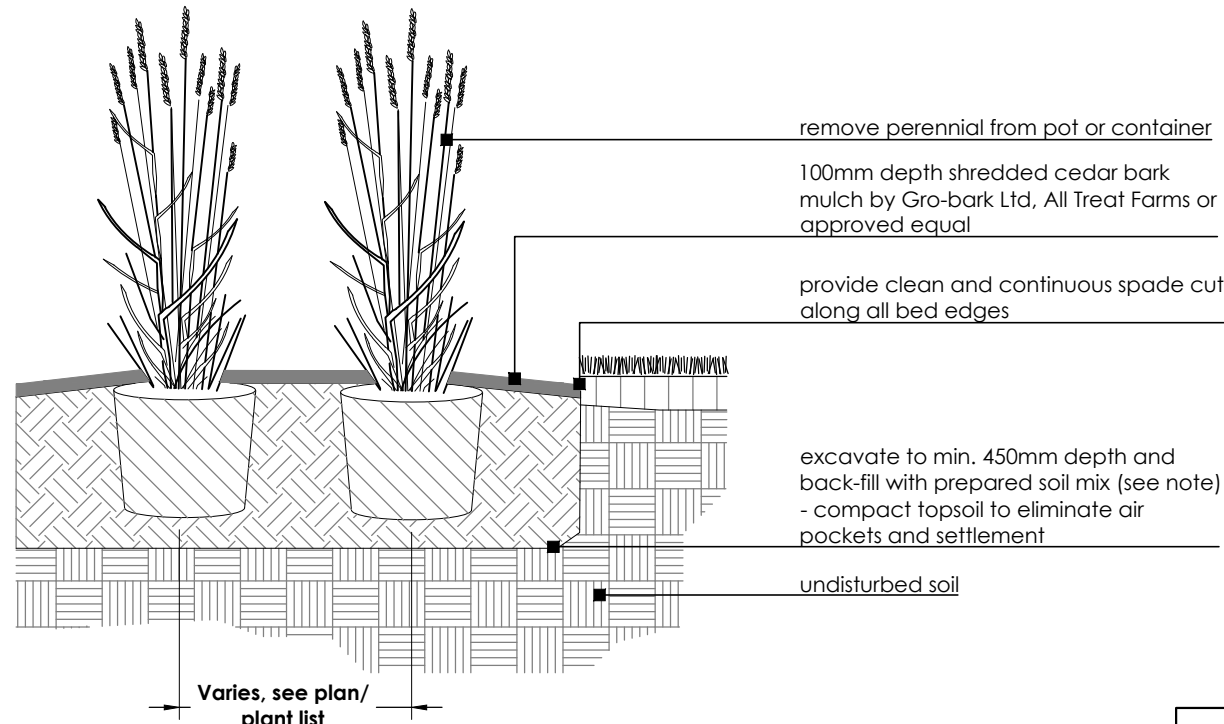
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L-5



CONTAINER GROWN SHRUB

N.T.S

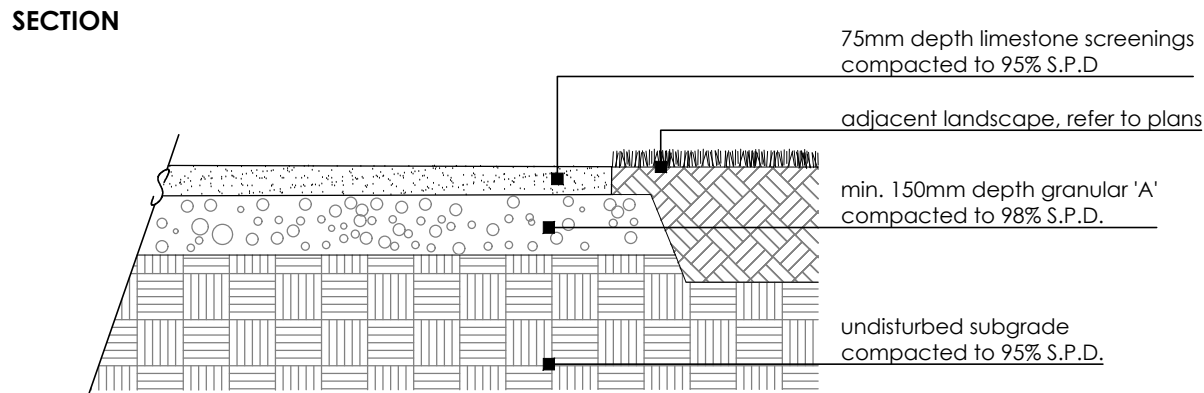
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L-5



CONTAINER GROWN PERENNIAL

N.T.S

4
L-5



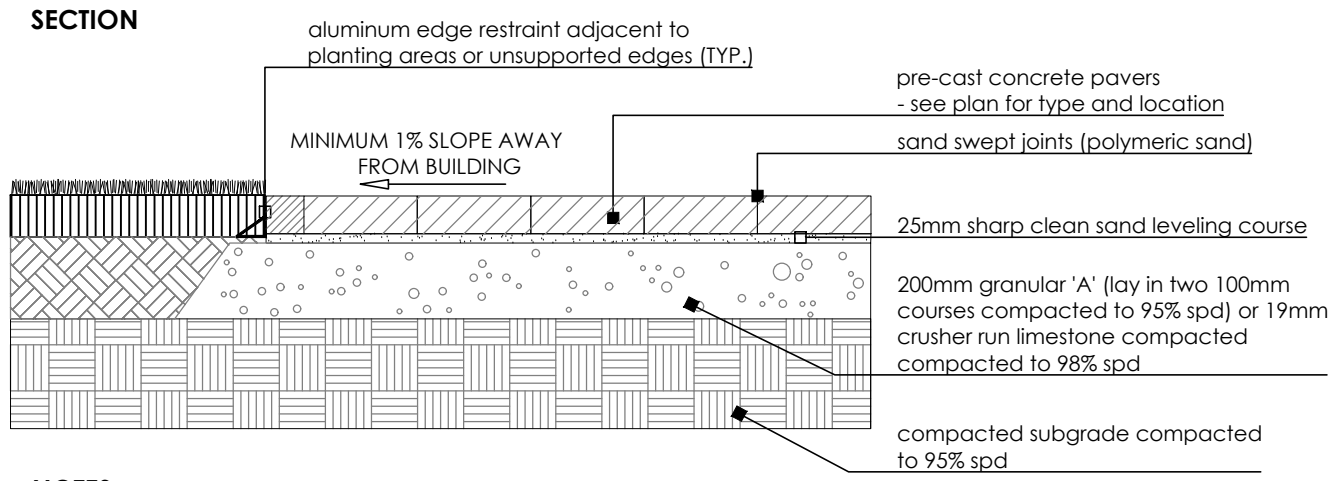
NOTES:

1. New limestone screening pathways to be minimum 2.5m wide. Refer to plans for layout.
2. Top up existing limestone screening pathways with new limestone screenings to meet specified grades. Fill in low spots to meet adjacent trail elevations. Refer to plans for layout.

LIMESTONE SCREENING PATHWAY

N.T.S

5
L-5



NOTES:

1. Paver types are as follows (or approved equal):

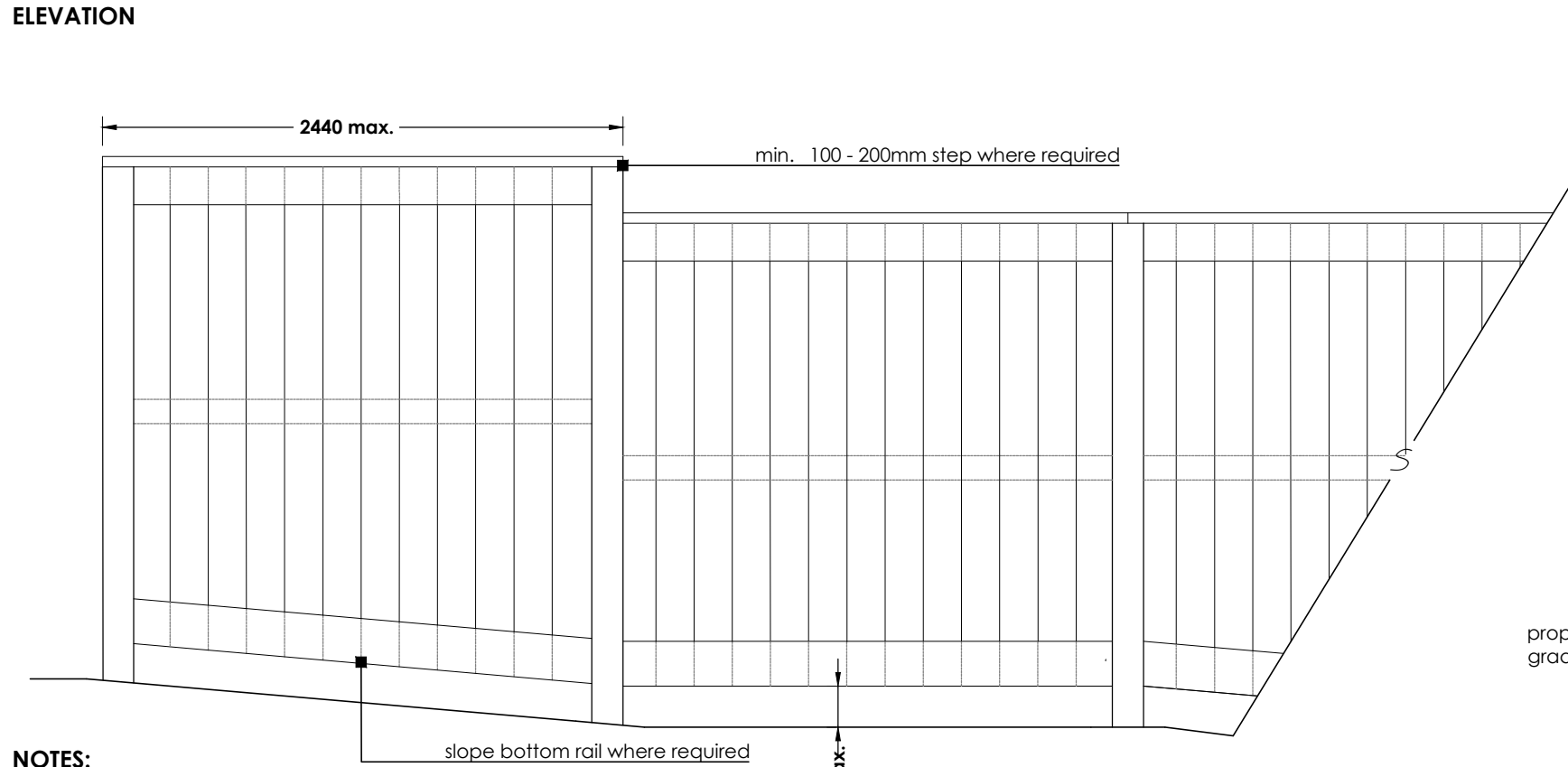
TYPE	DESCRIPTION	PATTERN	SIZE	COLOUR
'A'	Industria Paver 600 Series by Techobloc	Linear Pattern 29	600 x 600	TBD

2. Unit pavers are 60mm thick. Contractor to provide samples on site to be approved by Landscape Architect and/or Owner.

PRECAST CONCRETE PAVERS

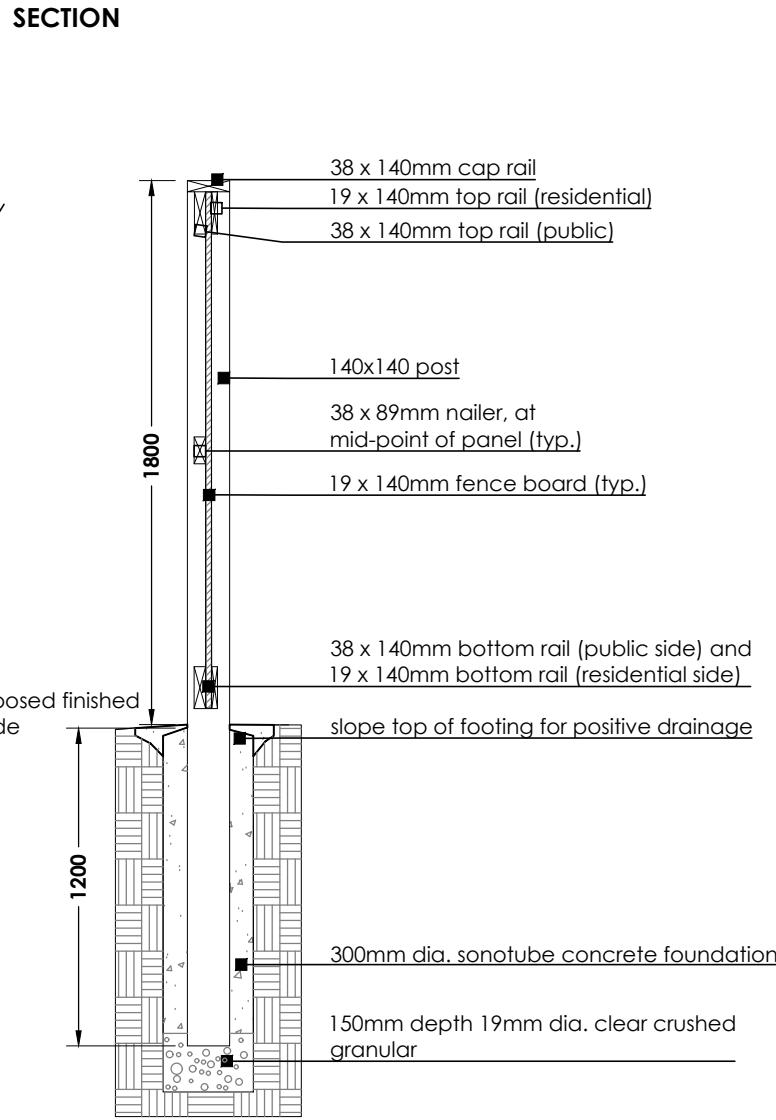
N.T.S

6
L-5



NOTES:

1. All materials, components and workmanship to conform to building and local by-laws.
2. All wood to be Pressure Treated (Spruce, Pine Fir) selected mainly for good appearance all members shall be free of wane and bark pockets. All torn grain shall be eliminated by sanding and planing. Members exhibiting moderate to heavy knots shall be well distributed throughout the site.
3. All cuts and holes that expose untreated wood should be liberally brush-coated with two applications of an end-cut preservative (copper naphthenate in ground contact or zinc naphthenate above ground) before the wood is installed. Follow the manufacturer's recommendations re: the application of suitable preservatives.
4. All wood to bear lumber grading stamp.
5. All fasteners shall have exterior grade finishes suitable for use with Pressure Treated lumber. Stainless steel, galvanized, zinc-dipped or ceramic-coated wood/deck screws are acceptable.
6. All galvanizing to be hot dipped in conformance to CSA standard C164.
7. Drive all fastener heads below surface of wood. Use sufficient size and quantity of fasteners to ensure a stable, secure structure.
8. Step fence panels minimum of 100 - 200mm at posts as required by grade conditions. Sloping of panels may be required for certain grade conditions - Consultant's approval required.
9. Lumber sizes are actual sizes rather than nominal sizes.
10. Concrete to have minimum compressive strength of 25 MPa @ 28 days with 5-7% air entrainment.
11. See landscape plan for fence location.

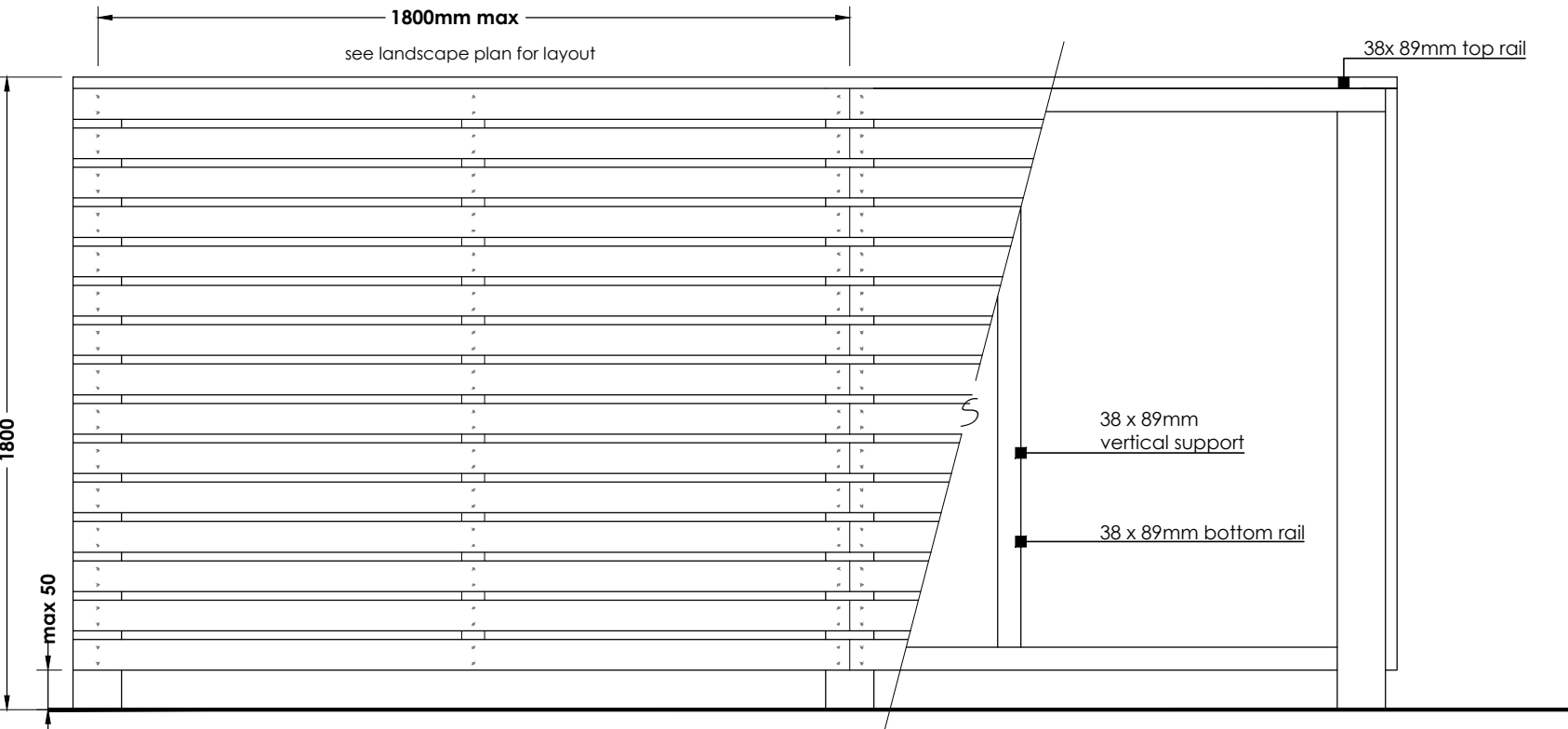


GENERAL LAYOUT NOTES

1. All fences adjacent to road allowances and walkways to be erected 0.15m onto private property. Fencing is not to be erected on the lot line or into any road allowance or easement.

2. Footing and excavation to be entirely on proposed development lands.

ELEVATION



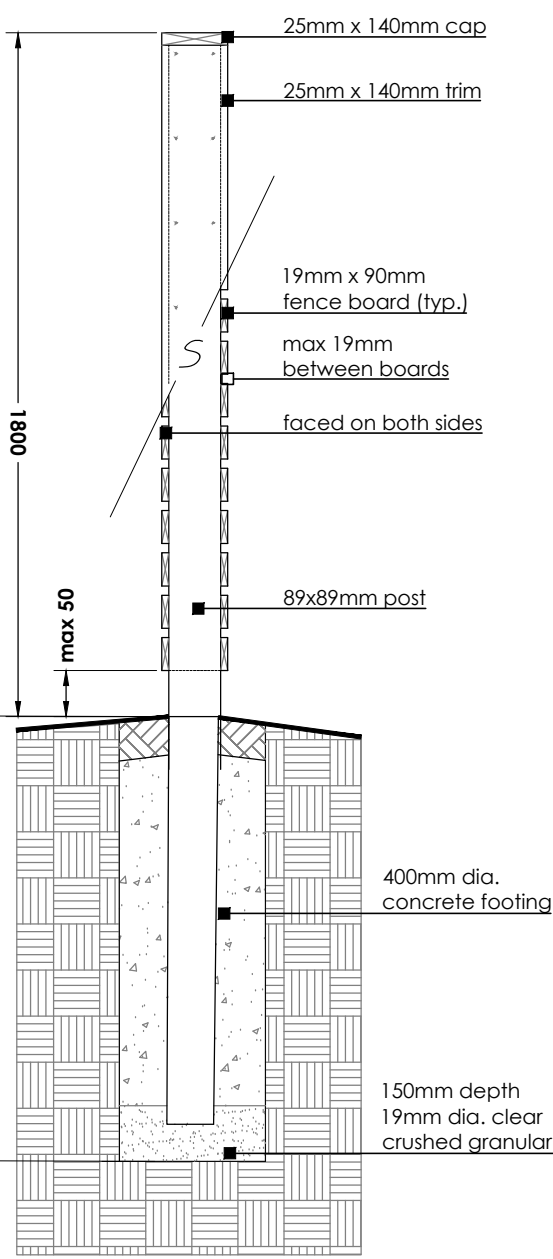
NOTES:

1. All materials, components and workmanship to conform to building and local by-laws.
2. All wood to be Pressure Treated (Spruce, Pine Fir) selected mainly for good appearance all members shall be free of wane and bark pockets. All torn grain shall be eliminated by sanding and planing. Members exhibiting moderate to heavy knots shall be well distributed throughout the site.
3. Stained to match architectural finish.
4. All cuts and holes that expose untreated wood should be liberally brush-coated with two applications of an end-cut preservative (copper naphthenate in ground contact or zinc naphthenate above ground) before the wood is installed. Follow the manufacturer's recommendations re: the application of suitable preservatives.
5. All wood to bear lumber grading stamp.
6. All fasteners shall have exterior grade finishes suitable for use with Pressure Treated lumber. Stainless steel, galvanized, zinc-dipped or ceramic-coated wood/deck screws are acceptable.
7. All galvanizing to be hot dipped in conformance to CSA standard C164.
8. Drive all fastener heads below surface of wood. Use sufficient size and quantity of fasteners to ensure a stable, secure structure.
9. Step fence panels minimum of 100 - 200mm at posts as required by grade conditions. Sloping of panels may be required for certain grade conditions - Consultant's approval required.
10. Lumber sizes are actual sizes rather than nominal sizes.
11. Concrete to have minimum compressive strength of 30 MPa @ 28 days with 5-7% air entrainment.
12. See landscape plan for fence location.

INSTALLATION NOTE:

1. All fences adjacent to road allowances and walkways to be erected 0.15m onto private property. Fencing is not to be erected on the lot line or into any road allowance or easement.
2. Footing and excavation to be entirely on proposed development lands.

SECTION



7
L-5

HORIZONTAL WOOD PRIVACY FENCE (1.8M HEIGHT - PRESSURE TREATED)

N.T.S

8
L-5

PLANTING NOTES:

1. Soil mixture: four (4) parts native soil, one (1) part well rotted compost. If existing soil is not suitable provide triple mix topsoil or approved equal.
2. Soucer shall be soaked with water and mulched immediately following planting.
3. Massed shrubs shall be planted in continuous mulched beds unless otherwise noted.
4. Staking schedule:
 - < 30mm caliper size/ 2500mm ht. - one stake
 - > 30mm caliper size/ 2500mm ht. - two stakes
 - > 70mm caliper - three stakes
5. All support systems must be removed once tree is established.
6. All trees to be straight and planted vertically regardless of slope.
7. Top of root flare shall be positioned 50mm above grade.
8. The following depths of soil are required for planting:
 - 15cm topsoil for sod;
 - 30cm of topsoil for perennials;
 - 45cm of topsoil for shrubs;
 - 90cm of topsoil for trees

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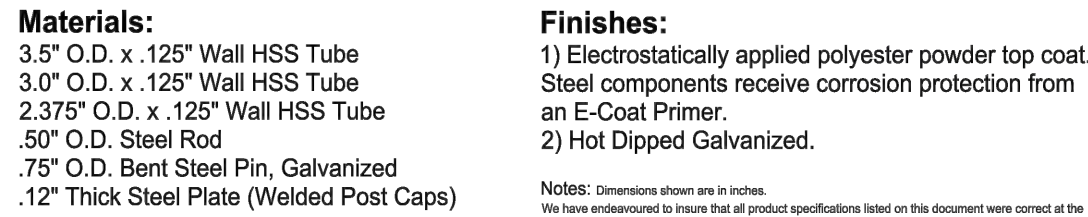
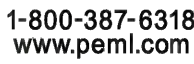
SHEET
Details

L-5

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t. 905.526.8876
e. info@adessodesigninc.ca
www.adessodesigninc.ca

Rev. B
Featuring 90 Degree Turning/Locking Increments



Finishes:

- 1) Electrostatically applied polyester powder top coat. Steel components receive corrosion protection from an E-Coat Primer.
- 2) Hot Dipped Galvanized.

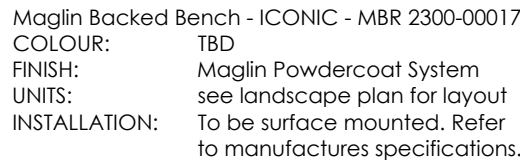
Notes: Dimensions shown are in inches.
We have endeavoured to insure that all product specifications listed on this document were correct at the time of publication. We reserve the right to improve, alter or discontinue specifications without notice.

05Jun12

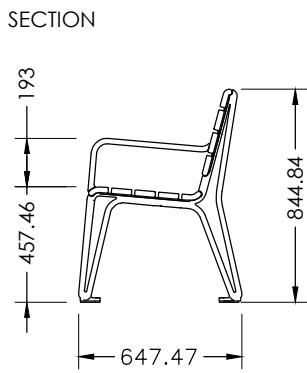
SWING GATE BY PARIS SITE FURNITURE (OR APPROVED EQUAL)

1

L-6



SUPPLIED BY: Maglin Furniture Systems Ltd.
Woodstock, ON
T: 1.800.716.5506
E: sales@maglin.com



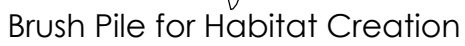
N.T.S.



1. Stone to be salvaged from on site, preferably through excavations. Do not source stone from existing rock piles on site (i.e. in remote areas).
2. Stone to be stockpiled during fine grading operations. Stones to be clean and free from soil.
3. Cairns to be created at planting stage. Final cairn locations to be reviewed on site with Landscape Architect.

Stone Habitat Structure

SCALE: NTS



SCALE: NTS



1. Brush to be soaked down on site, preferably through excavations.
2. Brush to be stockpiled during fine grading operations. Branches and brush to be clean and free from soil.
3. Final locations to be reviewed on site with Landscape Architect and approved by Conservation Halton.
4. Care must be taken not to incorporate any material from invasive species (especially Common Buckthorn or Tartarian Honeysuckle, e.g.), as these can potentially re-sprout and spread. Any material from invasive species must be collected and disposed of in a landfill.

4
L-6

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Norkfolk County

PROJECT
411 Queensway West
Simcoe, Ontario

MUNICIPAL FILE NUMBER

SHEET
Details

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69 John Street South, Suite 250
Hamilton, ON L8N 2B9
t. 905.526.8876
e. info@adessodesigninc.ca
www.adessodesigninc.ca

Natalie Ongena

From: Zach Lehman <Zachary.Lehman@cambium-inc.com>
Sent: Wednesday, April 15, 2026 3:03 PM
To: Natalie Ongena
Cc: Terri Cox
Subject: Re: Comment Request Form OPNPL2023206 & ZNPL2023207

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Natalie,

Thanks for your question. Stormwater infiltration facilities servicing greater than 200 m² of land (excluding roofs) where the predominant use is residential are considered a significant drinking water threat in Wellhead Protection Areas A or B with a vulnerability score of 10. The Long Point Region Source Protection Plan does not presently prohibit this threat. The threat is managed through an ECA or through the EASR process where eligible.

My understanding of this proposal is that the stormwater management works are proposed in the northwest corner of the property within the Wellhead Protection Area C, which has a vulnerability score of 8. In this case, the stormwater management works would not pose a significant drinking water threat.

I hope this answers your question. If you have any further inquiries, please don't hesitate to reach out.

Thank you,

Zach Lehman
Technician, Source Water Protection

Risk Management Official/Inspector
Water & Wastewater

m: 705.957.5571
e: Zachary.Lehman@cambium-inc.com
 



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From: Natalie Ongena <natalieongena@gdvallee.ca>
Sent: Wednesday, April 15, 2026 1:27 PM
To: Zach Lehman <Zachary.Lehman@cambium-inc.com>
Cc: Terri Cox <Terri.Cox@cambium-inc.com>
Subject: FW: Comment Request Form OPNPL2023206 & ZNPL2023207

This message's attachments contains at least one web link. This is often used for phishing attempts. Please only interact with this attachment if you know its source and that the content is safe. If in doubt, confirm the legitimacy with the sender by phone.

Natalie Ongena

From: Brett Hamm <brett.hamm@norfolkcounty.ca>
Sent: Thursday, April 16, 2026 8:31 AM
To: Natalie Ongena
Subject: RE: 22-032 HFW Simcoe - 2nd Submission for SPA (SPPL2024179)

Follow Up Flag: Follow up
Flag Status: Flagged

Good morning,

This detail will be okay as long as it is only used in rear yard & side yard areas that accept clean water, and the topsoil depth over the stone gallery only be 3 - 4" to ensure that it works properly.

Brett

Brett Hamm

Development Technologist
Gilbertson Administration Building
Engineering and Asset Management
Public Works
12 Gilbertson Drive, Simcoe, Ontario, N3Y 4N5
519-426-5870 x1081 | 226-NORFOLK



Providing valued public services that are responsive to our community's needs

We are committed to providing high-quality customer service and a safe and respectful environment for all. Read our Respect and Responsibilities Policy at norfolkCounty.ca/RR.

From: Natalie Ongena <natalieongena@gdvallee.ca>
Sent: Wednesday, April 15, 2026 4:07 PM
To: Brett Hamm <brett.hamm@norfolkcounty.ca>
Subject: RE: 22-032 HFW Simcoe - 2nd Submission for SPA (SPPL2024179)

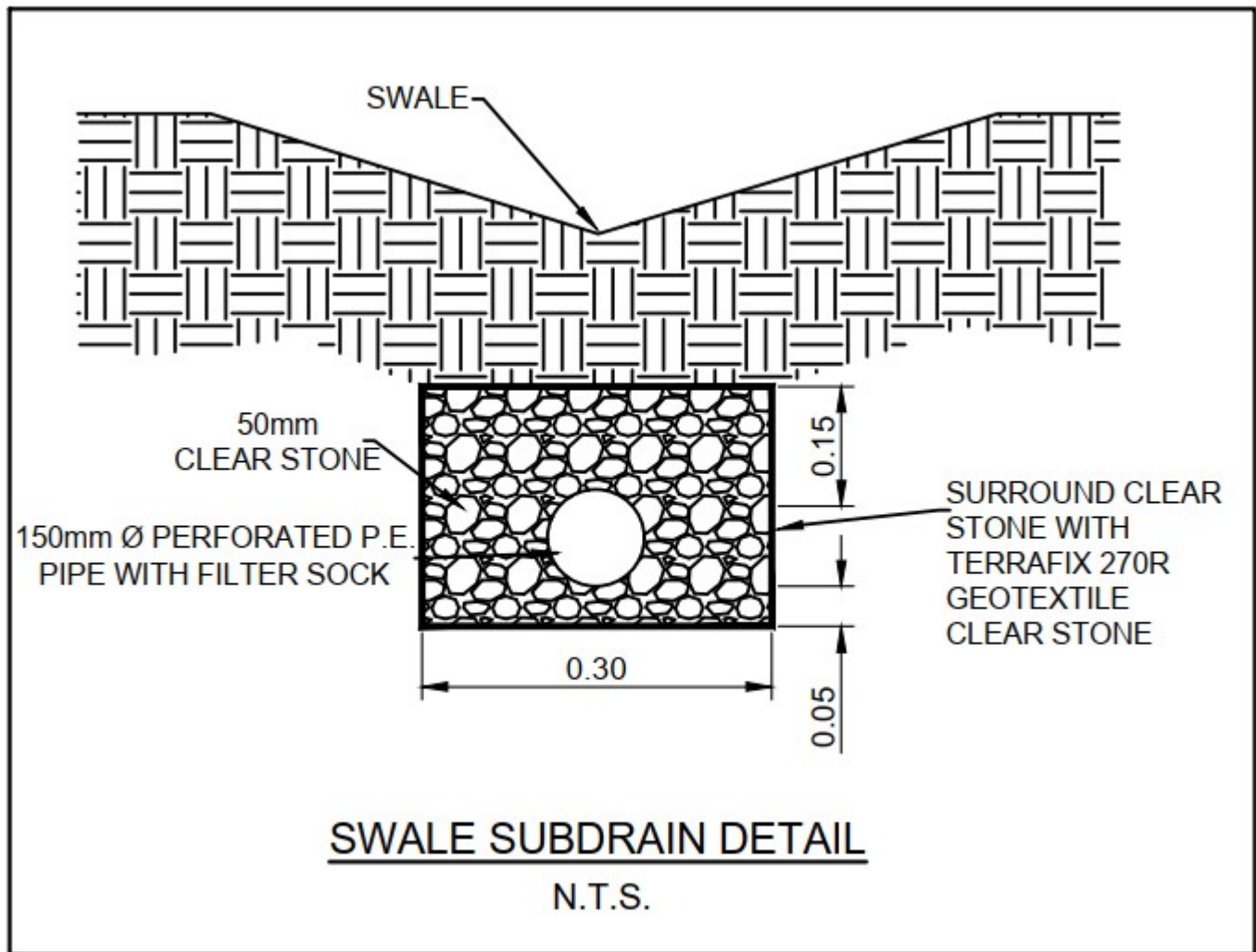
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Hi Brett,

I am working on addressing the comments provided for the HFW site. Hoping you can provide some guidance on one comment that we are having trouble addressing. Comment 25 requests: *"Rear and Side yard swales shall have a minimum slope of 2.0%. Maximum depth for all swales shall be 0.5m. Maximum side slope on any swale shall be 3:1"*

As part of the second submission, all swales were adjusted to achieve a minimum of 1% slope. However, we are having trouble achieving 2% rear and side yard slopes throughout the site due to depth restrictions related to the stormwater management pond/existing flood plain elevations, the existing topography of the site, and the proposed unit layouts.

As a solution, would the county be willing to accept the 1% slopes if subdrains were installed under all swales that are less than 2%, as per the below detail?



Thank you in advance,

Natalie Ongena, P. Eng.

G. DOUGLAS VALLEE LIMITED

2 Talbot Street North, Simcoe Ontario, N3Y 3W4

519-426-6270 x 1014 | www.gdvallee.ca

519-501-6278 (Mobile)



vallee

Consulting Engineers,
Architects & Planners



From: Brett Hamm <Brett.Hamm@norfolkcounty.ca>

Sent: Thursday, April 9, 2026 1:07 PM

To: Lesley Hutton-Rhora <lesleyhuttonrhora@gdvallee.ca>

Cc: Alisha Cull <Alisha.Cull@norfolkcounty.ca>; Darnell Lambert <Darnell.Lambert@norfolkcounty.ca>; Fabian Serra <Fabian.Serra@norfolkcounty.ca>; John Iezzi <johniezzi@gdvallee.ca>; Scott Puillandre <Scottpuillandre@gdvallee.ca>;



Simcoe Administration Building
12 Gilbertson Drive
Simcoe, ON N3Y 4N5
Phone: 519-426-5870 | 226-NORFOLK

Cambium Inc.
194 Sophia Street
Peterborough, ON K9H 1E5
Phone: 705-742-7900



May 12, 2026

To: **Fabian Serra, Planner**
County of Norfolk, Public Works, Environmental Services Division

Re: **395 Queensway West (the Property), Assessment Roll No: 3310403025007000000**
Municipal File: SPPL2024179

The following comments summarize the applicability of the *Clean Water Act, 2006* (CWA) to the Property noted above and reflect a review conducted by the Risk Management Office which was based on the information received including the Restricted Land Use (RLU) Screening Form dated August 15, 2023. This review serves to identify potential Threats, determine if a Restricted Land Use Notice is required and consider Transport Pathways.

The CWA is part of a multi-barrier approach to protecting drinking water that identifies vulnerable areas and Transport Pathways related to municipal drinking water sources. Locally developed source protection plan policies manage prescribed activities that pose a significant drinking water threat (Threat). The Property is located in the Lake Erie Source Protection Region and is subject to Long Point Region Source Protection Plan (SPP) policies. It is understood that the following is proposed:

- **Site Plan for a condominium development including 44 low-rise group townhouses and a stormwater management infiltration facility.**

1. Vulnerable Areas and Threats Assessment

The Property is located in a vulnerable area identified as a Wellhead Protection Area B (WHPA-B) with a vulnerability score of 10 and a Wellhead Protection Area C (WHPA-C) with a vulnerability score of 8 Simcoe Municipal Drinking Water System. In addition, the Property is located in a vulnerable area identified as a Highly Vulnerable Aquifer to which the *Provincial Planning Statement, 2024*, applies.

Table 1 lists potential Threats under the current Technical Rules, except stormwater and sanitary works which were assessed under updated Technical Rules. Table 2 lists potential Threats under the updated Technical Rules. Each table includes the applicability of the relevant SPP and related provincial permissions, as may apply. The updated SPP is expected to be submitted to the province in 2026 and once approved, the updated Technical Rules will come into effect.

Table 1: Potential Threats and Current SPP Applicability

Threat	Current SPP Applicability
The application of road salt.	Not a Threat

Table 2: Potential Threats and Proposed Updated SPP Applicability

Threat	Proposed Updated SPP Applicability
The application of road salt.	RMP may be required

RMP = Risk Management Plan. A RMP is a site-specific formal agreement between the Risk Management Official and the person engaged in the Threat activity and establishes measures to be followed to prevent and contain potential spills and/or leaks to protect the municipal drinking water source.

There do not appear to be any Threats proposed, which means that the SPP does not currently apply, although it may apply once the proposed updates come into effect. All Threats that are possible on the Property are listed in Appendix A, for information. Please contact the Risk Management Office if a listed Threat is proposed and not identified below.

Risk Management Office
Public Works, Environmental Services Division
12 Gilbertson Drive, Simcoe ON, N3Y 3N3
705-742-7900, sourcewaterprotection@cambium-inc.com

2. Restricted Land Use (RLU) Notice Considerations

Building Permit applications and those made under the *Planning Act, 1990*, or *Condominium Act, 1998*, require RLU Notice, unless otherwise specified. A Notice can typically be issued without fees within 5 business days of all required information being received. If the proposal will result in a Threat being initiated that is prohibited or requires a RMP that is not already in place, the RLU Notice will not be issued, and the municipality cannot approve the application.

A RLU Notice is not required.

3. Transport Pathway Considerations

Transport Pathways are man-made conditions of land that may increase the vulnerability of a municipal drinking water system's raw water supply. It appears that the stormwater management infiltration facility associated with the proposed development may create a Transport Pathway. Municipalities must report new (or modified) Transport Pathways pursuant to Section 27 (3)(4) of Ontario Regulation 287/07, which states:

(3) If a person applies to a municipality for approval of a proposal to engage in an activity in a wellhead protection area or a surface water intake protection zone that may result in the creation of a new transport pathway or the modification of an existing transport pathway, the municipality shall give the source protection authority and the source protection committee notice of the proposal and shall include a description of the proposal, the identity of the person responsible for the proposal and a description of the approvals the person requires to engage in the proposed activity.

(4) If a municipality gives a notice described in subsection (3), the municipality shall give a copy of the notice to the person responsible for the proposal.

Please return the enclosed Lake Erie Transport Pathway Notice to the Risk Management Office. Upon receipt of this Notice, a review will be initiated and additional information may be required to identify if any amendments to the SPP may be required.

For information on the Drinking Water Source Protection Program, visit the Lake Erie Source Protection Region website www.sourcewater.ca. Please let us know if you have any questions.

Sincerely,

Signed by:

A handwritten signature in blue ink, appearing to be 'TC', enclosed within a blue rectangular box.

47DB246BA3D644E...

Terri Cox

Risk Management Official

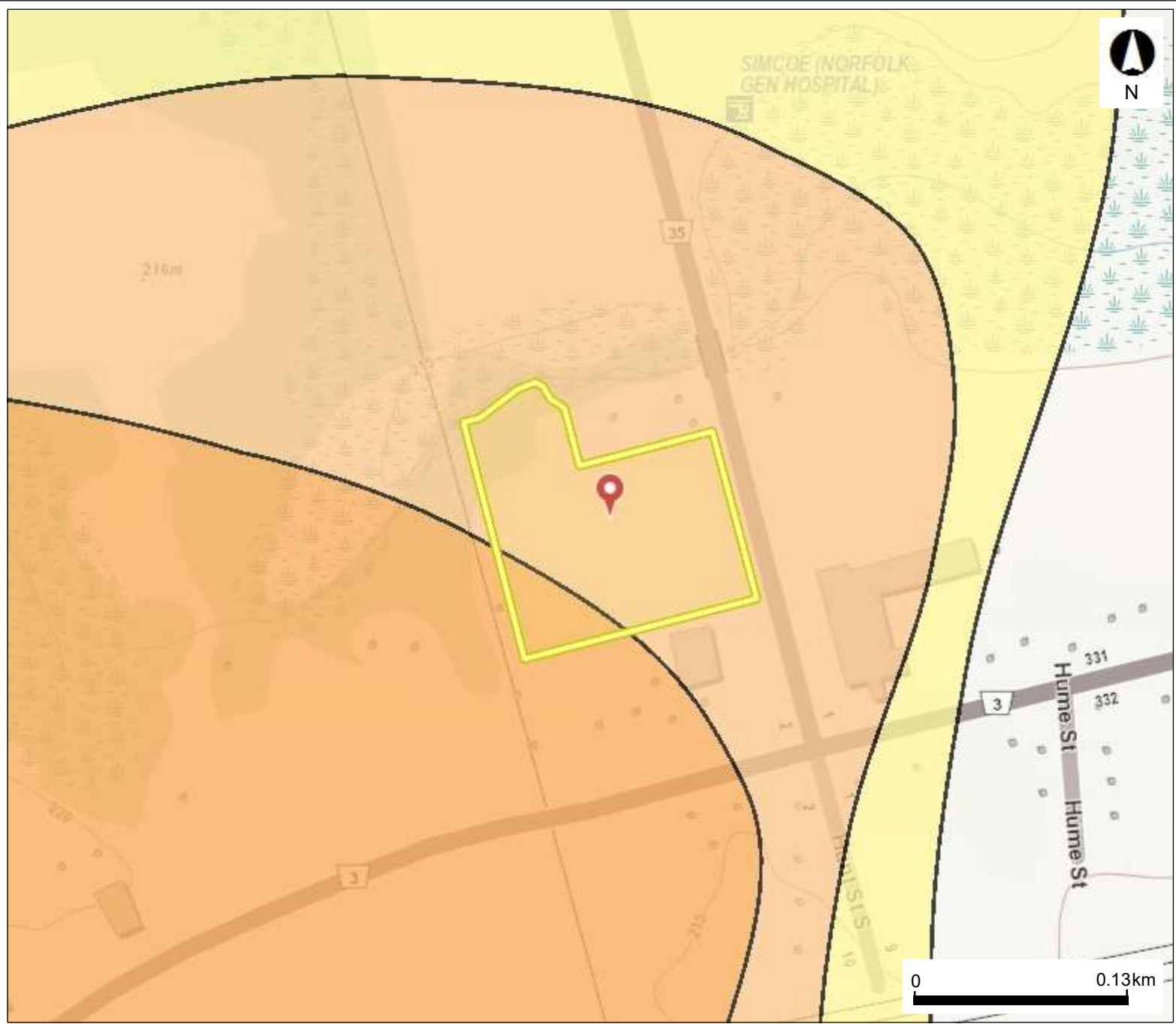
Encl (2): Source Water Protection Map, Lake Erie Region Transport Pathway Notice

Appendix A

Land Use Activities that pose a Significant Drinking Water Threat within a WHPA-B with a Vulnerability Score of 10

1. The application of road salt.
2. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.
3. The handling and storage of an organic solvent.
4. The handling and storage of non-ASM.
5. The storage of ASM.
6. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard. O. Reg. 385/08, s. 3.
7. The application of agricultural source material to land.
8. The application of commercial fertilizer to land.
9. The application of non-agricultural source material to land.
10. The application of pesticide to land.
11. The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.
12. The handling and storage of a dense non-aqueous phase liquid.
13. The handling and storage of commercial fertilizer.
14. The handling and storage of fuel.
15. The handling and storage of pesticide.
16. The handling and storage of road salt.
17. The management of runoff that contains chemicals used in the de-icing of aircraft.
18. The storage of snow.
19. The establishment and operation of a liquid hydrocarbon pipeline

395 Queensway West



Legend

- Issue Contributing Areas
- WHPA-E
- Wellhead Protection Area
 - A
 - B
 - C
 - C1
 - D
 - F
- Intake Protection Zone 1
- Event Based Areas
- Intake Protection Zone 2

This map should not be relied on as a precise indicator of routes or locations, nor as a guide to navigation. The Ontario Ministry of Environment, Conservation and Parks (MECP) shall not be liable in any way for the use or any information on this map. of, or reliance upon, this map.



Lake Erie Region Transport Pathway Notice

This template is being provided to satisfy transport pathways reporting requirements in accordance with Section 27 (3) and (4) of O. Reg. 287/07 made under the *Clean Water Act, 2006*.

To Be Completed by Applicant:

Name of Applicant: Gary Brasenell (HFW Holdings Ltd) Phone Number: 289-928-4667
 Email Address: gbrasene@gmail.com Date of Application: May 12, 2026
 Location of proposed activity (please provide description if activity not restricted to a single address):
395 Queensway West, Simcoe Norfolk County

Please check the activities below that apply to this application:

- | | |
|--|---|
| ☐ Construction of water wells or monitoring wells | ☒ Re-grading associated with new development |
| ☐ Construction of oil and gas wells | ☐ Construction of foundation envelopes |
| ☐ Excavation of pits and quarries | ☐ Construction of geothermal wells/earth energy systems |
| ☐ Construction of man-made ponds | ☒ Construction of linear sewage collection systems and linear utility corridors |

Please describe the proposed activity. If applicable, include pertinent details such as maps/cross-sections/figures; depth of excavation; distance to municipal wells, ponds; contaminated or potentially contaminated site(s), etc. (use additional sheets of paper if needed)

Construction of a 44-unit condominium development including all required sanitary, water and storm servicing including a dry stormwater management pond. The pond will be unlined to promote groundwater infiltration. Quality control treatment will be provided by HydroWorks HydroDome OGS unit. See attached complete civil drawing set.

Any information you provide to us is collected, used and disclosed in accordance with the Ontario [Municipal Freedom of Information and Protection of Privacy Act](#).

For Office Use Only:

Upon completion, please submit the following information to Lake Erie Region Source Protection Staff.

Municipality: _____
 Submitted By: _____
 Email Address: _____
 Date Submitted: _____

Please list the approvals the applicant requires to engage in the proposed activity:

Please check if applicable:

- ☐ **Yes**, the proposed activity may create or modify a transport pathway that changes the vulnerability of a raw water supply of a drinking water system

If applicable, please provide the change in vulnerability that may result from the proposed activity:

Intrinsic vulnerability rating prior to activity: _____ ; potential new intrinsic vulnerability rating _____

October 6, 2016



Delivery Planning
955 Highbury Ave N
London ON N5Y 1A3

August 19, 2026

Planner, Community Planning – Norfolk County
200 - 185 Robinson St
Simcoe ON N3Y 5L6

Re: 22-013 HFW Simcoe Development

To Whom it may concern,

In accordance with the Conditions of Draft Approval this letter is to inform you that the conditions regarding postal requirements outlined by Canada Post for this subdivision plan have been complied with.

Canada Post has dealt with the developer (or their agent) regarding the Community Mailbox location(s) for this subdivision and has clarified the location(s) and expectations for installation of a concrete pad and approach as well as a temporary location until the permanent location is ready. Should the layout of the subdivision change, please advise so that we can update our file.

Should you have any further questions or concerns regarding this matter, please do not hesitate to contact me.

Regards

Mo Chams

Mo Chams
Delivery Planning Officer
(519) 520-5820 Phone
mohamed.chams@canadapost.ca

411 Queensway West Outfall Channel Design

FINAL REPORT

Prepared for

HFW Holdings Ltd.

3 Fernwood Court
Richmond Hill, ON
L4B3C2

September 25, 2025
Project No. P2025-1010

Prepared by



GeoProcess
RESEARCH ASSOCIATES

GeoProcess Research Associates Inc.

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Version History

Version	Date	Issue	Description	Author	Approved
V01	2025-09-22	Draft	Issued for client review	CA	SG
V02	2025-09-25	Final	Issued for LPRCA review	CA	SG



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1. Introduction

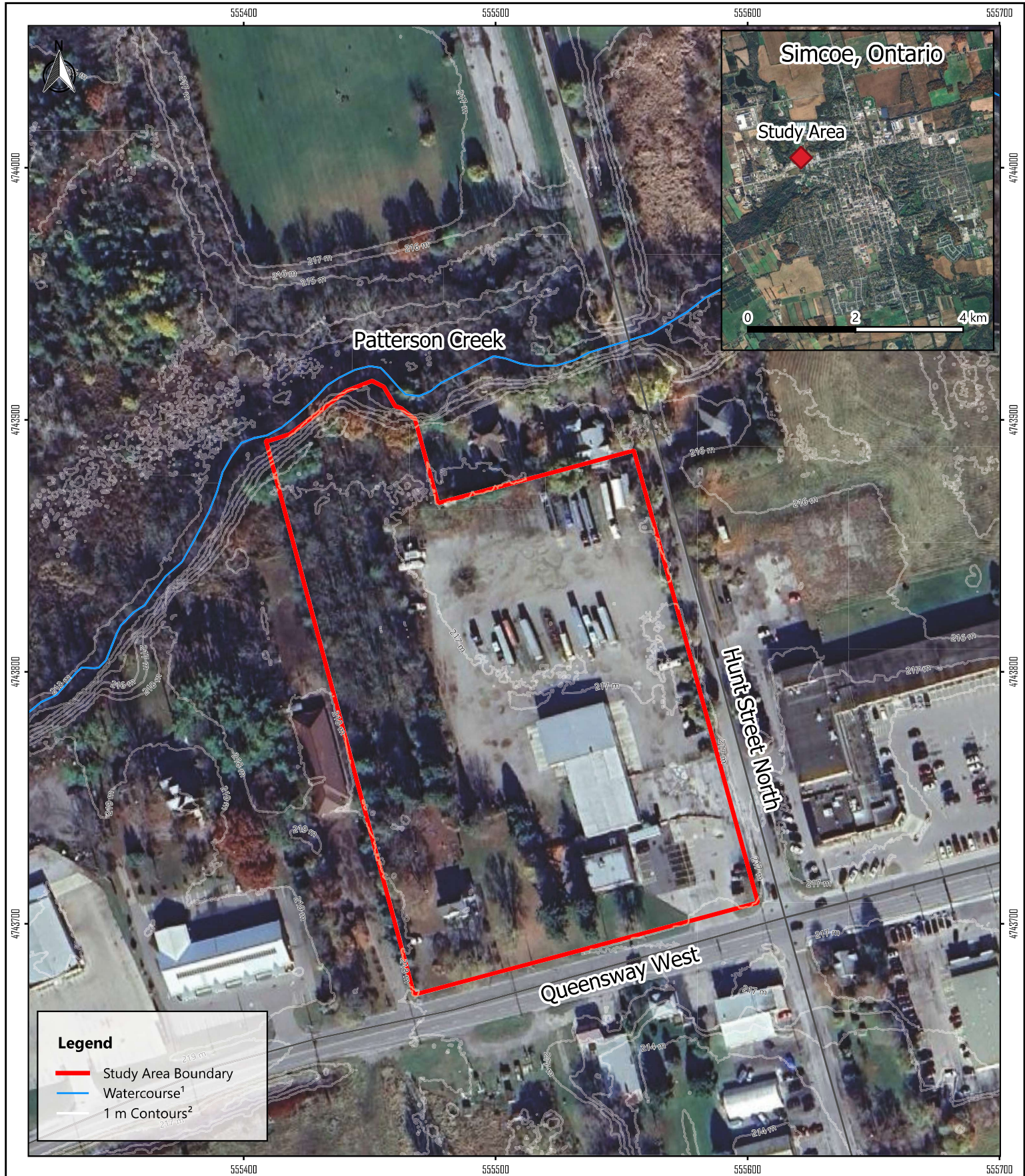


GeoProcess was retained by HFW Holdings Ltd. to complete the detailed design of a stormwater management (SWM) outfall channel in support of the proposed redevelopment at 395–411 Queensway West in the Community of Simcoe, Norfolk County, Ontario (the “subject property”). The subject property is located adjacent to the Patterson Creek valley corridor (Figure 1).

As part of the redevelopment, the existing storm outlet that currently discharges directly to Patterson Creek will be removed and replaced with a SWM pond. The new SWM pond will discharge to the creek through a combination of underground conveyance and a constructed outfall channel. Given that the proposed outfall channel will be constructed along the valley slope, the design must address erosion risks and ensure the long-term stability of both the slope and the receiving reach of Patterson Creek.

To inform the design, a geomorphic assessment was completed by GeoProcess on June 5, 2025. This study documented channel form, sediment characteristics, bank conditions, and valley constraints, providing the basis for hydraulic and stability analyses. The design approach incorporates step-pool sequences, plunge pool energy dissipation, and a naturalized tie-in with Patterson Creek. The intent is to safely convey flows from the SWM pond, minimize erosion at the discharge point, and reduce the disturbance footprint within the valley while also enhancing habitat where feasible.

This design brief summarizes the background conditions, supporting analyses, and proposed design. Key components include watershed context, climate and geology, geomorphic and hydraulic assessments, erosion hazard considerations, and stone sizing methodology. This report reflects the 90% design stage and is intended to support permit submissions and coordination with the Long Point Region Conservation Authority (LPRCA).



GeoProcess
RESEARCH ASSOCIATES

0 50 100 m

NAD83(CSRS) / UTM zone 17N (EPSG:2958)

Figure 1: Study area.

CREATED BY: AM PROJECT NO.: P2025-1010
CHECKED BY: CA DATE: Sep 25, 2025

Notes:
[1] Watercourse layer sourced from Ontario Hydro Network (OHN).
[2] Contours sourced from Ontario LiDAR-Derived DTM.
[3] Basemap imagery sourced from Google Earth (2025).

Queensway Outfall Channel Design
HFW Holdings Ltd.

2. Existing Conditions

2.1. Climate

Climate normals obtained from the Meteorological Service of Canada (1991–2020) for the nearest station note a mean annual air temperature of 8.4 °C. Average monthly temperatures range from -5.0 °C in January to 21.2 °C in July. The maximum observed air temperature of 36.3 °C was observed on July 21, 2011, with a record minimum of -34.1 °C recorded on February 16, 2015. On average, there are 140 days per year with a minimum temperature of 0 °C or less, and 15 days with a maximum temperature above 30 °C.

The region receives an average of 965.2 mm of precipitation annually. Monthly totals peak in the summer, with July being the wettest month at an average of 88.6 mm, while February is the driest month at 58.0 mm. On average, the area experiences 58 days per year with more than 5 mm of precipitation, 31 days exceeding 10 mm, and 6 days exceeding 25 mm.

2.2. Watershed Context

The subject property is situated within the Patterson Creek watershed, which has a total drainage area of approximately 54.1 km². The subject property contributes a drainage area of 2.89 ha, representing approximately 0.05% of the overall watershed. Under existing conditions, drainage within the subject property is divided into two subcatchments: PRE (2.55 ha), which drains to Patterson Creek through an existing storm outlet, and PRE-EXT (0.34 ha), which drains to Queensway West and Hunt Street.

2.3. Surficial Geology

The subject property is situated within the Norfolk Sand Plain. Surficial geology within the design footprint is defined by modern alluvium deposits associated with fluvial processes of Patterson Creek. These undifferentiated sediments consist of clay, silt, sand, and muck, deposited within a low-energy floodplain environment. The mixture of fine and coarse-grained materials reflects the dynamic depositional conditions of an active valley system, resulting in variable permeability, with infiltration generally limited by clay and silt layers but locally enhanced where sandy deposits are present. In contrast to upland glaciolacustrine or till-dominated landscapes common elsewhere in the region, the surficial materials here reflect recent, postglacial fluvial deposition during the Hudson episode of the Quaternary.

2.4. Surficial Soils

Surficial soils were classified as sandy textures over silt loam (Hydrologic Soil Group AB), with an assigned SCS Curve Number of 62 (woodlot and improved grassland). Current land cover includes 41% imperviousness in the PRE subcatchment and 23% imperviousness in the PRE-EXT subcatchment, with directly connected imperviousness of 27% and 19%, respectively.

2.5. Surface Drainage

Pre-development peak flows from the subject property were estimated to range from 0.146 m³/s under the 2-year storm event to 0.399 m³/s under the 100-year event. Drainage from the PRE subcatchment is conveyed

via storm sewer directly to Patterson Creek. Further details regarding the subcatchment delineation and hydrologic modelling are provided in the Vallee Stormwater Management Report (2024).

2.6. Field Investigation

A field investigation of Patterson Creek was completed by GeoProcess on July 4, 2025, to support the proposed outfall channel design. The purpose of the field investigation was to characterize existing geomorphic conditions along the proposed outfall channel alignment and downstream receiving reach of Patterson Creek. At this time, design opportunities and constraints were also documented.

2.6.1. Methods

Topographic data were collected using RTK GNSS equipment, supplemented by manual channel measurements where canopy cover limited signal quality to provide the necessary spatial information to inform the outfall channel design. A pebble count was completed at an upstream riffle to provide a representative sediment sample, and photographs were taken throughout the reach to document channel, outfall tie-in, and floodplain conditions.

2.6.2. Results

Within the subject property, Patterson Creek was characterized as a single-thread, meandering channel with well-defined banks. A cross-section measured at the proposed outfall tie-in indicated a bankfull width of 8.67 m and an average bankfull depth of 1.02 m. The reach exhibited an average slope of 0.18%, typical of Rosgen "C-type" channels in southern Ontario (Annable 1996). Riffle-pool bed morphology was present throughout the reach.

The channel bed was dominated by coarse sand with a median grain size (D50) of 5.42 mm, while banks consisted of cohesive materials. Localized bank erosion was observed near the proposed outfall tie-in on the south bank (Photo 1) along the southern valley slope, Patterson Creek is located in close proximity to the valley slope. Along the northern valley slope, a broad section of floodplain offsets the channel from the slope.

Stabilization measures, including bricks and concrete blocks, were observed along the channel bank adjacent to the nearby residential properties located on the southern tablelands, indicating previous attempts to limit bank erosion. Numerous fallen trees along the southern bank also indicated evidence of bank instability. In-channel vegetation was sparse, whereas the banks and adjacent floodplain were heavily vegetated (See Photo 2). Woody debris was abundant throughout the reach, primarily consisting of fallen trees and large branches from the steep southern slope and floodplain area (Photo 3). Overall, these observations are indicative of lateral migration along the southern channel bank.



Photo 1: Erosion of property line fence directly downstream of outlet channel tie-in.



Photo 2: Upstream view of channel typical section.

3. Proposed Design

This section describes the proposed design for the outfall channel, including the design objectives, design criteria, design features, and supporting analyses.

3.1. Design Objectives

The design was developed to meet the following design objectives:

- Stormwater discharge energy dissipation to mitigate erosion potential.
- Enhance terrestrial habitat, where feasible.
- Minimize construction footprint and associated impacts.

3.2. Design Criteria

The following design criteria governed the proposed outfall channel design:

- Provide stability for flows up to and including the 1:100 year flow.
- Mitigate erosion potential within the downstream receiving reach of Patterson Creek.
- Locate stormwater infrastructure (headwall) outside of the 30 m setback from Provincially Significant Wetland (PSW).
- Locate the headwall and plunge pool outside of the erosion hazard.

3.3. Erosion Hazard Assessment

To mitigate risk of erosion to the outlet headwall and plunge pool, the structures were located outside of the erosion hazard. The LPRCA's erosion hazard limit was refined using the 2023 topographic survey data collected by Jewitt and Dixon, resulting in an erosion hazard setback of 21.5 m from the watercourse bank (Table 1). The refined erosion hazard limit is shown on the outfall channel design drawings (Appendix A).

Table 1: Erosion hazard setback.

Approx. Slope Toe Elevation (m)	Approx. Tableland Elevation (m)	Toe Erosion Allowance (m) ¹	Long-Term Stable Slope Setback (m) ²	Total Erosion Hazard Setback (m) ³
212.5	217.0	8.0	13.5	21.5

¹From Table 3 (MNR 2002).

²Assuming a stable slope of 3H:1V.

³Excludes erosion access allowance.

3.4. Hydraulic Assessment

A hydraulic analysis was completed to evaluate the conveyance and hydraulic forces associated with the proposed outfall channel. This analysis was used to inform channel dimensions and stone sizing for bed and bank materials. The analysis was completed using a 1D at-a-station hydraulic model of an idealized outfall channel cross-section. The model was run using the 1:100 year flows produced from the Visual Otthymo computer model (0.331 m³/s).

Channel roughness tends to increase along with increasing channel gradient. To account for this, a Manning's n of 0.1 was assumed for the step-pool channels and plunge pools (consistent with photographic guidance provided by Yochum (2014)). The step-pool reaches were modelled using both the reach-averaged gradient and channel bed gradient. A summary of the modelled shear stress and velocity is provided in Table 2.

3.5. Outlet Channel Design Elements

The following sections provide a qualitative description of the various design elements incorporated into the outlet channel.

3.5.1. Step-pool Sequence

A sequence of boulder step-pool features is proposed to provide grade control and dissipate energy along the outlet channel. Boulder steps will be installed in a vortex weir formation (angled upstream), directing flows and erosion potential to the channel centreline. The invert elevation of the boulder step crests was designed to provide a localized backwater condition to the relevant upstream pool feature. During construction, positioning of the boulder steps will be field-fit, as required.

Cross-sectionally, the channel has been sized to convey the 1:100 year flood. Unlike a natural river system, all flows for this outfall will be contained within the channel to avoid erosion of the valley slope. Design dimensions and hydraulics of the proposed step-pool features are provided in Table 2 below.

Table 2: Design dimensions and hydraulics of step-pool features.

	Parameter	Outfall Channel	
		Step Crest	Pool
Bankfull Parameters	Top Width (m)	2.0	Varies
	Bottom Width (m)	1.0	1.0
	Depth (m)	0.25	Varies
	Bankfull Area (m ²)	0.36	Varies
	Hydraulic Radius (m)	0.17	Varies
	Width:Depth Ratio (-)	8.13	Varies
	Bankfull Flow (m ³ /s)	0.331	
	Bed Gradient (%)	20%	
	Bankfull Gradient (%)	8.6%	
Design Parameters Using Reach-Averaged Gradient (1:100 Year Flow)	1:100 Year Flow (m ³ /s)	0.331	
	Average Channel Velocity (m/s)	0.91	
	Average Channel Bed Shear (Pa)	145.4	
	Flow Depth (m)	0.24	
Design Parameters Using Local Bed Gradient (1:100 Year Flow)	1:100 Year Flow (m ³ /s)	0.331	
	Average Channel Velocity (m/s)	1.22	
	Average Channel Bed Shear (Pa)	281	
	Flow Depth (m)	0.19	

3.5.2. Plunge Pools

A plunge pool was designed to receive flow from the 450 mm diameter SWMF outlet. An invert elevation of 214.59 m was identified for the outlet, as designed by G. Douglas Vallee Limited. The plunge pool was sized to generally match the dimensions of the outlet channel. The MTO (1985) plunge pool sizing methodology was used as a check to ensure that the pool shape provided sufficient volume for energy dissipation. This method uses the size of the outlet pipe to determine the pool dimensions (a schematic of the MTO pool sizing criteria is provided in Figure 2). Table 3 provides a summary of the plunge pool dimensions, demonstrating that all dimensions meet or exceed the MTO (1985) sizing methodology. The pool will be stabilized with a roundstone lining and tied into the downstream channel. Stone sizing is discussed in the following section.

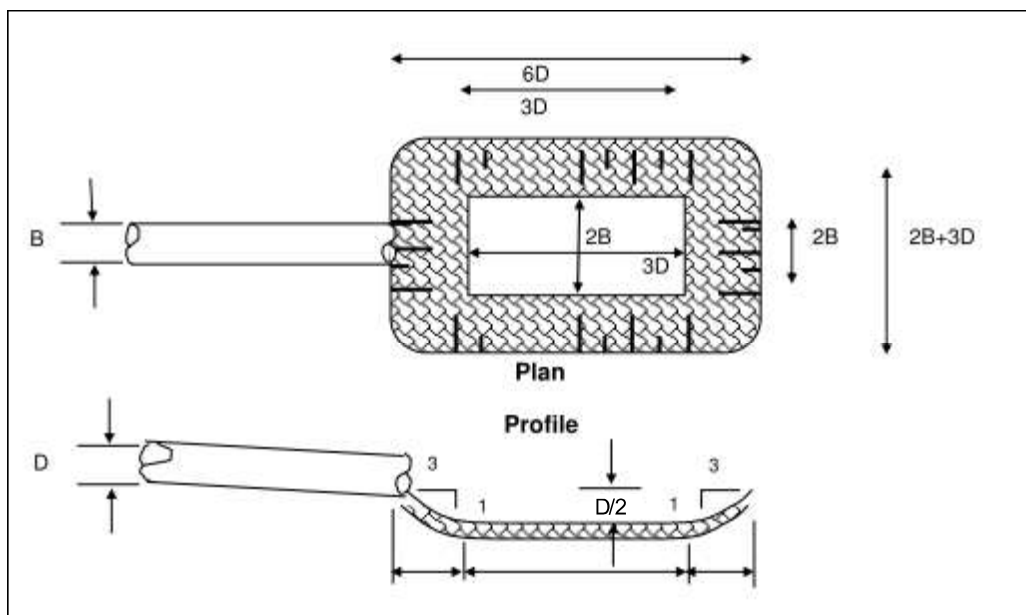


Figure 2: Schematic of the MTO (1985) plunge pool sizing method.

Table 3: Plunge pool dimensions.

Parameter	MTO (1985)	Plunge Pool Design
Top Length (m) [6D]	2.70	3.0
Bottom Length (m) [3D]	1.35	1.5
Bottom Width (m) [2B]	0.90	1.0
Top Width (m) [2B + 3D]	2.25	3.0
Depth (m) [Y]	0.23	0.25

3.5.3. Stone Sizing

Stone sizing was completed using three methods: the USACE Steep Slope equation, the Shields Method, and the MTO plunge pool methodology. Details of the stone sizing calculations and assumptions are provided in the sections below.

3.5.3.1. USACE Steep Slope Equation (1994) (Unit Discharge)

The USACE Steep Slope equation (USACE 1994) is given by:

$$D_{30} = \frac{1.95S^{0.555}q^{\frac{2}{3}}}{g^{\frac{1}{3}}}$$

Where D_{30} is the particle size (m) corresponding to the 30th percentile in the bed material gradation, q is the unit discharge (m^2/s), S is the channel gradient (m/m), and g is the gravitational acceleration (m/s^2). The steep slope equation was used for sizing material in the plunge pools, which have steep inlet gradients of 20%. Table 4 provides the parameter values used in the USACE steep slope equation. The unit discharge given in Table 4 was first increased by a flow concentration factor of 1.25 before being used in the steep slope equation. The required D_{50} stone size was estimated by multiplying the calculated D_{30} stone size by a factor of 1.25. Calculated D_{30} and D_{50} stone sizes are given in Table 4: USACE steep slope equation parameters.

Table 4: USACE steep slope equation parameters.

Location	Parameter	Description	Value	Unit	D_{30} (mm)	D_{50} (mm)
Outfall Channel	S	Channel gradient	20%	m/m	142	221
	q	Unit discharge	0.17	m^2/s		

3.5.3.2. Shields Method (1936) (Shear Stress)

The Shields method (Shields 1936) uses a threshold (tractive force) approach for predicting the threshold particle size for the maximum predicted shear stress. This approach relies on the determination of critical shear stress to calculate the stable stone size. The Shields parameter (τ_*) is used to define the ratio of shear force to the weight of a stone under channelized flow. The critical value of Shields (τ_{*c}) defines the particle size corresponding to the beginning of particle mobility. The Shields equation is given below. A description of the equation's parameters and the values used in this assessment is provided in Table 5.

$$d_s = \frac{\tau}{(p_s - p)g\tau_{*c}}$$

Table 5: Shields equation parameters (step-pool channels).

Coefficient	Description	Value
τ	Bed shear stress for 1:100 year discharge available (N/m ²)	280.9
p_s	Density of sediment (kg/m ³)	2650
p	Density of water (kg/m ³)	1000
g	Gravitational acceleration (m/s ²)	9.81
τ_{*C}	Critical Shield's parameter for coarse particles (Julien, 2002).	0.054

The Shields equation calculates a representative particle size d_s for which incipient motion will occur at the applied shear stress. The calculated d_s is multiplied by a safety factor (1.25) to obtain the required D₅₀ stone size.

3.5.3.3. MTO Methodology (1985) (discharge)

The MTO methodology (1985) provides an empirical equation for sizing stone in plunge pools at culvert outlets. The equation relates the required median stone size (D50) to the discharge (Q), pipe diameter (D), and tailwater depth (TW). The relationship is expressed as:

$$D50 = \frac{0.028D^2}{TW} \left(\frac{Q}{BD^{1.5}} \right)^{1.33}$$

Where D50 is the median stone size (m), Q is the discharge (m³/s), D is the culvert diameter (m), and TW is the tailwater depth (m). This method was applied to determine the stone sizing at the culvert outlet plunge pool, where energy dissipation occurs. Table 6 summarizes the input parameters used in the MTO equation. The resulting D50 stone size was then compared with the previous methods below in Table 7 ensure stability of the outfall channel during the design flow conditions.

Table 6: MTO equation parameters.

Coefficient	Description	Value
D/B	Culvert diameter (m)	0.45
TW	Normal depth at culvert outlet (m)	0.362
Q	Discharge from culvert (m ³ /s)	0.331

3.5.3.4. Stone Size Summary

Stone sizing was undertaken using three methods described above for the 1:100 year design flow. The analysis incorporated the USACE steep slope equation, the Shields method, and the MTO (1985) methodology. The stone sizing was completed using shear stress and unit discharge outputs from the one-dimensional at-a-station hydraulic analysis, as well as culvert discharge, diameter, and tailwater depth for plunge pool conditions. The stone sizing assessment was undertaken at channel steps using a reach-averaged slope, which was verified against the MTO plunge pool stone sizing. Table 7 lists the results of the stone sizing assessment.

Table 7: Stone sizing results.

Design Element	Method	Design Parameter	Design Parameter Value	Local Flow Depth (m)	D ₅₀ Stone Size (mm)	Factor of Safety	Stone Size incl. Safety Factor
Plunge Pool	MTO	Discharge	0.331 m ³	0.36 ¹	51	1.25	64
Step-Pool Channels	USACE Steep Slope	Unit Discharge	0.17 m ² /s	207	259	1.25	323
	Shields (1936)	Shear Stress	280.86 Pa	0.19 ²	321	1.25	401

¹ Normal depth of SWM pond outflow pipe; ²Depth resulting from 20% bed gradient between riffle crest and pool

The Shields equation produced the largest stone size at 401 mm, while the USACE steep slope equation produced a slightly lower size of 323 mm. The MTO plunge pool equation produced the lowest required stone size (64 mm).

Based on these results, a stone size of 400 mm has been specified for the step crests and channel lining within the plunge pool and step-pool channel. Voids between the 400 mm boulders will be filled using a gradation with a D₅₀ of 100 mm and D_{max} of 200 mm. The void filling gradation will also be used as substrate in the upstream feature that receives flow from the plunge pool, where hydraulic forces are expected to be low.

The stone sizes are presented in Table 8 Table and the gradations are provided in Table 9. Table 10 provides material specifications to produce the design stone gradation based on the *Material Specification for Aggregates – Waterbody* (OPSS 2022).

Table 8: Boulder/keystone sizing.

Design Component	Stone Size (mm)	Specification
Step crest	400	WB-400
Channel lining	400	WB-400
Plunge pool boulder	400	WB-400

¹See OPSS.PROV 1005 for material specifications.

Table 9: Void filling stone gradation.

% Finer	Size (In.)	Size (mm)
100%	8	200
75%	6	150
50%	4	100
25%	2	50

Table 10: Material specifications.

Specification	% of Gradation
WB-200	50%
WB-100	25%
WB-50	25%

3.5.4. Downstream Tie-in

The constructed outlet channel will tie in to Patterson Creek at the toe of the valley slope near the existing storm sewer outlet (Photo 3). To mitigate risk to the outlet channel associated with scour (downcutting) within Patterson Creek, the invert elevation of the downstream-most outlet channel pool feature was set to the approximate elevation of the downstream grade control (Hunt St culvert).



Photo 3: Location of outlet channel tie-in to Patterson Creek.

3.5.5. Revegetation Plan

Revegetation of the work area will be undertaken following completion of the outfall channel construction. All disturbed areas will be replanted. The revegetation area is divided into two zones: Grading Area and Vegetated Buttress (see Section 3.63.6). The Grading Area, which is located on the slopes of the channel corridor, will be restored with a riparian woodland community that would complement and enhance the existing neighbouring riparian vegetation community. The vegetated buttress will be restored as a riparian shrub thicket.

Micro-site selection for plants is expected to vary based on microtopography at the discretion of the planting team. Any invasive species identified in the planting area will be removed before the beginning of planting. Any compacted soil will also be loosened before planting. Plants will be installed approximately 0.5 to 1.0m apart off-centre.

3.5.5.1. Grading Area

The Grading Area, approximately 377 m², is situated on the east- and west-facing slopes of the outfall channel corridor. 90 shrubs and 35 trees were selected for this zone. The area, previously characterized in the EIS as a Dry-Fresh Sugar Maple Deciduous Forest, is classified as a significant woodland and dominated by sugar maple, with other species including white pine, black walnut, black locust, American elm and eastern cottonwood. The proposed tree and shrub plantings have been selected to maintain and enhance this community. Seven native tree and six native shrub species were chosen, including various flowering and berry-producing varieties, to achieve these enhanced ecological functions. In addition, eastern cottonwood (*Populus deltoidea*) and American elm (*Ulmus americana*) were included in the planting plan to complement the existing population. Any invasive species in the work area are recommended to be removed before planting.

3.5.5.2. Seed Mix

A native seed mix will be applied to all disturbed areas following the completion of construction and planting. The *Water's Edge Seed Mix* available from St. William's Nursery or similar is recommended due to its variety of species suitable for riparian zones. Approximately 0.5 kg of seed will be required to be spread at a rate of 8-10 kg/ha. This seed mix, or a similar mix approved by a qualified restoration professional, will assist in stabilization of disturbed soils, mitigate the colonization of invasive species, and improve species diversity. The seed mix contains a variety of upland and lowland species suitable for both planting zones that can adapt well to varying microtopography.

An annual cover crop, such as Canada Wild Rye or Virginia Rye (*Elymus* spp.), will also be applied with the native seed mix to quickly establish and stabilize soils so that native seed can better establish itself.

3.5.5.3. Monitoring and Plant Warranty

A vegetation monitoring and replacement program will be implemented. This plan will include annual monitoring over a three-year period during the growing season to track the survivorship of plants. Plants that are found to be dead or dying within three years of installation should be replaced.

3.6. Vegetated Buttress

To mitigate the risk of lateral migration, a vegetated buttress treatment will be used to restore the channel bank within the area of disturbance, extending approximately 5 m downstream of the outlet channel. All works will be limited to the subject property. The buttress treatment will be tied into the outlet channel, providing enhanced stability. Stone sizing for the outlet channel and buttress treatment was completed based on shear stress values from the hydraulic analysis, ensuring that they remain stable under the range of modelled flow conditions (see Table 7). Photo 4 shows an example of a vegetated buttress installation.



Photo 4: Example of a vegetated buttress.

3.6.1. Buttress Revegetation

A total of 72 native shrubs will be planted within the buttress structure, utilizing 1-2 gallon potted stock to enhance community establishment. These shrubs will be strategically spaced at approximately 0.5-1.0 meters off-centre to allow for optimal growth, root development, and canopy intermingling. The deliberate placement of these plants between the buttress stones serves a dual purpose: to establish continuous vegetated cover, which will help stabilize the soil and prevent erosion, and to create habitat for a diverse array of wildlife on a structure that would ordinarily provide minimal habitat. This includes providing potential nesting and foraging opportunities for various bird species, and nectar and pollen sources for a wide range of pollinator species, thereby supporting local biodiversity and providing a food source for amphibians in the nearby wetlands.

4. Conclusion



GeoProcess was retained by HFW Holdings Ltd. to complete the detailed design of a SWM outfall channel in support of the proposed redevelopment at 395–411 Queensway West in the Community of Simcoe, Norfolk County, Ontario. As part of the redevelopment, the existing storm outlet that currently discharges directly to Patterson Creek will be removed and replaced with a SWM pond. The new SWM pond will discharge to the creek through a combination of underground conveyance and a constructed outfall channel. Given that the proposed outfall channel will be constructed along the valley slope, the design has been developed to mitigate erosion risks and ensure the long-term stability of both the valley slope and the receiving reach of Patterson Creek.

5. References

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- OPSS. 2022. Material Specification for Aggregates - Waterbody. Ontario Ministry of Transportation and the Municipal Engineers Association p 12. Report No.: OPSS.PROV 1005. [accessed 2023 Oct 13]. <https://tcp.mto.gov.on.ca/sites/default/files/2022-10/OPSS.PROV%201005%20-%20Nov%202022.pdf>

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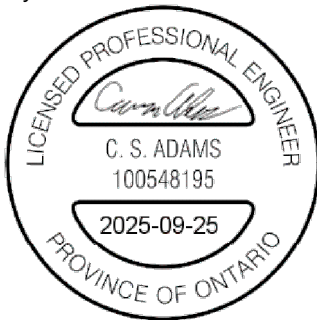
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411 Queensway West Outfall Channel Design

Prepared for HFW Holdings Ltd.

Version:	Date:	Issue:	Desc.:
Version 01	September 25, 2025	Final	Issued for LPRCA review

Prepared by:



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Reviewed by:

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Senior Geomorphologist

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Project Number P2025-1010



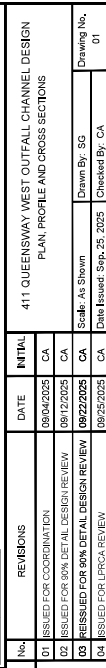
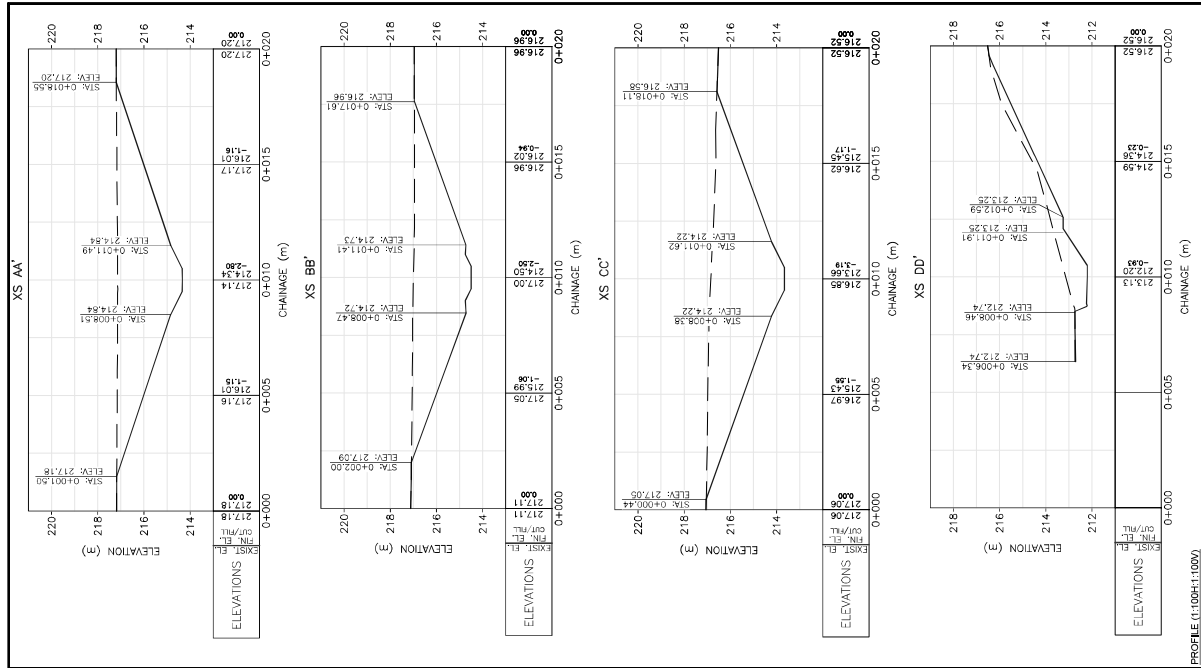
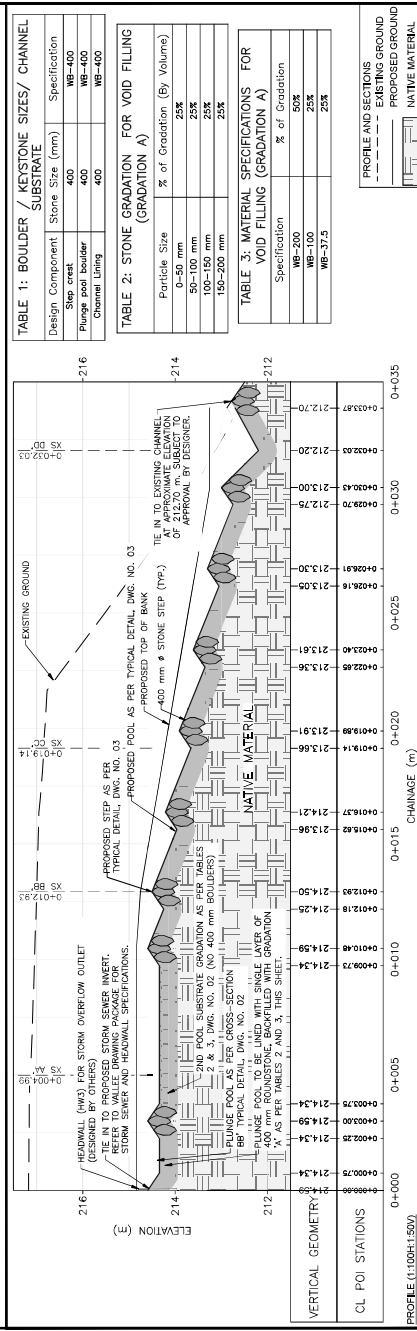
Appendix A

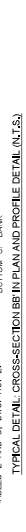
SWM Outlet Channel Design Drawings

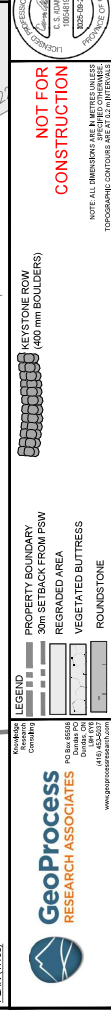
411 Queensway West Outfall Channel Design

HFW Holdings Ltd., Simcoe, ON
90% DETAILED DESIGN - NOT FOR CONSTRUCTION

LOCATION KEY MAP	ACCESS ROUTE KEY MAP	NO.	DESCRIPTION
		01	PLAN, PROFILE AND CROSS SECTIONS
		02	CONSTRUCTION DETAILS
		03	ESC. FLOW MANAGEMENT AND NOTES
		04	RESTORATION PLAN AND PLANTING NOTES



[illegible]

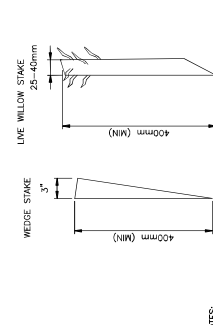


1. GENERAL PLANTING NOTES: PLANTING STOCK SHOULD BE INSTALLED IN THE SPRING AFTER THE LAST FROST (APRIL - JUNE) OR FALL BEFORE THE FIRST FROST (LATE SEPTEMBER - NOVEMBER) TO ENSURE SURVIVORSHIP OF PLANT. PLANT LOCATIONS SHOULD BE CHOSEN ACCORDING TO MICRO-SITE SELECTION FOR EXISTING PLANT COMPETITION. PLANTINGS WILL BE INSTALLED WITHIN THE RESTORATION AREAS IN NATURAL GROUPINGS UNDER THE SUPERVISION OF A PROJECT RESTORATION SPECIALIST OR OTHER QUALIFIED PROFESSIONAL WITH AN ECOLOGY OR PLANTING BACKGROUND. PLANTING HOLES MAY BE EITHER DUG BY HAND OR AUGURED WITH A HANDHELD AUGER TO REDUCE IMPACTS ON THE EXISTING ENVIRONMENT. HOLES WILL EQUAL THE DEPTH OF THE ROOT BALL AND 1.5 TIMES THEIR WIDTH.
2. PLANT INSTALLATION: INVASIVE SPECIES REMOVAL AND RESIDUE REMOVAL SHOULD BE UNDISTURBED TO MAINTAIN PLANTING CONDITIONS. WHERE SOIL COMPOSITION IS PRESENT, SOIL SHOULD BE MECHANICALLY SORTED, AND REMOVED PRIOR TO PLANTING AND RESIDUE A LAYER OF TOPSOIL AND ORGANIC MATTER TO IMPROVE GROWING CONDITIONS. ORGANIC MATTER WILL BE INCHES.
3. CONES OF DECAYED ORGANIC MATERIAL (HUMUS) SUCH AS COMPOST, COMPOSTED WOODY DEBRIS AND LIGN LITTER, AND/OR FOREST PRODUCT RESIDUALS PLACED AT A DEPTH RANGING FROM 2 TO 4 INCHES.
4. SEEDING: SHRUBS SHOULD BE PLANTED AT 0.5-1" M. OFF-CENTRE.
5. MONITORING: A MONITORING SCHEDULE INVOLVING YEARLY SITE INSPECTIONS BY A QUALIFIED BIOLOGIST OR OTHER ENVIRONMENTAL PROFESSIONAL IS RECOMMENDED. MONITORING EVENTS SHOULD OCCUR ONCE DURING THE GROWING SEASON (SPRING, SUMMER) FOR A MINIMUM OF THREE YEARS FOLLOWING THE INSTALLATION OF RESTORATION PLANTINGS. PERMANENT TX1 M-FLDS SHOULD BE ESTABLISHED, OR LIVE TRANSECTS SHOULD BE IMPLEMENTED FOR SUCCESSFUL MONITORING. VISUAL ANALYSIS INCORPORATING DETAILED NOTES TO ADDRESS SURVIVORSHIP OF PLANT SPECIES, INDIVIDUAL PLANT HEALTH AND POTENTIAL GROWTH OF NATIVE SPECIES IS RECOMMENDED. MORTALITY OF ALL PLANTED INDIVIDUALS SHOULD BE DETERMINED, AND THE CAUSES OF MORTALITY IDENTIFIED (SHADE/SLN INTOLERANCE, HERBIVORY, DROUGHT, ETC.). REMOVAL OF INVASIVE SPECIES SHOULD BE ADDRESSED DURING MONITORING EVENTS AND COMPLETED YEARLY FOR A PERIOD OF NO LESS THAN 3 YEARS.
6. ELABORATED: IN THE EVENT OF PLANT MORTALITY FOLLOWING RESTORATION INITIATIVES, REPLACEMENT PLANT MATERIAL SHOULD BE REPLACED BY SPECIES PROVIDED IN THE PLANTING TABLES.
7. INVASIVE SPECIES REMOVAL: BEFORE ESTABLISHING NATIVE PLANTINGS, THE REMOVAL OF NON-NATIVE INVASIVE SPECIES IDENTIFIED IN THE PLANTING AREA IS RECOMMENDED TO INCREASE PLANTING SUCCESS AND MITIGATE THE NEED FOR WARRANTY PLANT REPLACEMENT. COMMON INVASIVES FOR REMOVAL INCLUDE BUT ARE NOT LIMITED TO EUROPEAN BUCHLOREN, DOG-STRANGLING VINE, AND COMMON REED.
8. SEED MIX: A NATIVE SEED MIX MUST BE APPLIED TO ALL DISTURBED AREAS FOLLOWING THE COMPLETION OF ON-SITE WORK. THE SEED MIX CHOSEN FOR THIS SITE HAS BEEN DETERMINED BASED ON THE ECOLOGY OF THE SURROUNDING AREA. THE SEED MIX, WATER'S EDGE SEED MIX CAN BE SOURCED FROM ST. JULIAN'S NURSERY AND ECOLOGY CENTRE, 885 NORFOLK COUNTY HWY 24, ST. WILLIAMS, ON. NOE HQ. IF THE SEED MIX IS NOT AVAILABLE AT THE TIME OF PLANTING, A SIMILAR MIX MAY BE USED CONTAINING THE SAME OR SIMILAR SPECIES WITH THE APPROVAL OF A QUALIFIED PROFESSIONAL WITH A RESTORATION OR ECOLOGY BACKGROUND. SEED MIXES CONTAINING NON-NATIVE OR CULTIVARS OF NATIVE SPECIES ARE NOT ACCEPTABLE AND MAY RESULT IN LONG-TERM DAMAGE TO THE SURROUNDING PLANT COMMUNITY. SEED SHOULD BE APPLIED AT A RATE OF 8-10 kg/ha/m². IF THE AREA OF DISTURBANCE IS LARGER THAN ANTICIPATED, ADDITIONAL SEED MUST BE USED TO ANY EXTRA COVER. COARSE ANNUAL NURSE CROPP SHOULD BE APPLIED TO THE RESTORATION AREA, INCLUDING ALL NATIVE SEED AREAS, TO STABILIZE SOILS AND PROTECT NURSERY FROM FROST.

Common Name	Scientific Name	Size	Quantity
Gray Dogwood	<i>Cornus racemosa</i>	1-2' gallon potted	12
Red-crested Dogwood	<i>Cornus sericea</i>	1-2' gallon potted	12
Wild Black Currant	<i>Ribes americanum</i>	1-2' gallon potted	12
Wild Red Raspberry	<i>Rubus idaeus</i> ssp. <i>Strigosus</i>	1-2' gallon potted	12
Bald's Willow	<i>Salix babingtonii</i>	1-2' gallon potted	12
Common Elderberry	<i>Sambucus canadensis</i>	1-2' gallon potted	12
Total Shrubs			72

[illegible]

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Common Elderberry	<i>Sambucus canadensis</i>	1-2' gallon potted	12
Total Shrubs			72

[illegible]

THIS IS NOTE APPLIES TO ALL SPECIFICATIONS USING THESE TYPES OF WEDGE STAKES. RECOMMENDED DIMENSIONS ARE SHOWN ABOVE.

TYPICAL RETAIL WOOD WEDGES AND LIVE STAKES (NTS)

411 QUEENSWAY WEST OUTFALL CHANNEL DESIGN RESTORATION PLAN AND PLANTING NOTES	Scale: As Shown	Drawn By: SG	Drawing No. 04
	Date Issued: Sep. 25, 2025	Checked By: CA	