REVISED FUNCTIONAL SERVICING REPORT
STROHVEST SUBDIVISION
GERBER ROAD
TOWNSHIP OF WELLESLEY

June 27, 2024

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1 INTRODUCTION

1.1 SITE LOCATION

The Strohvest Subdivision (Site) is located at the southwest end of the Township of Wellesley, within the Region of Waterloo's Official Plan Urban Area designation. For the purpose of this Report, the subject property is considered as two (2) phases: Phase 1 representing the proposed development and Phase 2 representing a future development phase. Phase 1 is the south portion of the site, fronting on Gerber Road and has an area of 10.2 ha. Phase 2 is the north portion comprised of the balance of the property, with an area of 6.2 ha, and is considered as a future Phase in this Report.

The total site area is approximately 16.4 ha and is bounded by existing residential developments, predominantly single-family homes, to the east and north, existing farmed agricultural land to the west and existing Gerber Road to the South. These lands as described are illustrated on Figure 1.0 – Site Location Plan and within **Appendix A** - Proposed Draft Plan.

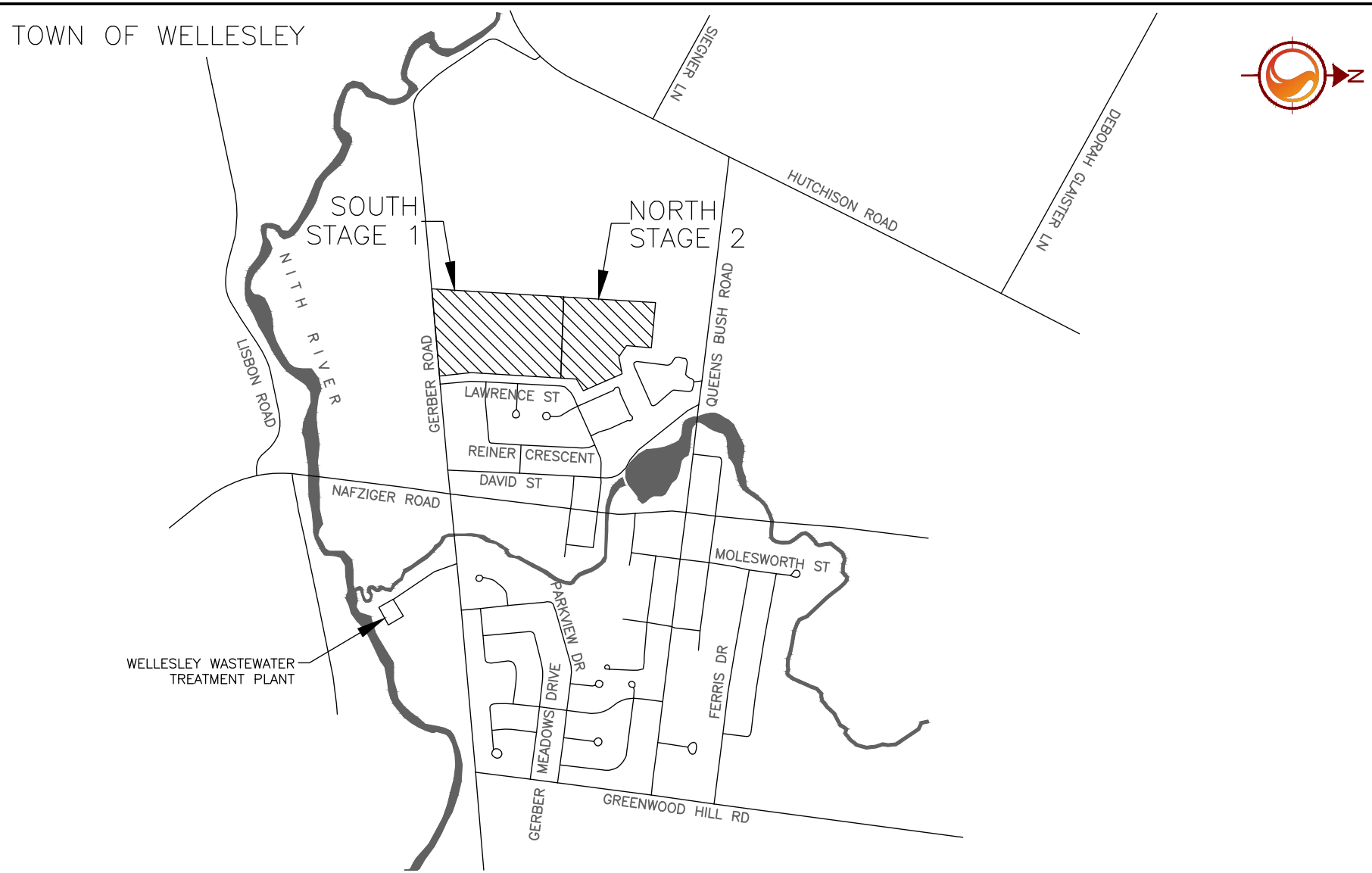
1.2 BACKGROUND AND OVERVIEW

Residential development in the Region of Waterloo has experienced an average growth of 16% over the past 5 years[1]. Within the Township of Wellesley, residential development is more sporadic. It is noted that there are two active planning applications in the Township of Wellesley, in addition to this subject project, there is a proposal for a 50-unit townhouse development located at 1016-1018 Doering Street and a 12-unit stacked townhouse project located at 1060 Queens Bush Road.

According to the Water and Wastewater Monitoring Report (WWMR) from June 2023[2], the Wellesley Wastewater Treatment Plant (WWTP) has a rated capacity of 1,100 m^3/d that can serve approximately 4,700 people when considering the 5-year average per capita flow of 0.2340 m^3/c/d. The remaining capacity of the WWTP as reported in the WWMR is 232 m^3/d. It is noted that this is an increase from the previous Monitoring Report from 2022, the fluctuation in flow is assumed to reflect years of higher infiltration into the sanitary service network.

[1] Canada Mortgage and Housing Corporation. (2024). Housing Market Information Portal. Retrieved April 22, 2024, from www03.cmhc-schl.gc.ca/hmip-pimh/#TableMapChart/0850/3/Kitchener - Cambridge - Waterloo

[2] Region of Waterloo. (2023). Water and Wastewater Monitoring Report June 21 2023, from WS2023WaterAndWastewaterMonitoringReportDOCS4416299.PDF (regionofwaterloo.ca)



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GERBER ROAD, WELLESLEY
TOWNSHIP OF WELLESLEY, ON

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161413217

Title
SITE LOCATION PLAN

Revision

Date
2022.01.07

Reference Sheet

Figure No.
1

Over the past 5 years, the remaining capacity of the WWTP has fluctuated between 806 and 991 additional people. The lower bound projected remaining capacity of 806 persons is considered in this Report.

Similarly, the Wellesley Water Supply (WWS) system has a capacity of 3,000 m^3/d and a remaining capacity for 6223 additional people when considering the maximum day demand per capita of 0.30276 m^3c/d. The remaining capacity of the water supply system is reported to be 1,884 m^3/d. It is noted that the average day use fluctuates year-to-year irrespective of population growth. Over the past 5 years, the remaining capacity of the WWS has fluctuated between 6,024 and 6,743 additional people. The lower bound projected remaining capacity of 6,024 persons is considered in this report.

1.3 PURPOSE OF THE REPORT

The purpose of this Functional Servicing Report (FSR) is to outline how the proposed Strohvest Subdivision can be supplied with adequate services, including sanitary, domestic water and fire water, storm drainage, stormwater management (SWM), and utilities. This Report is prepared in support of the Draft Plan of Subdivision Application for the Phase 1 area but also has consideration for the servicing to support the Phase 2 area. Please refer to the Proposed Draft Plan – **Appendix A**.

The following supplementary Reports should be read in conjunction with this Report:

- Final Geotechnical Investigation Report for Proposed Subdivision Development, Stroh Lands, Gerber Road, Wellesley, Ontario, Stantec Consulting Ltd., August 6, 2021
- Geotechnical Memo: Submission of Revised Draft Plan/ZBA - Basement Construction, Stantec Consulting Ltd., June 2024
- Scoped Natural Heritage Report for the Stroh Lands in Wellesley, Ontario, Memorandum, Stantec Consulting Ltd. dated November, 2021
- Wellesley Property, Gerber Road – Plan 1148, Part Lot 80 – Noise Impact Study, Stantec Consulting Ltd. Revised June 2024
- Hydrogeological Assessment, Strohvest Subdivision, Township of Wellesley, Ontario, Stantec Consulting Ltd., June 2024
- Strohvest Ontario Inc. – Village of Wellesley, Preliminary Servicing Feasibility in Support of Urban Area Expansion, Stantec Consulting Ltd., May 2017

The servicing strategies presented in this Report are conceptual. Detailed engineering drawings (for construction) and a Final SWM Report will be submitted as part of the final engineering design process once the proposed subdivision has received Draft Plan Approval.

1.4 ENVIRONMENTAL ASSESSMENT REQUIREMENTS

1.4.1 Municipal Class Environmental Assessments

Under the procedures set out in the Municipal Class Environmental Assessment Act, projects completed by the private sector through a Planning Act Process are considered as having fulfilled the Class EA requirements, except for some specific Schedule 'C' projects that are outlined in the Act.

All the works required for the Strohvest Subdivision lands are described in the subsequent sections of this Report. The plans, included in this Report, show the location of the proposed sanitary and storm sewers, proposed watermains, as well as grading, utilities, and subdivision phasing information. The intent of this Report and, the supplementary Reports, is to ensure that the commenting agencies and the public are made aware of the servicing strategies for the proposed development.

All the works required for the Strohvest Subdivision lands, will be completed by the Developer (i.e., by the Private Sector), are clearly described/shown in this Report in support of the Draft Plan, and therefore, are exempt from a Class EA.

1.4.2 Environmental Compliance Approvals

Environmental Compliance Approvals (ECA) will be required for storm and sanitary sewers, and the stormwater management facility (SWMF). It is our understanding that ECAs for sewers will need to be submitted to the Region of Waterloo for review and approval and ECAs for the SWMF will need to be submitted to the MECP for review and approval. It is anticipated that the ECA application and approval process will take approximately 6 months; however, this timeline is outside of Stantec's or the Applicant's control. ECA requirements should be made a condition of Draft Plan of Subdivision Approval.

Please note, a streamlined approval process through a director notification may be possible, should the municipality apply to the Ministry of the Environment, Conservation and Parks (MECP) for a Consolidated Line Infrastructure (CLI) ECA.

1.4.3 Record of Watermains Authorized as a Future Alteration – Form 1

A Record of Watermains Authorized as a Future Alteration (Form 1) shall be submitted to the Region of Waterloo. The requirement to submit a Form 1 should be made a condition of Draft Plan of Subdivision Approval.

2 EXISTING GRADING AND SERVICING

2.1 EXISTING LAND USE AND SITE TOPOGRAPHY

The subject lands are presently utilized for agriculture. There are no trees located on the subject lands. A number of large mature trees are present on adjacent properties, along the east and the west property lines, flanking the existing homes adjacent to the site.

The topography of the site has a gentle slope predominantly north to south with gentle hills with elevations ranging from approximately 363.5 m along the west property line to approximately 353.0 m at the south side of the site along Gerber Road. A portion of the northern lands within Phase 2 are sloped south to north and west to east. There are localized minor hills and valleys within the site with slopes ranging from 0.8% to 5%.

As illustrated on the Existing Drainage Area Plan included as Figure 3 under section 6 of this report, there are three major existing catchments within the site; the first, and largest, drains an area of approximately 17.97 ha to a low area along the south property line. This area includes a significant external area from the neighbouring agricultural field. This area is controlled by a 1,200 mm diameter (dia.) culvert under Gerber Road, draining overland and through an existing tile (Paff Drain) to the south and ultimately to the Nith River. The Paff Drain installed in 1967, develops into a 12" steel drain that is understood to be connected to a catchbasin on the south side of Gerber Road. The catchbasin and culvert under Gerber Road were updated in 2000.

The second catchment drains an area of approximately 2.71 ha via sheet flow uncontrolled offsite through the northwest corner of the Site. This area then flows via sheet flow through to the existing farm field toward Queens Bush Road.

The third catchment drains an area of approximately 2.22 ha of agricultural area in the northeastern portion of the site to an existing rear yard catchbasin (RYCB) to the east. This is illustrated on the Profile Drawings for Lawrence Street and Gerber Road included in **Appendix B**. and the Existing Conditions Plan No. C-050, included in **Appendix C**.

2.2 DESIGN CONSTRAINTS AND PROCEDURES

Constraints in designing the road profiles and lot grading are as follows:

1. Match existing grades, where possible, to minimize grading and cut/fill quantities and minimize changes to the surface hydrology and hydrogeology of the area.

2. Respect high groundwater elevations through grading design, the use of sump pumps to address the perched groundwater and if required, compensating foundation design.

3. Match existing Gerber Road elevations and improve roadside ditch.
4. Satisfy the Region of Waterloo and Township of Wellesley vertical and horizontal geometric design constraints for roadways.
5. Maintain adequate cover over storm, sanitary sewers, and watermain.

2.3 PROPOSED ROAD PROFILES AND OVERALL SITE GRADING

Preliminary road profiles within the subject site were established based on the proposed street pattern shown in the Draft Plan of Subdivision(**Appendix A**) to satisfy the constraints outlined in the previous Section 2.2. Most of the road profiles have been designed to follow the existing topography of the site with grades ranging from 0.5% to 4.5% in keeping with the 2017 Township of Wellesley Development Standards. This minimizes fill across the site and allows a match of perimeter grades. A 20.0 m right-of-way (ROW) cross-section in accordance with 2017 Township of Wellesley Development Standards, is proposed for the internal roads and a typical section is shown in Figure 2.0 – Typical Cross Section.

The proposed centerline road elevations are illustrated on the General Servicing Plan, Drawing No. C-100, Road Profile Drawing Nos. C-200 & C-201, and Conceptual Grading Plan Drawing Nos. C-400 & C-401 all included in **Appendix C**.

The Township was contacted regarding the future cross-section and road drainage for Gerber Road along the frontage of the Site. The Township has indicated that the current road configuration and alignment are not expected to change, although urbanization in the future should be considered.

The proposed lot grading within the site ranges from 1.0% to a maximum of 10.0% in keeping with the 2017 Township of Wellesley Development Standards. Ideally lot grading will be undertaken within a range of 2.5% and 5%. Transition slopes of 3:1 are utilized to accommodate the various grade changes within the proposed subdivision and at various perimeter locations. A combination of Type ‘A’ (back to front drainage), Type ‘D’ (split drainage), and Type ‘B’ (walkout) lots are all used in the proposed design. No Type ‘C’ (front walk-ins) lots are anticipated. The proposed lot grading is illustrated on the Grading Drawings No. C-400 & 401 included in **Appendix C**.

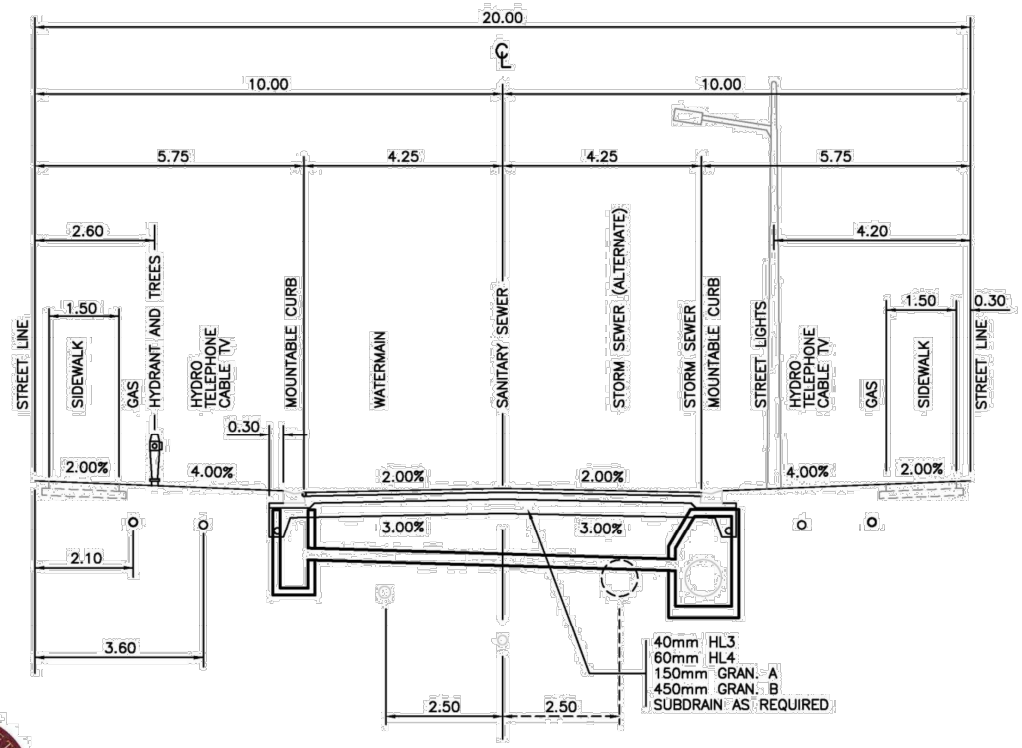
Preliminary earthwork calculations have been performed for the subject property which indicates that there is approximately 2,986 m^3 of earth surplus (cut) for the entire site (Phase 1 and Phase 2) and a Topsoil surplus of 19,938 m^3. Considering the lands subject to this Draft Plan of Subdivision Application (Phase 1 only), there is an approximate earth surplus of 17,200 m^3 predominantly generated from sub excavating the SWM. Similarly, from the Phase 1 lands there is an approximate topsoil surplus of 12,168 m^3.

It is proposed to manage excess soils from Phase 1 within the Phase 2 lands. Where possible, topsoil will be used as fill within green spaces (i.e., parks, boulevards, and rear yards).

At detailed design, profiles and grading will be refined to optimize the required earth cut/fill volumes.

TOWNSHIP OF WELLESLEY DEVELOPMENT STANDARDS

110
JUNE 22, 2015



TYPICAL CROSS-SECTION
20m RIGHT-OF-WAY

CROSS SECTIONAL POINTS		
DESCRIPTION	VERTICAL OFFSET FR. C/L	HORIZONTAL OFFSET FR. C/L
EDGE / PAVEMENT	-0.085	4.25
GUTTER LINE	-0.110	4.50
TOP / CURB	-0.060	4.75
FRONT / WALK	+0.078	8.20
BACK / WALK	+0.108	9.70
PROPERTY LINE	+0.114	10.00

20.0m ROAD CROSS SECTION

STREET A-E

STA:0+000 TO 0+000
NTS

MINIMUM DEPTH OF COVER (UNLESS OTHERWISE SPECIFIED)	
SANITARY SEWER	2.80m
STORM SEWER	1.50m
WATERMAIN	2.00m
GAS MAIN	0.80m
UTILITY CORRIDOR	0.90m

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2024.06.03

Reference Sheet

Figure No.
2

2.4 LOCAL GEOLOGY AND HYDROGEOLOGY

As documented in the June 2024 Hydrogeological Assessment report prepared by Stantec, the subsurface of the Site consists of a layer of topsoil and/or fill (ranging from 0.3 m to 1.5 m thick), which in turn is underlain by a combination of sandy silt, silt, silty clay, and clay tills (i.e., Aquitard 1; ATB1) that forms a horizontally and vertically contiguous unit that extends to a depth of at least 25 m below ground surface (BGS) (337 m AMSL) based on the boreholes drilled throughout the property. Layers and seams of sand, silt, and sand and gravel are also present in the glacial till at variable depths.

Based on three years of groundwater level monitoring data, groundwater levels recorded in the onsite monitoring wells indicate that the seasonally high groundwater table can be positioned just below ground surface to 0.5 m BGS, with these high groundwater conditions typically occurring in early to mid-fall (i.e., September / October) and continuing into the late spring (i.e., May). Following the spring, the groundwater table typically declines by up to 1.4 to 2.9 m over the summer months, with drops as large as 4.6 m being observed during periods of drought.

A series of test pits were excavated across the Site in May 2024 to confirm the positioning of the high groundwater table as suggested by water levels recorded in the on-Site monitoring wells. Results of the on-Site test pitting provided supporting evidence that the high-water levels observed in the monitoring wells are accurate as the test pit walls (excavated on May 2, 2024, and left open for approximately 24 hours) were beaded with water up to the approximate water level depths recorded in the wells. The ‘sweating’ test pit walls are an indication that groundwater was slowly seeping into the pits from the sandy silt, silt, silty clay, and clay till deposits that comprise the subsurface of the Site. This is not surprising given that these low permeability deposits are characterized by a bulk horizontal hydraulic conductivity in the range of 10^{-8} m/s, with estimated groundwater flow velocities of 0.26 m/year (i.e., one meter of groundwater movement through the subsurface every 3.9 years). In addition, varying degrees of soil sloughing off the test pits walls occurred while the excavations were open, pointing to soil saturation associated with a high groundwater table. Although relatively higher flowing seeps from saturated sand layers interbedded in the glacial till resulted in the ponding of groundwater at the base of some test pits, these seeps eventually stopped flowing within the time that the pit remained open, indicating that these higher permeability deposits had drained out and, subsequently, are of limited extent in the subsurface of the Site.

2.4.1 Ontario Building Code

The Ontario Building Code (2024) provides additional requirements for foundations built below the water table. In particular, Clause 9.13.3 Waterproofing and Clause 9.15.3.4.(3) should be evaluated.

Clause 9.13.3 can be accommodated by using a Terrafix Terradrain® 600 or equivalent waterproofing membrane to protect foundation walls from absorbing groundwater over-time due to hydrostatic pressures. This has become a common foundation construction detail for new construction. The Terrafix Terradrain® 600 will direct infiltration and ground water down the wall’s waterproof membrane to the weeping tile. The weeping tile will drain to a sump pit with a minimum depth of 0.6 m below the footing

level, to locally collect the groundwater surrounding the foundation during those periods when the groundwater table is high and intercepts the footings. As previously mentioned, given that groundwater moves slowly through the subsurface of the Site, infrequent cycling of the sump pump is expected.

Clause 9.15.3.4.(3) requires that footing width for foundations resting on gravel, sand or silt in which water table level is less than the width of the footings (traditionally 0.6m) be at least twice the minimum widths as required by Table 9.15.3.4. At typically founding depth, the dominant soil type is a silty-clay to clayey silt and therefore does not meet the soil type qualifications identified in Clause 9.15.3.4.(3). Further, the sump pumps described above will serve to address the saturated soil conditions.

2.4.2 Mitigating Measures

The groundwater system is variable across the Site and the presence of silty sand to sandy silt seams interbedded in the glacial till can present a localized challenge to managing the groundwater. Although the extents of these silty sand to sandy silt seams is unknown and will not be uncovered until the time of construction, evidence from the previously mentioned test pitting exercise indicates that these seams will effectively drain out once exposed to engineered subsurface outlets (e.g., foundation drains connected to sump pits / pumps) and not present a long-term dewatering challenge. For all foundation construction occurring temporarily to permanently below the groundwater table, the following mitigations measures shall be employed as required to the satisfaction of Stantec and the Township of Wellesley:

1. Install a waterproofing membrane such as Terrafix Terradrain® 600 or equivalent on all foundation walls as a standard building practice.

2. Install a sump pump with a sump pit depth a minimum 0.6 m below the footing elevation for all habitable structures below grade as a standard building practice. Sump pump shall discharge to a level above grade and then directly to the storm lateral riser.

3. Where silty sand to sandy silt seams are encountered and do not quickly drain, over excavate the sand seam and backfill with the native silty clay to clayey silt soils to eliminate the conduit effect of more permeable soils.

4. If sand seam extents are too vast to reasonably excavate and groundwater flow cannot be reasonably managed by a sump pump, local areas impacted shall have the foundation levels raised above the silty sand to sandy silt seam. This exercise will be completed on a case-by-case basis determined at the time of building permit. Stantec notes that this solution is unlikely to be required at the Site based on the combined findings of the geotechnical and hydrogeological investigations.

3 SANITARY SERVICING

Local 200 mm diameter sanitary sewers will be constructed throughout the proposed Strohvest Subdivision lands within the proposed roadways. The sanitary design utilizes one outlet; this outlet drains south through Street “B” to Gerber Road, and then east along Gerber Road towards the WWTP. Please refer to the General Servicing Plan No. C-100 included in **Appendix C**, for an illustration of the sanitary servicing strategy.

As per the 2024 Region of Waterloo and Area Municipal Design Guidelines and Supplemental Specifications for Municipal Service (DGSSMS), the proposed or future zoning for the development is to be considered when calculating sanitary flows. Phase 1 has been evaluated for the highest resulting density based on the Draft Plan. Phase 2 has been considered with a density of 55 people per hectare (ppl/ha), that is approximately 10 ppl/ha denser than Phase 1, thereby accommodating the potential for increased density in the future.

As part of the Draft Plan process, the single-family lots, semi-lots and townhouse blocks are identified as residential flow using an average flow of 275 Litres per capita per day (l/c/d). This equates to a flow rate of 6.2 Litres per Second (L/s) in Phase 1 and ultimately 13.8 L/s for Phase 1 and Phase 2 combined. Please refer to the proposed sanitary design sheet in **Appendix D**.

The onsite sewers will have adequate capacity and will be installed at sufficient depths to enable servicing the Site by gravity, including the future Phase 2.

3.1 MUNICIPAL SANITARY SERVICING

The downstream municipal sanitary sewer along Gerber Road up to Nafziger Road (identified as William Street on the Township Road No. 1 Plan and Profiles – see **Appendix B**) was analyzed for its capacity to accommodate the Strohvest Lands. The existing Lawrence St. Subdivision as well as the Crab Apple Ct. cul-de-sac were considered in the analysis; however further contributions to the sanitary sewer further downstream are unknown. The existing municipal sanitary sewer along Gerber Road is a 200 mm diameter pipe that varies in slope from 0.54% to 0.3% up to David Street. Thereafter, the municipal sanitary sewer is increases to a 250 mm diameter pipe at a 0.29% slope further east on Gerber Road. Therefore, the limiting capacity in the Gerber Road 200 mm municipal sanitary sewer at a 0.3% slope is 19.32 L/s.

Phase 1 of the development, subject to this Draft Plan Application, can be accommodated by the existing downstream infrastructure.

Phase 2 of the development results in total flows equal to the design capacity of the 200 mm pipe at 0.3% (99.9% of capacity). It should be noted that the Phase 2 lands were considered as having a density of 55 ppl/ha; whereby the target density for Phase 1 is 45 ppl/ha. If a phase 2 density of 45 ppl/ha is considered, the 200mm pipe at 0.3% would have a peak flow of 96% of its capacity. Therefore, at the

time of Draft Plan of Subdivision Approval for the future Phase 2 lands, the proposed subdivision density should be reviewed in order to appropriately identify any required municipal upgrades.

3.2 WASTE WATER TREATMENT PLANT CAPACITY

The available capacity of the Wastewater Treatment Plant located east of Nafziger Road has been determined to be able to accommodate an additional 806 persons. There is adequate capacity for the completion of Phase 1 that includes an estimated additional population of approximately 487 persons.

To accommodate the Phase 2 area, an additional population of approximately 356 people, as well as additional population from other developments within the Township of Wellesley should they occur, it is likely that upgrades to the Wastewater Treatment Plant will be required in the future. It should be noted that Appendix B of the 2023 WWMR port illustrates proposed WWTP upgrades (adding approximately 100 m^3/day of capacity) in years 2027 and 2032, which should coincide well with the approvals and development of the future Phase 2 area. The requirements for WWTP upgrades will need to be assessed at the time of Draft Plan of Subdivision for the Phase 2 area.

In addition, it is noted that at the time of writing this Report, the Region of Waterloo has commenced the Wellesley Water and Wastewater Master Plan Study and recently undertake the second of three public consultation meetings.

4 WATER DISTRIBUTION SYSTEM ANALYSIS

A water distribution analysis has been undertaken for the proposed subdivision based on the Draft Plan of Subdivision and the Preliminary Servicing and Grading Plans presented in the previous sections. The primary intent of the analysis is to determine appropriate sizes for the proposed watermains within the Subdivision that will adequately distribute projected domestic and fire flow demands, and to confirm if the required fire flow can be achieved through the proposed fire hydrants onsite under various domestic and fire demand scenarios recommended in the Ministry of the Environment Conservation and Parks (MECP) and Region of Waterloo Pressure and Distribution Guidelines.

The detailed analysis presented in the following sections covers both the current Phase 1 and future Phase 2 areas of the proposed subdivision. The water servicing strategy for the proposed development will include two connections to the existing 200 mm dia. watermain on Lawrence Street to provide a looped system, as shown on the General Servicing Plan No. C-100 included in **Appendix C**. These two connections will be provided as part of the Phase 1 development of the Subdivision.

4.1 METHODOLOGY

4.1.1 Model Development and Design Criteria

The water distribution analysis was performed using the Haestad Methods Hydraulic Modeling WaterCAD Software. The distribution network was created by assigning physical parameters to each node and pipe. The model was run under the various demand scenarios presented in **Table 1**, and each scenario was checked against the relevant guidelines for operating and residual pressures as well as fire flow availability. The parameters and criteria are outlined in the following sections.

Appendix E contains correspondence dated December 16, 2021, from the Region of Waterloo and the boundary conditions data they have provided from the Region's overall water model. The Region has provided data pertaining to node 'JCT_01084' which is located at one of the proposed connection points at Gerber Road and Lawrence Street. Hydraulic modeling results for this node under various demand scenarios were provided to establish the Hydraulic Grade Line (HGL) for the proposed analysis.

The water for the proposed distribution network within Strohvest Subdivision will be drawn from two connections on Lawrence Street as outlined in Section 4.1 above. From these connections, 200 mm dia. watermains will be extended within the proposed road ROW throughout the proposed Subdivision as shown on the General Servicing Plan No. C-100 included in **Appendix C**.

4.1.2 Region of Waterloo Municipal Design Guidelines

The *DGSSMS, 2024* is intended to provide a common regional and area-wide standardization for municipal water distribution and wastewater designs and installation. The general guidelines have been published to provide direction for water distribution system analysis and design, including:

1. Pressure, demand, and velocity criteria
2. Hydraulic modeling parameters (i.e., friction factors)
3. Hydrant spacing and location
4. Minimum watermain sizing criteria

This analysis conforms to the DGSSMS Guidelines.

4.1.3 Boundary Conditions

HGL information for the proposed Subdivision is based on the modeling results provided by the Region, included in **Appendix E**. The HGL's were obtained for the average day and maximum day as well as data pertaining to a range of fire flow scenarios. A reservoir was assigned the HGL determined from the Region's model for each demand scenario. Fire flows were derived from the fire flow analysis flow curve provided by the Region. **Table 1** provides a summary of the hydraulic grade lines used in the analysis:

Table 1: Hydraulic Grade Lines (Node JCT_01084) for Various Demand Scenarios

Demand Scenario	Hydraulic Grade Line (m)
Average Day	425.06
Maximum Day	422.07
Minimum Hour	425.45
Peak Hour	417.84
Max Day + 70 L/S Fire	388.07
*HGL interpolated from the fire flow analysis data provided by the Region of Waterloo	

Based on the fire flow analysis results provided by the Region, the maximum fire flow availability at Node 'JCT_01084' is limited to 78.3 L/s during the maximum day scenario while maintaining a minimum design pressure of 140 kPa (20 psi) at all nodes within the pressure zone.

4.1.4 Peaking Factors

The peaking factors used in the model are based on the Region's DGSSMS document and *Table 3-1* of the *2008 MOE Design Guidelines for Drinking-Water Systems*, as outlined in **Table 2**.

Table 2: Peaking Factors for Various Design Scenarios

Demand Scenario	Factor
Average Day	1.00
Maximum Day	2.00
Peak Hour	3.00
Minimum Hour	0.50

4.1.5 Domestic Water System Demands

Population projections were used in conjunction with per capita rates and demand factors to calculate future water demands for the proposed development. A residential per capita rate of 225 L/cap/day was used based on the Region of Waterloo Water Supply and Distribution Optimization Master Plan, May 2015. Using the Draft Plan concept and population estimates, a water demand allocation was completed by assigning future demand from contributory areas to each applicable node. Please refer to **Appendix E** for detailed water demand calculations.

4.1.6 Fire Flow Requirements

According to the DGSSMS, 2024, the fire flow requirements for the proposed development shall be determined in accordance with the current issue of the Water Supply for Public Fire Protection, Fire Underwriter's Survey (FUS). The FUS manual outlines the following criteria for the fire flow requirements:

- Modern semi and detached homes >3 m separation – 4,000 L/min (67 L/S)
- Modern semi and detached homes <3 m separation – 6,000 L/min (100 L/S)
- High density, contiguous multi-block homes – 8,000 L/min (133 L/S)

Assuming a worst-case scenario where the majority of the proposed residences may be within a 3 m separation of each other, the larger 100 L/S fire flow is generally used in the modeling of semi and single detached residential areas. The multi-residential blocks (i.e., townhouses) are generally modeled using the 133 L/S fire flow demand. That said, for rural communities like Wellesley, the fire flow available is generally less than that available in urban centres.

As noted in Section 4.1.6 above, the maximum fire flow availability at the proposed connection point is limited to 78.3 L/s as per the data provided by the Region. Accordingly, the proposed development has been modeled using a lower fire flow requirement of 70 L/s. The Township, the Region and the local Fire Department must review the proposed fire flow requirement criteria and confirm their acceptance or advise of any concerns. It is noted that as part of the first Draft Plan submission, both the Region was accepting of the proposed fire flow requirement of 70 L/s. Please see the email correspondence from April 18, 2023 between Stantec and the Region of Waterloo included in **Appendix E**.

4.1.7 Pressure Requirements

The Region of Waterloo Pressure Guidelines are to be maintained for all demand scenarios and are consistent with the MECP requirements. The guidelines are shown in **Table 3** below.

Table 3: Region of Waterloo Pressure Requirements

	Pressure Guidelines (kPa)	
	Min.	**Max.**
Average Day	350	550
Maximum Day	350	550
Peak Hour	275	700
Minimum Hour	275	700
Max. Day + Fire	140	700

The Region requires the use of individual pressure-reducing valves (PRV) on each water service where pressures exceed 550 kPa (80 psi) under any demand scenario.

4.1.8 Velocity Requirements

The Region and the MECP recommend that velocities throughout the distribution system not exceed a maximum of 5 m/s for non-regional watermains and 1.5 m/s for regional watermains during any demand scenario. Areas of concern are typically at long cul-de-sacs or dead-end stubs of smaller dia. (150 mm dia.). Large fire flow loads may cause the velocity in these mains to exceed 5 m/s.

4.1.9 Friction Factor

The following Hazen-Williams C-factors are commonly used to estimate frictional losses through the distribution system based on material type, as outlined in **Table 4**. All pipes were assumed to be PVC and a C value of 150 was applied.

Table 4: Hazen-Williams C-Factors

Pipe Material	C
Polyvinyl Chloride (PVC)	150
Ductile Iron (D.I.)	130
Concrete Pressure Pipe (CPP)	140
High-Density Polyethylene (HDPE)	140

4.2 RESULTS

As indicated earlier in Section 4.1.1 and shown schematically on the proposed water distribution network included in **Appendix E**, the subdivision pipe sizes were assumed at 200 mm dia. connecting to the existing 200 mm dia. watermain on Lawrence Street at two locations to provide a looped system. The water model was run according to the boundary conditions, design criteria and water demands outlined in the previous sections. A series of tables summarizing the output results of the WaterCAD analysis are also included in **Appendix E**.

Table 5 and **Table 6** present a summary of the modeling results at select nodes within the development.

Table 5: Modeling Results - Fire Flow

	Node	Node Elevation (m)	Required Fire Flow (L/S)	Available Fire Flow (L/S)	Required System Pressure (kPa)	Fire Node Pressure (kPa)	Residual System Pressure (kPa)
Two Connections to Existing Watermains on Lawrence Street	J-4	358.70	70	75	140	184	140
	J-8	361.90	70	75	140	157	140
	J-12	363.80	70	71	140	140	178

Note: Representative nodes shown in **Table 5**. See **Appendix E** for remaining nodes and all pipe results.

Table 6: Modeling Results - Pressures

	Node	Node Elevation (m)	Pressure (kPa)			
			Average Day Demand	Maximum Day Demand	Peak Hour Demand	Minimum Hour Demand
Two Connections to Existing Watermains on Lawrence Street	J-4	358.70	649	620	579	653
	J-8	361.90	618	589	547	622
	J-12	363.80	600	570	529	603

Note: Representative nodes shown in **Table 6**. See **Appendix E** for remaining nodes and all pipe results.

Based on the results shown in **Table 5** and **Appendix E**, a fire flow of 70 L/s can be provided at each node within the Phase 1 and Phase 2 with the MECP minimum system pressure of 140 kPa (20 psi) as per the DGSSMS

The Region of Waterloo requires the use of individual PRVs on each water service where pressures exceed 550 kPa (80 psi) under any demand scenario. **Table 6** provides a summary of pressures during normal operating conditions at select nodes within the Development. Based on the results shown in **Table 6** and **Appendix E**, individual PRVs will be required throughout the subject Subdivision.

The Region of Waterloo recommends maintaining the velocity in watermains below 5 m/s, where possible, to prevent transient pressures from damaging the pipe system. The watermain configuration for the proposed development can deliver the required fire flow to the onsite hydrants while maintaining velocities of less than 5 m/s.

4.3 WATER DISTRIBUTION SYSTEM ANALYSIS SUMMARY

From the above analysis, the main findings can be summarized as follows:

1. The proposed water distribution network will consist of two connections to the existing 200 mm dia. watermain on Lawrence Street. From these connections, 200 mm dia. watermains will be extended throughout the subject Subdivision to form a looped system.

2. Based on the boundary conditions data provided by the Region, the maximum fire flow availability at the proposed connection on Lawrence Street at Gerber Road is limited to 78.3 L/s during the maximum day scenario while maintaining a minimum design pressure of 140 kPa (20 psi) at all nodes within the pressure zone. Therefore, the proposed development has been modeled using a lower fire flow requirement of 70 L/s which is lower than the FUS recommended fire flow requirements of 100 L/s for semi and single detached areas, and 133 L/s for townhouse development areas. The Township and the Region must review and confirm their acceptance or advise of any concerns.

3. Velocities in all watermains are less than 5 m/s under all design scenarios, particularly under fire flow conditions.

4. Individual PRVs will be required within the proposed development.

5 STORM SERVICING

The proposed storm sewer system has been designed to convey all minor storm events (up to the 5-year design storm), as per the Region of Waterloo and Area Municipalities DGSSMS, last revised February 2024. Catchbasins and catchbasin manholes have been located at a maximum spacing of 90 m and on the upstream sides of all intersections. Runoff will be directed to these structures within the rights-of-way and routed to the SWMF, further described in Section 6.0, via PVC and reinforced concrete storm sewers ranging in diameter from 300 mm to 1050 mm. In general, a minimum of 1.5 m cover has been achieved for the storm services; however, there are some deficient areas near the pond inlet that may require insulation. Please see **Appendix D** for storm sewer design sheets.

The conveyance system for major flow events (greater than the 5-year design storm) will be split between the storm sewer system and a major overland flow route that is contained within the street rights-of-way and directed to the SWMF via Street “A”.

Each lot will be serviced with a 150 mm storm service lateral 1 m inside the property line. These storm service laterals will be used to connect each building’s sump pump via a riser and gooseneck connection above grade by the home builder. This detail shall form part of the Building Permit and is presented here for information only.

6 PRELIMINARY STORMWATER MANAGEMENT

The Preliminary Stormwater Management (PSWM) Report has been completed in support of a Draft Plan of Subdivision for the proposed Strohvest Subdivision, Wellesley, Ontario. This section discusses the PSWM strategy for the site that has been developed in order to mitigate potential impacts of the proposed development within the development and on adjacent private lands and water features.

6.1 STUDY APPROACH

A PSWM strategy for the site has been developed in order to mitigate against potential offsite water quality and quantity impacts associated with the Development of the subject lands.

The SWM design involved the following study components:

- Complete a hydrologic study to determine the existing site conditions with respect to topography, soils information, and existing land uses.
- Prepare an existing and proposed development condition hydrologic model using Visual OTTHYMO Version 6.2 (VO6) to determine runoff volumes and peak flow rates to downstream areas.
- Complete the preliminary design of the SWMF to provide sufficient water quality and water quantity control to achieve target rates to downstream receivers.
- Coordinate with the Drainage Engineer (K. Smart Associates) regarding the concurrent design of the Paff Drain Improvements to ensure the subdivision design accommodates upstream drainage, the connection into future drain is designed properly, and flow rates from the site are accounted for in the future Paff Drain.
- Develop an Erosion and Sedimentation Control Strategy.
- Summarize the Study through preliminary design and recommendations.

6.2 BACKGROUND

The following reports and primary guidance documents were referenced in the completion of the proposed PSWM design:

1. Geotechnical Memo: Submission of Revised Draft Plan/ZBA - Basement Construction, Stantec Consulting Ltd., May 2024
2. Hydrogeological Assessment, Strohvest Subdivision, Township of Wellesley, Ontario, Stantec Consulting Ltd., June 2024.
3. Final Geotechnical Investigation Report for Proposed Subdivision Development, Stroh Lands, Gerber Road, Wellesley, Ontario, Stantec Consulting Ltd., August 6, 2021

4. Erosion and Sediment Control Guide for Urban Construction, Toronto and Region Conservation Authority, 2019

5. Strohvest Ontario Inc. – Village of Wellesley Preliminary Servicing Feasibility in Support of Urban Area Expansion, Stantec Consulting Ltd., May 2017

6. Township of Wellesley Official Plan, Township of Wellesley, Ontario, 2013

7. Stormwater Management Planning and Design (SWMPD) Manual, Ministry of the Environment, Conservation and Parks (MECP), March 2003

8. The Paff Drainage Works Report, Gamsby and Mannerow Consulting Professional Engineers, October 26, 1967.

6.3 STORMWATER MANAGEMENT DESIGN CRITERIA

The SWM criteria for the subject lands were established through the above-mentioned documentation and pre-consultation with the Grand River Conservation Authority (GRCA) and the Township of Wellesley. The SWM criteria are as follows:

- **Water Quality** – Provide sufficient permanent pool and extended detention volume to meet the MECP *Enhanced* (80% Total Suspended Solids [TSS] Removal) criteria and promote the at-source removal of potential contaminants.
- **Water Quantity** – Provide sufficient water quantity control to maintain post-development peak flow rates to pre-development levels for all storms up to and including the 100-year storm event.
- **Infiltration and Water Balance** – Promote infiltration measures where possible and provide best efforts to match pre-development infiltration rates.
- **Erosion Control** – Provide sufficient extended detention for the 25 mm storm event with a minimum 24-hour drawdown period.
- **Erosion and Sediment Control** – Provide appropriate erosion and sediment control during construction/area grading to protect adjacent properties from potential siltation.

6.4 EXISTING CONDITIONS

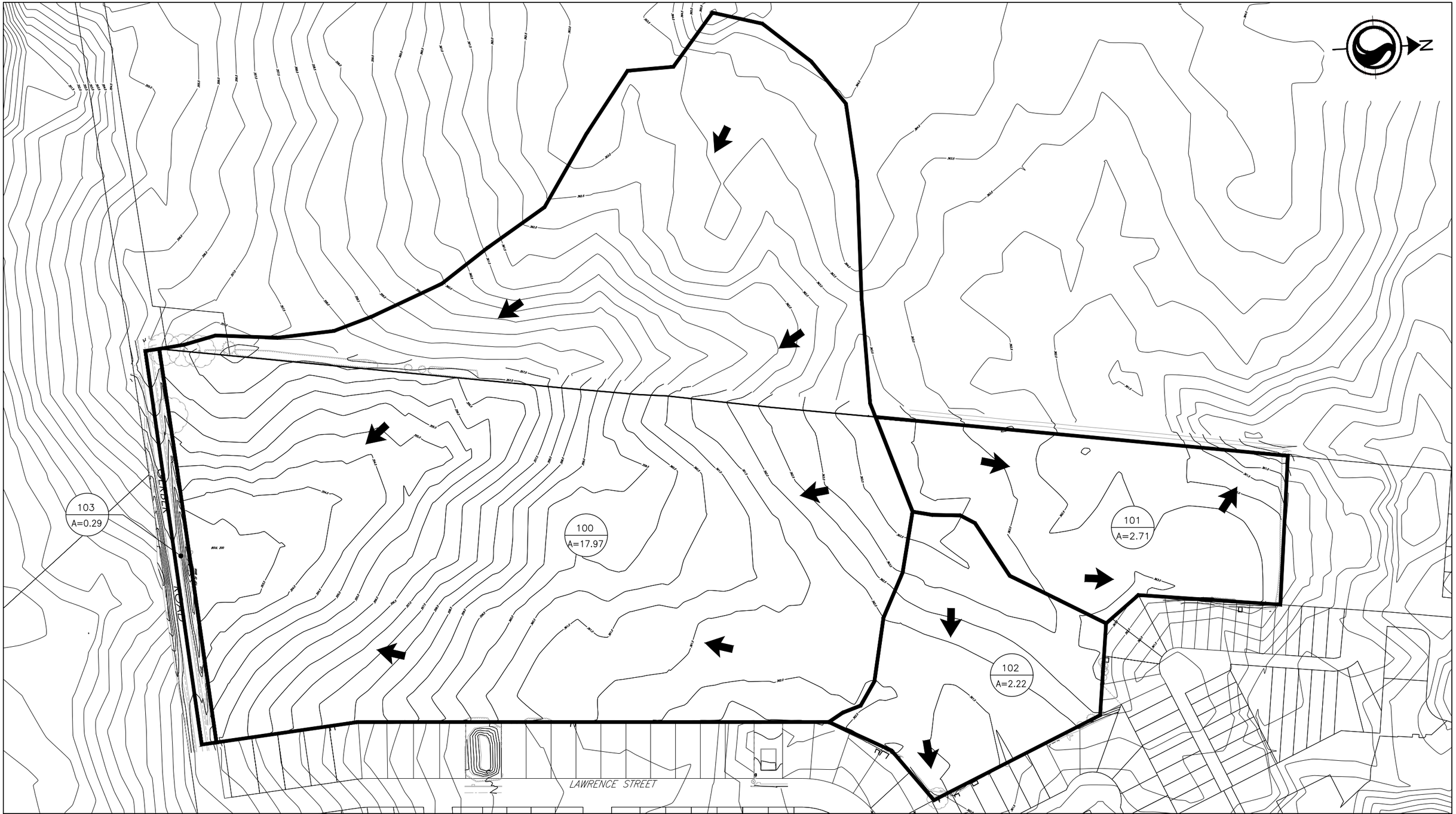
6.4.1 Topography and Surface Drainage

As noted in the *Geotechnical Memo Re: Submission of Revised Draft Plan/ZBA - Basement Construction (*Stantec, June 2024), the site topography can be described as gently rolling hills. Based on topography mapping, the ground surface is highest in the northern portion of the subject site near elevation 363.5 m above mean sea level (AMSL) and slopes down toward Gerber Road in the south near elevation 353.5 m AMSL. Thus, the overall grade change is about 10 m.

The majority of the Site drains south, overland, towards an existing 1200 mm dia. corrugated steel pipe (CSP) culvert that crosses Gerber Road ultimately discharging to the Nith River. An external area to the west of the Site also contributes to the Gerber Road culvert, with overland and subsurface flows directed through the subject site. The remainder of the Site drains overland to the north towards Queens Bush Road or east to a rear yard catchbasin at the back of the lots along Zinkann Crescent.

The catchment area to Gerber Road from the site and external area to the west is part of the Paff Drain watershed, which is an existing, subsurface Municipal Drain that crosses through the site. This drain was constructed in 1967 and initiates on the external property to the west of the site as a 150 mm concrete field tile and enters the subject property at approximately the topographic low point in the southwest portion of the Site. It transitions to a 200 mm field tile partway through the subject site, continuing south under Gerber Road. This subsurface drain increases to a 300 mm steel field tile further downstream and eventually outlets to the Nith River. The original plan and profile drawing for the existing Paff Drain has been included in **Appendix F**. There is a catchbasin located on the south side of Gerber Road, just downstream of the 1200 mm diameter CSP culvert, that is assumed to connect into the Paff Drain. Further discussion on the Paff Drain is included in subsequent sections.

Existing conditions drainage information is presented on Figure 3, Existing Drainage Area Plan.



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Notes

100 / A=1.57 CATCHMENT ID / CONTRIBUTING AREA (ha)

MAJOR OVERLAND FLOOD ROUTE

PROPOSED DRAINAGE BOUNDARY

Scale

1:2500 0 25 75 125m

Client/Project

STROHVEST ONTARIO INC.
WELLESLEY PROPERTY

GERBER ROAD, WELLESLEY
TOWNSHIP OF WELLESLEY, ON

Project No.
161413217

Title

EXISTING DRAINAGE AREA PLAN

Revision

Date
2024.06.12

Reference Sheet

Figure No.
3

6.4.2 Hydrogeological and Geotechnical Information

As identified in the *Geotechnical Memo Re: Submission of Revised Draft Plan/ZBA - Basement Construction (*Stantec, June 2024), the subsurface soils for the Site are predominantly comprised of clayey and sandy glacial tills. The sandy glacial tills are underlain by clayey glacial tills, which are exposed on the ground surface in the southern half of the Site (Phase 1 Lands).

Based on the available bedrock geology map and data of the area, the limestone bedrock of the Bois Blanc Formation is encountered at between elevations of 295 m AMSL and 307 m AMSL beneath the Site.

Based on results presented in the *Stantec 2024 Hydrogeological Assessment R*eport, groundwater levels across the Site fluctuated from just below ground surface to 4.8 m BGS (elevations ranging from 353.1 m to 361.7 m AMSL) over the monitoring period (i.e., June 2021 to June 2024), with the subsurface deposits having estimated infiltration rates ranging from 6 mm/hour to 42 mm/hour. The period where the groundwater table is positioned at its highest point throughout the Site typically occurs from the early to mid-fall (i.e., September / October) and into the late spring (i.e., May), where groundwater is encountered at just below ground surface to 0.5 m BGS.

6.5 STORMWATER MANAGEMENT DESIGN

6.5.1 Hydrologic Modelling

A hydrologic model was prepared using Visual OTTHYMO Version 6.2 (VO6) to simulate drainage conditions for the subject development under existing and proposed development conditions. The model was employed to predict flows and design SWM systems to ensure the criteria are achieved.

In the absence of Intensity-Duration-Frequency (IDF) parameters for Township of Wellesley, City of Kitchener's IDF parameters were used. Model results were obtained for the existing and proposed conditions for the following events:

- The 25 mm, 4-hour Chicago Storm derived using the parameters as provided in Table 7
- The 2-, 5-, 25-, 50-, and 100-year, 3-hour Chicago distributions derived using the parameters provided in Table 7.
- The 48-hour Regional Rainfall Event (i.e., Hurricane Hazel)

Table 7: Rainfall Events - City of Kitchener IDF Parameters

Return Period	IDF Parameters			
	A	B	C	Depth (mm)
25 mm, 4-hr	508.5	6	0.7989	25.0
2-year, 3-hr	743	6	0.7989	34.3
5-year, 3-hr	1593	11	0.8789	47.2
25-year, 3-hr	3158	15	0.9355	68.1
50-year, 3-hr	3886	16	0.9495	77.2
100-year, 3-hr	4688	17	0.9624	87.3
Hurricane Hazel	-	-	-	285

6.5.2 Existing Conditions Hydrologic Model

An existing conditions hydrologic model was prepared to simulate existing conditions for the Site. Input and output files for the Visual OTTHYMO Version 6.2 (VO6) model are provided in **Appendix F.** SCS Curve Numbers and catchment parameters were calculated for each existing catchment based on land use and soil type and are also provided in **Appendix F**.

Delineation of existing drainage catchments is provided on Figure 3, Existing Drainage Area Plan, and is summarized below:

- Catchment 100: 17.97 ha of agricultural area including the southern portion of the Site and the external agricultural area to the west of the site draining south towards Gerber Road
- Catchment 101: 2.71 ha of agricultural area in the northern portion of the Site draining north
- Catchment 102: 2.22 ha of agricultural area in the north-eastern portion of the site draining east to an existing rear yard catchbasin behind the properties fronting Zinkann Crescent
- Catchment 103: 0.29 ha including north side of Gerber Road and North Ditch of Gerber Road draining to an existing culvert crossing the Road

6.5.3 Proposed Conditions Hydrologic Model

The proposed development incorporates a mixed residential development consisting of single-detached and semi-detached lots, 10 townhouse blocks (able to support up to 54 townhouse units), one townhouse or apartment block (able to support up to 24 units), neighborhood and linear park blocks, and a single SWMF. Please see the Draft Plan within Appendix A.

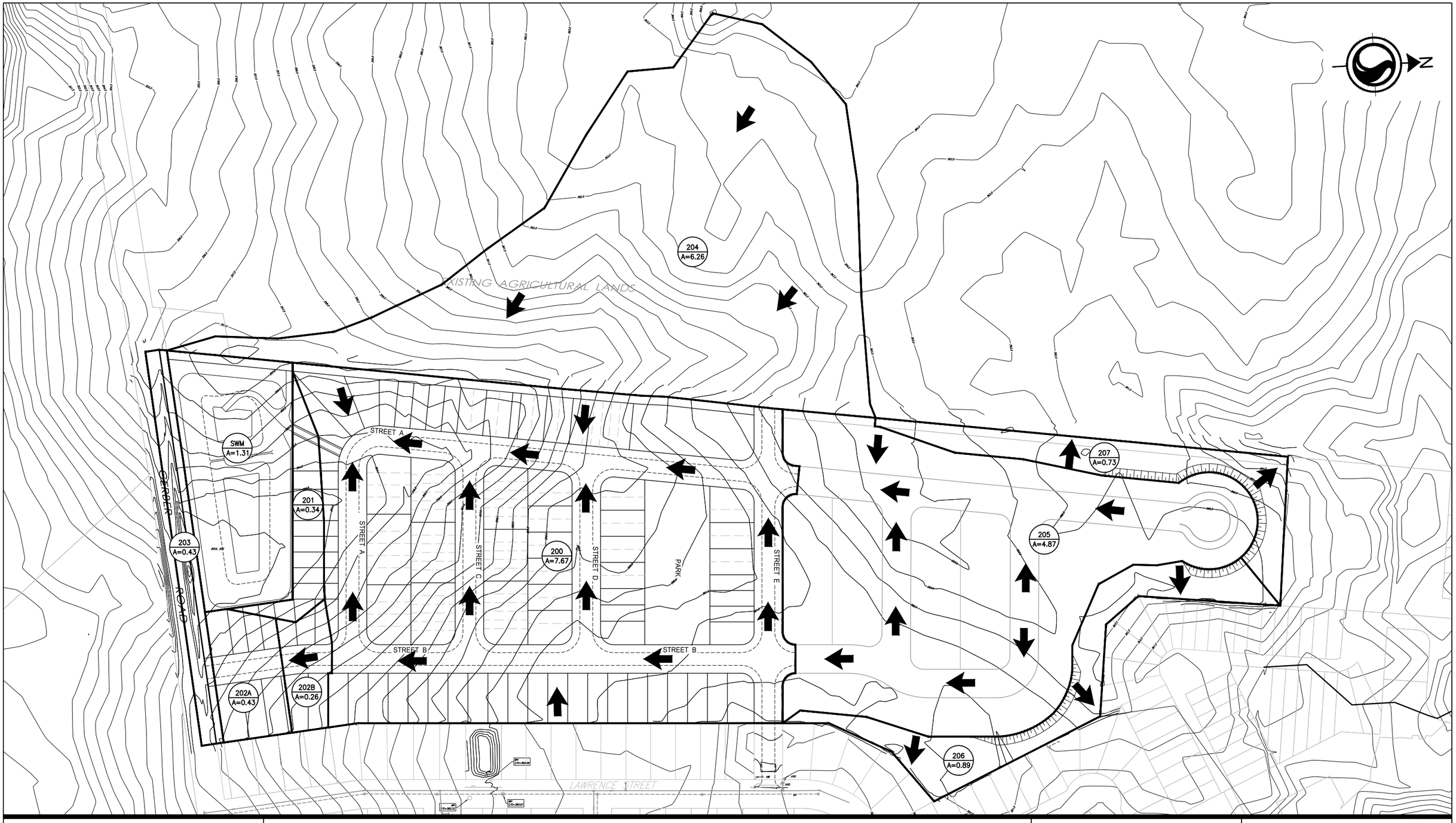
The proposed SWMF will be located in the southern portion of the site along Gerber Road and discharge to the Paff Drain through a future subsurface connection. Further discussion on the Paff Drain and outlet is presented in more detail in subsequent sections.

The SWMF is proposed to provide water quality and quantity control for the entire proposed Strohvest Lands Draft Plan of Subdivision (Phase 1), the additional Strohvest lands to the north (which will comprise a future Phase 2 subdivision proposal), and the predevelopment condition of the external agricultural lands to the west. The northern portion of the Strohvest site, not included in the current Draft Plan, has been assumed to have similar land use to the southern portion for sizing of the SWMF (i.e., a mix of residential lot and housing types within the proposed Draft Plan of Subdivision). Due to grading and servicing constraints, minor and major flows from 0.43 ha of the proposed development (Catchment 202A) and additional major flows from 0.26 ha of the proposed development (Catchment 202B) drain south towards Gerber Road, bypassing the SWMF, flowing to the Gerber Road ROW ditch, and ultimately contributing to the future Paff Drain. These areas consist of residential lots and the Site entrance. Flows from small portions of the future development lands to the north (Phase 2), mainly including rear yards and rooftop areas, drain uncontrolled towards the north and east overland via sheet flow, matching the existing drainage pattern.

SCS Curve Numbers were calculated for each of the proposed catchments based on land use and soil type and are provided in **Appendix F**. All input and output files are also provided in **Appendix F**. The delineation of the proposed drainage catchments is provided on **Figure 4**, Proposed Drainage Area Plan, and is summarized as follows:

- Catchment 200: 7.67 ha of the proposed residential development draining to the proposed onsite SWMF.
- Catchment 201: 0.34 ha of the proposed residential development draining to the SWMF (mostly rear yards and rooftops).
- Catchment 202A: 0.43 ha of the proposed residential development with both minor and major flows draining south, uncontrolled, to the north ditch of Gerber Road.
- Catchment 202B: 0.26 ha of the proposed residential development with minor flows contributing to the proposed onsite SWMF and major flows draining overland, uncontrolled, to the north ditch of Gerber Road, similar to Catchment 202A.
- Catchment 203: 0.43 ha including north side of Gerber Road and North Ditch of Gerber Road contributing to the future Paff Drain
- Catchment 204: 6.26 ha of external agricultural land draining to the subject site via sheet flow and an existing subsurface tile to a proposed rear-yard catchbasin, subsequently contributing to the SWMF via an independent pipe network along the linear park block. This pipe network will be designed to convey the 1 in 100-year storm event to the SWMF.

- Catchment 205: 4.87 ha of the future residential development draining to the proposed SWMF.
- Catchment 206: 0.89 ha of the future residential development draining, uncontrolled, towards east (mostly rear yards and rooftops)
- Catchment 207: 0.73 ha of the future residential development draining, uncontrolled, towards north and northwest (mostly rear yards and rooftops)
- Catchment SWM: 1.31 ha SWMF Block.



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Notes

200 / A=7.68 — CATCHMENT ID / CONTRIBUTING AREA (ha)

MAJOR OVERLAND FLOOD ROUTE

PROPOSED DRAINAGE BOUNDARY

Scale

1:2500

0 25 75 125m

Client/Project

STROHVEST ONTARIO INC.
WELLESLEY PROPERTY

GERBER ROAD, WELLESLEY
TOWNSHIP OF WELLESLEY, ON

Project No.
161413217

Title

PROPOSED DRAINAGE AREA PLAN

Revision

Date
2024.05.27

Reference Sheet

Figure No.
4

6.5.4 Proposed SWM Strategy

The proposed SWM strategy for the Strohvest Lands Subdivision incorporates minor system conveyance via storm sewer networks to the proposed SWMF for water quality and quantity control while major storm runoff is conveyed via overland flow through the rights-of-way. The SWM strategy has been developed in accordance with the objectives and criteria previously listed.

6.5.4.1 STORMWATER MANAGEMENT FACILITY DESIGN

Runoff from the majority of the proposed development will drain to the proposed wet pond SWMF located immediately north of Gerber Road on the southwest portion of the site. The proposed SWMF is designed to provide water quantity and quality control for 20.71 ha of land including 14.45 ha of proposed/future development of the Strohvest Ontario Inc. lands as well as 6.26 ha of external agricultural land. As outlined in the preliminary criteria, the SWMF is required to provide 'Enhanced' water quality treatment prior to discharging downstream.

The preliminary design of the SWMF has maximum ponding elevations of 353.34 m above sea level (ASL) and 354.10 m ASL during the 100-year and Regional Storm events, respectively. This leads to a depth of 1.24 m above permanent pool during the 100-year storm event and a depth of 2.00 m during the Regional Storm event. The freeboard to the emergency weir for 100-year and Regional Storm events is 1.36 m and 0.60 m, respectively, with an additional 0.3 m freeboard to the top of the pond. Although the Regional Storm event ponds to an active depth equal to 2 m, the 100-year active depth is still below the 2 m MECP target. A 1.5 m deep forebay has been included in the design to provide for the centralized collection of sediment for ease of removal. The forebay sediment storage capacity is 332 m^3 at a maximum depth of 0.5 m, providing an expected cleanout frequency of approximately once every 17 years. The designed forebay area is approximately equal to the MECP target of 33% (approximately 33.7%) of the total permanent pool area. The MECP volume requirement for quality control, based on an enhanced level of treatment, is 3,352 m^3. Subtracting the 40 m^3/ha (828 m^3) of extended detention volume included in this volume leads to required permanent pool volume of 2,524 m^3 for enhanced treatment.

The preliminary design provides 4,357 m^3 of permanent pool within the forebay and main cell areas (excluding sediment storage), meaning an enhanced level of water quality treatment is achieved. In addition to the permanent pool characteristics, the SWMF will provide sufficient extended detention storage to achieve a 41-hour drawdown of the 25 mm event and 25-hour drawdown of the extended detention volume. Design characteristics for the proposed SWMF are summarized in **Table 8**, with design calculations provided in **Appendix F**.

The forebay length required to provide appropriate dispersion and settling length for the 5-year inlet flow is 44.4 m and the length provided is approximately 50 m. Detailed design calculations are provided in **Appendix F**.

The SWMF is proposed to be drained by a multi-stage outlet consisting of an inverted pipe, ditch inlet catchbasin (DICB), and emergency overflow weir. Low flows will discharge through the inverted pipe that will provide temperature mitigation by drawing the cooler water near the bottom of the wet pond. A manhole is proposed downstream of the inverted pipe containing an orifice plate to provide extended detention and

control the smaller storm events while the outlet pipe from the DICB contains a second orifice control for larger storm events. The trapezoidal emergency overflow spillway conveys flows only during the emergency circumstance of blockage of the remaining outlet structures. Details on the outlet structure sizes and elevations are summarized in **Table 8** below and the detailed stage-storage-discharge analysis for the proposed SWMF is provided in **Appendix F**. Additionally, a detailed drawing of the SWMF is included on Drawing C-800 (**Appendix C**).

Table 8: SWMF Design Characteristics

Parameter	Basin Characteristics
Total Contributing Area (quality and quantity)	20.71 ha
Total Percent Impervious to SWMF (includes external agricultural area – developed area contributing to the SWMF is 14.45 ha at 63% IMP)	44%
Quality Control:	
Unit Area Storage Requirement - Enhanced Treatment	162 m^3
Total Volume Required- Enhanced Treatment	3,352 m^3
Permanent Pool Volume Required - Enhanced Treatment	2,524 m^3
Permanent Pool Volume Provided	4,357 m^3
Permanent Pool Depth in Main Cell	1.5 m
Permanent Pool Depth in Forebay	1.5 m
MECP Extended Detention Volume Required (40 m^3/ha)	828 m^3
4-hour, 25 mm Chicago Event Extended Detention Drawdown Time	41.45 hrs.
Forebay Parameters:	
Required Forebay Settling Length	10.8 m
Required Forebay Dispersion Length	44.4 m
Sediment Storage Volume Provided	332 m^3
Cleanout Frequency	17.1 Years
Outlet Structure Details:	
Orifice #1 Invert/Dia.	352.10 m / 150 mm
Orifice #2 Invert/Dia. (within DICB)	351.80 m / 650 mm
Overflow Weir Crest Invert/ Length/ Side Slopes (H:V)	354.70 m / 20 m / 10:1

Target peak flow rates as well as peak flow rates for proposed conditions are summarized in Table 9 below while detailed modelling files are included in **Appendix F**. As observed in the table below, water quantity targets have been met as the post-development peak flow rates from the SWMF and the areas discharging uncontrolled, towards south, bypassing the SWMF, are at or below target levels.

Table 9: SWMF Operating Characteristics

Storm Event	25 mm	2year	5year	25year	50year	100year	Regional
Existing Flows from Site and External Agricultural Areas Towards Gerber Road (m^3/s)	0.101	0.238	0.495	1.000	1.251	1.514	2.002
Total Existing Flows at Gerber Road ROW (including flows from Gerber Road) (m^3/s)	**0.104**	**0.244**	**0.504**	**1.015**	**1.268**	**1.531**	**2.033**
Proposed Flows to pond (m^3/s)	1.321	2.042	2.776	4.663	5.450	6.247	2.750
Proposed Flows from pond (m^3/s)	0.027	0.056	0.329	0.886	0.952	1.021	1.304
Total Proposed Flows at Gerber Road ROW (including flows from Gerber Road) (m^3/s)	**0.046**	**0.076**	**0.344**	**0.952**	**1.029**	**1.097**	**1.384**
Maximum Storage Volume (m^3)	1,967	3,139	3,899	5,109	6,036	7,114	13,058
Maximum Ponding Depth (m)	0.40	0.61	0.74	0.94	1.08	1.24	2.00
Maximum Ponding Elevation (m)	352.50	352.71	352.84	353.04	353.18	353.34	354.10
Drawdown Time (hours)	41.4	51.6	53.0	53.6	53.9	54.2	55.6

Peak flow rates from site towards north and east, for existing and proposed conditions, are summarized in Table 10 below while detailed modelling files are included in **Appendix F**. As observed in the table below, post-development peak flow rates towards north and east are at or below pre-development peak flow rates, therefore water quantity targets are met.

Table 10: Existing and Proposed Flow Rates Towards North and East

Storm Event	25 mm	2year	5year	25year	50year	100year	Regional
Existing Flows to the north (m^3/s)	0.015	0.037	0.079	0.163	0.206	0.251	0.314
Proposed Flows to the north (m^3/s)	0.011	0.027	0.056	0.119	0.149	0.184	0.096
Existing Flows to the east (m^3/s)	0.014	0.033	0.072	0.149	0.188	0.230	0.267
Proposed Flows to the east (m^3/s)	0.014	0.033	0.068	0.145	0.182	0.224	0.117

6.5.5 Additional Design Considerations

6.5.5.1 INFILTRATION

The geotechnical work performed by Stantec identifies a predominant soil of glacial tills across the site with smaller areas of sands and silts. The conclusion of the *Final Geotechnical Investigation Report* (Stantec, 2021) is that the native soils can be used for the post-development infiltration of stormwater; however, due to the high silt content, lower infiltration rates should be expected. As presented in the *Stantec 2024*

Hydrogeological Assessment report, infiltration rates ranging from 6 mm/hour to 42 mm/hour are estimated for the sandy silt, silt, silty clay, and clay tills that predominantly characterize the Site subsurface.

Due to the high groundwater levels, lot level infiltration galleries may not be feasible throughout much of the Site; however, such measures should be implemented where possible to promote a water balance. Infiltration galleries will be located and designed at the detailed design stage where grading, native soils, and groundwater elevations permit. For any areas that can accommodate lot-level infiltration, the infiltration galleries will be sized to retain runoff from the 25 mm event. Rooftop areas in the townhome blocks will be directed to lot-level or centralized infiltration galleries within the Block. All infiltration galleries are to be oversized by 15% to account for downspout disconnections and decreased performance over time. End-of-pipe infiltration is likely not possible due to high groundwater conditions in the area of the SWMF.

As stated above, further investigation/analysis will be necessary at the detailed design and site plan stages to confirm infiltration rates and depth to high groundwater levels at the base of any proposed infiltration trenches.

6.5.5.2 WATER BALANCE

A water balance analysis completed as part of the current work determined that the development of the lands to a residential land use with an impervious coverage of 60% would result in significant impacts on the volume of water that is recharged to the groundwater system, if only “passive” infiltration through the remaining pervious surfaces were considered. The water balance analysis, included within **Appendix F**, indicates that the estimated pre-development infiltration of 204 mm/year would see a 60% reduction to 82 mm/year, if “active” infiltration measures are not implemented. This leads to a recharge deficit of 122 mm/year compared to pre-development conditions.

As stated in Section 6.5.5.1, it is recommended that rooftop runoff from the 25 mm event be captured and infiltrated where soil conditions and groundwater levels will allow. This could result in a 76 mm/year increase in groundwater recharge over the “passive” post-development scenario. Thus, infiltrating rooftop runoff would reduce the recharge deficit from 122 mm/year under the “passive” post-development scenario to 46 mm/year, compared to pre-development conditions.

Based on the water balance calculations included in **Appendix F**, the runoff surplus as a result of the development, under the ultimate post-development scenario, will be 410 mm/year, which will be attenuated in the proposed SWMF. This surplus may be reduced to 334 mm/year if rooftop infiltration galleries can be implemented throughout the Site.

As per preliminary results from the Hydrogeological Assessment (Stantec, 2024), high groundwater elevations are likely to inhibit implementation of rooftop infiltration galleries throughout large portions of the site, specifically in the southern half (Phase 1). The water balance and infiltration design will need to be revisited during detailed design to ensure best efforts are made to match pre-development infiltration levels while maintaining sufficient separation from groundwater. Ongoing groundwater monitoring will be used and incorporated into this future design.

6.5.5.3 SWMF LINER

As discussed in the *Geotechnical Investigation*, the soils within the proposed SWMF Block include sandy silts and clay tills with the high groundwater level measured to be within 0.3 m below the existing ground surface with the proposed bottom of wet pond below the existing ground elevation. Due to the shallow depths to groundwater and low permeability soils, no end-of-pipe infiltration is proposed at this stage. To improve the extended detention time in the facility and prevent untreated runoff from infiltrating, it is recommended at this stage to provide a liner within the facility. This pond liner may not be required where clay deposits are exposed at the pond bottom but would be needed otherwise due to the presence of non-cohesive silt seams, layers, and deposits. The design of the pond liner should be confirmed at the detailed design phase, prior to construction, through additional laboratory testing, inspection, and analysis by a Geotechnical Engineer.

6.5.5.4 SWMF OUTLET AND PAFF DRAIN IMPROVEMENTS

As previously discussed, the Paff Drain transects the proposed site, conveying field drainage through a subsurface drainage tile across Gerber Road, and subsequently to the Nith River. This system was installed in 1967 and is undersized based on current design standards. Under existing condition on the site, flows that exceed the capacity of the subsurface tile are conveyed through the surface 1200 mm diameter CSP culvert under Gerber Road, where they then flow into a catchbasin on the south side of the road that is connected to the Paff Drain. When the downstream Paff Drain is at capacity, flows will continue to flow overland through the agricultural field to the south.

K.Smart and Associates is currently undertaking the required Engineering Report to address the updated design for improvements to the Paff Drain as required under the Drainage Act. At the time of this report, a general plan for the Paff Drain improvements has been established, with further details to be coordinated through the design and consultation process as part of the Section 78 drain review under the Drainage Act. It is understood from the Township's Drainage Superintendent that the redesigned Paff Drain will be suitable to accommodate the anticipated storm flows, as projected through this PSWM strategy, and provide for a "legal outlet" as per the Drainage Act.

As part of the work, the Paff Drain is proposed to be abandoned upstream of Gerber Road (through the subject site) with the portion downstream of the site to be upgraded to the outlet (from the north side of Gerber Road to the Nith River). The upstream external lands to the west of the site will drain to a rear yard catchbasin that will convey subsurface (private tile) and surface flows to the proposed SWMF. The upgraded drain downstream of the site will allow for discharge of the proposed SWMF to the ultimate receiver of the Nith River without impacting the agricultural activities on the south side of Gerber Road caused by increased runoff volumes. It will also provide improved field drainage for the external contributing lands to the drain south of Gerber Road.

As the current preliminary design for the Strohvest Subdivision SWMF is occurring concurrently with the design of an upgraded Paff Drain, the details of the SWMF outlet structure will need to be confirmed and refined at future detailed design stages. Under the current design, all storm events will outlet from the SWMF through a single 750 mm outlet pipe that will connect into a future Ditch Inlet Catchbasin (DICB) on the north side of Gerber Road. This DICB will be the start of the future Paff Drain and collect subsurface drainage from the Strohvest SWMF as well as ditch drainage from the Gerber Road ROW. A new 1200 mm diameter pipe will then convey flow under Gerber Road to a DICB on the south side of Gerber Road, subsequently draining

through a smaller pipe down to the Nith River. Larger flows will therefore be conveyed through the new 1200 mm diameter pipe under Gerber Road and 'bubble' up through the south DICB when the downstream pipe capacity is exceeded, subsequently flowing overland towards the Nith River. Preliminary drawings of the Paff Drain improvements are presented in **Appendix F**.

Stantec will continue to work closely with the Township and drainage engineers from K. Smart to ensure the connection into the future Paff Drain from the Strohvest lands is designed correctly, the drain is designed to accommodate the anticipated flows from the SWMF, and all other requirements of the drainage engineer/Township are met. It is not anticipated that the Paff Drain improvements will change any other aspect of the SWMF design with the exception of the last pipe connection (i.e. the size of the SWMF and outlet structures within will remain as is).

6.5.5.5 OVERLAND FLOW ROUTES

Major overland flow depths were calculated at a few locations along the major flow routes using FlowMaster to ensure that the proposed major overland flow routes have enough capacity to convey major flows without causing flooding issues on private properties. As the proposed internal storm sewer system is sized to convey the 5-year storm event, major overland flow has been calculated by subtracting the 5-year flow from the 100-year peak flow rate for calculating major overland flow depths. Flows at the access road to the SWMF were prorated to calculate major overland flow depths at the critical locations along Street A.

Two major overland flow routes (i.e., Street A, running in north-south direction, and Street A, running in east-west direction) are proposed to drain towards the proposed SWMF, entering the facility through the proposed SWMF access path. The majority of the overland flows contributing to the SWMF are conveyed via the north-south run of Street A.

Major overland flow depths were calculated at the critical locations using typical cross-sections along north-south running Street A (Cross-section A-A), east-west running Street A (Cross-section B-B), and the access road (Cross-section C-C).

Table 11 summarizes the results of the major overland flow depth calculations while detailed modelling files are provided in **Appendix F**. The results of the modelling show that overland flow can be conveyed within the Street A ROW widths.

Table 11: Summary of Overland Flow Depth Calculations

Cross-section	Location	Contributing Area (ha)	Flow Rate (m3/s)	Major Overland Flow Depth (m)
A-A	Along Street A, Running North-South	6.56	1.563	0.17
B-B	Along Street A, Running East-West	4.66	1.110	0.15
C-C	Along SWMF Access Road	11.63	2.771	0.21

6.6 EROSION AND SEDIMENT CONTROL PLAN

The erosion and sediment control strategy has been developed and is to be implemented during the construction process, in order to minimize the potential for offsite discharge of sediment and the resultant negative environmental impacts. This plan will focus on the protection of the downstream areas.

6.6.1 Erosion Potential

The *Toronto and Region Conservation Authority's Erosion and Sediment Control Guide for Urban Construction (2019)* was used to determine the erosion potential of the site. The erosion potential is based on slope gradient, slope length, and soil texture and is then used to determine the appropriate erosion control methods, as follows:

- Site Slopes: Generally Gentle (< 2%) – average slope is approximately 1.9%
- Slope Lengths: Long (generally greater than 30 m)
- Erodibility Classification: High erodibility rate for loam and moderate erodibility rate for sandy-loam soils

Therefore, based on this classification, the site has moderate to high erosion potential.

6.6.2 Preliminary Erosion and Sedimentation Control Plan

The following approach to erosion and sediment control onsite has been prepared to minimize the potential impacts associated with onsite erosion and/or offsite transport of sediment to downstream areas.

Prior to any grading or servicing works commencing onsite, erosion and sedimentation control measures shall be implemented as detailed on the Pre-Grading, Erosion and Sedimentation Control Plans (prepared during detailed design). The erosion and sedimentation controls will include the following items:

- Steep slopes (>3:1) shall have erosion blankets.
- Light and/or heavy-duty silt fencing will be erected on all site boundaries where there is potential for runoff to be discharged offsite, to protect adjacent downstream lands from migration of sediment in overland flow. The location of this fencing will be adjacent to the limit of grading. Silt fence attached to paige wire fencing will be installed periodically throughout the site adjacent to sensitive areas. Silt fencing should be erected before grading begins to protect adjacent and downstream areas from migration of sediment in overland flow.
- Storm service outlets will be installed during servicing and roadworks construction to provide lot level dead and live storage.
- Erosion control berms/swales will be located in appropriate (critical) areas to divert flows to temporary sediment basins.
- A construction entrance feature ("mud-mat") will be provided at all site entrances to minimize the offsite transport of sediment via construction vehicles.

- Swales constructed onsite will have temporary rock check dams to help attenuate flows and encourage deposition of suspended sediment where appropriate.
- All disturbed areas where construction is not expected for 30 days shall be re-vegetated with 50 mm of topsoil and hydro-seeding according to OPSS 572.
- During construction, all catchbasins are to be sealed until roads are paved to prevent sediment deposition in the catchbasin's sumps and conveyance of silt to the SWMF.
- An Erosion Control Implementation Schedule will be included with the Detailed Erosion and Sedimentation Control Plan, prepared in conjunction with the pre-grading application and/or final engineering design.
- Following completion of construction, defined as 90% house construction, and site stabilization, all erosion and sediment control measures and accumulated sediment are to be removed.

The erosion control measures shall be maintained in good repair during the entire construction period and shall only be removed as contributing drainage areas are restored and stabilized. In addition, the condition of erosion control works, their overall performance, and any repairs, replacement or modifications to the installed item shall be noted in monitoring Reports submitted to the GRCA and the Township. Monitoring Reports should be submitted bi-monthly (quarterly during periods of inactivity or house construction) and should be based on inspection completed bi-weekly or after any significant rainfall events (>13 mm), whichever is more frequent.

6.6.3 Monitoring, Maintenance and Mitigation

Monitoring and maintenance activities are an important part of a SWM Plan to ensure that the designed features continue to operate as intended. A Monitoring Program should be established in consultation with the Region of Waterloo, Township of Wellesley, and the Ministry of Environment, Conservation and Parks and incorporated into the Final Stormwater Management Plan.

7 UTILITIES

7.1 HYDRO

According to Enova Power there is capacity on the circuit in the area to service the proposed Strohvest Subdivision. Enova Power will require an AutoCAD and PDF copy of the approved Draft Plan of Subdivision to progress their design. It is intended to reengage with Enova Power after conditional Draft Plan approval is received and detailed design has commenced. Correspondence with the utility provider is included in **Appendix G**.

7.2 NATURAL GAS

According to Enbridge there is gas servicing on both Gerber Road and Lawrence Street and there are no foreseeable issues regarding capacity to service the proposed Strohvest Subdivision. To confirm natural gas service, Enbridge requires a development application be submitted. It is intended to reengage with Enbridge after conditional Draft Plan approval is received and detailed design has commenced. Correspondence with the utility provider is included in **Appendix G**.

7.3 TELECOMMUNICATIONS

According to Rogers Communications, telecommunication services can be provided to the proposed Strohvest subdivision. Rogers Communications will require a detailed submission to progress their design. It is intended to reengage with Rogers Communications (or their competitors) after conditional Draft Plan approval is received and detailed design has commenced. Correspondence with the utility provider is included in **Appendix G.**

Bell Canada was circulated on the first submission of this Draft Plan of Subdivision and provided comments on April 18, 2022. Bel Canada advised that they should be contacted at planninganddevelopment@bell.ca during the detailed utility design stage to confirm the provision of communication/telecommunication infrastructure needed to service the development.

8 CONCLUSION AND RECOMMENDATIONS

8.1 CONCLUSION

It has been demonstrated that the Strohvest Subdivision Phase 1 lands, as illustrated within the Draft Plan of Subdivision contained in **Appendix A**, can be developed with full municipal servicing, SWM, and utilities to the requirements of the Township of Wellesley and the Region of Waterloo. The Future Phase 2 municipal services, SWM and utilities are accommodated in the design capacity of the Site; however, downstream upgrades to municipal infrastructure, in particular the sanitary sewer and wastewater treatment plant, may be required for the complete build out of Phase 2.

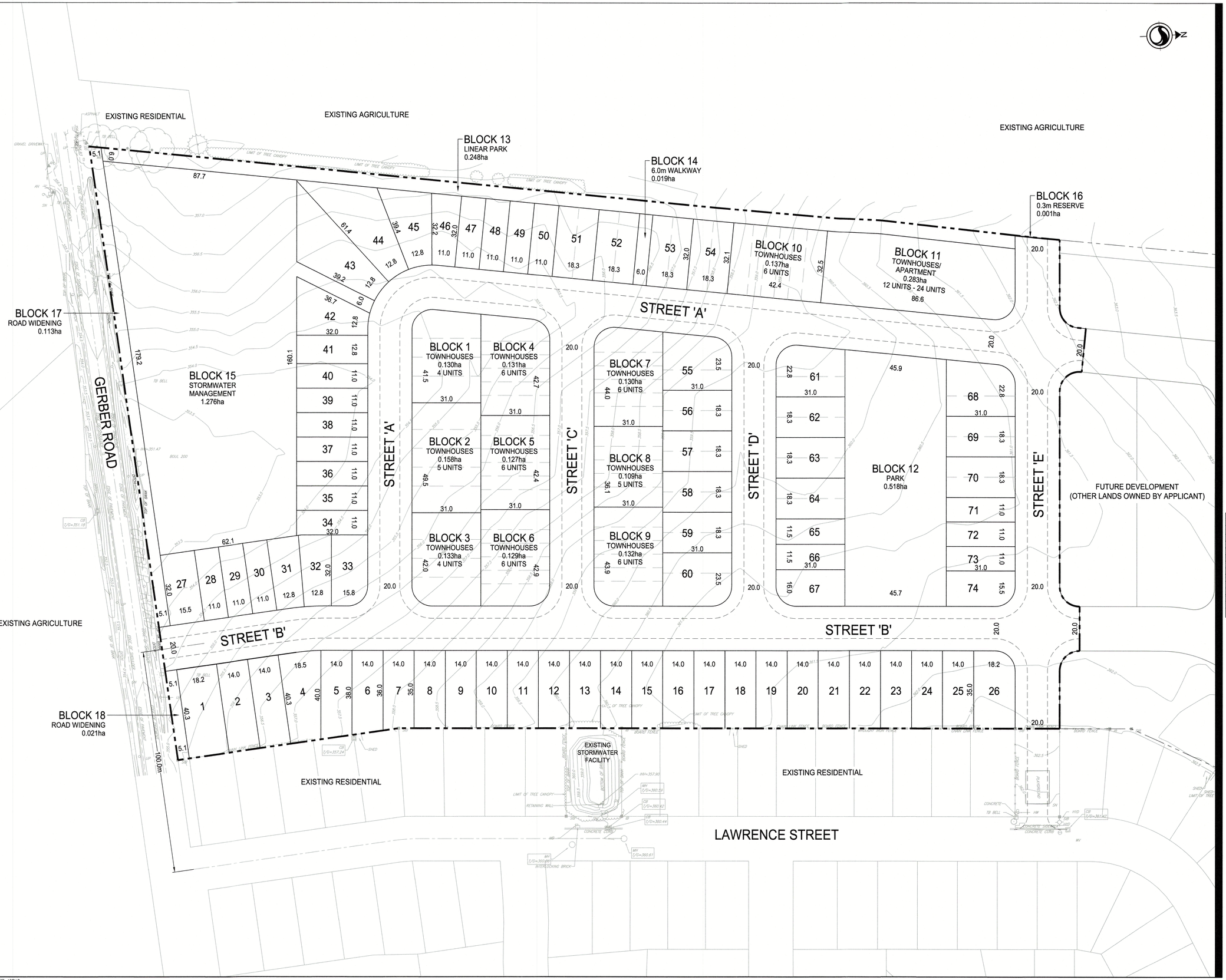
Based on the findings of this Report, it is concluded that:

1. The proposed Strohvest Lands Subdivision (Phase 1) can be adequately serviced by municipal sewage, storm drainage, water services and utilities.
2. The proposed wet pond SWMF provides water quantity and water quality control for the proposed Strohvest Lands Subdivision.
    a. Sufficient permanent pool in the proposed SWMF is provided to achieve an 'Enhanced' water quality control for the Subdivision in order to meet MECP water quality requirements.
    b. The proposed SWMF provides sufficient storage to attenuate post-development discharge to maintain existing target flow rates.
3. Lot level soakaway pits should be incorporated to infiltrate the first 25 mm of clean roof runoff where possible and to help promote at-source infiltration across the site to achieve a water balance.
4. The seasonally high groundwater table can be managed by traditional construction practices, including waterproofing membranes and sump pumps directed to dedicated storm lateral risers, for each structure with habitable space below grade.

8.2 RECOMMENDATIONS

1. This Report shall be circulated to the Municipalities and various approval agencies in support of Draft Plan of Subdivision Approval.
2. Detailed grading and servicing design drawings be prepared, and a Final Stormwater Management Report and Erosion Sediment Control Plan be completed as Conditions of Draft Plan of Subdivision Approval for the Strohvest Subdivision.
3. The detailed design of the SWMF outlet structure is to be completed in conjunction with any proposed upgrades / future works along the Paff Drain.

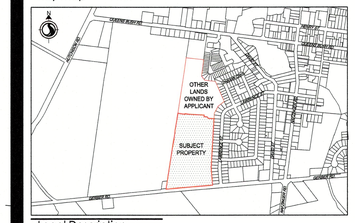
APPENDIX A DRAFT PLAN OF SUBDIVISION DP-1



Stantec

Stantec Consulting Ltd.
100-300 Hagey Boulevard
Waterloo ON N2L 0A4
Tel: (519) 579-4410
www.stantec.com

Key Map NTS.



Legal Description

Plan 1148, Part Lot 80,
Registered Reference Plan 58R-3548, Part 1,
Township of Wellesley,
Regional Municipality of Waterloo

Information Required

Under Section 51(17) of the Planning Act,
R.S.O 1990 c.P 13 as Amended
a) - As Shown
b) - As Shown
c) - As Shown
d) - As Listed Below
e) - As Shown
f) - As Shown
g) - As Shown
h) - Municipal Water
i) - As Shown
j) - Municipal Sanitary and Storm Sewers
k) - None

Surveyor's Certificate

I hereby certify the boundaries of the subject lands and their relationship to the adjoining lands have been accurately and correctly shown.

Signed
Merrill McLean, O.L.S.
Stantec Geomatics Ltd.
Date 2024.05.29

Owner's Certificate

I hereby authorize Stantec Consulting Ltd. to submit this Draft Plan of Subdivision on my behalf.

Signed
Ron Stroh
Strohvest Ontario Inc.
Date June 6/24

Land Use Schedule

Lots/Blocks	Land Use	Area (ha)	# of Units (Min - Max)
Lots 1-50, 65-67, 71-74	Single Detached	2.696	57
Lots 51-64, 68-70	Semi Detached	1.046	34
Blocks 1-10	Townhouse	1.316	54
Block 11	Townhouse/Apartment	0.283	12 - 24
Block 12	Park	0.518	
Block 13	Linear Park	0.248	
Block 14	6.0m Walkway	0.019	
Block 15	Stormwater Management	1.276	
Block 16	0.3m Reserve	0.001	
Blocks 17-18	Road Widening	0.134	
Roads		2.612	
TOTAL		10.149	157- 169 Units

Revision	By	Appd	YYYY.MM.DD
ISSUED FOR DRAFT PLAN PAPROVAL	JJ	GR	2024.05.31
1. REVISED AS PER TOWNSHIP COMMENTS	JJ	GR	2023.07.26
ISSUED FOR CLIENT REVIEW	JJ	GR	2021.06.14
File Name: 161413217_R-DP	Dwn. JJ	Dsgn. JJ	Chkd. GR 2021.04.21 YYYY.MM.DD

Permit-Seal

GREG ROMANICK
REGISTERED PROFESSIONAL PLANNER
R.P.P.
ONTARIO PROFESSIONAL PLANNERS INSTITUTE

APPROVED: DATE: 2024.05.31

I hereby certify that the plan was prepared under the supervision of a Registered Professional Planner, within the meaning of the Ontario Professional Planners Institute Act, 1994.

Client/Project
STROHVEST ONTARIO INC.

WELLESLEY PROPERTY
GERBER ROAD

TOWNSHIP OF WELLESLEY, ON

Title
DRAFT PLAN OF SUBDIVISION

Project No. 161413217
Scale 1:750 (0 7.5 22.5 37.5m)
Revision 1
Sheet 1 of 1
Drawing No. DP-1

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6/3/2024 8:56:54 AM By: Jakielko, Jeff

ORIGINAL SHEET - ARCH D

APPENDIX B EXISTING PLAN & PROFILE DRAWINGS

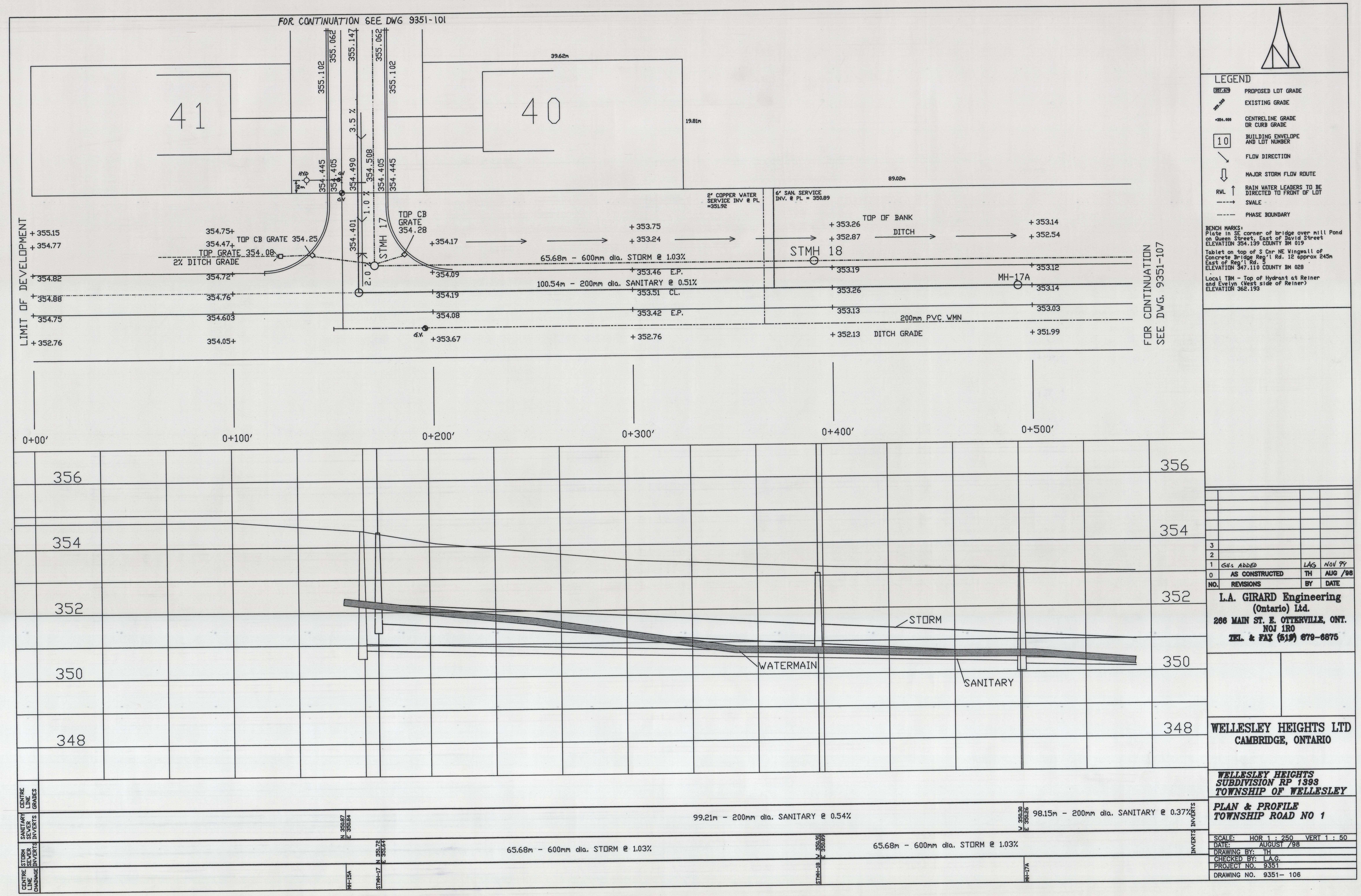
B.1 REGISTERED PLAN 139 – STA 0+000 – STA 0+500 (GERBER ROAD)

B.2 REGISTERED PLAN 139 – STA 0+500 – STA 1+050 (GERBER ROAD)

B.3 REGISTERED PLAN 139 – STA 1+050 – STA 1+500 (GERBER ROAD)

B.4 LAWRENCE ROAD STA 0+149 – STA 0+360

B.5 LAWRENCE ROAD STA 0+360 – STA 0+594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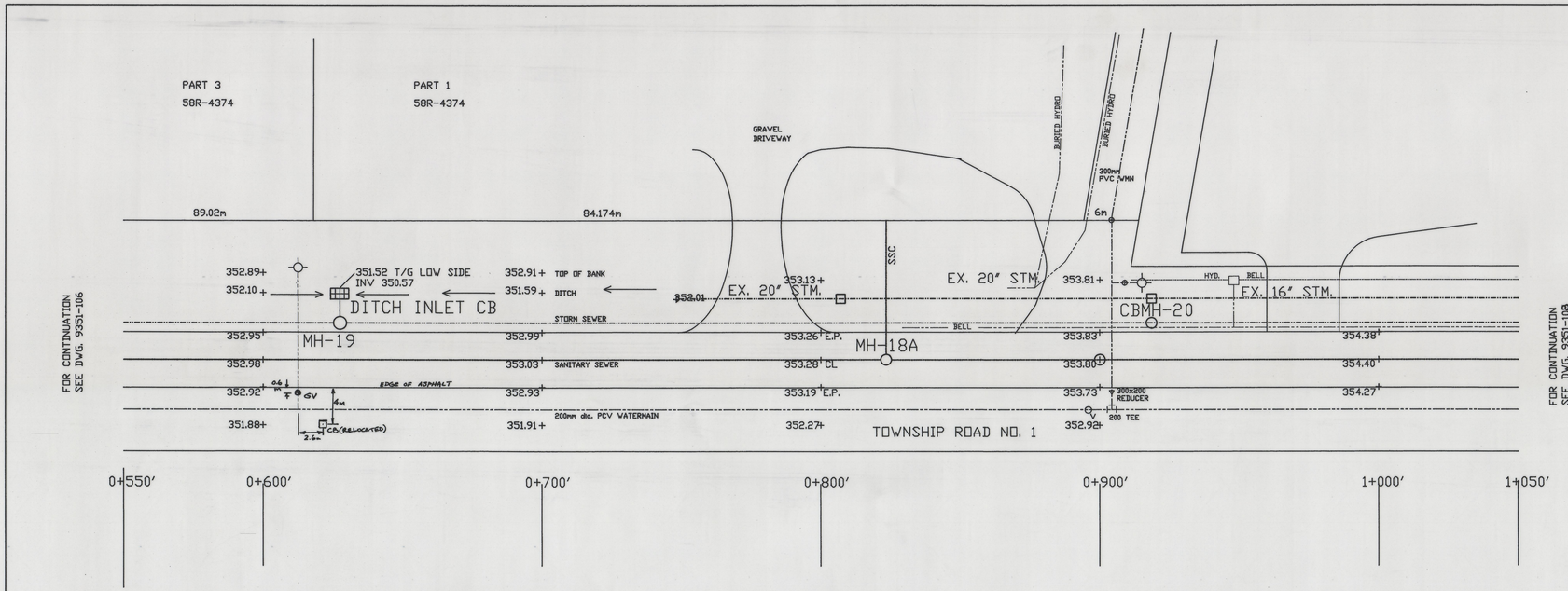
41
40
39.62m
19.81m
89.02m
355.102
355.062
355.147
3.5 %
354.445
354.405
354.490
354.508
1.0 %
2.0 %
354.401
STMH 17
TOP CB GRATE 354.28
TOP CB GRATE 354.25
TOP GRATE 354.08
2% DITCH GRADE
LIMIT OF DEVELOPMENT
2" COPPER WATER SERVICE INV @ PL =351.92
6" SAN. SERVICE INV. @ PL = 350.89
TOP OF BANK
DITCH
STMH 18
MH-17A
65.68m - 600mm dia. STORM @ 1.03%
100.54m - 200mm dia. SANITARY @ 0.51%
200mm PVC WMN
DITCH GRADE
E.P.
CL.
FOR CONTINUATION SEE DWG. 9351-107
0+00'
0+100'
0+200'
0+300'
0+400'
0+500'
356
354
352
350
348
STORM
WATERMAIN
SANITARY
CENTRE LINE GRADES
SANITARY SEWER INVERTS
STORM SEWER INVERTS
CENTRE LINE CHAINAGE
99.21m - 200mm dia. SANITARY @ 0.54%
98.15m - 200mm dia. SANITARY @ 0.37%
65.68m - 600mm dia. STORM @ 1.03%
MH-15A
STMH-17
STMH-18
MH-17A
LEGEND
PROPOSED LOT GRADE
EXISTING GRADE
CENTRELINE GRADE OR CURB GRADE
BUILDING ENVELOPE AND LOT NUMBER
FLOW DIRECTION
MAJOR STORM FLOW ROUTE
RWL RAIN WATER LEADERS TO BE DIRECTED TO FRONT OF LOT
SWALE
PHASE BOUNDARY
BENCH MARKS:
Plate in SE corner of bridge over mill Pond on Queen Street, East of David Street ELEVATION 354.139 COUNTY BM 019
Tablet on top of S Cnr NE Wingwall of Concrete Bridge Reg'l Rd. 12 approx 245m East of Reg'l Rd. 5 ELEVATION 347.110 COUNTY BM 028
Local TBM - Top of Hydrant at Reiner and Evelyn (West side of Reiner) ELEVATION 362.193
1 G.V.s ADDED LAG NOV 99
0 AS CONSTRUCTED TH AUG /98
NO. REVISIONS BY DATE
L.A. GIRARD Engineering (Ontario) Ltd.
266 MAIN ST. E. OTTERVILLE, ONT. N0J 1R0
TEL. & FAX (519) 879-6875
WELLESLEY HEIGHTS LTD
CAMBRIDGE, ONTARIO
WELLESLEY HEIGHTS SUBDIVISION RP 1393 TOWNSHIP OF WELLESLEY
PLAN & PROFILE TOWNSHIP ROAD NO 1
SCALE: HOR 1 : 250 VERT 1 : 50
DATE: AUGUST /98
DRAWING BY: TH
CHECKED BY: L.A.G.
PROJECT NO. 9351
DRAWING NO. 9351- 106



DESIGN NOTES:

LEGEND

- 357.47 — PROPOSED LOT GRADE
- 357.000 — EXISTING GRADE
- +354.000 — CENTRELINE GRADE OR CURB GRADE
- 10 — BUILDING ENVELOPE AND LOT NUMBER
- FLOW DIRECTION
- MAJOR STORM FLOW ROUTE
- RWL — RAIN WATER LEADERS TO BE DIRECTED TO FRONT OF LOT
- SWALE
- PHASE BOUNDARY

BENCH MARKS:
Plate in SE corner of bridge over mill Pond on Queen Street, East of David Street
ELEVATION 354.139 COUNTY BM 019

Tablet on top of S Cnr NE Wingwall of Concrete Bridge Reg'l Rd. 12 approx 245m East of Reg'l Rd. 7
ELEVATION 347.110 COUNTY BM 028

Local TBM - Top of Hydrant at Reiner and Evelyn (West side of Reiner)
ELEVATION 362.193

NO.	REVISIONS	BY	DATE
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2			
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L.A. GIRARD Engineering (Ontario) Ltd.
286 MAIN ST. E. OTTERVILLE, ONT. N0J 1R0
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WELLESLEY HEIGHTS LTD
CAMBRIDGE, ONTARIO

WELLESLEY HEIGHTS SUBDIVISION RP 1393
TOWNSHIP OF WELLESLEY

PLAN & PROFILE
TOWNSHIP ROAD NO 1

SCALE:	HOR 1 : 250 VERT 1 : 50
DATE:	AUGUST '98
DRAWING BY:	TH
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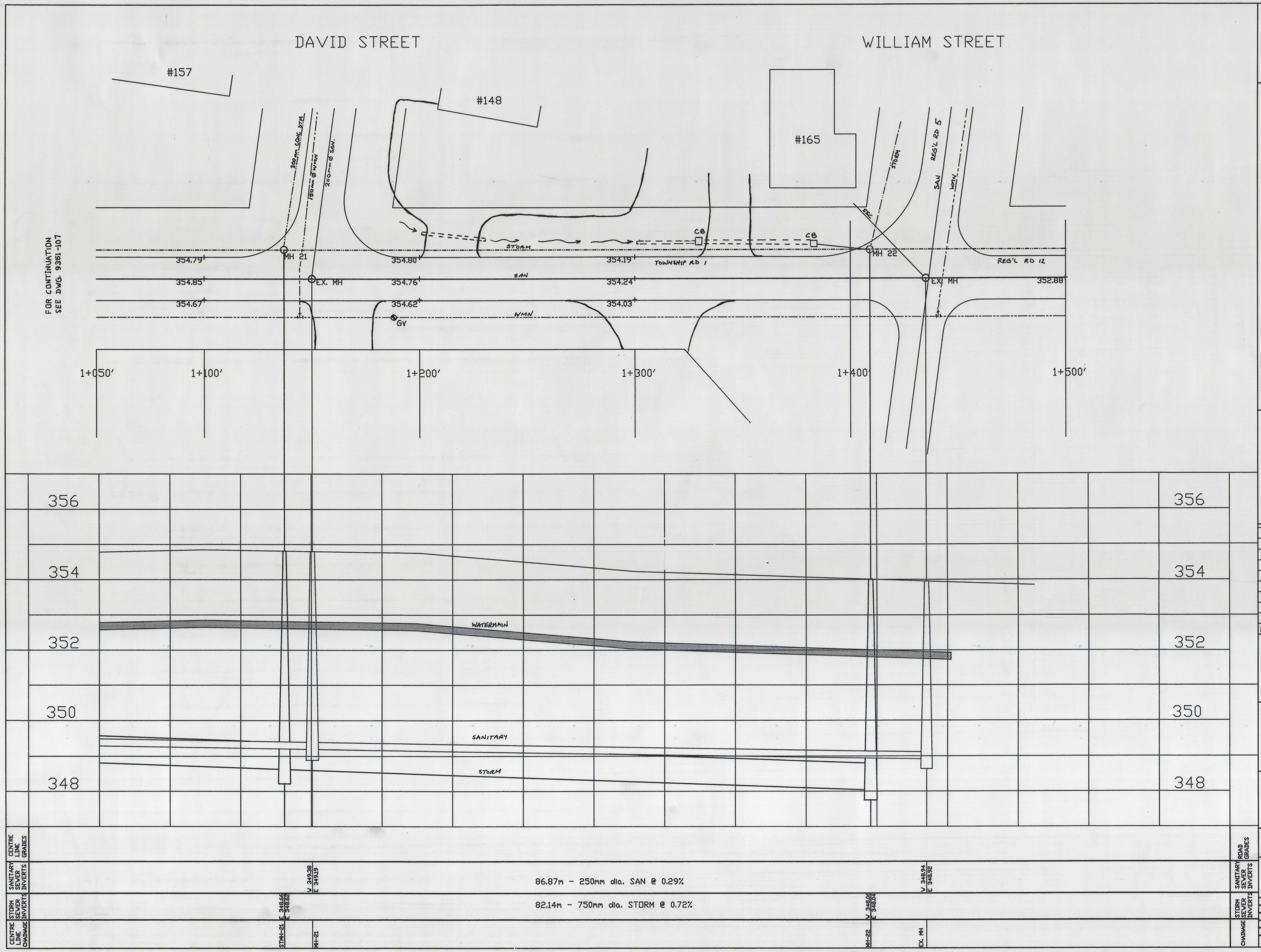
PROJECT NO.	9351
DRAWING NO.	9351- 107



DESIGN NOTES:

LEGEND

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359.393	EXISTING GRADE
+354.000	CENTRELINE GRADE OR CURB GRADE
10	BUILDING ENVELOPE AND LOT NUMBER
↘	FLOW DIRECTION
⇩	MAJOR STORM FLOW ROUTE
RWL ↑	RAIN WATER LEADERS TO BE DIRECTED TO FRONT OF LOT
---→	SWALE
----	PHASE BOUNDARY

BENCH MARKS:
Plate in SE corner of bridge over mill Pond on Queen Street, East of David Street
ELEVATION 354.139 COUNTY BM 019

Tablet on top of S Cnr NE Wingwall of Concrete Bridge Reg'l Rd. 12 approx 245m East of Reg'l Rd. 5
ELEVATION 347.110 COUNTY BM 028

Local TBM - Top of Hydrant at Reiner and Evelyn (West side of Reiner)
ELEVATION 362.193

NO.	REVISIONS	BY	DATE
3			
2			
1	DRIVEWAYS ADDED	LAG	NOV 99
0	AS CONSTRUCTED	TH	AUG 98

L.A. GIRARD Engineering (Ontario) Ltd.
212 MAIN ST. W., OTTERVILLE
ONTARIO NOJ 1RO
TEL: 519-879-6875 FAX: 879-6536

WELLESLEY HEIGHTS LTD
CAMBRIDGE, ONTARIO

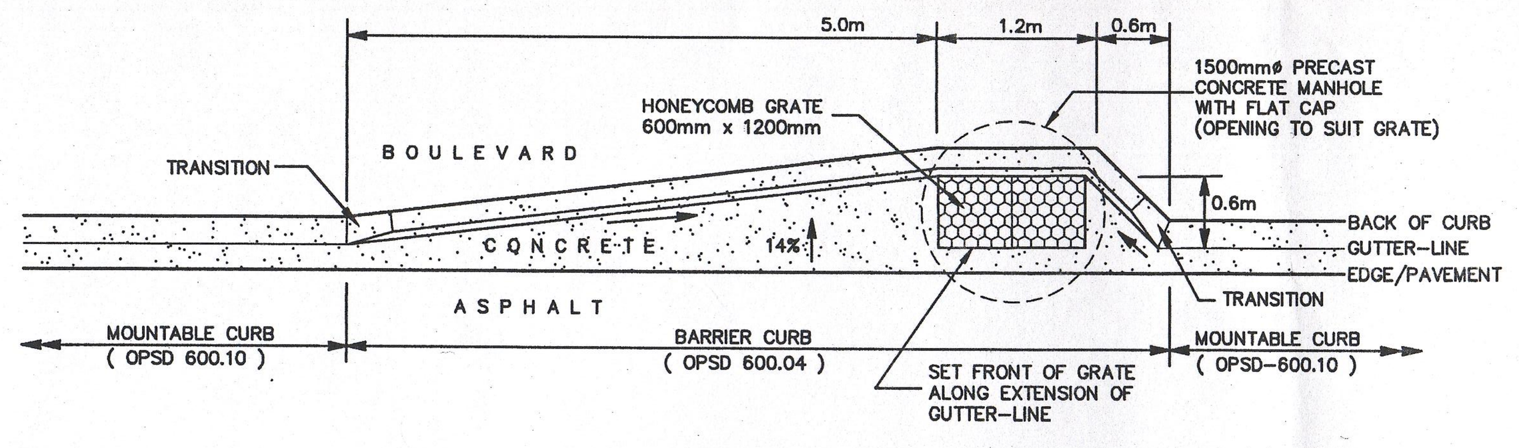
WELLESLEY HEIGHTS SUBDIVISION RP 1393 TOWNSHIP OF WELLESLEY

PLAN & PROFILE TOWNSHIP ROAD no 1

SCALE: HOR 1 : 250 VERT 1 : 50
DATE: AUGUST /98
DRAWING BY: TH
CHECKED BY: L.A.G.
PROJECT NO. 9351
DRAWING NO. 9351- 108

LAWRENCE ST. 0+149.34 TO 0+380.0

MTE Computer Dwg No. 0340X06.DWG



SET-BACK DCBMH DETAIL

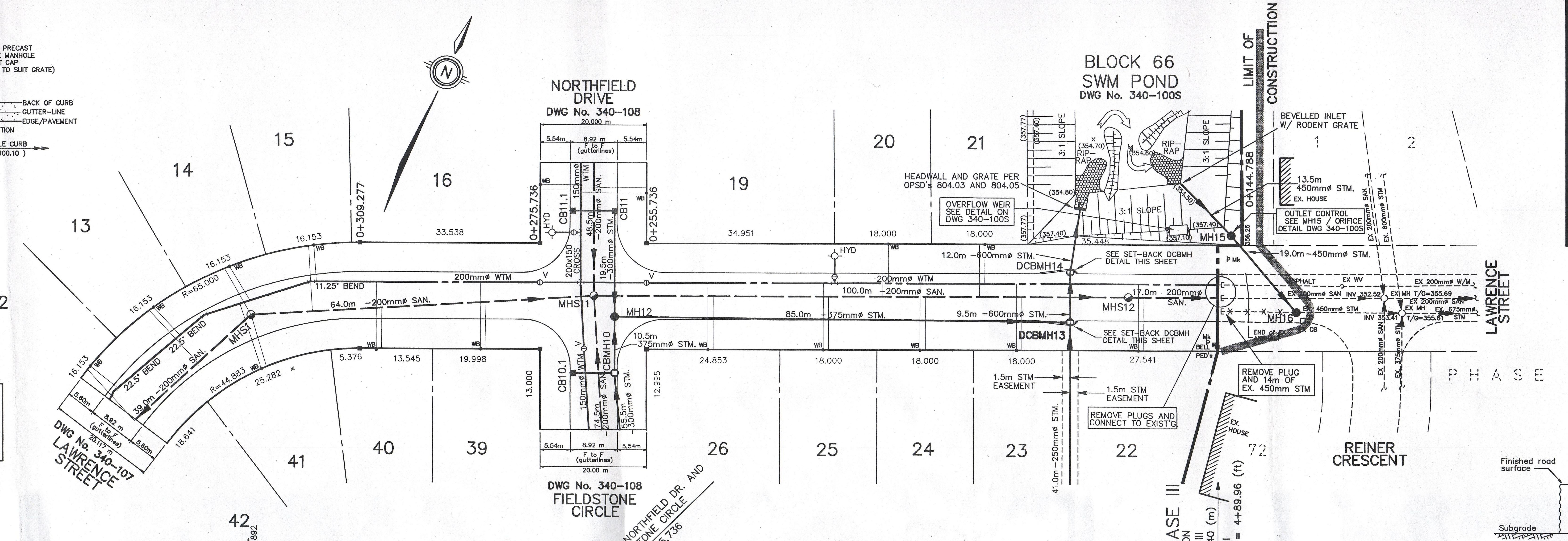
N.T.S.

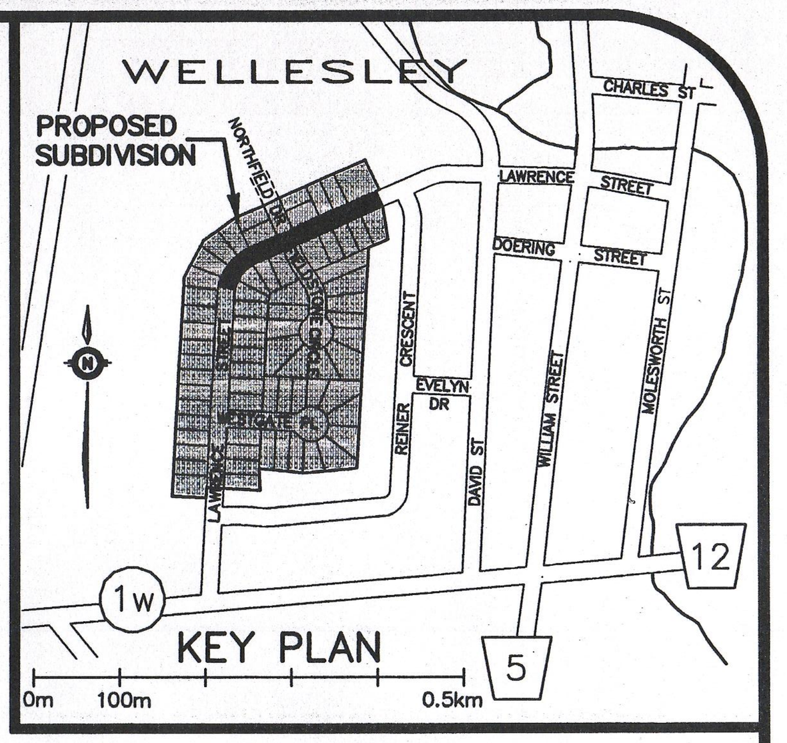
PIPE MATERIALS:

SIZE	ALLOWABLE MATERIALS	AS-BUILT MATERIAL	PIPE CLASSIFICATION (UNLESS NOTED OTHERWISE)	BEDDING CLASS
SANITARY				
100mmø	PVC (CSA B182.2)		SDR 28 (HOUSE CONNECTION)	"B"
200mmø to 250mmø	PVC (CSA B182.2)		SDR 35	"B"
	CONC. (CSA A257.1)		CLASS 3	"B"
300mmø and LARGER	PVC (CSA B182.2)		SDR 35	"B"
	CONC. (CSA A257.2)		100-D	"B"
STORM				
250mmø to 450mmø	CONC. (CSA A257.1)		CLASS 3	"B"
	RIBBED PVC (CSA B182.4)		>320 KpA STIFFNESS AT < 5% PIPE DEFLECTION	"B"
	SMOOTHWALL HDPE gasketted (CSA B182.6)			"B"
525mmø to 600mmø	CONC. (CSA A257.2)		65-D	"B"
	RIBBED PVC (CSA B182.4)		>320 KpA STIFFNESS AT < 5% PIPE DEFLECTION	"B"
	SMOOTHWALL HDPE gasketted (CSA B182.6)			"B"
675-900ø	CONC. (CSA A257.2)		65-D	"B"
975mmø >	CONC. (CSA A257.2)		50-D	"B"
WATER				
19mmø	COPPER		TYPE K (HOUSE CONNECTION)	SAND
150mmø and LARGER	DUCTILE IRON (CSA B131.13)		CLASS 52 (cement lined)	"B"
	PVC (CSA B157.3)		CLASS 150	"B"

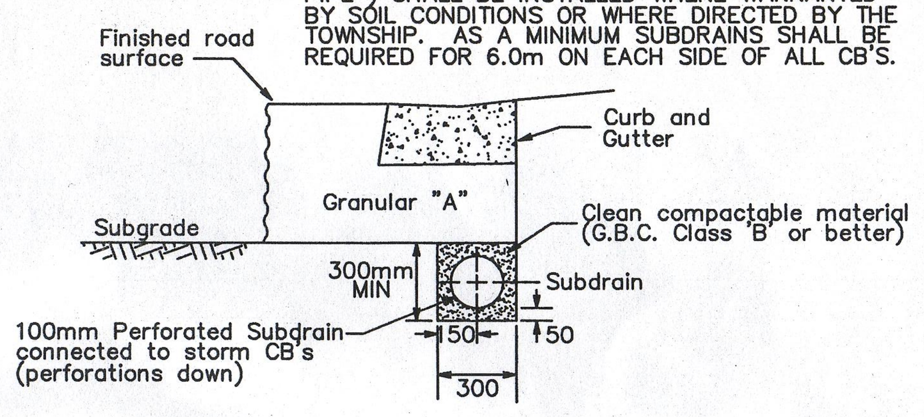
HORIZONTAL CURVE DATA

Δ = 62° 56' 01"
R = 54.9415m
La = 60.3477m
Lc = 57.3594m
T = 33.6244m



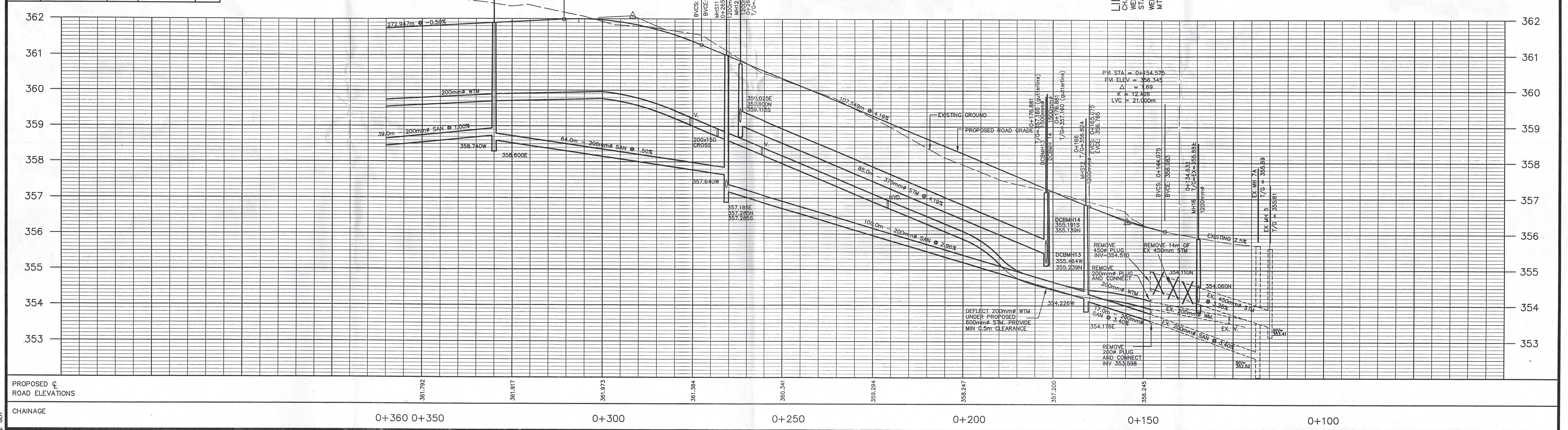


NOTE:
CONTINUOUS SUBDRAINS (150mmø PERFORATED PIPE) SHALL BE INSTALLED WHERE WARRANTED BY SOIL CONDITIONS OR WHERE DIRECTED BY THE TOWNSHIP. AS A MINIMUM SUBDRAINS SHALL BE REQUIRED FOR 6.0m ON EACH SIDE OF ALL CB'S.



CURB SUBDRAIN DETAIL N.T.S.

MTE STD S06-4-05 (MODIFIED)



GENERAL NOTES:

ALL STANDARDS ARE AS FOLLOWS, UNLESS INDICATED OTHERWISE ON THIS DRAWING. (SEE ALLOWABLE PIPE MATERIALS TABLE THIS SHEET.)

1. FACTORY MANUFACTURED TEES SHALL BE USED FOR ALL SANITARY SERVICE CONNECTIONS.
2. ALL CONCRETE STORM SEWERS SHALL USE RUBBER GASKETS ON JOINTS.
3. ALL WATERMAIN SHALL BE INSTALLED AT A DEPTH OF 2m COVER.
4. RESIDENTIAL SANITARY SEWER CONNECTIONS SHALL BE AT A MINIMUM GRADE OF 2% TO DEPTH AT PROPERTY LINE OF 2.6m.
5. RESIDENTIAL WATER SERVICE CONNECTIONS SHALL BE INSTALLED TO A DEPTH AT THE PROPERTY LINE OF 2.0m.
6. CATCHBASIN LEADS SHALL BE 250mm ø FOR SINGLE CB'S AND 300mm ø FOR DOUBLE CB'S, BOTH AT 2% GRADE.
7. ROAD STRUCTURE SHALL BE:

GBC CLASS B	450 mm
GBC CLASS A	150 mm
BINDER HL. 4	50 mm
SURFACE HL. 3 FINE	30 mm

8. CURB RADIUS AT INTERSECTIONS SHALL BE 9.0m.
9. TOWNSHIP OF WELLESLEY STANDARDS

SANITARY MANHOLES	OPSD 701.01
STORM MANHOLES	OPSD 701.01, OPSD 701.02
CATCH BASINS	OPSD 705.01, OPSD 705.02
PIPE BEDDINGS	FOR SAN. OPSD 1005.01 FOR STM. OPSD 802.03 FOR WTM. OPSD 1102.03
SANITARY SERVICE CONNECTIONS	OPSD 1006.01
WATER SERVICE CONNECTIONS	OPSD 1104.01
CONCRETE CURB AND GUTTER	OPSD 600.10, OPSD 600.04
STREET SECTION	110

December 3, 1996 — 3:32 p.m. — Plotted By: GEH

No.	REVISIONS	BY	DATE
5.			
4.			
3.			
2.			
1.	1st Submission	G.E.H	96/12/03

BENCHMARK ELEV. = 353.136

DESCRIPTION

MTE BENCHMARK — TOP OF MANHOLE CASTING LOCATED ON THE NORTH SIDE OF TOWNSHIP ROAD No.1 APPROXIMATELY 68m EAST OF PROPOSED TOWNSHIP ROAD No.1 AND LAWRENCE STREET INTERSECTION

MTE consultants inc. DEC 0 4 1996 PRINTED

OWNER

BOBAN DEVELOPMENTS
1201 RATCLIFFE, RR#21
CAMBRIDGE, ONTARIO

TWP. of WELLESLEY

PROJECT

WELLESLEY HEIGHTS III
R.P. # 0000

DRAWING

LAWRENCE STREET
STA 0+149.340 to STA 0+360.00

MTE consultants inc. CONSULTING CIVIL ENGINEERS

650 Riverbend Dr., Kitchener Ont., N2K 3S2
Phone (519) 743-6500 Fax (519) 743-6513

Design By	MEC	City File No.	
Checked By	JEM		
Drawn By	AVD/GEH	MTE Drawing No.	340-106
Date	DECEMBER 3, 1996		
Scale	H 1:500 (M) V 1:50	SHEET	of

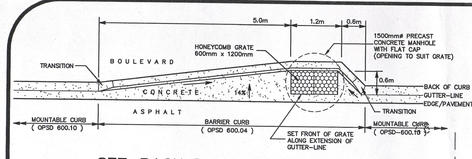
LAWRENCE ST. 0+360.0 TO 0+594.105

MTE Computer Dwg No. 03403107.DWG

December 3, 1996 — 3:38 p.m. — Plotted By: GEH

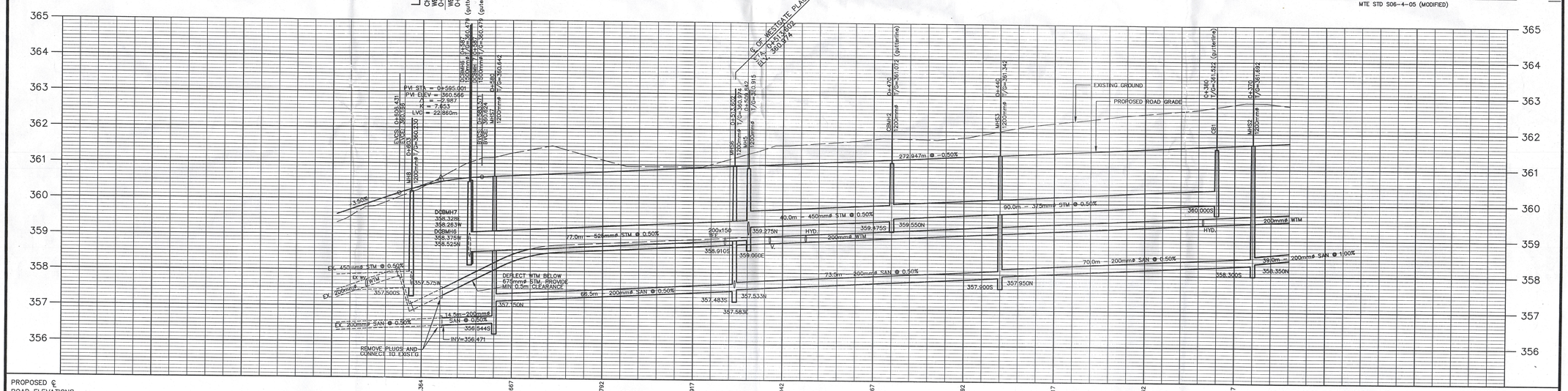
SET-BACK DCBMH DETAIL

N.T.S.



PIPE MATERIALS:

SIZE	ALLOWABLE MATERIALS	AS-BUILT MATERIAL	PIPE CLASSIFICATION (UNLESS NOTED OTHERWISE)	BEDDING CLASS
SANITARY				
100mmø	PVC (CSA B182.2)		SDR 28 (HOUSE CONNECTION)	"B"
200mmø to 250mmø	PVC (CSA B182.2)		SDR 35	"B"
	CONC. (CSA A257.1)		CLASS 3	"B"
300mmø and LARGER	PVC (CSA B182.2)		SDR 35	"B"
	CONC. (CSA A257.2)		100-D	"B"
STORM				
250mmø to 450mmø	CONC. (CSA A257.1)		CLASS 3	"B"
	RIBBED PVC (CSA B182.4)		>320 KpA STIFFNESS	"B"
	SMOOTHWALL HDPE gasketted (CSA B182.6)		AT < 5% PIPE DEFLECTION	"B"
525mmø to 600mmø	CONC. (CSA A257.2)		65-D	"B"
	RIBBED PVC (CSA B182.4)		>320 KpA STIFFNESS	"B"
	SMOOTHWALL HDPE gasketted (CSA B182.6)		AT < 5% PIPE DEFLECTION	"B"
675-900ø	CONC. (CSA A257.2)		65-D	"B"
975mmø >	CONC. (CSA A257.2)		50-D	"B"
WATER				
19mmø	COPPER		TYPE K (HOUSE CONNECTION)	SAND
150mmø and LARGER	DUCTILE IRON (CSA B131.13)		CLASS 52 (cement lined)	"B"
	PVC (CSA B157.3)		CLASS 150	"B"



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STREET SECTION	110

No.	REVISIONS	BY	DATE
5.			
4.			
3.			
2.			
1.	1st Submission	G.E.H	96/12/03

BENCHMARK ELEV. = 353.136

DESCRIPTION

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MTE consultants inc. DEC 04 1996 PRINTED

OWNER
BOBAN DEVELOPMENTS
1201 RATCLIFFE, RR#21
CAMBRIDGE, ONTARIO

TWP. of WELLESLEY

PROJECT
WELLESLEY HEIGHTS III
R.P. # 0000

DRAWING
LAWRENCE STREET
STA 0+360.0 to STA 0+594.105

MTE consultants inc.
CONSULTING CIVIL ENGINEERS
650 Riverbend Dr., Kitchener Ont., N2K 3S2
Phone (519) 743-6500 Fax (519) 743-6513

Design By	MEC
Checked By	JEM
Drawn By	AVD/GEH
Date	DECEMBER 3, 1996
Scale	H 1:500 (M) V 1:50
City File No.	
MTE Drawing No.	340-107
SHEET	of

FOR APPROVAL ONLY

APPENDIX C ENGINEERING DRAWINGS

C.1 EXISTING CONDITIONS AND REMOVALS C-050

C.2 CONCEPTUAL SERVICING PLAN C-100

C.3 CONCEPTUAL ROAD PROFILES C-200 & C-201

C.4 CONCEPTUAL GRADING PLAN C-400 & C-401

C.5 STORMWATER MANAGEMENT FACILITY C-800

C.6 PRELIMINARY CUT/FILL PLAN C-900

ORIGINAL SHEET - ARCH D

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100-300 Hagey Boulevard
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Tel: (519) 579-4410
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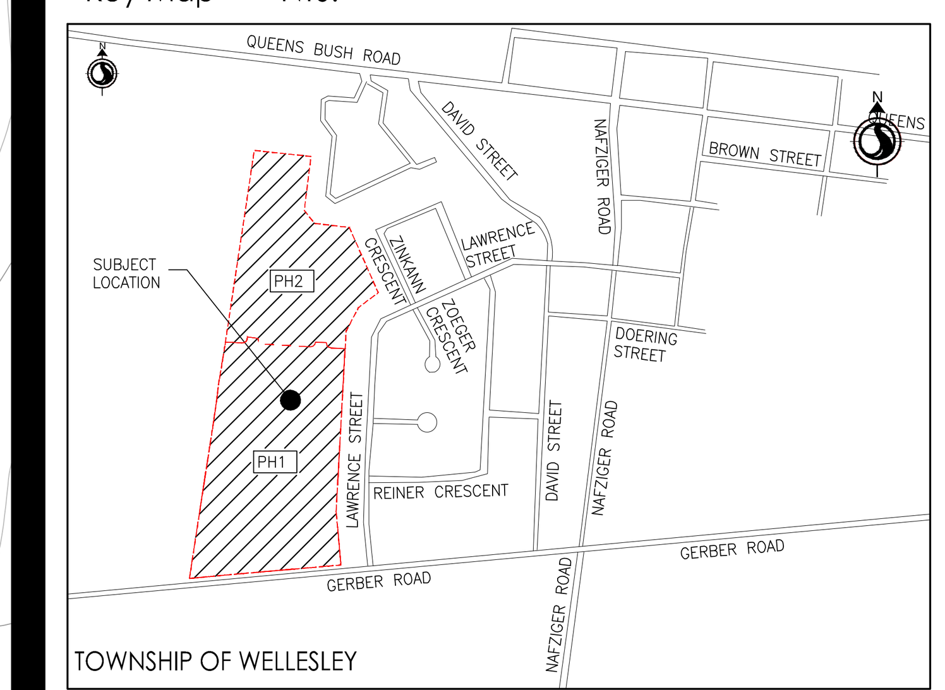
Notes

1. ELEV'S ARE REFERRED TO THE CANADIAN GEODETIC VERTICAL DATUM (CGVD-1928:1978)
2. DRAFT PLAN PREPARED BY STANTEC CONSULTING LTD., DATED MAY 2024.
3. CALCULATED PLAN PREPARED BY XXX, DATED XXX.
4. TOPOGRAPHICAL SURVEY PREPARED BY STANTEC CONSULTING LTD., DATED NOV 18, 2021. CONTOURS OUTSIDE OF THE PROPERTY LINE, AND WITHIN THE HEAVILY WOODED AREA OF THE SITE, HAVE BEEN OBTAINED FROM S.W.O.O.P TOPOGRAPHIC INFORMATION (2015).

Key Map NTS.



Legend

PROPERTY LINE
EXISTING WATERMAIN
EXISTING SANITARY SEWER
EXISTING STORM SEWER

1.	SECOND SUBMISSION	BWM	JL/KRB	2024.06.27
0.	FIRST SUBMISSION	EMV	JV	2023.05.08
Revision		By	Appd	YYYY.MM.DD

File Name: 161413217_C-DP	EMV	JV	EMV	2022.03.21
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

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LICENSED PROFESSIONAL ENGINEER
J. L. LEFAIVE
100230470
06/28/2024
PROVINCE OF ONTARIO

Client/Project
STROHVEST ONTARIO INC.

WELLESLEY PROPERTY
GERBER ROAD

TOWNSHIP OF WELLESLEY, ON

Title
EXISTING CONDITIONS PLAN

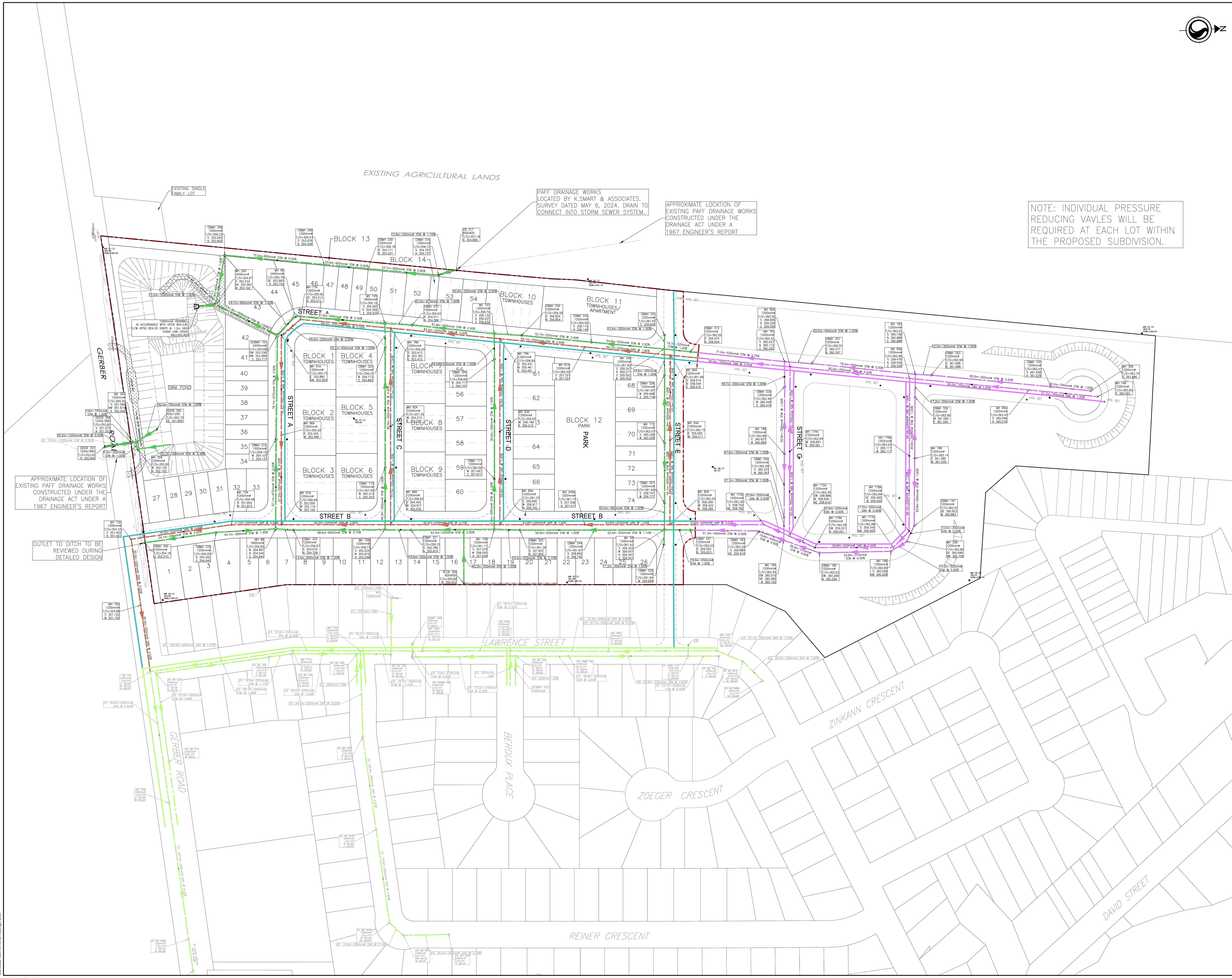
Project No. 161413217

Scale 1:1250 (0 12.5 37.5 62.5m)

Revision 1

Sheet of

Drawing No. C-050



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Key Map NTS.

TOWNSHIP OF WELLESLEY

Legend

- PROPOSED WATERMAIN (200mmø UNLESS NOTED OTHERWISE)
- EXISTING WATERMAIN
- FUTURE WATERMAIN
- PROPOSED SANITARY SEWER
- EXISTING SANITARY SEWER
- FUTURE SANITARY SEWER
- PROPOSED STORM SEWER
- EXISTING STORM SEWER
- FUTURE STORM SEWER
- PROPOSED LIMIT OF DRAFT PLAN

STRUCTURE ID
STRUCTURE SIZE
FINISH GRADE OF STRUCTURE
INVERT OF SEWERS

1.	SECOND SUBMISSION	BWM	JL/KRB	2024.06.27
0.	FIRST SUBMISSION	EMV	JV	2023.05.08
Revision		By	Appd	YYYY.MM.DD

File Name: 161413217_C-UG	EMV	JV	EMV	2022.03.21
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

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100230470
06/28/2024
PROVINCE OF ONTARIO

Client/Project
STROHVEST ONTARIO INC.

WELLESLEY PROPERTY
GERBER ROAD

TOWNSHIP OF WELLESLEY, ON

Title
CONCEPTUAL SERVICING PLAN

Project No. 161413217
Scale 1:1250 (0 12.5 37.5 62.5m)
Revision 1
Sheet of
Drawing No. C-100

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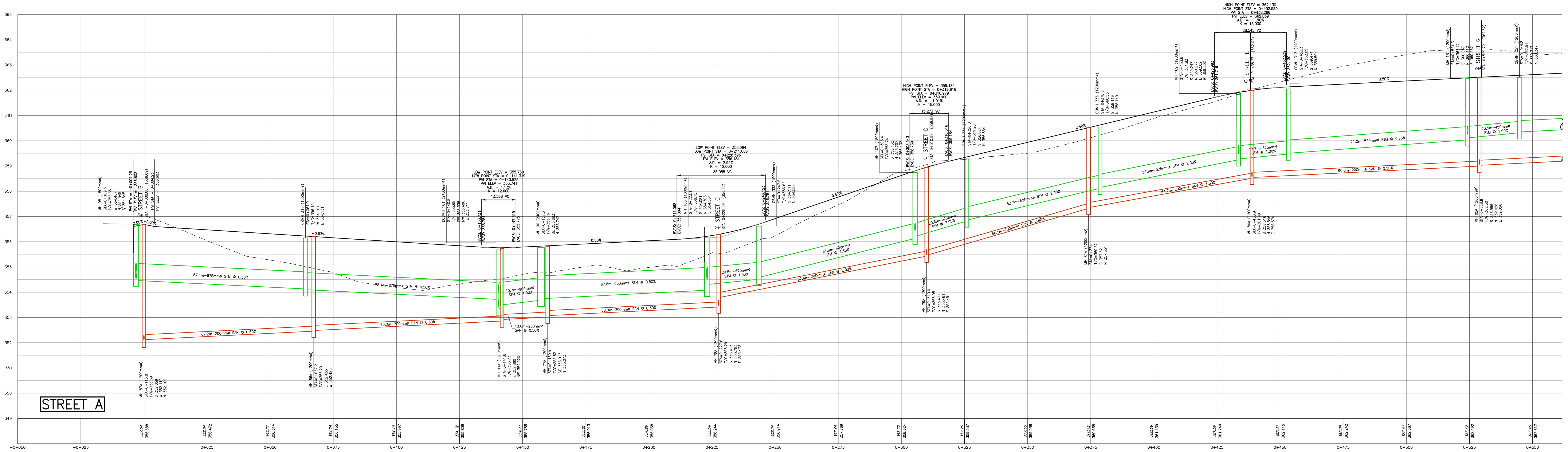

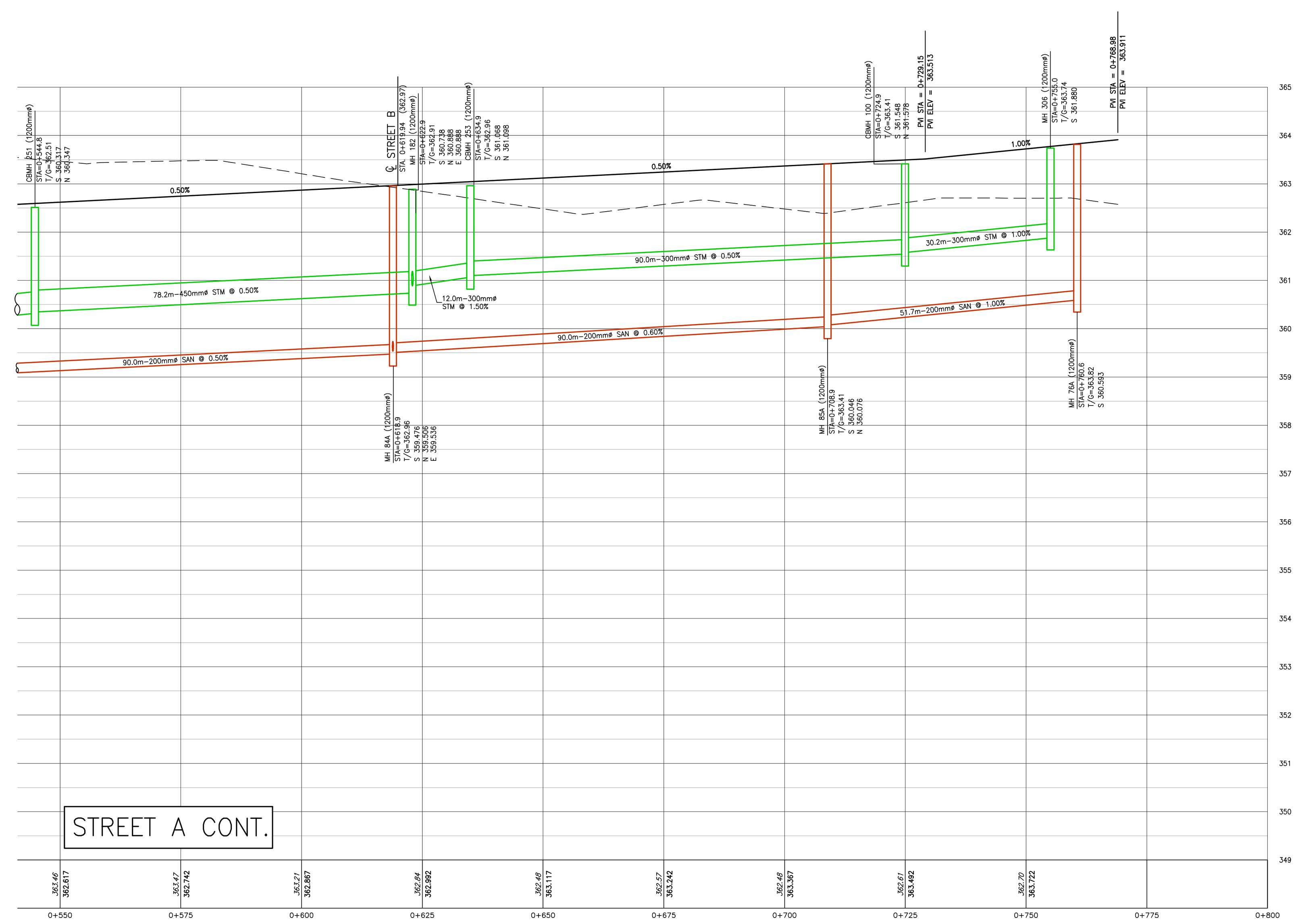

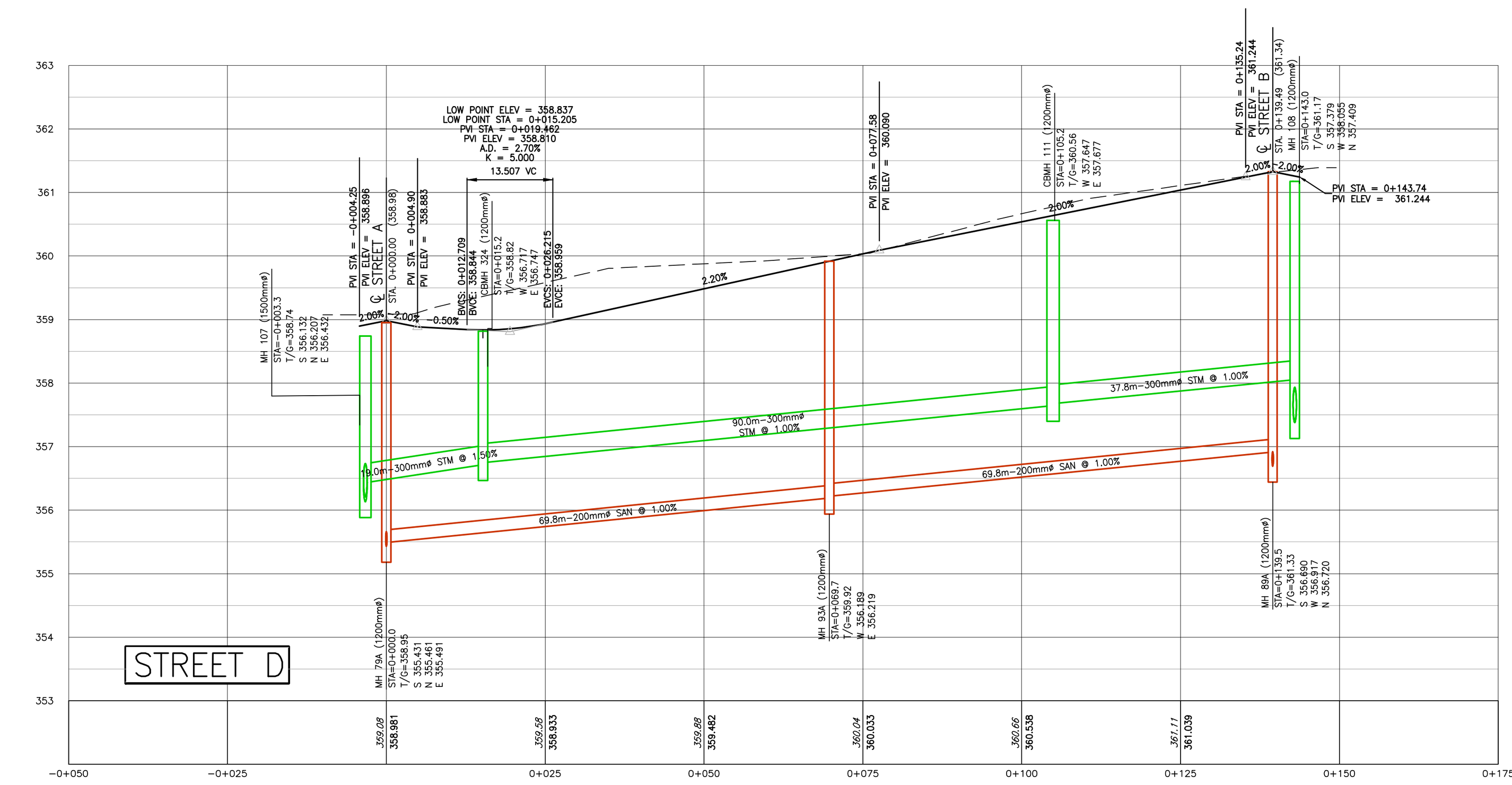

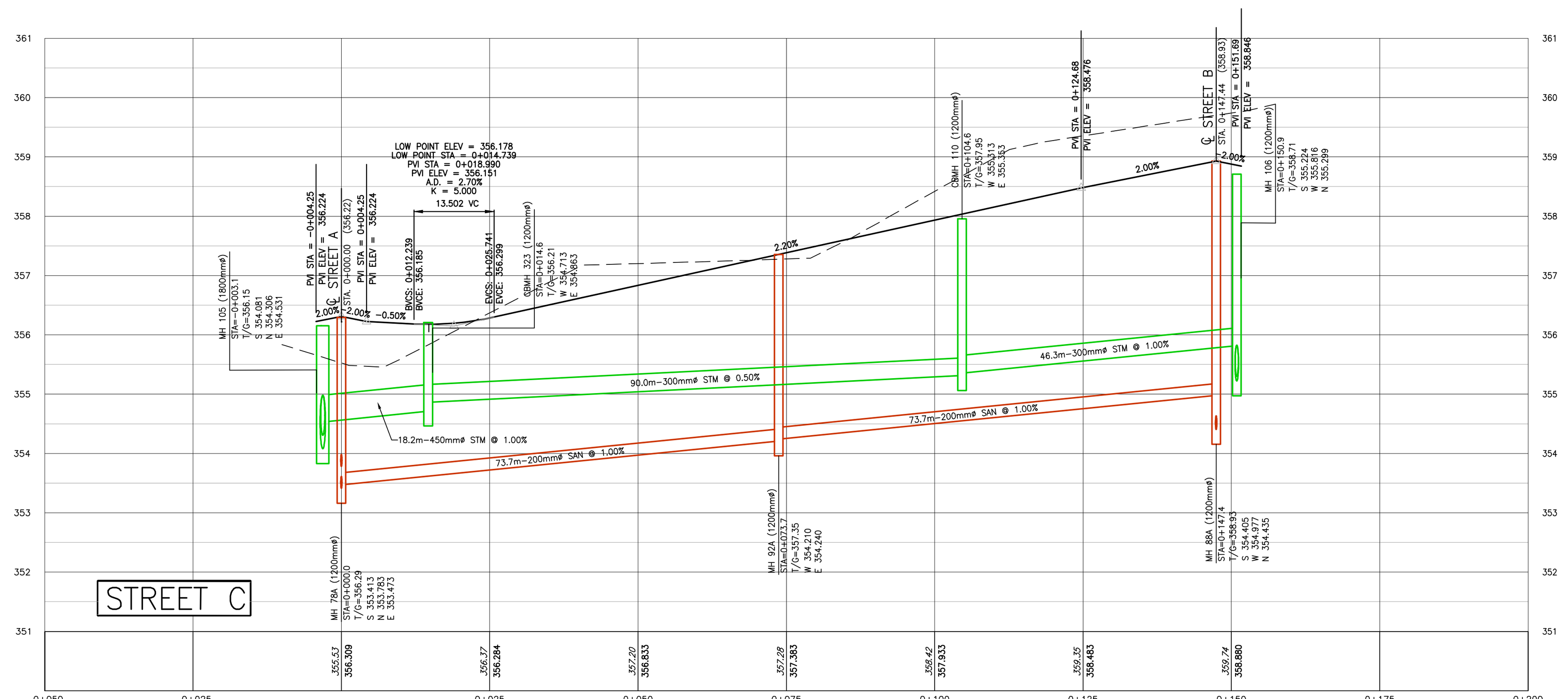

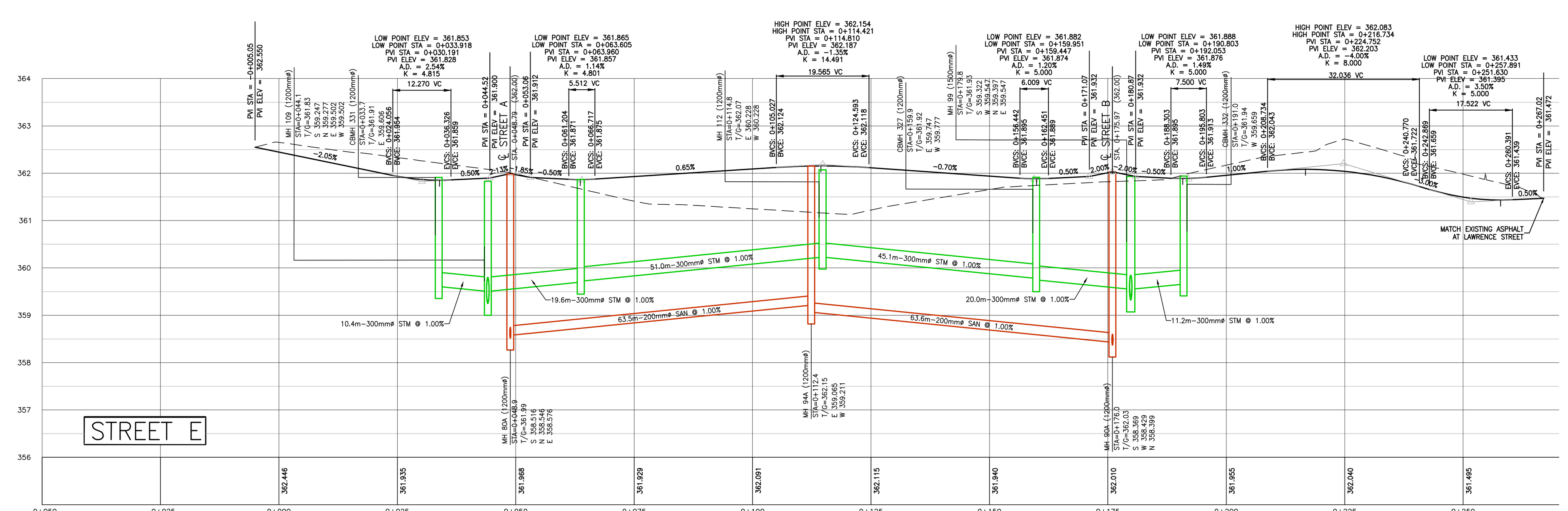

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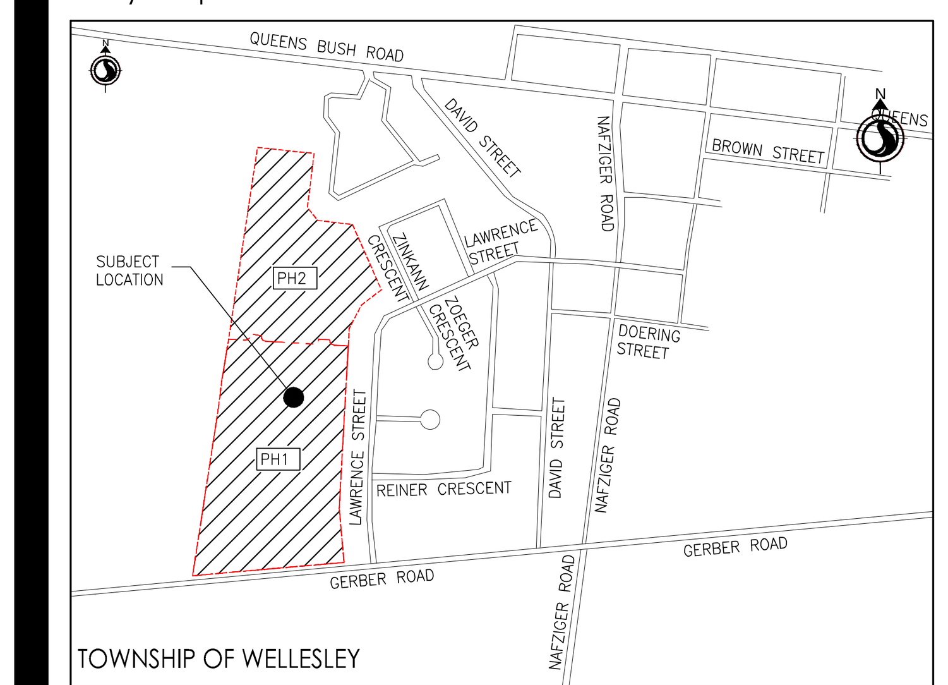
Key Map NTS.



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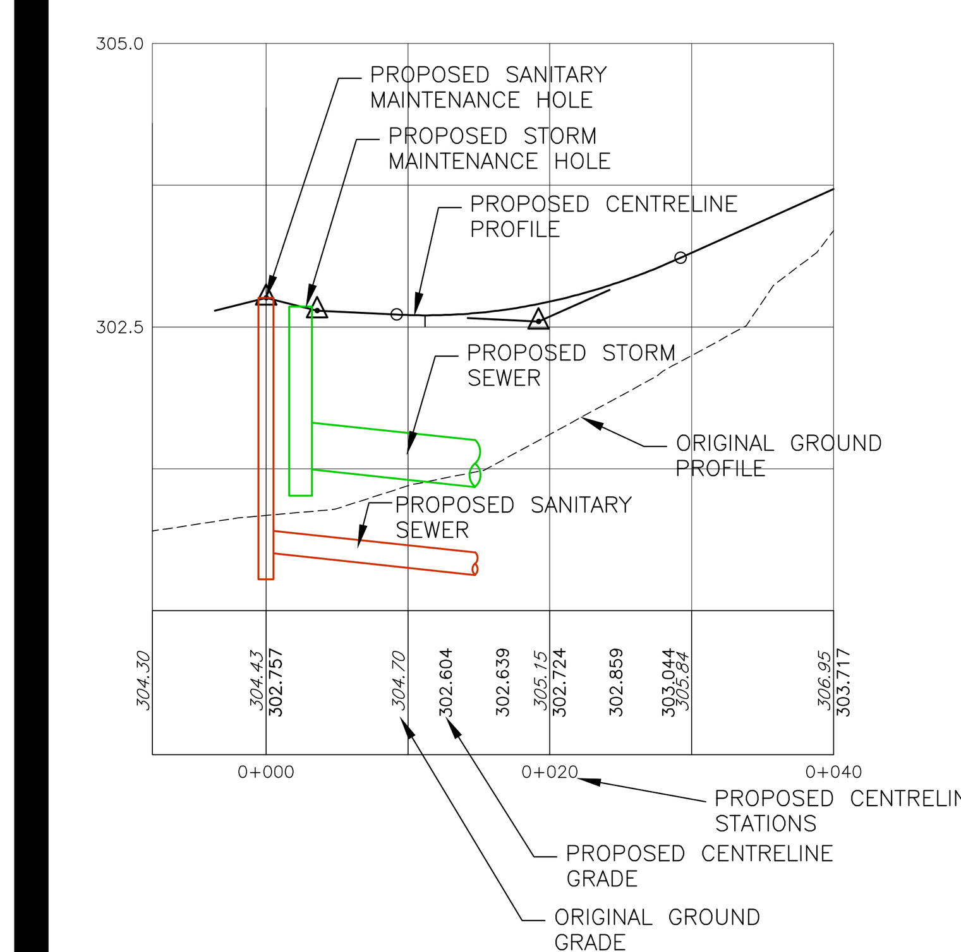

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0.	FIRST SUBMISSION	EMV	JV	2023.05.08
Revision		By	Appd	YYYY.MM.DD

File Name: 161413217_C-200ST	EMV	JV	EMV	2022.03.21
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

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100230470
06/28/2024
PROVINCE OF ONTARIO

Client/Project

STROHVEST ONTARIO INC.

WELLESLEY PROPERTY
GERBER ROAD

TOWNSHIP OF WELLESLEY, ON

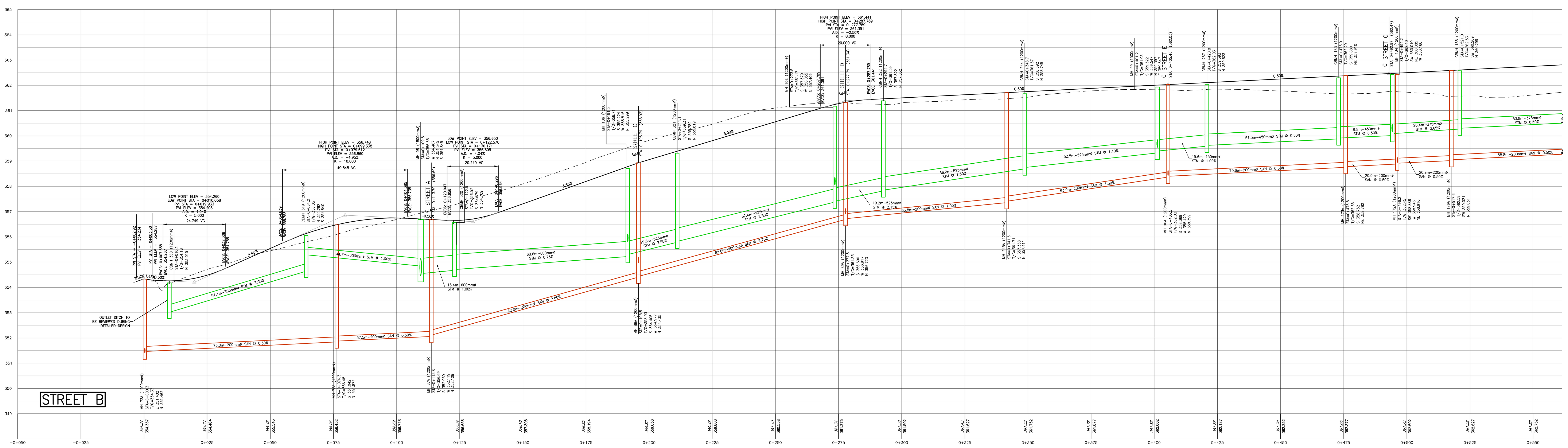
Title

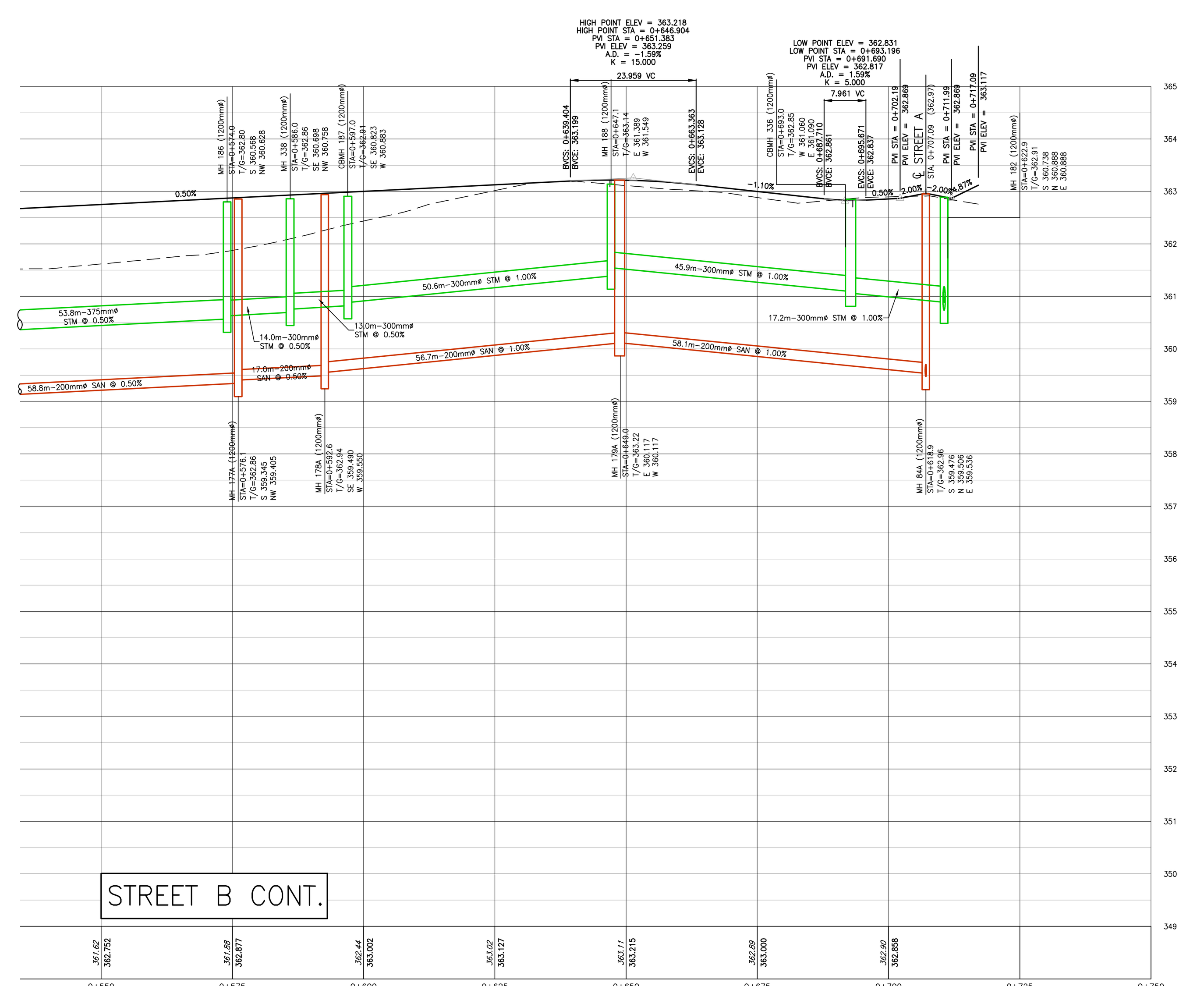
CONCEPTUAL PROFILES

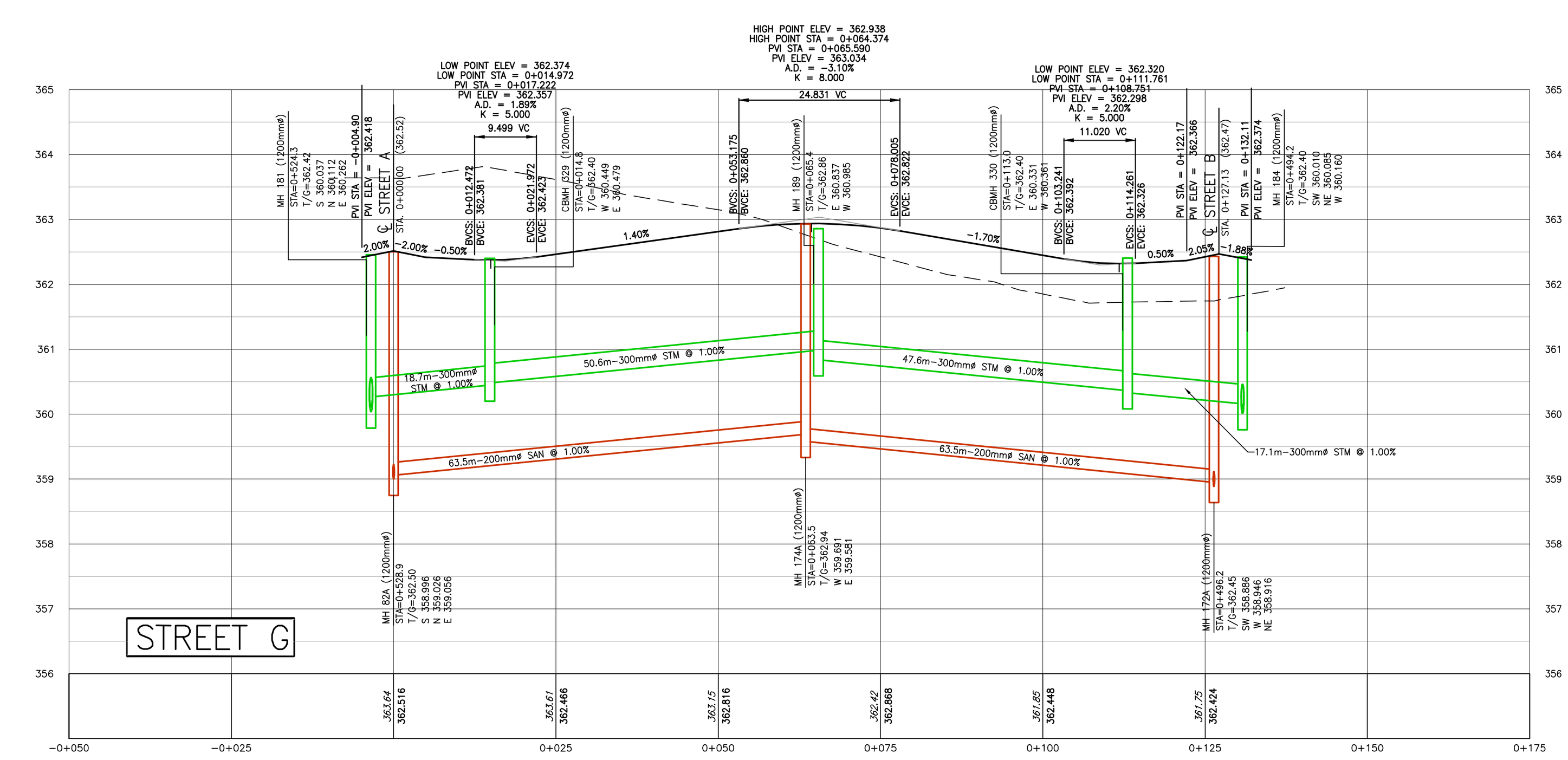
Project No.	Scale
161413217	1:1000H 1:100V

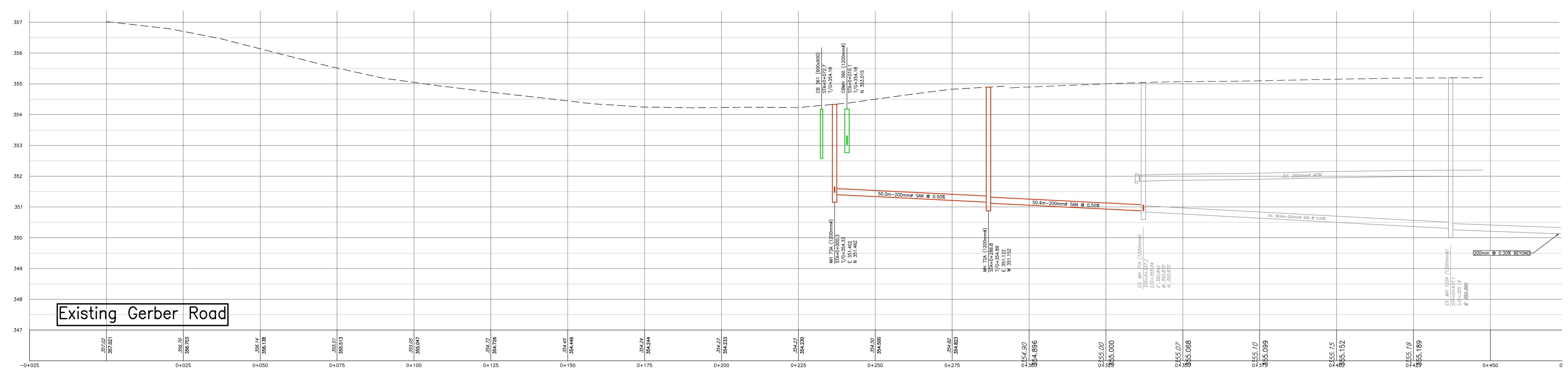
Revision	Sheet	Drawing No.
1	of	C-200

ORIGINAL SHEET - ARCH D









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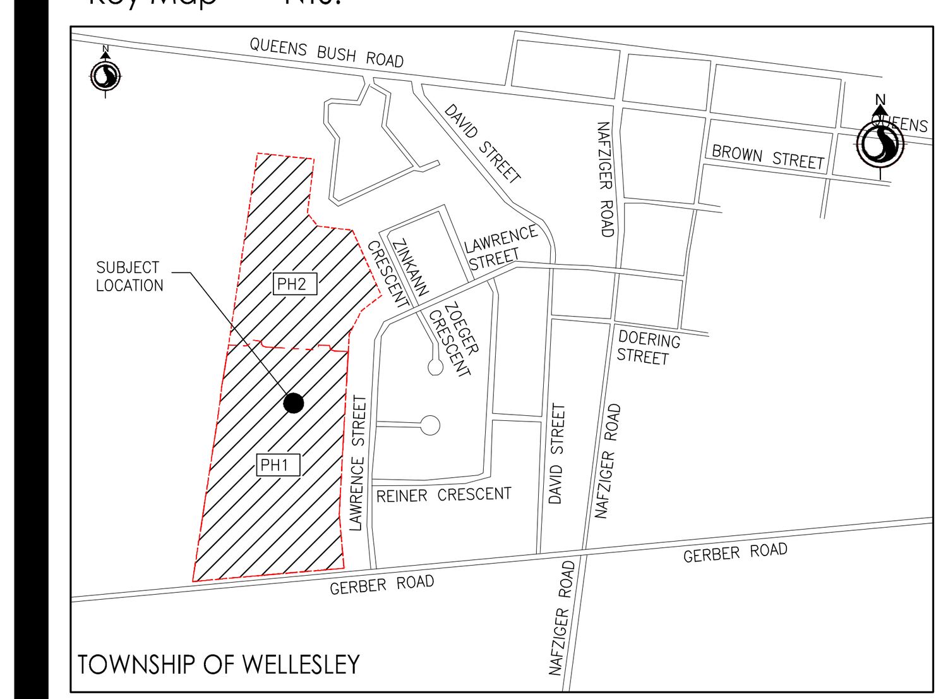
Key Map NTS.



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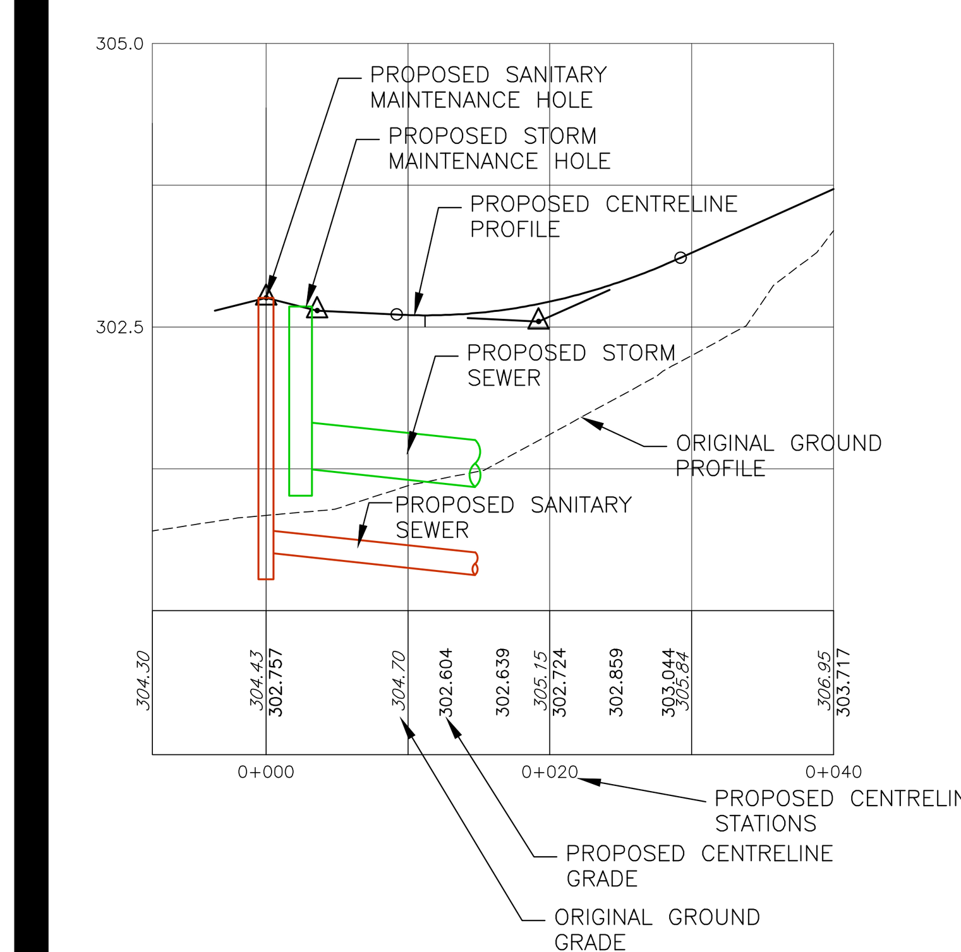

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0.	FIRST SUBMISSION	EMV	JV	2023.05.08
Revision		By	Appd	YYYY.MM.DD

File Name: 161413217_C-200ST	EMV	JV	EMV	2022.03.21
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

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100230470
06/28/2024
PROVINCE OF ONTARIO

Client/Project
STROHVEST ONTARIO INC.

WELLESLEY PROPERTY
GERBER ROAD

TOWNSHIP OF WELLESLEY, ON

Title
CONCEPTUAL PROFILES

Project No. 161413217

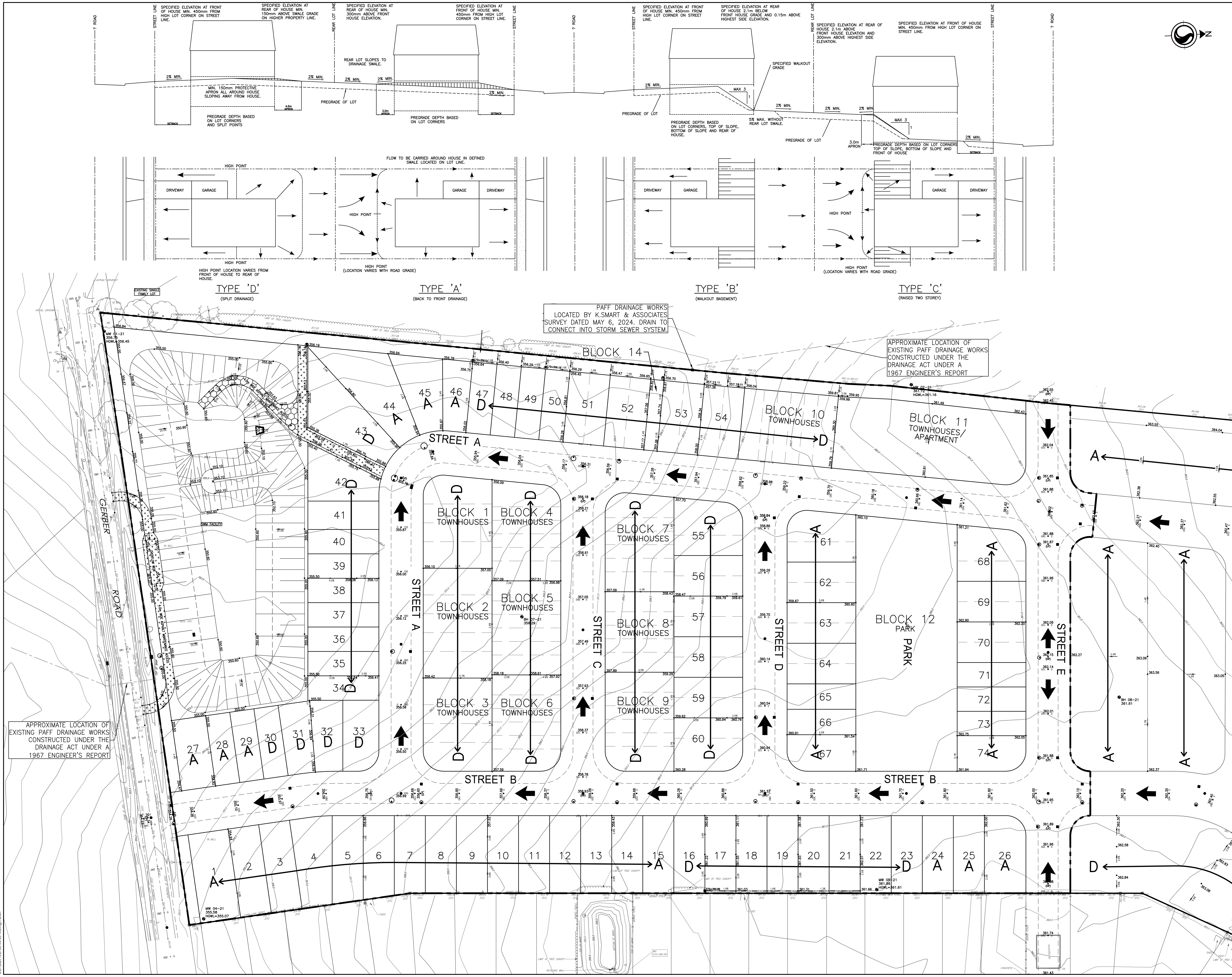
Scale 1:1000H 1:100V

Revision 1

Sheet of

Drawing No. **C-201**

ORIGINAL SHEET - ARCH D



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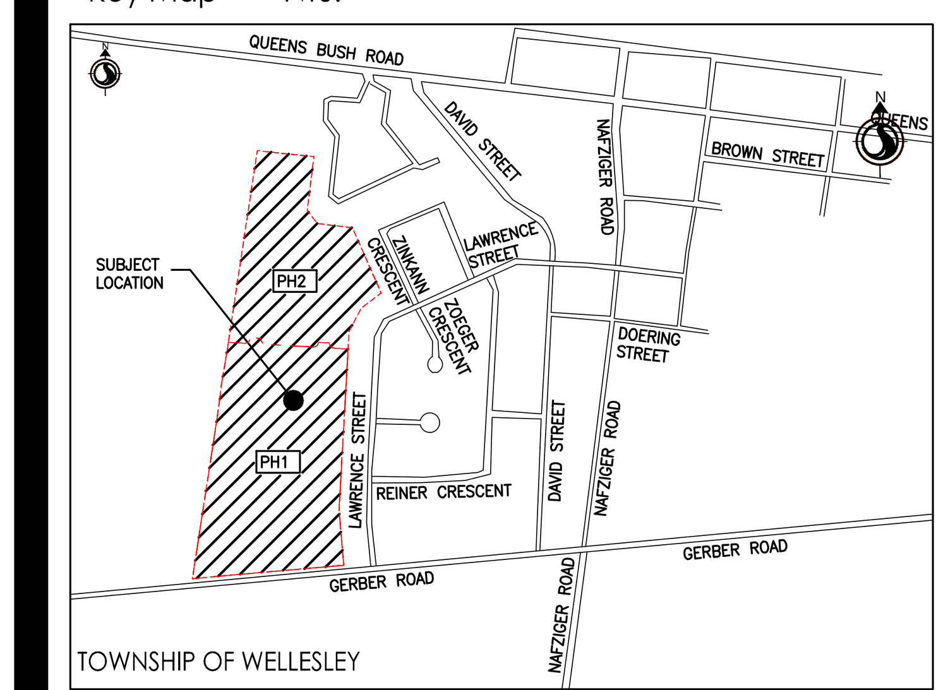
Key Map NTS.



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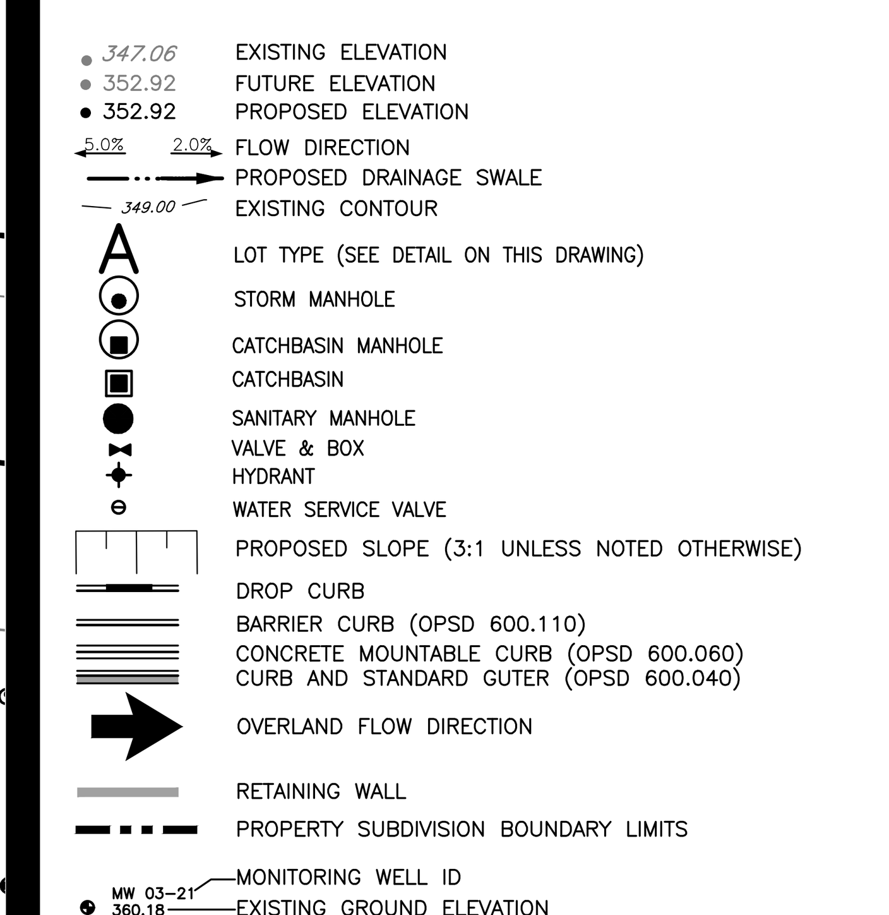


1.	SECOND SUBMISSION	BWM	JL/KRB	2024.06.27
0.	FIRST SUBMISSION	EMV	JV	2023.05.08
Revision		By	Appd	YYYY.MM.DD

File Name: 161413217_C-GP	EMV	JV	EMV	2022.03.21
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

LICENSED PROFESSIONAL ENGINEER
J. L. LEFAIVE
100230470
06/28/2024
PROVINCE OF ONTARIO

Client/Project

STROHVEST ONTARIO INC.

WELLESLEY PROPERTY
GERBER ROAD

TOWNSHIP OF WELLESLEY, ON

Title

CONCEPTUAL GRADING PLAN

Project No. 161413217

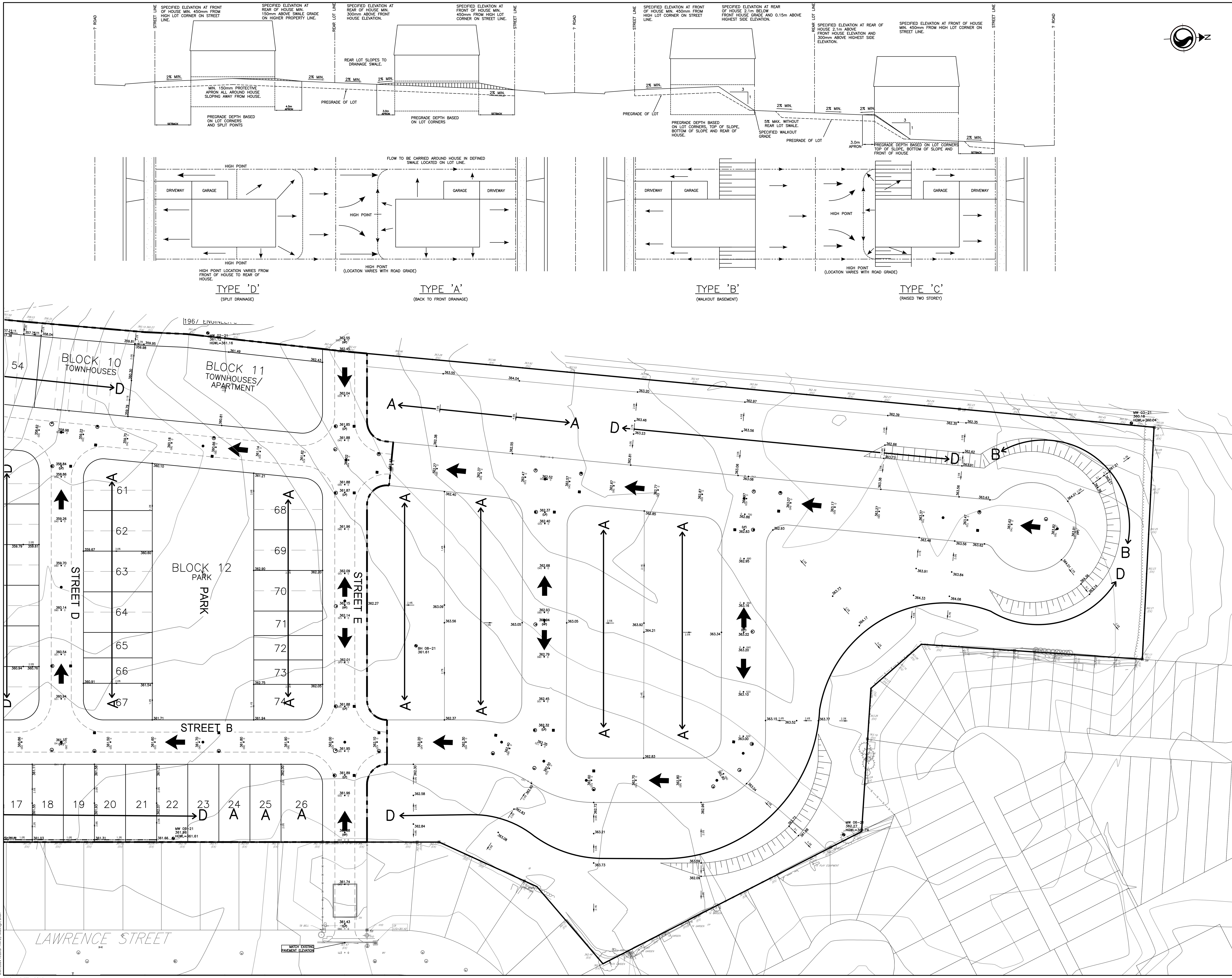
Scale 1:750 (0 7.5 22.5 37.5m)

Revision 1

Sheet of

Drawing No. C-400

ORIGINAL SHEET - ARCH D



ORIGINAL SHEET - ARCH D

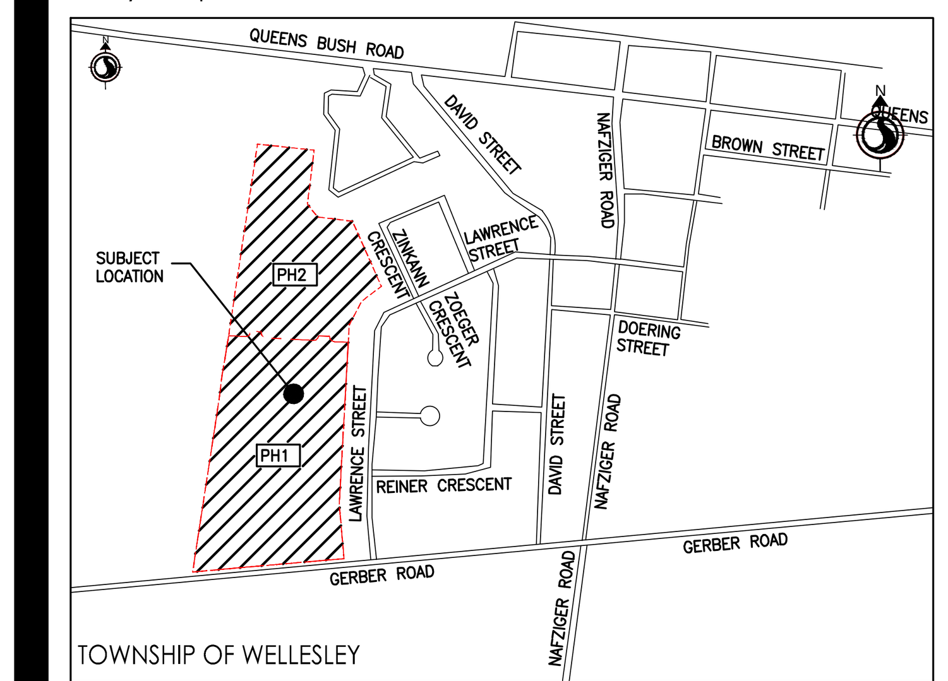
Stantec

Stantec Consulting Ltd.
100-300 Hagey Boulevard
Waterloo ON N2L 0A4
Tel: (519) 579-4410
www.stantec.com

Notes

1. ELEV'S ARE REFERRED TO THE CANADIAN GEODETIC VERTICAL DATUM (CGVD-1928:1978)
2. DRAFT PLAN PREPARED BY STANTEC CONSULTING LTD., DATED MAY 2024.
3. CALCULATED PLAN PREPARED BY XXX, DATED XXX.
4. TOPOGRAPHICAL SURVEY PREPARED BY STANTEC CONSULTING LTD., DATED NOV 18, 2021. CONTOURS OUTSIDE OF THE PROPERTY LINE, AND WITHIN THE HEAVILY WOODED AREA OF THE SITE, HAVE BEEN OBTAINED FROM S.W.O.O.P TOPOGRAPHIC INFORMATION (2015).

Key Map NTS.



Legend

- 347.06 EXISTING ELEVATION
- 352.92 FUTURE ELEVATION
- 352.92 PROPOSED ELEVATION
- 5.0% 2.0% FLOW DIRECTION
- PROPOSED DRAINAGE SWALE
- 349.00 EXISTING CONTOUR
- A LOT TYPE (SEE DETAIL ON THIS DRAWING)
- STORM MANHOLE
- CATCHBASIN MANHOLE
- CATCHBASIN
- SANITARY MANHOLE
- VALVE & BOX
- HYDRANT
- WATER SERVICE VALVE
- PROPOSED SLOPE (3:1 UNLESS NOTED OTHERWISE)
- DROP CURB
- BARRIER CURB (OPSD 600.110)
- CONCRETE MOUNTABLE CURB (OPSD 600.060)
- CURB AND STANDARD GUTER (OPSD 600.040)
- OVERLAND FLOW DIRECTION
- RETAINING WALL
- PROPERTY SUBDIVISION BOUNDARY LIMITS
- MW 03-21 — MONITORING WELL ID
- 360.18 — EXISTING GROUND ELEVATION

Revision	By	Appd	YYYY.MM.DD
1. SECOND SUBMISSION	BWM	JL/KRB	2024.06.27
0. FIRST SUBMISSION	EMV	JV	2023.05.08

File Name: 161413217_C-GP	Dwn.	Chkd.	Dsgn.	YY.MM.DD
	EMV	JV	EMV	2022.03.21

Permit-Seal

LICENSED PROFESSIONAL ENGINEER
J. L. LEFAIVE
100230470
06/28/2024
PROVINCE OF ONTARIO

Client/Project

STROHVEST ONTARIO INC.

WELLESLEY PROPERTY
GERBER ROAD

TOWNSHIP OF WELLESLEY, ON

Title

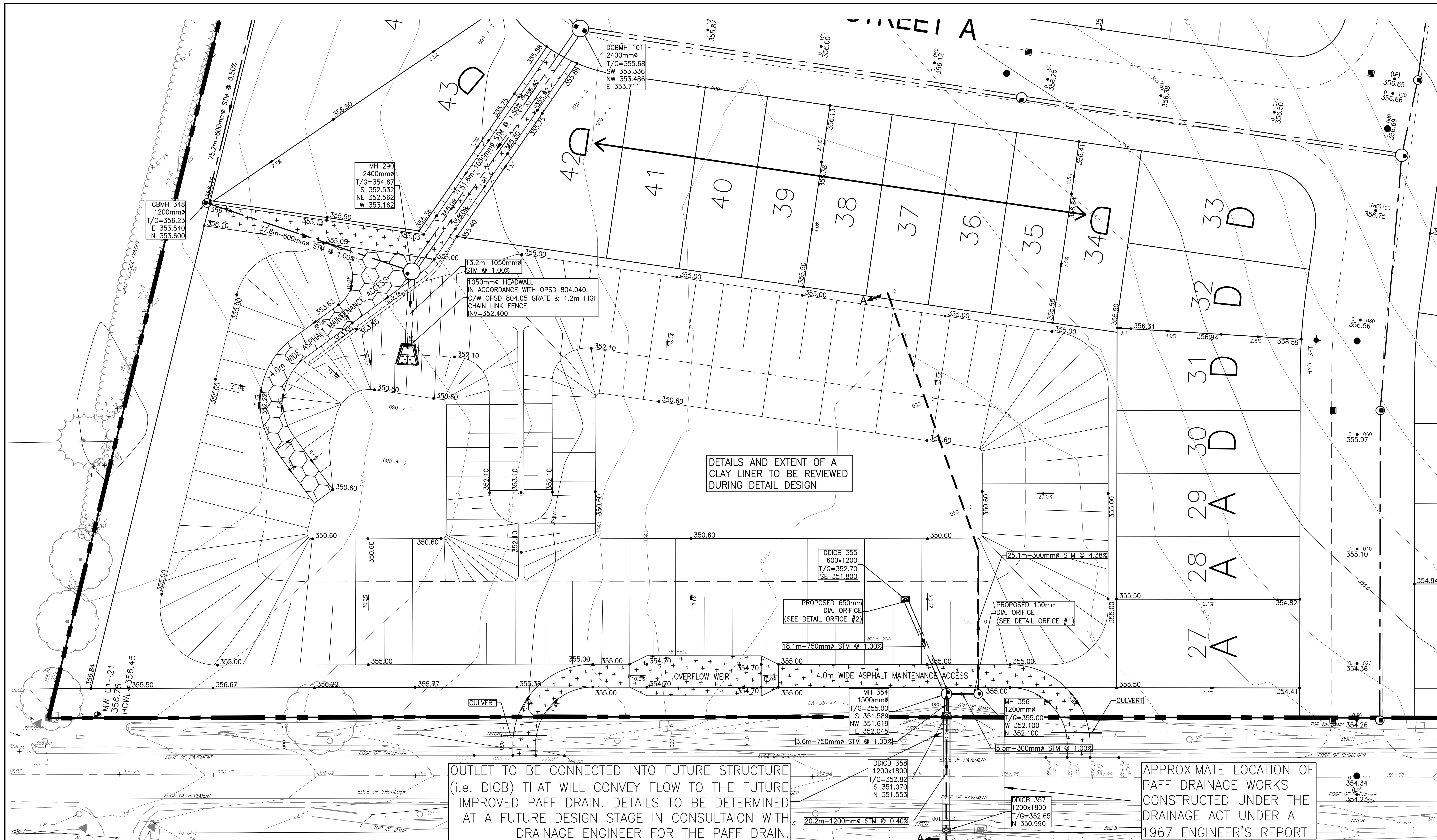
CONCEPTUAL GRADING PLAN

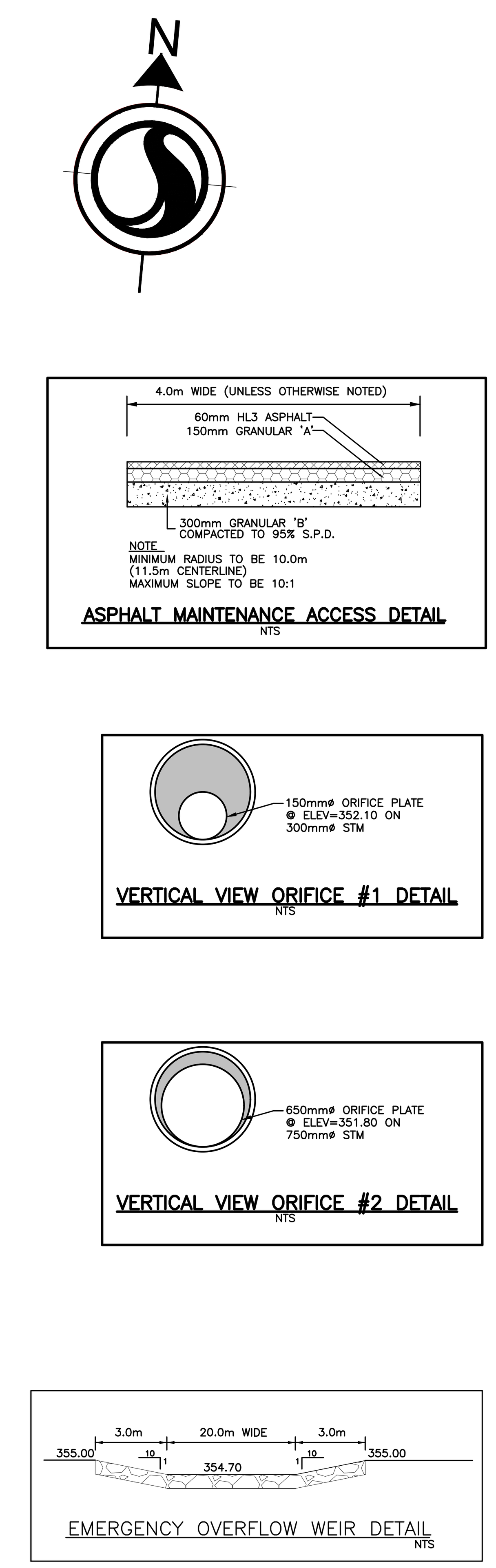
Project No. 161413217

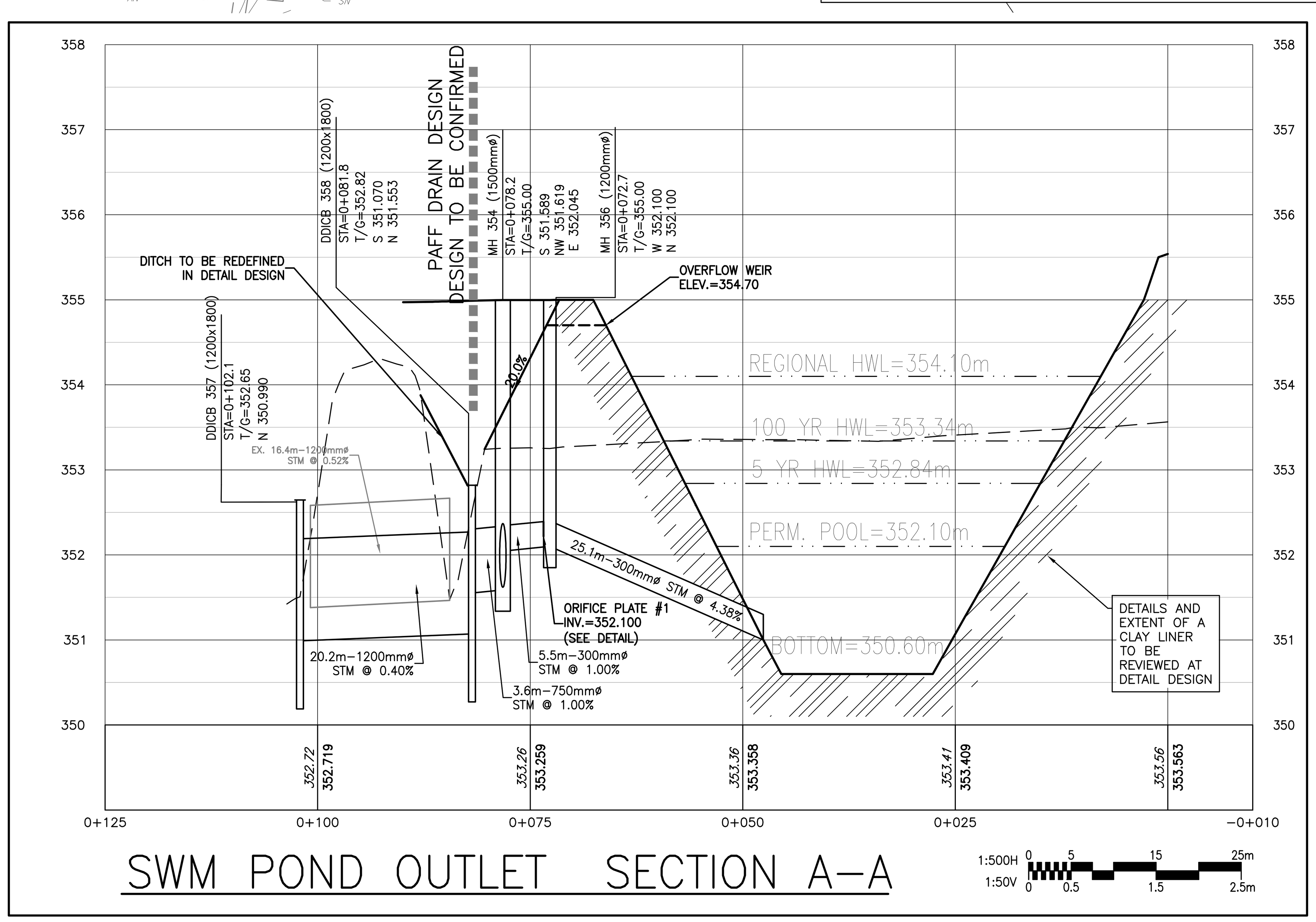
Scale 1:750 — 0 7.5 22.5 37.5m

Revision 1 Sheet of

Drawing No. **C-401**







SWM POND OUTLET SECTION A–A

Stantec

Stantec Consulting Ltd.
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www.stantec.com

Notes

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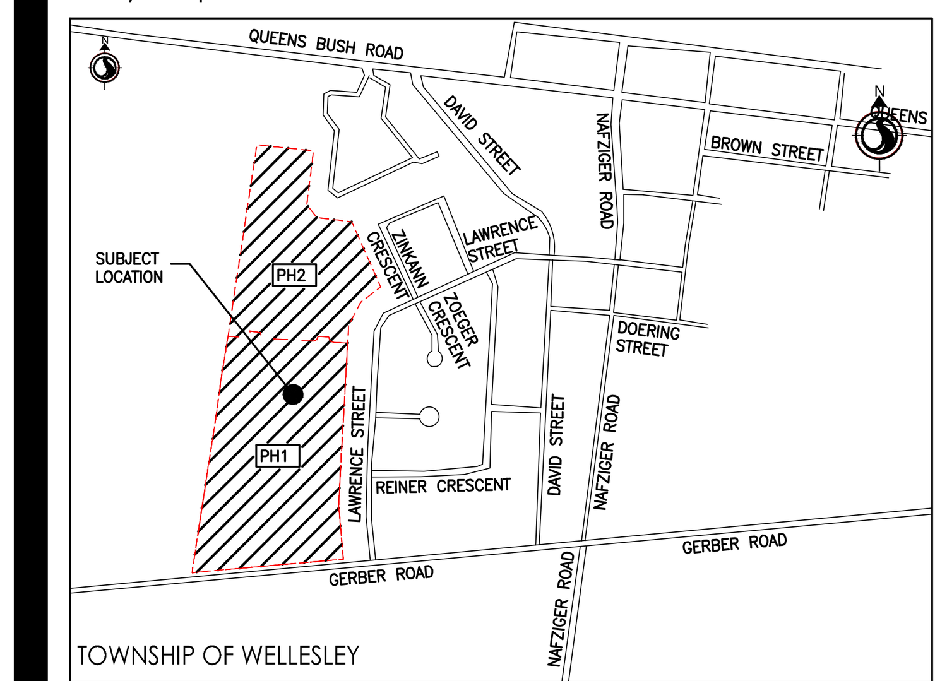
Key Map NTS.



Legend

1. SECOND SUBMISSION	BWM	JL/KRB	2024.06.27
0. FIRST SUBMISSION	EMV	JV	2023.05.08
Revision	By	Appd	YYYY.MM.DD

File Name: 161413217_C-HX	EMV	JV	EMV	2022.03.21
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

LICENSED PROFESSIONAL ENGINEER
J. L. LEFAIVE
100230470
06/28/2024
PROVINCE OF ONTARIO

Client/Project

STROHVEST ONTARIO INC.

WELLESLEY PROPERTY
GERBER ROAD

TOWNSHIP OF WELLESLEY, ON

Title

STORMWATER MANAGEMENT FACILITY

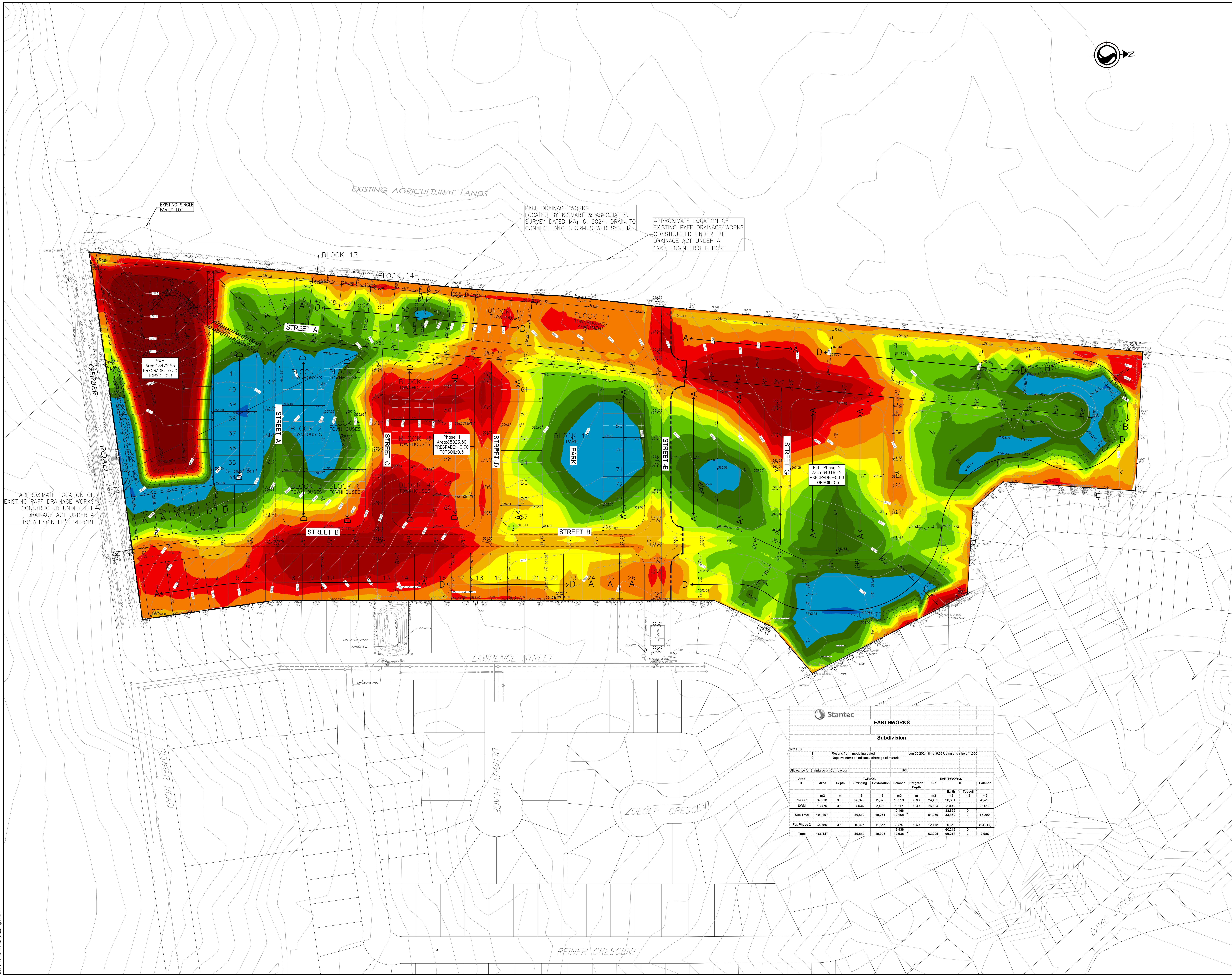
Project No. 161413217

Scale 1:400 0 4 12 20m

Revision 1 Sheet of

Drawing No. **C-800**

ORIGINAL SHEET - ARCH D



Stantec										
EARTHWORKS										
Subdivision										
NOTES										
1		Results from modeling dated				Jun 05 2024 time: 9.33 Using grid size of 1.000				
2		Negative number indicates shortage of material.								
Allowance for Shrinkage on Compaction					**10%**					
Area		**TOPSOIL**				**EARTHWORKS**				
ID	**Area**	**Depth**	**Stripping**	**Restoration**	**Balance**	**Pregrade Depth**	**Cut**	**Fill**		**Balance**
								Earth	**Topsoil**	
	m2	m	m3	m3	m3	m	m3	m3	m3	m3
Phase 1	87,918	0.30	26,375	15,825	10,550	0.60	24,435	30,851		(6,416)
SWM	13,479	0.30	4,044	2,426	1,617	0.30	26,624	3,008		23,617
					12,168			33,859	0	
Sub-Total	**101,397**		**30,419**	**18,251**	**12,168**		**51,059**	**33,859**	**0**	**17,200**
Fut. Phase 2	64,750	0.30	19,425	11,655	7,770	0.60	12,145	26,359		(14,214)
					19,938			60,218	0	
Total	**166,147**		**49,844**	**29,906**	**19,938**		**63,205**	**60,218**	**0**	**2,986**

Stantec

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Notes

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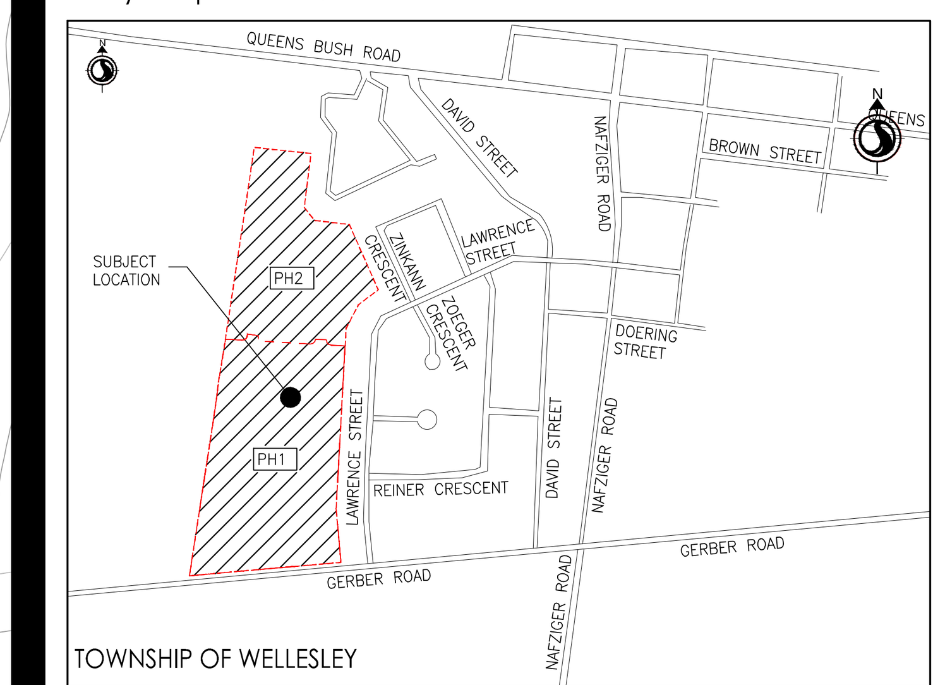
Key Map NTS.



Legend

Elevations Table				
Number	Minimum Elevation	Maximum Elevation	Area	Color
1	−6.13	−2.00	6259.68	
2	−2.00	−1.00	10690.25	
3	−1.00	−0.75	8522.94	
4	−0.75	−0.50	14109.39	
5	−0.50	−0.25	23346.51	
6	−0.25	−0.10	14624.61	
7	−0.10	0.10	14324.77	
8	0.10	0.25	9143.83	
9	0.25	0.50	18316.18	
10	0.50	0.75	16397.81	
11	0.75	1.00	11461.77	
12	1.00	2.00	18857.81	
13	2.00	2.46	203.14	

Revision		By	Appd	YYYY.MM.DD
1.	SECOND SUBMISSION	BWM	JL/KRB	2024.06.27
0.	FIRST SUBMISSION	EMV	JV	2023.05.08

File Name: 161413217_C-900CF	EMV	JV	EMV	2022.03.21
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

LICENSED PROFESSIONAL ENGINEER
J. L. LEFAIVE
100230470
06/28/2024
PROVINCE OF ONTARIO

Client/Project

STROHVEST ONTARIO INC.

WELLESLEY PROPERTY
GERBER ROAD

TOWNSHIP OF WELLESLEY, ON

Title

PRELIMINARY CUT/FILL PLAN

Project No. 161413217

Scale 1:1250 0 12.5 37.5 62.5m

Revision 1 Sheet of

Drawing No. **C-900**

ORIGINAL SHEET - ARCH D

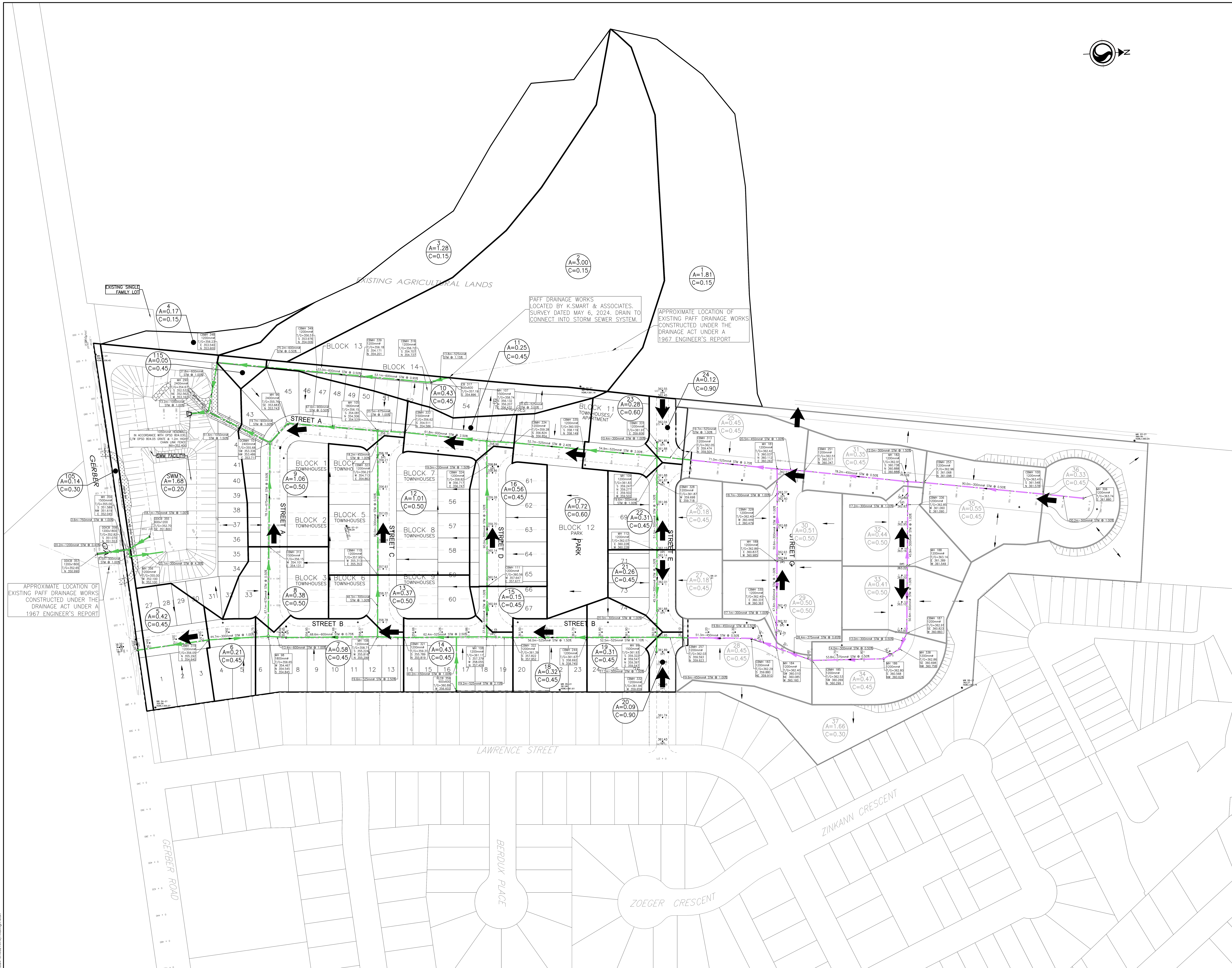
APPENDIX D SEWER DESIGN SHEETS

D.1 CONCEPTUAL STORM DRAINAGE AREA PLAN C-110

D.2 STORM SEWER DESIGN SHEET

D.3 CONCEPTUAL SANITARY DRAINAGE AREA PLAN C-120

D.4 SANITARY SEWER DESIGN SHEET



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Tel: (519) 579-4410
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Notes

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3. CALCULATED PLAN PREPARED BY XXX, DATED XXX.
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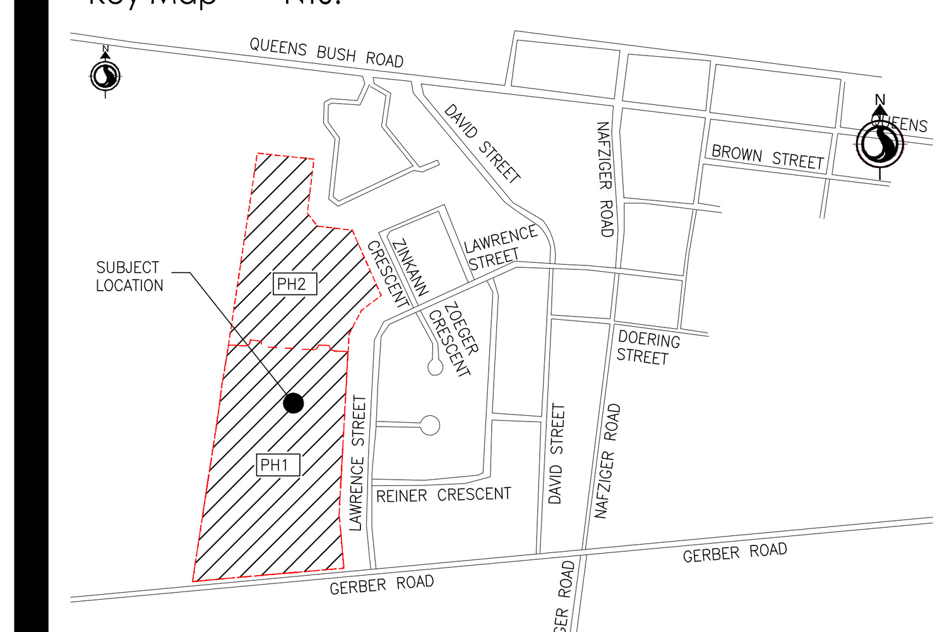
Key Map NTS.



TOWNSHIP OF WELLESLEY

Legend

10 / C=0.45 / A=0.85	CATCHMENT ID / RUNOFF COEFFICIENT / CONTRIBUTING AREA (ha)
(arrow)	MAJOR OVERLAND FLOOD ROUTE
(line)	AREA BOUNDARY
(line)	PROPOSED STORM SEWER
(line)	EXISTING STORM SEWER
(line)	PROPOSED STORM SEWER
10 / C=0.25 / A=0.65	CATCHMENT ID / FUTURE RUNOFF COEFFICIENT / FUTURE CONTRIBUTING AREA (ha)

Revision		By	Appd	YYYY.MM.DD
1.	SECOND SUBMISSION	BWM	JL/KRB	2024.06.27
0.	FIRST SUBMISSION	EMV	JV	2023.05.08

File Name: 161413217_C-110SD	Dwn.	Chkd.	Dsgn.	YY.MM.DD
	EMV	JV	EMV	2022.03.21

Permit-Seal

Client/Project
STROHVEST ONTARIO INC.

WELLESLEY PROPERTY
GERBER ROAD

TOWNSHIP OF WELLESLEY, ON

Title
CONCEPTUAL STORM DRAINAGE AREA PLAN

Project No. 161413217

Scale 1:1250 (0, 12.5, 37.5, 62.5m)

Revision 1 Sheet of

Drawing No. **C-110**

ORIGINAL SHEET - ARCH D

Stantec

Strohvest Ontario Inc.
Strohvest Lands

DATE: May 31, 2024
DESIGNED BY: BWM
CHECKED BY: JL

STORM SEWER DESIGN SHEET

FILE NUMBER: 30T- N/A

DESIGN PARAMETERS

DESIGN STORM 1 IN 5 Years

I = a / ((tc + b) ^c)

a=	1593.00	MANNING'S n =	0.013		
b=	11.00	MINIMUM COVER:	1.500	m	
c=	0.8789	TIME OF ENTRY	10	min	

LOCATION			DRAINAGE AREA								PIPE SELECTION							
Street	U/S	D/S	Area ID	5-Year Area Design (ha)	Runoff Coeff. Design	A x R	Accum. A x R	U/S T_C (min)	Rainfall Intensity (mm/hr)	Total Flow (m^3/s)	Length Design (m)	Design Size (mm)	Slope Design (%)	Full Capacity (m^3/s)	Full Velocity (m/s)	Actual Velocity (m/s)	Time of Flow (min)	5-Year Q_A/Q_C (%)
Fut.Street A	306	100	36	0.33	0.45	0.15	0.15	10.00	109.68	0.045	30.2	300	1.00	0.097	1.37	1.34	0.38	46.8%
	100	253	-	0.00	0.00	0.00	0.15	10.38	107.98	0.045	90.0	300	0.50	0.068	0.97	1.04	1.45	65.1%
	253	182	35	0.55	0.45	0.25	0.40	11.82	101.93	0.112	12.0	300	1.50	0.118	1.68	1.94	0.10	94.7%
								11.93										
Fut. Street B	188	336	-	0.00	0.00	0.00	0.00	10.00	109.68	0.000	45.9	300	1.00	0.097	1.37	0.00	0.01	0.0%
	336	182	32	0.44	0.50	0.22	0.22	10.00	109.68	0.067	17.2	300	1.00	0.097	1.37	1.48	0.19	69.3%
								10.19										
Fut. Street A	182	251	-	0.00	0.00	0.00	0.62	11.93	101.53	0.174	78.2	450	0.50	0.202	1.27	1.44	0.91	86.2%
	251	181	31	0.35	0.45	0.16	0.77	12.83	98.13	0.211	20.5	450	1.00	0.285	1.79	1.97	0.17	74.0%
								13.01										
Fut. Street G	189	329	-	0.00	0.00	0.00	0.00	10.00	109.68	0.000	50.6	300	1.00	0.097	1.37	0.00	0.01	0.0%
	329	181	30	0.51	0.50	0.26	0.26	10.00	109.68	0.078	18.7	300	1.00	0.097	1.37	1.53	0.20	80.3%
								10.20										
Fut. Street A	181	313	-	0.00	0.00	0.00	1.03	13.01	97.51	0.279	71.0	525	0.75	0.372	1.72	1.90	0.62	74.8%
Street A	313	109	25	0.45	0.45	0.20	1.23	13.63	95.34	0.326	19.7	525	1.00	0.430	1.99	2.20	0.15	75.8%
								13.78										
Street E (West)	331	109	24	0.12	0.90	0.11	0.11	10.00	109.68	0.033	10.4	300	1.00	0.097	1.37	1.23	0.14	34.0%
								10.14										
Street E	112	328	-	0.00	0.00	0.00	0.00	10.00	109.68	0.000	51.0	300	1.00	0.097	1.37	0.00	0.01	0.0%
(Ph 2 CA)			26	0.18	0.45	0.08		10.00										
			22	0.31	0.45	0.14												
Street E	328	109	-	0.49	0.45	0.22	0.22	10.00	109.68	0.067	19.6	300	1.00	0.097	1.37	1.48	0.22	69.5%
								10.22										
Street A	109	335	-	0.00	0.00	0.00	1.56	13.78	94.83	0.411	54.9	525	2.00	0.608	2.81	3.02	0.30	67.5%
	335	334	23	0.28	0.60	0.17	1.73	14.08	93.83	0.450	52.7	525	2.40	0.666	3.08	3.31	0.27	67.6%
	334	107	17	0.72	0.60	0.43	2.16	14.35	92.96	0.558	20.6	525	3.00	0.745	3.44	3.80	0.09	74.9%
								14.44										
Street D	108	111	-	0.00	0.00	0.00	0.00	10.00	109.68	0.000	37.8	300	1.00	0.097	1.37	0.00	0.01	0.0%
	111	324	15	0.15	0.45	0.07	0.07	10.01	109.63	0.021	90.0	300	1.00	0.097	1.37	1.04	1.44	21.3%
	324	107	16	0.56	0.45	0.25	0.32	11.45	103.42	0.092	19.0	300	1.50	0.118	1.68	1.86	0.17	77.5%
								11.62										

Stantec

Strohvest Ontario Inc.
Strohvest Lands

DATE: May 31, 2024
DESIGNED BY: BWM
CHECKED BY: JL

STORM SEWER DESIGN SHEET

FILE NUMBER: 30T- N/A

DESIGN PARAMETERS

DESIGN STORM 1 IN 5 Years

I = a / ((tc + b) ^c)

a=	1593.00	MANNING'S n =	0.013	
b=	11.00	MINIMUM COVER:	1.500	m
c=	0.8789	TIME OF ENTRY	10	min

LOCATION			DRAINAGE AREA								PIPE SELECTION							
Street	U/S	D/S	Area ID	5-Year Area Design (ha)	Runoff Coeff. Design	A x R	Accum. A x R	U/S T_C (min)	Rainfall Intensity (mm/hr)	Total Flow (m^3/s)	Length Design (m)	Design Size (mm)	Slope Design (%)	Full Capacity (m^3/s)	Full Velocity (m/s)	Actual Velocity (m/s)	Time of Flow (min)	5-Year Q_A/Q_C (%)
Street A	107	333					2.48	14.44	92.67	0.638	61.8	600	2.50	0.971	3.43	3.67	0.28	65.7%
	333	105	11	0.25	0.45	0.11	2.59	14.72	91.78	0.661	20.5	675	1.00	0.841	2.35	2.62	0.13	78.6%
								14.85										
Street C	106	110	-	0.00	0.00	0.00	0.00	10.00	109.68	0.000	46.3	300	1.00	0.097	1.37	0.00	0.01	0.0%
	110	323	13	0.37	0.50	0.19	0.19	10.01	109.63	0.056	90.0	300	0.50	0.068	0.97	1.09	1.38	82.4%
	323	105	12	1.01	0.50	0.51	0.69	11.39	103.68	0.199	18.2	450	1.00	0.285	1.79	1.95	0.16	69.7%
								11.54										
Street A	105	96	-	0.00	0.00	0.00	3.28	14.85	91.38	0.833	67.6	900	0.50	1.280	2.01	2.15	0.52	65.1%
	96	101	-	0.00	0.00	0.00	3.28	15.37	89.78	0.818	19.7	900	1.00	1.810	2.85	2.75	0.12	45.2%
								15.49										
Fut. Street B	188	187	-	0.00	0.00	0.00	0.00	10.00	109.68	0.000	50.6	300	1.00	0.097	1.37	0.00	0.01	0.0%
	187	338	33	0.41	0.50	0.21	0.21	10.01	109.63	0.062	13.0	300	0.50	0.068	0.97	1.11	0.20	91.3%
	338	186	-	0.00	0.00	0.00	0.21	10.21	108.74	0.062	14.0	300	0.50	0.068	0.97	1.11	0.21	90.6%
	186	185	-	0.00	0.00	0.00	0.21	10.42	107.80	0.061	53.8	375	0.50	0.124	1.12	1.11	0.81	49.5%
	185	184	34	0.47	0.45	0.21	0.42	11.22	104.35	0.121	28.4	375	0.65	0.141	1.28	1.45	0.33	85.4%
								11.55										
Fut. Street G	189	330	-	0.00	0.65	0.00	0.00	10.00	109.68	0.000	47.6	300	1.00	0.097	1.37	0.00	0.01	0.0%
	330	184	29	0.50	0.50	0.25	0.25	10.01	109.63	0.076	17.1	300	1.00	0.097	1.37	1.53	0.19	78.7%
								10.20										
Fut. Street B	184	183	-	0.00	0.00	0.00	0.67	11.55	103.02	0.191	19.8	450	0.50	0.202	1.27	1.46	0.23	94.6%
	183	257	-	0.00	0.00	0.00	0.67	11.78	102.13	0.189	51.3	450	0.50	0.202	1.27	1.46	0.59	93.8%
	257	99	28	0.45	0.45	0.20	0.87	12.36	99.87	0.241	19.6	450	1.00	0.285	1.79	2.03	0.16	84.6%
								12.52										
Street E (East)	332	99	20	0.09	0.90	0.08	0.08	10.00	109.68	0.025	11.2	300	1.00	0.097	1.37	1.09	0.17	25.5%
								10.17										
Street E	112	327	-	0.00	0.00	0.00	0.00	10.00	109.68	0.000	45.1	300	1.00	0.097	1.37	0.00	0.01	0.0%
			27	0.18	0.45	0.08		10.01										
			21	0.26	0.45	0.12												
	327	99	-	0.44	0.45	0.20	0.20	10.00	109.68	0.060	20.0	300	1.00	0.097	1.37	1.45	0.23	62.4%
								10.23										

Stantec

Strohvest Ontario Inc.
Strohvest Lands

DATE: May 31, 2024
DESIGNED BY: BWM
CHECKED BY: JL

STORM SEWER DESIGN SHEET

FILE NUMBER: 30T- N/A

DESIGN PARAMETERS

DESIGN STORM 1 IN 5 Years

I = a / ((tc + b) ^c)

a=	1593.00	MANNING'S n =	0.013	
b=	11.00	MINIMUM COVER:	1.500	m
c=	0.8789	TIME OF ENTRY	10	min

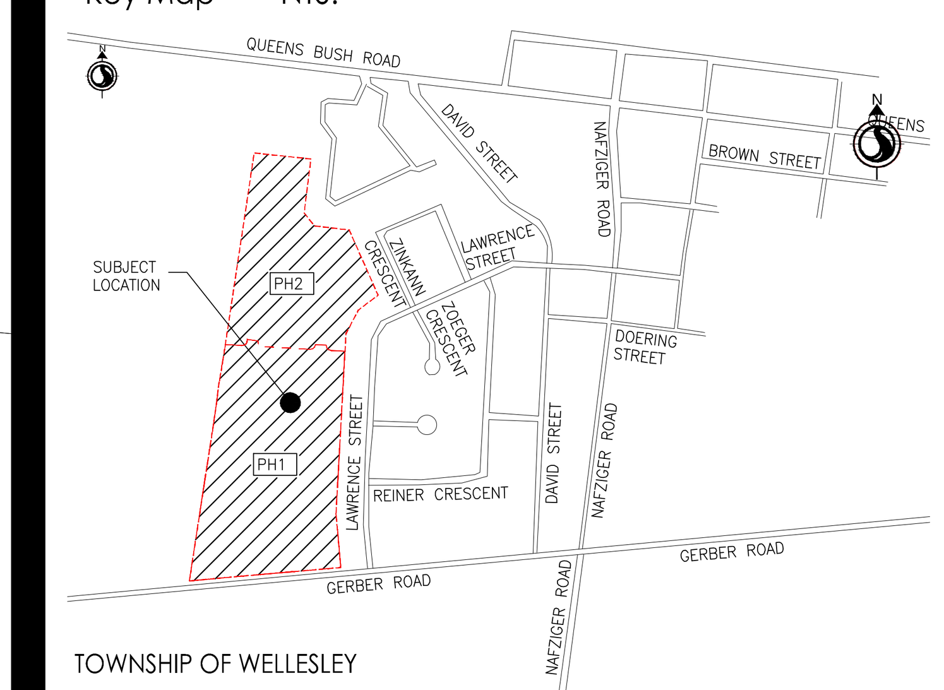
LOCATION			DRAINAGE AREA								PIPE SELECTION							
Street	U/S	D/S	Area ID	5-Year Area Design (ha)	Runoff Coeff. Design	A x R	Accum. A x R	U/S T_C (min)	Rainfall Intensity (mm/hr)	Total Flow (m^3/s)	Length Design (m)	Design Size (mm)	Slope Design (%)	Full Capacity (m^3/s)	Full Velocity (m/s)	Actual Velocity (m/s)	Time of Flow (min)	5-Year Q_A/Q_C (%)
Street B	99	244	-	0.00	0.00	0.00	1.15	12.52	99.27	0.317	52.5	525	1.10	0.451	2.08	2.27	0.39	70.2%
	244	322	19	0.31	0.45	0.14	1.29	12.91	97.86	0.350	56.0	525	1.50	0.527	2.43	2.62	0.36	66.4%
	322	108	18	0.32	0.45	0.14	1.43	13.27	96.59	0.384	19.2	525	2.15	0.631	2.91	3.06	0.10	60.9%
	108	321	-	0.00	0.00	0.00	1.43	13.37	96.23	0.383	62.4	525	2.50	0.680	3.14	3.24	0.32	56.3%
	321	106	14	0.43	0.45	0.19	1.63	13.69	95.13	0.429	19.6	525	2.50	0.680	3.14	3.33	0.10	63.1%
	106	320	-	0.00	0.00	0.00	1.63	13.79	94.80	0.428	68.6	600	0.75	0.532	1.88	2.11	0.54	80.5%
	320	98	7	0.58	0.45	0.26	1.89	14.33	93.01	0.487	13.4	600	1.00	0.614	2.17	2.42	0.09	79.4%
								14.42										
Street B	319	98	6	0.21	0.45	0.09	0.09	10.00	109.68	0.029	44.7	300	1.00	0.097	1.37	1.16	0.64	29.8%
								10.64										
Street A	98	312	-	0.00	0.00	0.00	1.98	14.42	92.71	0.510	67.1	675	0.50	0.594	1.66	1.88	0.60	85.8%
	312	101	8	0.38	0.50	0.19	2.17	15.02	90.84	0.548	78.1	675	0.50	0.594	1.66	1.91	0.68	92.1%
								15.70										
To HW	101	290	9	1.06	0.50	0.53	5.98	15.70	88.80	1.476	51.6	1050	1.50	3.344	3.86	3.73	0.23	44.1%
								15.93										
Paff Drain*	317	316	2	3.00	0.15	0.45	0.45	10.00	196.54	0.246	13.8	525	1.15	0.461	2.13	2.15	0.11	53.3%
	316	339	10	0.43	0.45	0.19	0.64	10.11	195.79	0.350	53.1	600	0.95	0.598	2.12	2.20	0.40	58.5%
	339	349	-	0.00	0.00	0.00	0.64	10.51	193.04	0.345	33.0	600	0.50	0.434	1.54	1.71	0.32	79.5%
	349	348	-	0.00	0.00	0.00	0.64	10.83	190.89	0.341	75.2	600	0.50	0.434	1.54	1.71	0.73	78.6%
			3	1.28	0.15	0.19		11.56										
			115	0.05	0.45	0.02												
	348	290	-	1.33	0.16	0.21	0.86	11.56	186.18	0.444	37.8	600	1.00	0.614	2.17	2.39	0.26	72.3%
								11.83										
To HW	290	218	-	0.00	0.00	0.00	6.84	15.93	88.13	1.675	13.2	1050	1.00	2.731	3.15	3.31	0.07	61.3%
								16.00										
				* Paff Drain intercept to be sized for the 1 in 100 Yr Event														

Stantec Consulting Ltd.
100-300 Hagey Boulevard
Waterloo ON N2L 0A4
Tel: (519) 579-4410
www.stantec.com

Notes

1. ELEV'S ARE REFERRED TO THE CANADIAN GEODETIC VERTICAL DATUM (CGVD-1928:1978)
2. DRAFT PLAN PREPARED BY STANTEC CONSULTING LTD., DATED MAY 2024.
3. CALCULATED PLAN PREPARED BY XXX, DATED XXX.
4. TOPOGRAPHICAL SURVEY PREPARED BY STANTEC CONSULTING LTD., DATED NOV 18, 2021. CONTOURS OUTSIDE OF THE PROPERTY LINE, AND WITHIN THE HEAVILY WOODED AREA OF THE SITE, HAVE BEEN OBTAINED FROM S.W.O.O.P TOPOGRAPHIC INFORMATION (2015).

Key Map NTS.



Legend

PROPOSED

- AREA ID / AREA (ha) / POPULATION ppl/unit
- AREA BOUNDARY
- PROPOSED SANITARY SEWER

EXTERNAL/FUTURE

- AREA ID / FUTURE AREA EXTERNAL TO STAGE 1 (ha) / FUTURE POPULATION ppl/unit
- FUTURE AREA BOUNDARY
- FUTURE SANITARY SEWER

- AREA ID / EXISTING AREA (ha) / EXISTING POPULATION ppl/unit
- EXISTING SANITARY SEWER

1. SECOND SUBMISSION	BWM	JL/KRB	2024.06.27
0. FIRST SUBMISSION	EMV	JV	2023.05.08
Revision	By	Appd	YYYY.MM.DD

File Name: 161413217_C-120SS	EMV	JV	EMV	2022.03.21
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project
STROHVEST ONTARIO INC.

WELLESLEY PROPERTY
GERBER ROAD

TOWNSHIP OF WELLESLEY, ON

Title
CONCEPTUAL SANITARY DRAINAGE AREA PLAN

Project No. 161413217
Scale 1:1250 (0 12.5 37.5 62.5m)

Revision 1 Sheet of
Drawing No. C-120

ORIGINAL SHEET - ARCH D

Stantec

Strohvest Ontario Inc.
Strohvest Lands

DATE: June 5, 2024
DESIGNED BY: BWM
CHECKED BY: JL

SANITARY SEWER DESIGN SHEET

FILE NUMBER: N/A
Project Number 161413217

Design Parameters

Mininum Velocity= 0.600 m/s
n= 0.013
Max Peak Factor= 4.500
Min Peak Factor= 1.500

Residential: 275 L/day/Person
0.0032 L/s/Person
Comercial: 0.500 L/s/Ha
Industrial: 0.400 L/s/Ha
Institutional: 0.250 L/s/Ha
Infiltration: 0.250 L/s/Ha

LOCATION			RESIDENTIAL AREA AND POPULATION								INFILTRATION				PIPE SELECTION						
Street	U/S	D/S	Area ID	Residential Area (ha)	Population Density (P/ha)	Population (P)	Cummulative Area (ha)	Cumulative Population (min)	Peak Factor	Peak Flow L/s	Total Area (ha)	Accumulated Area (ha)	Flow (L/s)	Total Flow (L/s)	Length Design (m)	Design Size (mm)	Slope Design (%)	Full Capacity (L/s)	Full Velocity (m/s)	Actual Velocity (m/s)	Q_A/Q_C (%)
Fut Street A	76	85	32	0.95	55	53	0.95	53	4.31	0.73	0.95	0.95	0.238	0.96	51.7	200	1.00	35.26	1.16	0.42	2.7%
	85	84	31	0.64	55	36	1.59	89	4.26	1.21	0.64	1.59	0.398	1.60	90.0	200	0.60	27.32	0.90	0.92	5.9%
Fut Street B	179	84	29	0.46	55	26	0.46	26	4.36	0.36	0.46	0.46	0.115	0.48	58.1	200	1.00	35.26	1.16	1.19	1.4%
Fut Street A	84	82	28	0.48	55	27	2.53	142	4.20	1.90	0.48	2.53	0.633	2.53	90.0	200	0.50	24.94	0.82	0.84	10.1%
Fut Street G	174	82	27	0.47	55	26	0.47	26	4.36	0.36	0.47	0.47	0.118	0.48	63.5	200	1.00	35.26	1.16	1.19	1.4%
Fut Street A	82	80	21	0.41	55	23	3.41	191	4.16	2.53	0.41	3.41	0.853	3.38	90.0	200	0.50	24.94	0.82	0.84	13.5%
Street E			22	0.18	55	10															
			19	0.29	55	17															
	94	80	-	0.47	0	27	0.47	27	4.36	0.37	0.47	0.47	0.118	0.49	63.5	200	1.00	35.26	1.16	1.19	1.4%
Streeet A	80	81	14	0.59	55	53	4.47	271	4.10	3.53	0.59	4.47	1.118	4.65	64.7	200	1.80	47.31	1.55	1.60	9.8%
	81	79	-	0.00	0	0	4.47	271	4.10	3.53	0.00	4.47	1.118	4.65	64.1	200	2.90	60.05	1.97	2.03	7.7%
Street D	89	93	12	0.50	55	37	0.50	37	4.34	0.51	0.50	0.50	0.125	0.64	69.8	200	1.00	35.26	1.16	1.19	1.8%
	93	79	13	0.51	55	40	1.01	77	4.27	1.05	0.51	1.01	0.253	1.30	69.8	200	1.00	35.26	1.16	1.19	3.7%
Street A	79	78	7	0.42	55	28	5.90	376	4.03	4.83	0.42	5.90	1.475	6.30	82.4	200	2.00	49.87	1.64	1.68	12.6%
Street C	88	92	9	0.55	55	44	0.55	44	4.33	0.61	0.55	0.55	0.138	0.74	73.7	200	1.00	35.26	1.16	1.19	2.1%
	92	78	8	0.53	55	41	1.08	85	4.26	1.15	0.53	1.08	0.270	1.42	73.7	200	1.00	35.26	1.16	1.19	4.0%
Street A	78	77	6	0.51	55	27	7.49	488	3.98	6.18	0.51	7.49	1.873	8.05	68.0	200	0.50	24.94	0.82	0.84	32.3%
	77	91	-	0.00	0	0	7.49	488	3.98	6.18	0.00	7.49	1.873	8.05	18.6	200	0.50	24.94	0.82	0.84	32.3%
	91	86	5	0.81	55	46	8.30	534	3.96	6.73	0.81	8.30	2.075	8.80	75.0	200	0.50	24.94	0.82	0.84	35.3%
	86	87	4	0.36	55	19	8.66	553	3.95	6.95	0.36	8.66	2.165	9.12	67.2	200	0.50	24.94	0.82	0.84	36.6%
Fut Street B	179	178	30	0.65	55	36	0.65	36	4.34	0.50	0.65	0.65	0.163	0.66	56.7	200	1.00	35.26	1.16	1.19	1.9%
	178	177	25	0.95	55	53	1.60	89	4.26	1.21	0.95	1.60	0.400	1.61	17.0	200	0.50	24.94	0.82	0.84	6.4%
	177	176	-	0.00	0	0	1.60	89	4.26	1.21	0.00	1.60	0.400	1.61	58.8	200	0.50	24.94	0.82	0.84	6.4%
	176	172	-	0.00	0	0	1.60	89	4.26	1.21	0.00	1.60	0.400	1.61	20.9	200	0.50	24.94	0.82	0.84	6.4%
Fut Street G	174	172	26	0.57	55	32	0.57	32	4.35	0.44	0.57	0.57	0.143	0.59	63.5	200	1.00	35.26	1.16	1.19	1.7%
Fut Street B	172	173	24	0.40	55	23	2.57	144	4.20	1.92	0.40	2.57	0.643	2.57	20.9	200	0.50	24.94	0.82	0.84	10.3%
	173	90	-	0.00	0	0	2.57	144	4.20	1.92	0.00	2.57	0.643	2.57	70.6	200	0.50	24.94	0.82	0.84	10.3%
Street E			23	0.18	55	11															
			18	0.31	55	17															
	94	90	-	0.49	0	28	0.49	28	4.36	0.39	0.49	0.49	0.123	0.51	63.6	200	1.00	35.26	1.16	1.19	1.4%
Street B	90	245	16	0.32	55	14	3.38	186	4.16	2.46	0.32	3.38	0.845	3.31	63.9	200	1.50	43.19	1.42	1.46	7.7%
	245	89	11	0.30	55	14	3.68	200	4.15	2.64	0.30	3.68	0.920	3.56	63.8	200	1.00	35.26	1.16	1.19	10.1%
Street B	89	88	10	0.44	55	20	4.12	220	4.13	2.89	0.44	4.12	1.030	3.92	82.0	200	2.75	58.48	1.92	1.97	6.7%
Street B	88	87	3	0.44	55	20	4.56	240	4.12	3.15	0.44	4.56	1.140	4.29	82.0	200	2.80	59.01	1.94	1.99	7.3%
Street B	87	75	2	0.28	55	14	13.50	807	3.86	9.91	0.28	13.50	3.375	13.28	37.5	200	0.50	24.94	0.82	0.84	53.3%
	75	73	1	0.57	55	30	14.07	837	3.85	10.25	0.57	14.07	3.518	13.77	76.0	200	0.50	24.94	0.82	0.84	55.2%
Gerber Rd.	73	72	-	0.00	0	0	14.07	837	3.85	10.25	0.00	14.07	3.518	13.77	50.0	200	0.50	24.94	0.82	0.84	55.2%
	72	71	-	0.00	0	0	14.07	837	3.85	10.25	0.00	14.07	3.518	13.77	50.4	200	0.50	24.94	0.82	0.84	55.2%

Stantec

Strohvest Ontario Inc.
Strohvest Lands

DATE: June 5, 2024
DESIGNED BY: BWM
CHECKED BY: JL

SANITARY SEWER DESIGN SHEET

FILE NUMBER: N/A
Project Number 161413217

Design Parameters

Mininum Velocity=	0.600	m/s	Residential:	275	L/day/Person
				0.0032	L/s/Person
n=	0.013		Comercial:	0.500	L/s/Ha
Max Peak Factor=	4.500		Industrial:	0.400	L/s/Ha
Min Peak Factor=	1.500		Institutional:	0.250	L/s/Ha
			Infiltration:	0.250	L/s/Ha

LOCATION			RESIDENTIAL AREA AND POPULATION								INFILTRATION				PIPE SELECTION						
Street	U/S	D/S	Area ID	Residential Area (ha)	Population Density (P/ha)	Population (P)	Cummulative Area (ha)	Cumulative Population (min)	Peak Factor	Peak Flow L/s	Total Area (ha)	Accumulated Area (ha)	Flow (L/s)	Total Flow (L/s)	Length Design (m)	Design Size (mm)	Slope Design (%)	Full Capacity (L/s)	Full Velocity (m/s)	Actual Velocity (m/s)	Q_a/Q_c (%)
															* Note: Distance taken as longest run and Slope average pipe slope						
Ex. Subdivision	184	71	40	7.88	55	264	7.88	264	4.10	3.45	7.88	7.88	1.970	5.42	468.3	200	0.86	32.70	1.07	1.10	16.6%
Ex. Gerber Rd.	71	122	-	0.00	0	0	21.95	1101	3.77	13.22	0.00	21.95	5.488	18.71	99.9	200	0.54	25.91	0.85	0.87	72.2%
	122	346	-	0.00	0	53	21.95	1154	3.76	13.81	0.00	21.95	5.488	19.29	103.1	200	0.37	21.45	0.70	0.72	89.9%
	346	347	-	0.00	0	0	21.95	1154	3.76	13.81	0.00	21.95	5.488	19.29	24.0	200	0.30	19.32	0.63	0.65	99.9%
	347	345	-	0.00	0	0	21.95	1154	3.76	13.81	0.00	21.95	5.488	19.29	73.8	200	0.30	19.32	0.63	0.65	99.9%
	345	344	-	0.00	0	0	21.95	1154	3.76	13.81	0.00	21.95	5.488	19.29	89.3	250	0.29	34.43	0.72	0.74	56.0%

APPENDIX E WATER DISTRIBUTION ANALYSIS

E.1 ROW BOUNDARY CONDITIONS LETTER

E.2 WATER DEMAND CALCULATIONS

E.3 WATERMAIN SCHEMATIC PLAN

E.4 WATERCAD OUTPUT FILES

E.5 EMAIL CORRESPONDENCE WITH ROW, APRIL 18, 2023

Region of Waterloo

TRANSPORTATION AND
ENVIRONMENTAL SERVICES
Water Services

150 Frederick Street
Kitchener ON Canada N2G 4J3
Telephone: (519) 575-4426
Fax: (519) 575-4452
www.region.waterloo.on.ca

Date: December 16, 2021
File #: E18-50/WEL

Hitesh Ladd, M. Eng., P. Eng.
Stantec
100-300 Hagey Blvd
Waterloo, ON N2L 0A4
t. 519.585.7268
c. 519.498.2809
e. Hitesh.Ladd@stantec.com

Dear: Hitesh

Re: Strohvest Lands, Wellesley

Please find the results of the modeling simulations for boundary conditions requested on November 10, 2021. The results included a figure showing the locations of the node from the Region's model. Attached are a series of spreadsheets containing results for Average Day, Maximum Day demands and available fire flows for node JCT_01084 located at Gerber Rd and Lawrence St. The diurnal 24-hour demand distribution accounts for the minimum hour and peak hour peaking factors. The minimum hourly demand on the average day represents the minimum hour, and the maximum hourly demand on the maximum day represents the peak hour.

Table 2 summarizes the modeling results.

Table 2 – Demands and Fire Flow Results

Node	Location	Elevation (mASL)	Residential Demand (L/s)		Fire Flow Results	
			Ave Day	Max Day	Design Flow (L/s)	Design Pressure (m)
JCT_01084	Gerber Rd and Lawrence St	354.00	2.58	5.16	78.3	25.5

A fire flow analysis shows the maximum flow available at a node with an associated design pressure during the maximum day scenario while maintaining the minimum design pressure of 14 m (140 kPa) at all nodes within the pressure zone.

If you have any questions, please contact me.

Kevin Dolishny P.Eng.
Senior Engineer
Water Services
t. 519.575.4757 x 3862
c. 226.751.4551
e-mail: kdolishny@regionofwaterloo.ca

WEL Infowater Pro Gerber and Lawrence

JCT_ 01084 Average Day 24 Hour Simulation

Time	Demand (L/s)	Head (m)	Pressure (m)
00:00 hrs	1.70	425.43	71.43
01:00 hrs	1.70	425.44	71.44
02:00 hrs	1.44	425.45	71.45
03:00 hrs	1.52	425.44	71.44
04:00 hrs	1.70	425.43	71.43
05:00 hrs	1.73	425.43	71.43
06:00 hrs	1.76	425.43	71.43
07:00 hrs	2.07	425.41	71.41
08:00 hrs	2.70	425.36	71.36
09:00 hrs	2.99	417.79	63.79
10:00 hrs	3.17	425.33	71.33
11:00 hrs	3.17	425.33	71.33
12:00 hrs	3.01	425.34	71.34
13:00 hrs	2.78	425.36	71.36
14:00 hrs	2.73	425.37	71.37
15:00 hrs	2.62	425.38	71.38
16:00 hrs	2.54	425.38	71.38
17:00 hrs	2.62	425.38	71.38
18:00 hrs	2.78	425.36	71.36
19:00 hrs	3.12	425.34	71.34
20:00 hrs	3.62	425.29	71.29
21:00 hrs	3.88	425.27	71.27
22:00 hrs	3.88	425.27	71.27
23:00 hrs	3.09	425.34	71.34

Average Day HGL: 425.06
Minimum Hour: 425.45

JCT_ 01084 Maximum Day 24 Hour Simulation

Time	Demand (L/s)	Head (m)	Pressure (m)
00:00 hrs	3.40	417.96	63.96
01:00 hrs	3.40	425.35	71.35
02:00 hrs	2.88	425.39	71.39
03:00 hrs	3.03	425.38	71.38
04:00 hrs	3.40	425.35	71.35
05:00 hrs	3.45	425.35	71.35
06:00 hrs	3.50	425.34	71.34
07:00 hrs	4.13	425.29	71.29
08:00 hrs	5.39	421.67	67.67
09:00 hrs	5.96	420.66	66.66
10:00 hrs	6.33	420.01	66.01
11:00 hrs	6.33	419.93	65.93
12:00 hrs	6.01	420.40	66.40
13:00 hrs	5.54	421.22	67.22
14:00 hrs	5.44	421.61	67.61
15:00 hrs	5.23	421.30	67.30
16:00 hrs	5.07	425.38	71.38
17:00 hrs	5.23	425.37	71.37
18:00 hrs	5.54	421.53	67.53
19:00 hrs	6.22	420.31	66.31
20:00 hrs	7.22	418.63	64.63
21:00 hrs	7.74	417.84	63.84
22:00 hrs	7.74	417.93	63.93
23:00 hrs	6.17	420.54	66.54

Maximum Day HGL: 422.07
Peak Hour: 417.84

WEL Infowater Pro Gerber and Lawrence

Available Flow (L/s)	Residual Pressure (m)
0.0	69.5
20.0	62.3
40.0	56.4
60.0	44.4
78.3	25.5

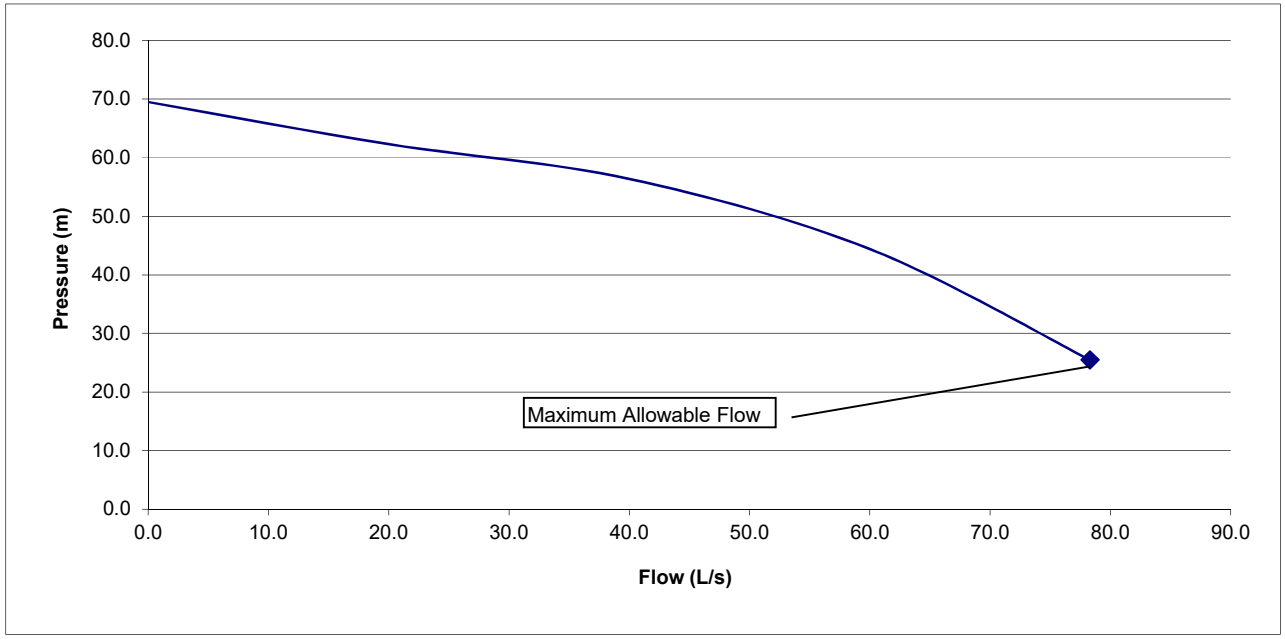
Fire Flow Analysis

Fire Flow Node:	JCT_01084
Design Flow (L/s):	78.3
Design Pressure (m)	25.5

The final adjusted flow at the node to maintain the minimum design pressure (14m (140 kPa)) at ALL locations within the pressure zone.

The lowest allowable pressure at the node to maintain the minimum design pressure (14m (140 kPa)) at ALL locations within the pressure zone.

The constraining node within the pressure zone that drops to the minimum design pressure of (14m (140 kPa)) during the design flow.



Township of Wellesley

Subject Site

JCT_01084

Township of Wilmot

Lawrence St

Lawrence St

Lawrence St

Reiner Cres

Reiner Cres

Evelyn Dr

David St

David St

Berdux Pl

Crab Apple Crt

Gerber Rd

Gerber Rd

Gerber Rd

Gerber Rd

Gerber Rd

0 55 110 220 330 440

Meters

Document Path: \\ahqfs1\vp\water\InfoWater\Modeling Requests\2021\Stantec\Strohvest Lands\Strohvest Lands.aprx

Author: ADing

Date: 2021-12-10

Time: 3:48 PM

Region of Waterloo

TRANSPORTATION AND ENVIRONMENTAL SERVICES

Water Services

150 Frederick Street
Kitchener ON Canada N2G 4J3
Telephone: (519) 575-4426
Fax: (519) 575-4452
www.regionofwaterloo.ca

Assessment Parcels (MPAC) selection
Wellesley_Billing_2020

Junction
Type
Active
Domain
Inactive
<All other values>

Tank
Type
Active
Domain
Inactive
<All other values>

Reservoir
Type
Active
Domain
Inactive
<All other values>

Pump
Type
Active
Domain
Inactive
<All other values>

Valve
Type
Active
Domain
Inactive
<All other values>

Pipe
Type
Active
Domain
Inactive
<All other values>

Roads

Roads
Highway
Arterial/Collector
Local
Private
Proposed Roads

Non modelling data Layer
Assessment Parcels (MPAC)
Regional Municipal Boundaries

Strohvest Lands, Wellesley

1614-13217: Strohvest Lands - Gerber Road, Wellesley, Ontario

Nodal Data Input - Water Demand Calculation

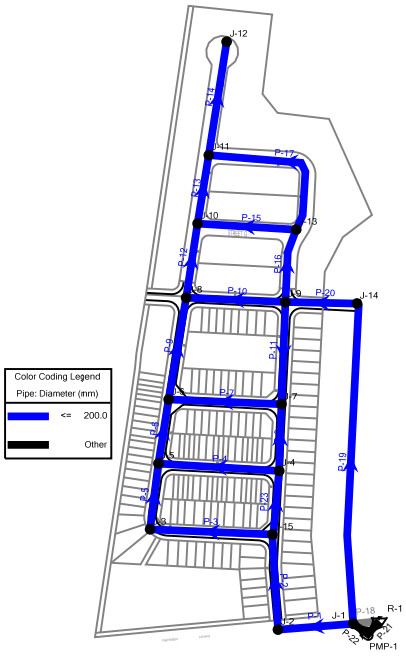
15-May-24

Location	Node No.	Residential							Avg Day Demand	Min. Hour Demand	Max Day Demand	Peak Hour Demand	Fire Flow Demand
		Single Family				Multi Family							
		Units	Future Area	#persons	Demand	Units	#persons	Demand					
			ha		(L/s)	(ha)		(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)
Supply Node	J1												
Entrance Node	J2												
Single Detached/Townhouse Lots	J3	8		27	0.07	9	23	0.06	0.13	0.07	0.26	0.39	70
Single Detached/Townhouse Lots	J4	6		20	0.05	17	43	0.11	0.16	0.08	0.32	0.48	70
Single Detached/Townhouse Lots	J5	7		24	0.06	18	45	0.12	0.18	0.09	0.36	0.54	70
Single Detached Lots	J6	20		66	0.17	6	15	0.04	0.21	0.11	0.42	0.63	70
Single Detached Lots	J7	19		63	0.16				0.16	0.08	0.32	0.48	70
Single Detached/Apartment Lots	J8	6	0.18	30	0.08	24	44	0.11	0.19	0.10	0.38	0.57	70
Single Detached Lots	J9	10	0.18	43	0.11				0.11	0.06	0.22	0.33	70
Future Residential	J10		0.88	49	0.13				0.13	0.07	0.26	0.39	70
Future Residential	J11		1.59	88	0.23				0.23	0.12	0.46	0.69	70
Future Residential	J12		1.59	88	0.23				0.23	0.12	0.46	0.69	70
Future Residential	J13		1.92	106	0.28				0.28	0.14	0.56	0.84	70
Entrance Node	J14												
Single Detached/Townhouse Lots	J15	15		50	0.13	4	10	0.03	0.16	0.08	0.32	0.48	70
TOTAL		91	6.34	654	1.70	78	180	0.47	2.17	1.09	4.34	6.51	

Specific Usage Rates

Land Use	Average Day		Source
Residential	3.30	c/units	Township of Wellesley Criteria and Region of Waterloo DGSSMS 2018
(Single Family)	225	L/c/d	
Residential	2.48	c/units	
(Townhouse)	225	L/c/d	
Residential	1.83	c/units	
(Apartments)	225	L/c/d	
Future Residential	55	persons/ha	
	225	L/c/d	
Peaking Factors:			
Residential	min	0.50	Region of Waterloo DGSSMS 2018/MOECC Design Guidelines for Drinking Water Systems 2008 (3,000-10,000 people)
	avg	1.00	
	max	2.00	
	peak	3.00	

Strohvest Lands - Gerber Road, Wellesley
Scenario: Max_Day + 70L/s Fire Flow
Active Scenario: Max_Day + 70L/s Fire Flow



Strohvest Lands - Gerber Road, Wellesley

FlexTable: Junction Table

Active Scenario: Avg_Day

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
J-1	353.90	0.00	425.06	696
J-2	354.30	0.00	425.06	693
J-3	355.75	0.13	425.06	678
J-4	358.70	0.16	425.06	649
J-5	356.05	0.18	425.06	675
J-6	358.95	0.21	425.06	647
J-7	361.35	0.16	425.06	624
J-8	361.90	0.19	425.06	618
J-9	362.00	0.11	425.06	617
J-10	362.50	0.13	425.06	612
J-11	363.00	0.23	425.06	607
J-12	363.80	0.23	425.06	600
J-13	362.45	0.28	425.06	613
J-14	362.25	0.00	425.06	615
J-15	356.65	0.16	425.06	670

Strohvest Lands - Gerber Road, Wellesley

FlexTable: Junction Table

Active Scenario: Max_Day

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
J-1	353.90	0.00	422.07	667
J-2	354.30	0.00	422.07	663
J-3	355.75	0.26	422.07	649
J-4	358.70	0.32	422.07	620
J-5	356.05	0.36	422.07	646
J-6	358.95	0.42	422.07	618
J-7	361.35	0.32	422.07	594
J-8	361.90	0.38	422.07	589
J-9	362.00	0.22	422.07	588
J-10	362.50	0.26	422.06	583
J-11	363.00	0.46	422.06	578
J-12	363.80	0.46	422.06	570
J-13	362.45	0.56	422.06	583
J-14	362.25	0.00	422.07	585
J-15	356.65	0.32	422.07	640

Strohvest Lands - Gerber Road, Wellesley

FlexTable: Junction Table

Active Scenario: Min_Hour

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
J-1	353.90	0.00	425.45	700
J-2	354.30	0.00	425.45	696
J-3	355.75	0.07	425.45	682
J-4	358.70	0.08	425.45	653
J-5	356.05	0.09	425.45	679
J-6	358.95	0.11	425.45	651
J-7	361.35	0.08	425.45	627
J-8	361.90	0.10	425.45	622
J-9	362.00	0.06	425.45	621
J-10	362.50	0.07	425.45	616
J-11	363.00	0.12	425.45	611
J-12	363.80	0.12	425.45	603
J-13	362.45	0.14	425.45	617
J-14	362.25	0.00	425.45	619
J-15	356.65	0.08	425.45	673

Strohvest Lands - Gerber Road, Wellesley

FlexTable: Junction Table

Active Scenario: Peak_Hour

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
J-1	353.90	0.00	417.84	626
J-2	354.30	0.00	417.84	622
J-3	355.75	0.39	417.83	608
J-4	358.70	0.48	417.83	579
J-5	356.05	0.54	417.83	605
J-6	358.95	0.63	417.83	576
J-7	361.35	0.48	417.83	553
J-8	361.90	0.57	417.83	547
J-9	362.00	0.33	417.83	546
J-10	362.50	0.39	417.83	541
J-11	363.00	0.69	417.83	537
J-12	363.80	0.69	417.83	529
J-13	362.45	0.84	417.83	542
J-14	362.25	0.00	417.84	544
J-15	356.65	0.48	417.83	599

Strohvest Lands - Gerber Road, Wellesley
Fire Flow Node FlexTable: Fire Flow Report
Active Scenario: Max_Day + 70L/s Fire Flow

Label	Satisfies Fire Flow Constraints?	Flow (Total Needed) (L/s)	Flow (Total Available) (L/s)	Pressure (Residual Lower Limit) (kPa)	Pressure (Calculated Residual) (kPa)	Pressure (System Lower Limit) (kPa)	Pressure (Calculated System Lower Limit) (kPa)	Junction w/ Minimum Pressure (System)
J-1	True	70.00	76.02	140	237	140	140	J-12
J-2	True	70.00	75.61	140	226	140	140	J-12
J-3	True	70.26	75.44	140	207	140	140	J-12
J-4	True	70.32	75.48	140	184	140	140	J-12
J-5	True	70.36	75.49	140	209	140	140	J-12
J-6	True	70.42	75.44	140	183	140	140	J-12
J-7	True	70.32	75.37	140	159	140	140	J-12
J-8	True	70.38	75.09	140	157	140	140	J-12
J-9	True	70.22	75.17	140	158	140	140	J-12
J-10	True	70.26	74.44	140	152	140	140	J-12
J-11	True	70.46	73.93	140	148	140	140	J-12
J-12	True	70.46	71.07	140	140	140	178	J-11
J-13	True	70.56	74.85	140	152	140	140	J-12
J-14	True	70.00	75.99	140	155	140	140	J-12
J-15	True	70.32	75.59	140	204	140	140	J-12

Strohvest Lands - Gerber Road, Wellesley

FlexTable: Junction Table

Active Scenario: Max_Day + 70 L/s Fire Flow to J-8

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
J-1	353.90	0.00	384.18	296
J-2	354.30	0.00	383.82	289
J-3	355.75	0.26	383.34	270
J-4	358.70	0.32	383.31	241
J-5	356.05	0.36	383.28	267
J-6	358.95	0.42	383.18	237
J-7	361.35	0.32	383.25	214
J-8	361.90	70.38	382.80	205
J-9	362.00	0.22	383.25	208
J-10	362.50	0.26	382.96	200
J-11	363.00	0.46	382.99	196
J-12	363.80	0.46	382.99	188
J-13	362.45	0.56	383.06	202
J-14	362.25	0.00	384.17	215
J-15	356.65	0.32	383.43	262

Strohvest Lands - Gerber Road, Wellesley

FlexTable: Pipe Table

Active Scenario: Max_Day + 70 L/s Fire Flow to J-8

Label	Length (Scaled) (m)	Start Node	Stop Node	Diameter (mm)	Hazen-Williams C	Minor Loss Coefficient (Local)	Flow (L/s)	Velocity (m/s)
P-1	94	J-1	J-2	200.0	150.0	1.330	27.64	0.88
P-2	119	J-2	J-15	200.0	150.0	0.000	27.64	0.88
P-3	152	J-3	J-15	200.0	150.0	1.330	-10.72	0.34
P-4	151	J-4	J-5	200.0	150.0	1.330	5.25	0.17
P-5	83	J-5	J-3	200.0	150.0	1.330	-10.46	0.33
P-6	81	J-5	J-6	200.0	150.0	1.330	15.35	0.49
P-7	141	J-6	J-7	200.0	150.0	1.330	-9.66	0.31
P-8	83	J-7	J-4	200.0	150.0	1.330	-11.02	0.35
P-9	129	J-6	J-8	200.0	150.0	1.330	24.59	0.78
P-10	124	J-8	J-9	200.0	150.0	1.330	-27.47	0.87
P-11	127	J-9	J-7	200.0	150.0	1.330	-1.04	0.03
P-12	94	J-8	J-10	200.0	150.0	1.330	-18.32	0.58
P-13	86	J-10	J-11	200.0	150.0	1.330	-6.85	0.22
P-14	143	J-11	J-12	200.0	150.0	1.330	0.46	0.01
P-15	123	J-10	J-13	200.0	150.0	1.330	-11.73	0.37
P-16	92	J-13	J-9	200.0	150.0	1.330	-20.06	0.64
P-17	202	J-11	J-13	200.0	150.0	1.330	-7.77	0.25
P-18	32	R-1	J-1	200.0	150.0	0.000	(N/A)	(N/A)
P-19	400	J-1	J-14	200.0	150.0	0.000	46.70	1.49
P-20	89	J-14	J-9	200.0	150.0	1.330	46.70	1.49
P-21	21	R-1	PMP-1	1,000.0	150.0	0.000	74.34	0.09
P-22	22	PMP-1	J-1	1,000.0	150.0	0.000	74.34	0.09
P-23	81	J-15	J-4	200.0	150.0	1.330	16.59	0.53

Strohvest Lands - Gerber Road, Wellesley

FlexTable: Junction Table

Active Scenario: Max_Day + 70 L/s Fire Flow to J-12

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
J-1	353.90	0.00	384.18	296
J-2	354.30	0.00	383.84	289
J-3	355.75	0.26	383.38	270
J-4	358.70	0.32	383.34	241
J-5	356.05	0.36	383.33	267
J-6	358.95	0.42	383.25	238
J-7	361.35	0.32	383.27	215
J-8	361.90	0.38	383.05	207
J-9	362.00	0.22	383.23	208
J-10	362.50	0.26	382.53	196
J-11	363.00	0.46	381.80	184
J-12	363.80	70.46	378.80	147
J-13	362.45	0.56	382.58	197
J-14	362.25	0.00	384.17	215
J-15	356.65	0.32	383.46	262

Strohvest Lands - Gerber Road, Wellesley

FlexTable: Pipe Table

Active Scenario: Max_Day + 70 L/s Fire Flow to J-12

Label	Length (Scaled) (m)	Start Node	Stop Node	Diameter (mm)	Hazen-Williams C	Minor Loss Coefficient (Local)	Flow (L/s)	Velocity (m/s)
P-1	94	J-1	J-2	200.0	150.0	1.330	27.00	0.86
P-2	119	J-2	J-15	200.0	150.0	0.000	27.00	0.86
P-3	152	J-3	J-15	200.0	150.0	1.330	-10.19	0.32
P-4	151	J-4	J-5	200.0	150.0	1.330	3.65	0.12
P-5	83	J-5	J-3	200.0	150.0	1.330	-9.93	0.32
P-6	81	J-5	J-6	200.0	150.0	1.330	13.22	0.42
P-7	141	J-6	J-7	200.0	150.0	1.330	-4.63	0.15
P-8	83	J-7	J-4	200.0	150.0	1.330	-12.53	0.40
P-9	129	J-6	J-8	200.0	150.0	1.330	17.43	0.55
P-10	124	J-8	J-9	200.0	150.0	1.330	-16.61	0.53
P-11	127	J-9	J-7	200.0	150.0	1.330	-7.58	0.24
P-12	94	J-8	J-10	200.0	150.0	1.330	33.66	1.07
P-13	86	J-10	J-11	200.0	150.0	1.330	41.90	1.33
P-14	143	J-11	J-12	200.0	150.0	1.330	70.46	2.24
P-15	123	J-10	J-13	200.0	150.0	1.330	-8.50	0.27
P-16	92	J-13	J-9	200.0	150.0	1.330	-38.08	1.21
P-17	202	J-11	J-13	200.0	150.0	1.330	-29.02	0.92
P-18	32	R-1	J-1	200.0	150.0	0.000	(N/A)	(N/A)
P-19	400	J-1	J-14	200.0	150.0	0.000	47.34	1.51
P-20	89	J-14	J-9	200.0	150.0	1.330	47.34	1.51
P-21	21	R-1	PMP-1	1,000.0	150.0	0.000	74.34	0.09
P-22	22	PMP-1	J-1	1,000.0	150.0	0.000	74.34	0.09
P-23	81	J-15	J-4	200.0	150.0	1.330	16.50	0.53

From:	Lad, Hitesh
To:	Lefaive, Joe
Subject:	FW: Strohvest Lands, Wellesley
Date:	Thursday, May 2, 2024 11:31:23 AM
Attachments:	image002.jpg image004.jpg image005.jpg image007.jpg

---

FYI the below correspondence with the Region, let us chat anytime after 1:30pm this afternoon once you have reviewed it.

Thanks and sorry for the delay!

Hitesh

From: WaterServicesDistributionDevelopment <WaterServicesDistributionDevelopment@regionofwaterloo.ca>
Sent: Tuesday, April 18, 2023 5:00 PM
To: Lad, Hitesh <Hitesh.Lad@stantec.com>; WaterServicesDistributionDevelopment <WaterServicesDistributionDevelopment@regionofwaterloo.ca>
Cc: Romanick, Greg <Greg.Romanick@stantec.com>; Matthew Colley <MColley@regionofwaterloo.ca>
Subject: RE: Strohvest Lands, Wellesley

Hi Hitesh,

FYI Cody has taken a new role at the Region and is no longer on my team.

To reiterate the comments below, the FSR submission demonstrates that the water servicing strategy is adequate to support only Stage 1 of the proposed development.

With respect to comment #5, the level of service in the existing system is not impacted by the addition of Stage 1 of the subject lands. The model results reflect the addition of the proposed lands. In other words, the demand imposed on the existing system by the proposed lands has been accounted for in the model results provided by the Region.

With respect to comments #6 and 7, transient analysis and flushing velocities are not typically part of the review of the water servicing strategy for developments in Wellesley.

With respect to comments #8 and 9, the consultant is responsible for calculating the required fire flow for the proposed development using the DGSSMS guidelines which reference the Fire Underwriters Survey in Section B.2.2.3. Confirmation of the fire flow calculations fall under the purview of the Region and the Township Fire Department. The empirical calculations and model results are not open to interpretation, i.e "close enough". The analysis provided by Stantec does not support the development of Stage 2 of the subdivision.

Kevin Dolishny, P. Eng. | Senior Engineer
Water and Wastewater Services | Region of Waterloo
o.519.575.4400x3862 | c.226.751.4551
kdolishny@regionofwaterloo.ca

From: Lad, Hitesh <Hitesh.Lad@stantec.com>
Sent: April 13, 2023 9:12 AM
To: Kevin Dolishny <KDolishny@regionofwaterloo.ca>; Cody Scott <CoScott@regionofwaterloo.ca>; WaterServicesDistributionDevelopment <WaterServicesDistributionDevelopment@regionofwaterloo.ca>
Cc: Romanick, Greg <Greg.Romanick@stantec.com>

Subject: RE: Strohvest Lands, Wellesley

****EXTERNAL ALERT** This email originated from outside the Region of Waterloo.**

Good morning,

Could you please provide any update on my email below as soon as possible?

Thank you,

Hitesh

From: Lad, Hitesh
Sent: Thursday, March 30, 2023 2:51 PM
To: 'Kevin Dolishny' <KDolishny@regionofwaterloo.ca>; 'Cody Scott' <CoScott@regionofwaterloo.ca>
Cc: Romanick, Greg <Greg.Romanick@stantec.com>; Vleeming, John <John.Vleeming@stantec.com>
Subject: RE: Strohvest Lands, Wellesley

Good afternoon Kevin and Cody,

Further to our email exchanges below and our subsequent FSR submission last year (Water Section Appendix D attached), we had received a few comments from the Region of Waterloo and also GM BluePlan (attached) on our water distribution section of the FSR as noted below that we would like to clarify/confirm with you.

Region of Waterloo Comments

- Based on the above comment, it appears that the Region has accepted and approved the water modeling results presented in the FSR. Could you please re-confirm that the Region has been satisfied and that no additional information is required in this regard so we can let the Township know accordingly.

GM Blue Plan Comments

- Could you please review comment # 5 above and confirm as requested by GM BluePlan (i.e., modeling being adequate and the new development won't worsen the existing condition) so we can respond back

to the Township? Please advise.

- Further to comments # 6 & 7, we typically have not included this information in our reports for other municipalities in the Region. Not sure why they are asking for it here.
- Further to comment # 8, what is the acceptable minimum fire flow availability for this area? Please advise.
- Further to comment # 9, available fire flow of less than 70 L/s occurs within Stage 2 area which is not part of this submission. That said, the available flow of 67.56 L/s at J-12 within Stage 2 is only marginally less than the assumed fire flow requirement of 70 L/s. Could you please re-confirm that the Region has no issues with this.

Please advise at your earliest convenience as we are in the process of submitting the revised documents to the Township.

Thank you for your time,

Hitesh Lad M.Eng., P.Eng.
Project Manager/Associate, Community Development

~~Direct: 519-585-7268~~
Mobile: 519-498-2809
Hitesh.Lad@stantec.com

Stantec
100-300 Hagey Boulevard
Waterloo ON N2L 0A4

From: Lad, Hitesh
Sent: Thursday, December 16, 2021 5:19 PM
To: Kevin Dolishny <KDolishny@regionofwaterloo.ca>
Cc: Cody Scott <CoScott@regionofwaterloo.ca>
Subject: RE: Strohvest Lands, Wellesley

Hi Kevin – thanks for this clarification. What was the fire flow recommended in GMBP study for this area that I can use in my water modeling for this subdivision? I would think the Region would review our water distribution analysis and therefore, how much minimum fire flow availability you would be looking for as the system will most likely not meet the 100 or 133 L/s fire flow we typically use in City areas.

Thanks,

Hitesh Lad M.Eng., P.Eng.
Project Manager/Associate, Community Development

~~Direct: 519-585-7268~~
Mobile: 519-498-2809
Hitesh.Lad@stantec.com

Stantec
100-300 Hagey Boulevard
Waterloo ON N2L 0A4

From: Kevin Dolishny <KDolishny@regionofwaterloo.ca>
Sent: Thursday, December 16, 2021 5:01 PM
To: Lad, Hitesh <Hitesh.Lad@stantec.com>
Cc: Cody Scott <CoScott@regionofwaterloo.ca>
Subject: RE: Strohvest Lands, Wellesley

Hi Hitesh, the low fire flow availability was one of the reasons it took a while to confirm the results. However, the model results provided are generally consistent with the model calibration work that was undertaken by GM BluePlan in 2018. Through the GMBP assignment, a number of hydrants tests were conducted, compared with pressure loggers in the system, and validated with pressure and flow results from SCADA. The hydraulic model was then updated accordingly, and that is the model that was used as the basis for these results.

For some smaller communities, the fire flow availability is less than typically seen in the larger urban centres.

Kevin Dolishny, P. Eng. | Senior Engineer
Water Services | Region of Waterloo
o.519.575.4400x3862 | c.226.751.4551
kdolishny@regionofwaterloo.ca

From: Lad, Hitesh <Hitesh.Lad@stantec.com>
Sent: December-16-21 3:22 PM
To: Kevin Dolishny <KDolishny@regionofwaterloo.ca>
Subject: RE: Strohvest Lands, Wellesley

Thanks Kevin – I will check with the modeling but based on the fire flow curve provided in your results, it does not look like a fire flow demand of 133 L/s can be met at proposed townhouses. Do you know if available fire flow is historically low and a concern in this area of the Township?

Hitesh Lad M.Eng., P.Eng.
Project Manager/Associate, Community Development

~~Direct: 519-585-7268~~
Mobile: 519-498-2809
Hitesh.Lad@stantec.com

Stantec
100-300 Hagey Boulevard
Waterloo ON N2L 0A4

From: Kevin Dolishny <KDolishny@regionofwaterloo.ca>
Sent: Thursday, December 16, 2021 3:10 PM
To: Lad, Hitesh <Hitesh.Lad@stantec.com>; WaterServicesDistributionDevelopment <WaterServicesDistributionDevelopment@regionofwaterloo.ca>
Cc: Romanick, Greg <Greg.Romanick@stantec.com>; Vleeming, John <John.Vleeming@stantec.com>
Subject: RE: Strohvest Lands, Wellesley

Good Day Hitesh,

Attached are the results from your model request for the Strohvest Lands in Wellesley.

Kevin Dolishny, P. Eng. | Senior Engineer
Water Services | Region of Waterloo
o.519.575.4400x3862 | c.226.751.4551
kdolishny@regionofwaterloo.ca

From: Lad, Hitesh <Hitesh.Lad@stantec.com>
Sent: December-16-21 9:01 AM
To: WaterServicesDistributionDevelopment <WaterServicesDistributionDevelopment@regionofwaterloo.ca>; Kevin Dolishny <KDolishny@regionofwaterloo.ca>
Cc: Romanick, Greg <Greg.Romanick@stantec.com>; Vleeming, John <John.Vleeming@stantec.com>
Subject: RE: Strohvest Lands, Wellesley

Good morning Cody – could you please provide any further update on this?

Thank you,

Hitesh

From: WaterServicesDistributionDevelopment <WaterServicesDistributionDevelopment@regionofwaterloo.ca>
Sent: Wednesday, December 08, 2021 8:42 AM
To: Lad, Hitesh <Hitesh.Lad@stantec.com>; WaterServicesDistributionDevelopment <WaterServicesDistributionDevelopment@regionofwaterloo.ca>; Kevin Dolishny <kdolishny@regionofwaterloo.ca>
Cc: Romanick, Greg <Greg.Romanick@stantec.com>; Vleeming, John <John.Vleeming@stantec.com>
Subject: RE: Strohvest Lands, Wellesley

Hi Hitesh,

We have isolated an issue which is preventing the model to properly solve. We are just running through some final fixes to confirm the changes are valid and should have the model working by the end of the week.

Thanks,

Cody Scott, C.Tech.
Coordinator, Engineering & Planning (Water)
Transportation and Environmental Services - Water Services
Region of Waterloo
150 Frederick Street, 7th Floor
Kitchener ON N2G 4J3
telephone. 519-575-4757 x 3180
cell: 519-505-5185
CoScott@regionofwaterloo.ca

From: Lad, Hitesh <Hitesh.Lad@stantec.com>
Sent: Tuesday, December 7, 2021 8:57 AM
To: WaterServicesDistributionDevelopment <WaterServicesDistributionDevelopment@regionofwaterloo.ca>; Kevin Dolishny <KDolishny@regionofwaterloo.ca>
Cc: Romanick, Greg <Greg.Romanick@stantec.com>; Vleeming, John <John.Vleeming@stantec.com>
Subject: RE: Strohvest Lands, Wellesley

Good morning Cody – could you please provide any further update on this?

Thank you,

Hitesh

From: WaterServicesDistributionDevelopment <WaterServicesDistributionDevelopment@regionofwaterloo.ca>
Sent: Monday, November 29, 2021 2:27 PM
To: Lad, Hitesh <Hitesh.Lad@stantec.com>; WaterServicesDistributionDevelopment <WaterServicesDistributionDevelopment@regionofwaterloo.ca>; Kevin Dolishny <kdolishny@regionofwaterloo.ca>
Cc: Romanick, Greg <Greg.Romanick@stantec.com>; Vleeming, John <John.Vleeming@stantec.com>
Subject: RE: Strohvest Lands, Wellesley

Hi Hitesh,

We are working through an update of the model to bring it up to date with our most recent billing records and a few minor housekeeping items.

Unfortunately it wont be completed by December 1st, but we hope to have it done within the next week. I will follow up with an update towards the end of the week if this timeline is still looking realistic.

Thank you,

Cody Scott, C.Tech.
Coordinator, Engineering & Planning (Water)
Transportation and Environmental Services - Water Services
Region of Waterloo
150 Frederick Street, 7th Floor
Kitchener ON N2G 4J3
telephone. 519-575-4757 x 3180
cell: 519-505-5185
CoScott@regionofwaterloo.ca

From: Lad, Hitesh <Hitesh.Lad@stantec.com>
Sent: Monday, November 29, 2021 1:16 PM
To: WaterServicesDistributionDevelopment

<WaterServicesDistributionDevelopment@regionofwaterloo.ca>; Kevin Dolishny <KDolishny@regionofwaterloo.ca>
Cc: Romanick, Greg <Greg.Romanick@stantec.com>; Vleeming, John <John.Vleeming@stantec.com>
Subject: RE: Strohvest Lands, Wellesley

Good afternoon – could you please provide any update on this request?

Thank you,

Hitesh

From: Lad, Hitesh
Sent: Wednesday, November 10, 2021 4:48 PM
To: WaterServicesDistributionDevelopment <WaterServicesDistributionDevelopment@regionofwaterloo.ca>; Kevin Dolishny <KDolishny@regionofwaterloo.ca>
Cc: Romanick, Greg <Greg.Romanick@stantec.com>; Vleeming, John <John.Vleeming@stantec.com>
Subject: Strohvest Lands, Wellesley

Good afternoon,

We need to complete a water distribution/fire flow analysis for the proposed subdivision development off of Gerber Road in Wellesley as shown on the attached conceptual draft plan of subdivision. We have estimated the following total water demands for the current draft plan plus the future development lands owned by the same applicant, as shown on the attached table:

- Residential: An average day demand (ADD) of 2.58 L/s, a max day demand (MDD) of 5.16 L/s and a peak hour demand (PHD) of 7.74 L/s

Could you please provide the relevant HGL information from the Region's water model to complete our analysis. Also, forward any background information that may be useful for our analysis.

We have been requested by the client to submit our report by the first week of December. Therefore, we kindly request your immediate attention to this request and provide the requested data as soon as possible.

Thank you very much,

Hitesh Lad M.Eng., P.Eng.
Project Manager/Associate, Community Development

~~Direct: 519-585-7268~~
Mobile: 519-498-2809
Hitesh.Lad@stantec.com

Stantec
100-300 Hagey Boulevard
Waterloo ON N2L 0A4

APPENDIX F STORMWATER MANAGEMENT

F.1 EXISTING PAFF DRAIN WORKS PLAN AND PROFILE

F.2 CN PARAMETERS

F.3 VO PARAMETERS

F.4 SWMF BASIN CHARACTERISTICS

F.5 SWMF DICB OUTLET CHARACTERISTICS

F.6 SWMF FOREBAY CHARACTERISTICS

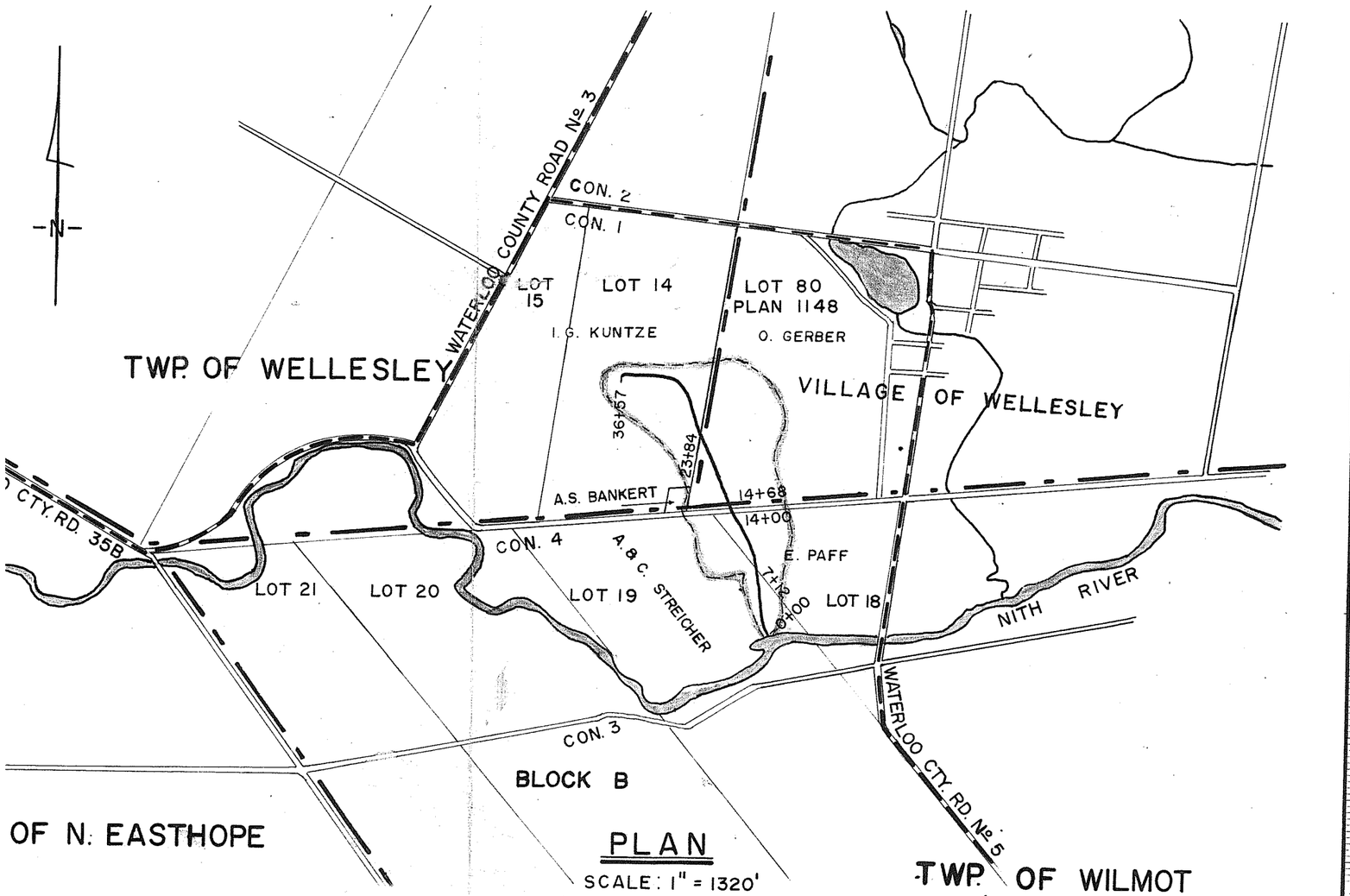
F.7 VO OUTPUT

F.8 EXISTING WATER BALANCE CALCULATIONS

F.9 PROPOSED WATER BALANCE CALCULATIONS

F.10 MAJOR OVERLAND FLOW CALCULATIONS

F.11 K. SMART & ASSOCIATES PROPOSED PAFF DRAIN DRAFT PLANS



PLAN

SCALE: 1" = 1320'

BENCH MARKS

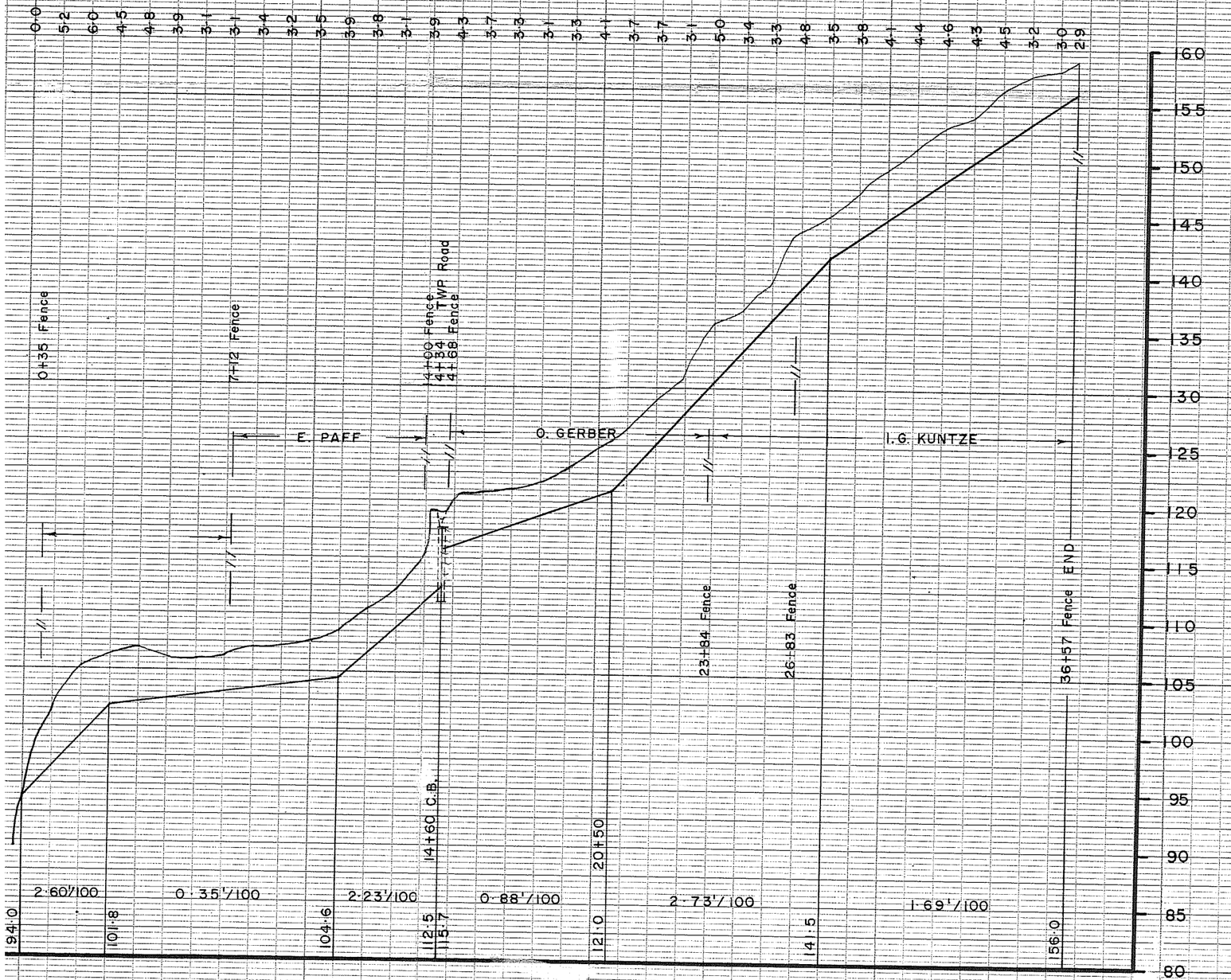
No1 ELEV. 100.00 NAIL IN N FACE 1'Ø ELM 82' LT STA 0+35, ON FL

No2 ELEV. 107.57 NAIL IN FENCE POST 25' RT. STA 6+70, ON FL

No3 ELEV 122.89 TOP OF S.E. CONCRETE HANDRAIL POST 16' LT STA 14+21

No4 ELEV. 135.40 NAIL IN N.E. FACE FENCE POST 50' LT. STA 23+84, ON FL

No5 ELEV 159.92 NAIL IN S.E. FACE FENCE POST 10' RT. STA. 36+67



TILE SIZES

STA. 0+00 TO 0+10	— 10 L.F.	—	12"Ø C.M.P.
STA. 0+10 TO 11+00	— 1090 L.F.	—	12"Ø FIELD TILE
STA. 11+00 TO 14+00	— 300 L.F.	—	8"Ø FIELD TILE
STA. 14+00 TO 14+60	— 60 L.F.	—	8"Ø C.M.P.
STA. 14+60 TO 20+50	— 590 L.F.	—	8"Ø FIELD TILE
STA. 20+50 TO 36+57	— 1607 L.F.	—	6"Ø FIELD TILE

CATCH BASIN STA. 14+60

PROJECT No	D-46
DRAWING No	D-46-1
DESIGNED BY:	W. J. M.
DRAWN BY:	R. E. A.
DATE:	OCT. 1967
SCALE:	HOR. 1" = 400' VERT. 1" = 10'

REGISTERED PROFESSIONAL ENGINEER
W. J. MANNEROW
PROVINCE OF ONTARIO

THE PAFF DRAINAGE WORKS TOWNSHIP OF WILMOT

— PLAN AND PROFILE —

GAMSBY AND MANNEROW
CONSULTING PROFESSIONAL ENGINEERS
344 WOOLWICH STREET — GUELPH, ONTARIO

STROHVEST LANDS SUBDIVISION-161413217
NRCS (SCS) Curve Number Determination

TABLE OF CURVE NUMBERS (CN's)									
Land Use		Hydrologic Soil Type							Manning's
		A	AB	B	BC	C	CD	D	'n'
Meadow	"Good"	30	44	58	64.5	71	74.5	78	0.40
Woodlot	"Fair"	36	48	60	66.5	73	76	79	0.40
Gravel		76	80.5	85	87	89	90	91	0.30
Lawns	"Good"	39	50	61	67.5	74	77	80	0.25
Pasture/Range		58	61.5	65	70.5	76	78.5	81	0.17
Crop		66	70	74	78	82	84	86	0.13
Fallow (Bare)		77	82	86	89	91	93	94	0.05
Impervious		98	98	98	98	98	98	98	0.01

1. MTO Drainage Manual (1997), Design Chart 1.09-Soil/Land Use Curve Numbers
2. Chin (2000), Water-Resources Engineering, Table 6.13-Curve Numbers for Various Urban Land Uses

HYDROLOGIC SOIL TYPE (%)								
	Hydrologic Soil Type							
Catchment	A	AB	B	BC	C	CD	D	TOTAL
Existing Conditions								
100				33	67			100
101				100				100
102				100				100
103					100			100
Proposed Conditions								
200				40	60			100
201				35	65			100
202A					100			100
202B				10	90			100
203					100			100
204				18	82			100
205				99	1			100
206				100				100
207				100				100
SWM				4	96			100

LAND USE (%)									
Catchment	Meadow	Woodlot	Gravel	Lawns	Pasture Range	Crop	Fallow (Bare)	Impervious (see note)	Total
Existing Conditions									
100						100			100
101						100			100
102						100			100
103	40							60	100
Proposed Conditions									
200				36				64	100
201				60				40	100
202A				49				51	100
202B				41				59	100
203				35				65	100
204						100			100
205				34				66	100
206				60				40	100
207				60				40	100
SWM	50							50	100

CURVE NUMBER (CN)										
Catchment	Meadow	Woodlot	Gravel	Lawns	Pasture Range	Crop	Fallow (Bare)	Impervious	Weighted CN	Pervious CN
Existing Conditions										
100	0	0	0	0	0	81	0	0	81	81
101	0	0	0	0	0	78	0	0	78	78
102	0	0	0	0	0	78	0	0	78	78
103	28	0	0	0	0	0	0	59	87	71
Proposed Conditions										
200	0	0	0	26	0	0	0	63	88	71
201	0	0	0	43	0	0	0	39	82	72
202A	0	0	0	37	0	0	0	50	86	74
202B	0	0	0	30	0	0	0	58	88	73
203	0	0	0	26	0	0	0	64	90	74
204	0	0	0	0	0	81	0	0	81	81
205	0	0	0	23	0	0	0	64	88	68
206	0	0	0	41	0	0	0	39	80	68
207	0	0	0	41	0	0	0	39	80	68
SWM	35	0	0	0	0	0	0	49	84	71

** AMC II assumed
** Hydrological Soil Group taken from MTO Drainage Manual for each soil type

STROHVEST LANDS SUBDIVISION-161413217
Visual OTTHYMO Parameters

Existing Conditions

Area Description	Catchment ID	SWMHYMO Command	Area (ha)	CN	TIMP	XIMP	Slope (%)	Length (m)	IA (mm)	Tc (hrs)	Tp (hrs)
Agricultural area draining south, including the southern portion of the site and the external agricultural lands	100	DESIGN NASHYD	17.97	81	0.00		2.0%	613	7.0	1.02	0.61
Agricultural area in the northern portion of the site draining north	101	DESIGN NASHYD	2.71	78	0.00		1.4%	286	7.0	0.79	0.47
Agricultural area draining east to the existing rear yard catchbasin behind the properties fronting Zinkann Crescent	102	DESIGN NASHYD	2.22	78	0.00		1.3%	203	7.0	0.67	0.40
North side of Gerber Road and North Ditch of Gerber Road contributing to the existing culvert	103	DESIGN STANDHYD	0.29	71	0.60	0.01	2.9%	157			

Proposed Conditions

Area Description	Catchment ID	SWMHYMO Command	Area (ha)	CN	TIMP	XIMP	Slope (%)	Length (m)	IA (mm)	Tc (hrs)	Tp (hrs)
Proposed residential development draining to on site SWMF	200	DESIGN STANDHYD	7.67	71	0.64	0.51	2.0%				
Proposed development draining to SWMF (mostly rear yards and rooftops)	201	DESIGN STANDHYD	0.34	72	0.40	0.01	2.0%				
Proposed residential development draining uncontrolled towards south	202A	DESIGN STANDHYD	0.43	74	0.51	0.41	2.0%				
Proposed residential development with minor flows contributing to onsite SWMF and major flows draining to the south	202B	DESIGN STANDHYD	0.26	73	0.59	0.47	2.0%				
North side of Gerber Road and North Ditch of Gerber Road contributing to the ROW	203	DESIGN STANDHYD	0.43	74	0.65	0.01	2.0%				
External agricultrual land draining to the site via sheet flow and contributing to the SWMF	204	DESIGN NASHYD	6.26	81	0.00	0.00	2.5%	326	7.0	0.69	0.41
Future residential development draining to the SWMF	205	DESIGN STANDHYD	4.87	68	0.66	0.52	2.0%				
Future development (mostly rear yards and rooftops), draining uncontrolled towards northeast	206	DESIGN STANDHYD	0.89	68	0.40	0.01	2.0%				
Future development (mostly rear yards and rooftops), draining uncontrolled towards west and northwest	207	DESIGN STANDHYD	0.73	68	0.40	0.01	2.0%				
SWMF Block	SWM	DESIGN STANDHYD/ROUTE RESERVOIR	1.31	71	0.50	0.50	2.0%				

Total to SWM Pond	20.71		44%
Total developed area to SWM pond	14.45		63%
Total Site Area	16.50		60%

Notes:

CN is only calculated for pervious areas for DESIGN STANDHYD. CN is a weighted average for DESIGN NASHYD.

TIMP — *Total percent impervious*

XIMP — *Percent impervious directly connected*

Time of Concentration calculated using the Airport Method — $Tc = [\ 3.26\ (1.1\text{-}C)\ L^{0.5}\ ]\ /\ S^{0.33}$

Where: *C = Runoff Coefficient according to MTO Design chart 1.07 for 'cultivated' on silt loam/loam soil*

L = Length of Overland Flow (m)

S = Slope (%)

Time to Peak (hr) — $Tp = 0.6Tc$

STROHVEST LANDS SUBDIVISION-161413217
Stormwater Management Facility Design Calculations

	Rating Curve				Estimated	Volume Estimation								Outlet Structure Controls						
			Storage		Detention		Forebay	Total Pond	Active Storage	Total		Active Storage		Ext. Detention	DICB			Emergency		
	Elevation	Discharge	Active	Total	Time	Elevation	Volume	Volume	Volume	Volume	Volume (excl. sediment)	Depth	Elevation	Orifice #1	Inlet	Orifice #2	Control	Spillway	Total Flow	Parameters
	(m)	(m³/s)	(m³)	(m³)	(hrs)	(m)	(m³)	(m³)	(m³)	ha.m	(m³)	(m)	(m)	(m³/s)	(m³/s)	(m³/s)	(m³/s)	(m³/s)		
Bottom of SWMF	350.60					350.60							350.6							Water Quality Extended Detention Orifice #1
	350.70			144		350.70	55	199			144		350.7							Orifice #1 Elev (m) / Orifice Coeff.
	350.80			297		350.80	116	413			297		350.8							352.10 / 0.600
	350.90			459		350.90	182	641			459		350.9							Orifice #1-Midpoint (m) / Perimeter (m)
	351.00			630		351.00	254	885			630		351.0							352.18 / 0.471
Max. Sed. Storage	351.10			812		351.10	332	1,144			812		351.1							Orifice Diameter (mm) / Area (m²)
	351.20			1,087		351.20	416	1,419			1,087		351.2							150 / 0.018
	351.30			1,379		351.30	506	1,711			1,379		351.3							Weir Coeff. (Sharp) / Orientation
	351.40			1,687		351.40	602	2,019			1,687		351.4							1.80 / Vertical
	351.50			2,013		351.50	705	2,345			2,013		351.5							Orifice #2
	351.60			2,356		351.60	815	2,688			2,356		351.6							Orifice #3 Elev (m) / Orifice Coeff.
	351.70			2,718		351.70	932	3,050			2,718		351.7							351.80 / 0.600
	351.80			3,099		351.80	1056	3,431			3,099		351.8							Orifice #3-Midpoint (m) / Perimeter (m)
	351.90			3,498		351.90	1188	3,830			3,498		351.9							352.13 / 2.042
	352.00			3,917		352.00	1327	4,249			3,917		352.0							Orifice Diameter (mm) / Area (m²)
Permanent Pool	352.10			4,357		352.10	1474	4,688			4,357		352.1							650 / 0.332
	352.20	0.007	461	4,818	17.3	352.20		5,150	461	0.0461	4,818	0.1	352.2	0.007					0.007	Weir Coeff. (Sharp) / Orientation
	352.30	0.017	942	5,298	28.4	352.30		5,630	942	0.0942	5,298	0.2	352.3	0.017					0.017	1.80 / Vertical
	352.40	0.022	1,442	5,798	35.5	352.40		6,130	1,442	0.1442	5,798	0.3	352.4	0.022					0.022	Emergency Overflow Weir
	352.50	0.027	1,961	6,318	41.4	352.50		6,650	1,961	0.1961	6,318	0.4	352.5	0.027					0.027	Spillway Invert (m) / Top of Berm (m)
	352.60	0.031	2,501	6,858	46.6	352.60		7,190	2,501	0.2501	6,858	0.5	352.6	0.031					0.031	354.70 / 355.00
	352.70	0.034	3,061	7,418	51.4	352.70		7,750	3,061	0.3061	7,418	0.6	352.7	0.034					0.034	Spillway Length @ Invert (m) / Max. Flow Depth (m)
	352.80	0.197	3,642	7,998	52.8	352.80		8,330	3,642	0.3642	7,998	0.7	352.8	0.037	0.160	0.725	0.160		0.197	20 / 0.30
	352.90	0.508	4,243	8,600	53.3	352.90		8,932	4,243	0.4243	8,600	0.8	352.9	0.040	0.468	0.776	0.468		0.508	Side Slopes (ratio of H:V) / Topwidth
	353.00	0.868	4,866	9,222	53.6	353.00		9,554	4,866	0.4866	9,222	0.9	353.0	0.043	0.983	0.825	0.825		0.868	10.00 / 26.00
	353.10	0.916	5,509	9,866	53.8	353.10		10,198	5,509	0.5509	9,866	1.0	353.1	0.045	1.710	0.871	0.871		0.916	Weir Coefficient (Rectangle) / Weir Coeff. (Triangle)
	353.20	0.962	6,177	10,533	54.0	353.20		10,865	6,177	0.6177	10,533	1.1	353.2	0.048	2.402	0.914	0.914		0.962	1.70 / 1.30
	353.30	1.006	6,862	11,219	54.1	353.30		11,551	6,862	0.6862	11,219	1.2	353.3	0.050	2.962	0.956	0.956		1.006	
	353.40	1.048	7,567	11,924	54.3	353.40		12,256	7,567	0.7567	11,924	1.3	353.4	0.052	3.583	0.996	0.996		1.048	DICB invert (m) / 352.70
	353.50	1.088	8,292	12,648	54.5	353.50		12,980	8,292	0.8292	12,648	1.4	353.5	0.054	4.229	1.034	1.034		1.088	
	353.60	1.127	9,036	13,392	54.7	353.60		13,724	9,036	0.9036	13,392	1.5	353.6	0.056	4.856	1.071	1.071		1.127	
	353.70	1.165	9,800	14,156	54.9	353.70		14,488	9,800	0.9800	14,156	1.6	353.7	0.058	5.469	1.107	1.107		1.165	
	353.80	1.201	10,583	14,940	55.1	353.80		15,272	10,583	1.0583	14,940	1.7	353.8	0.060	6.096	1.141	1.141		1.201	
	353.90	1.237	11,388	15,744	55.3	353.90		16,076	11,388	1.1388	15,744	1.8	353.9	0.062	6.724	1.175	1.175		1.237	
	354.00	1.271	12,212	16,569	55.4	354.00		16,901	12,212	1.2212	16,569	1.9	354.0	0.063	7.348	1.208	1.208		1.271	
	354.10	1.305	13,058	17,415	55.6	354.10		17,747	13,058	1.3058	17,415	2.0	354.1	0.065	7.971	1.239	1.239		1.305	
	354.20	1.337	13,925	18,282	55.8	354.20		18,614	13,925	1.3925	18,282	2.1	354.2	0.067	8.597	1.270	1.270		1.337	
	354.30	1.369	14,813	19,170	56.0	354.30		19,502	14,813	1.4813	19,170	2.2	354.3	0.068	9.222	1.301	1.301		1.369	
	354.40	1.400	15,724	20,080	56.2	354.40		20,412	15,724	1.5724	20,080	2.3	354.4	0.070	9.847	1.330	1.330		1.400	
	354.50	1.431	16,656	21,012	56.4	354.50		21,344	16,656	1.6656	21,012	2.4	354.5	0.072	10.471	1.359	1.359		1.431	
	354.60	1.461	17,609	21,966	56.5	354.60		22,298	17,609	1.7609	21,966	2.5	354.6	0.073	11.096	1.387	1.387		1.461	
Top of Active Storage	354.70	1.490	18,585	22,941	56.7	354.70		23,273	18,585	1.8585	22,941	2.6	354.7	0.075	11.721	1.415	1.415		1.490	
	354.80	2.635	19,581	23,937	56.9	354.80		24,269	19,581	1.9581	23,937	2.7	354.8	0.076	12.346	1.442	1.442	1.116	2.635	
	354.90	4.820	20,597	24,954	56.9	354.90		25,286	20,597	2.0597	24,954	2.8	354.9	0.078	12.970	1.469	1.469	3.274	4.820	
Top of SWMF	355.00	7.802	21,633	25,990	57.0	355.00		26,321	21,633	2.1633	25,990	2.9	355.0	0.079	13.595	1.495	1.495	6.228	7.802	

Drawdown Time Calculations Greater than 0.1 m above the permanent pool

$T=[v_2-v_1]/[(Q_2+Q_1)/2]/3600$

where

T=drawdown time in hours

v_2=starting pond volume

v_2=ending pond volume

Q_2=starting flow

Q_1=ending flow

From 0.0 to 0.1 m above the permanent pool

$T=[v_2-v_1]/[(Q_2)]/3600$

where

T=drawdown time in hours

v_2=starting pond volume

v_2=ending pond volume

Q_2=starting flow

Weir Equation Used: $Q = C_{ws}*L*H^{1.5} + C_{wt}*S*H^{2.5}$

where

L = bottom width of spillway

H = head above weir invert

S = side slopes (ratio of H:V)

C_{wt} = weir coefficient (triangular)

C_{wb} = weir coefficient (broad-crested)

Sharp crested semi-circular weir equation

Sharp crested semi-circular weir equation

$Q=C*D^{2.5}*(H/D)^{1.88}$

where

C = sharp crested semi-circular weir coefficient

D = diameter of orifice

H = head above orifice invert

Note: used when water elevation is below 3/4 of the orifice diameter

Orifice Flow Calculations: Orifice flow equation

$Q = C{\cdot}A_r{\cdot}(2{\cdot}g{\cdot}H)^{0.5}$

where

C = orifice coefficient

A = area of orifice

g = acceleration due to gravity

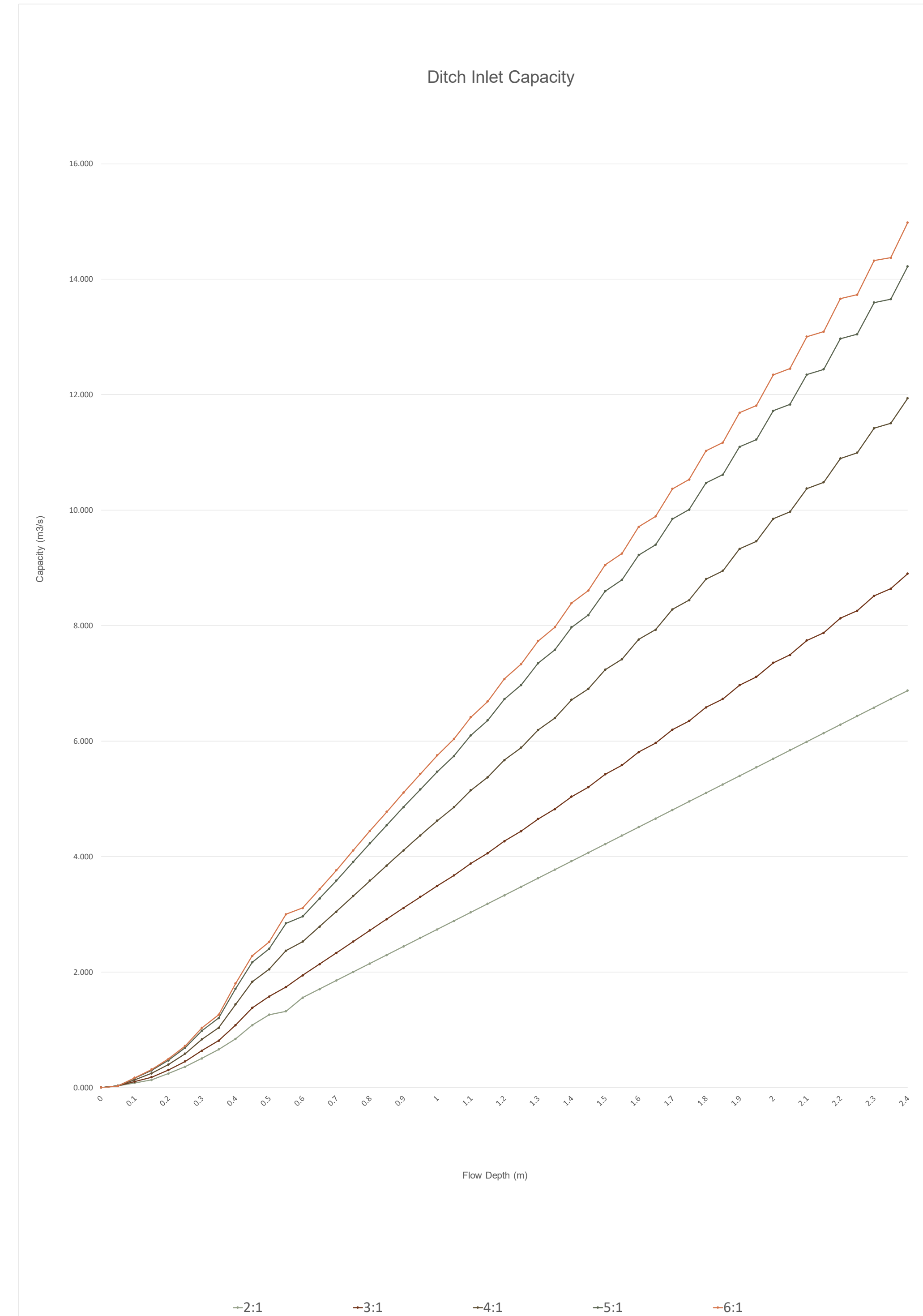
H = head above centre line of orifice

Note: used when water elevation is above 3/4 of the orifice diameter

Ditch Inlet Capacity Calculation (OPSD Type 705.030, Grate Type 403.010)
MTO Design Chart 4.20

Ditch Inlet Width: 1.2 m   5 :1 grate slope

	Capacity (m^3/s) per meter width						Actual Inlet Flow m^3/s				
Flow Depth	**2:1**	**3:1**	**4:1**	**5:1**	**6:1**	**Head**	**2:1**	**3:1**	**4:1**	**5:1**	**6:1**
0	0.000	0.000	0.000	0.000	0.000	0	0.000	0.000	0.000	0.000	0.000
0.05	0.024	0.023	0.022	0.021	0.021	0.05	0.029	0.028	0.027	0.026	0.025
0.1	0.065	0.084	0.112	0.133	0.140	0.1	0.078	0.101	0.134	0.160	0.168
0.15	0.110	0.148	0.204	0.246	0.260	0.15	0.132	0.177	0.245	0.295	0.312
0.2	0.200	0.253	0.331	0.390	0.410	0.2	0.240	0.303	0.398	0.468	0.492
0.25	0.300	0.375	0.488	0.572	0.600	0.25	0.360	0.450	0.585	0.686	0.720
0.3	0.420	0.530	0.695	0.819	0.860	0.3	0.504	0.636	0.834	0.983	1.032
0.35	0.550	0.675	0.863	1.003	1.050	0.35	0.660	0.810	1.035	1.204	1.260
0.4	0.700	0.900	1.200	1.425	1.500	0.4	0.840	1.080	1.440	1.710	1.800
0.45	0.900	1.150	1.525	1.806	1.900	0.45	1.080	1.380	1.830	2.168	2.280
0.5	1.050	1.313	1.706	2.002	2.100	0.5	1.260	1.575	2.048	2.402	2.520
0.55	1.100	1.450	1.975	2.369	2.500	0.55	1.320	1.740	2.370	2.843	3.000
0.6	1.296	1.620	2.105	2.469	2.590	0.6	1.556	1.944	2.526	2.962	3.108
0.65	1.419	1.780	2.321	2.727	2.863	0.65	1.703	2.136	2.786	3.273	3.435
0.7	1.543	1.941	2.538	2.986	3.135	0.7	1.851	2.329	3.045	3.583	3.762
0.75	1.666	2.104	2.762	3.255	3.419	0.75	1.999	2.525	3.314	3.906	4.103
0.8	1.789	2.268	2.986	3.524	3.704	0.8	2.147	2.721	3.583	4.229	4.445
0.85	1.912	2.429	3.204	3.785	3.979	0.85	2.294	2.914	3.845	4.542	4.775
0.9	2.035	2.590	3.422	4.047	4.255	0.9	2.442	3.108	4.107	4.856	5.106
0.95	2.158	2.750	3.637	4.302	4.524	0.95	2.590	3.300	4.364	5.163	5.429
1	2.281	2.909	3.851	4.558	4.793	1	2.738	3.491	4.622	5.469	5.752
1.05	2.404	3.061	4.045	4.784	5.030	1.05	2.885	3.673	4.854	5.741	6.036
1.1	2.528	3.232	4.288	5.080	5.344	1.1	3.033	3.878	5.146	6.096	6.413
1.15	2.651	3.381	4.476	5.298	5.572	1.15	3.181	4.057	5.372	6.358	6.686
1.2	2.774	3.554	4.725	5.604	5.896	1.2	3.329	4.265	5.671	6.724	7.076
1.25	2.897	3.700	4.905	5.809	6.110	1.25	3.476	4.440	5.886	6.971	7.332
1.3	3.020	3.876	5.160	6.124	6.445	1.3	3.624	4.651	6.193	7.348	7.734
1.35	3.143	4.018	5.330	6.315	6.643	1.35	3.772	4.822	6.396	7.578	7.971
1.4	3.266	4.198	5.595	6.643	6.992	1.4	3.920	5.037	6.714	7.971	8.391
1.45	3.389	4.335	5.754	6.818	7.172	1.45	4.067	5.202	6.905	8.181	8.607
1.5	3.513	4.520	6.031	7.164	7.542	1.5	4.215	5.424	7.237	8.597	9.050
1.55	3.636	4.654	6.181	7.326	7.708	1.55	4.363	5.584	7.417	8.791	9.250
1.6	3.759	4.842	6.467	7.685	8.091	1.6	4.511	5.810	7.760	9.222	9.710
1.65	3.882	4.972	6.607	7.833	8.242	1.65	4.658	5.966	7.928	9.400	9.890
1.7	4.005	5.164	6.902	8.205	8.640	1.7	4.806	6.197	8.282	9.847	10.368
1.75	4.128	5.290	7.032	8.339	8.775	1.75	4.954	6.348	8.439	10.007	10.530
1.8	4.251	5.486	7.337	8.726	9.189	1.8	5.102	6.583	8.805	10.471	11.027
1.85	4.374	5.608	7.458	8.846	9.308	1.85	5.249	6.729	8.950	10.615	11.170
1.9	4.498	5.808	7.773	9.247	9.738	1.9	5.397	6.969	9.327	11.096	11.686
1.95	4.621	5.926	7.884	9.353	9.842	1.95	5.545	7.111	9.461	11.223	11.810
2	4.744	6.130	8.208	9.767	10.287	2	5.693	7.355	9.850	11.721	12.344
2.05	4.867	6.244	8.310	9.859	10.376	2.05	5.840	7.493	9.972	11.831	12.451
2.1	4.990	6.451	8.644	10.288	10.836	2.1	5.988	7.742	10.372	12.346	13.003
2.15	5.113	6.562	8.736	10.366	10.909	2.15	6.136	7.875	10.483	12.439	13.091
2.2	5.236	6.773	9.079	10.809	11.385	2.2	6.284	8.128	10.895	12.970	13.662
2.25	5.359	6.880	9.161	10.872	11.442	2.25	6.431	8.256	10.994	13.047	13.731
2.3	5.483	7.095	9.515	11.329	11.934	2.3	6.579	8.514	11.418	13.595	14.321
2.35	5.606	7.198	9.587	11.379	11.976	2.35	6.727	8.638	11.505	13.655	14.371
2.4	5.729	7.417	9.950	11.850	12.483	2.4	6.875	8.901	11.940	14.220	14.980



STROHVEST LANDS SUBDIVISION-161413217
Sediment Forebay Sizing Calculations

Using MOE - SWMPD Manual (2003)

Settling

Dist = $\sqrt{(r * Q_p / v_s)}$

= **10.8** **m**

r : 1 = l to w ratio	r =	1.3	
Q_p = peak SWM outflow during quality storm	Q_p =	0.027	Note 1.
v_s = settling velocity for 0.15 mm particles (m/s)	v_s =	0.0003	

Dispersion Length

Dist = 8Q/dv

= **44.4** **m**

y_s = total depth of sediment in forebay (m)	y_s =	0.5	
Q = inlet flow (m^3/s)	Q =	2.776	Note 2.
d = depth of perm pool in forebay above y_s (m)	d =	1.0	
v_f = desired vel in forebay (m/s)	v_f =	0.5	

Velocity Checks

v = Q/A

= **0.09** **m/s**

Therefore, **Velocity Target Satisfied**

y = total depth above sediment storage	y =	1	Note 3.
b = bottom width of (avg) of forebay (m)	b =	20.5	
Q = inlet flow (m^3/s)	Q =	2.776	Note 2.
A = cross-sectional area (m^2)	A =	30.68	Note 3.
Target velocity (m/s)	V_{targ} =	0.15	

Cleanout Frequency

Table 5.3 MOEE SWMPP Guidelines

cleanout = $Vol/(load * A_{sew} * effic)$

= **17.1** **years**

A_{sew} = Contributing Sewer Area (ha)	A_{sew} =	20.71	
Imp = Percent Impervious (%)	Imp =	44%	
load = Sediment Loading (m^3/ha)	load =	1.2	
effic = Removal Efficiency (%) - Level 1	effic =	80%	
Targ = Cleanout Frequency Target (years)	Targ =	7	
Vol = Sediment volume (m^3)	Vol =	332	Note 4.

Therefore, **Cleanout Frequency Satisfied**

Surface Area Check

SA_f/SA_{pp} = **33.7%**

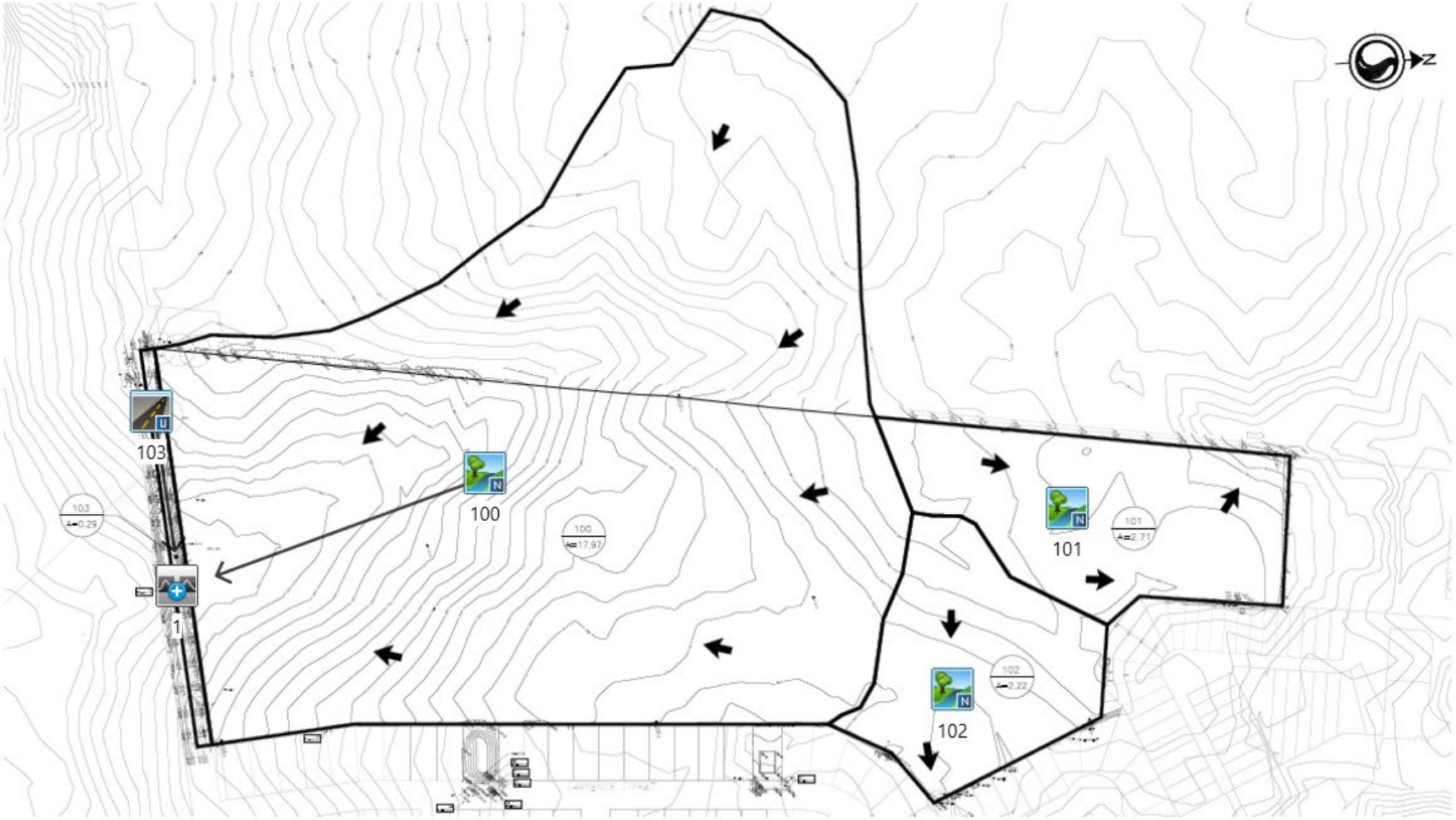
SA_f = Forebay Surface Area (m^2)	SA_f =	1,513	
SA_{pp} = Total Permanent Pool Surface Area (m^2)	SA_{pp} =	4,492	
Targ = Forebay size (as % of Permanent Pool Area)	Targ =	33%	

Notes

1. Taken as the peak outflow of the Water Quality Extended Detention Volume
2. Peak inlet flows to SWM facility based on VO6 modelling (5-year storm)
3. Cross-sectional area based on depth above maximum sedimentation depth (0.5 m)
4. Volume of bottom 0.5 m depth, the maximum sediment accumulation depth

Existing Conditions VO6 Model:

Project Number: 161413217



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================================================================================

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      V V   I    SS    U   U AAAAA  L
      V V   I     SS   U   U A   A  L
       VV   I   SSSSS  UUUUU A   A  LLLLL

      OOO   TTTTT  TTTTT  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    M 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 *****


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DATE: 05/26/2024                      TIME: 04:17:13

USER:


COMMENTS:
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--------------------------------------------------------------------------------
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  ************************************************
  ** SIMULATION : 1. 25mm 4-hr Chicago Storm    **
  ************************************************


--------------------
| CHICAGO STORM    |   IDF curve parameters: A= 508.500
| Ptotal= 25.01 mm |                         B=   6.000
--------------------                         C=   0.799
                    used in:   INTENSITY =  A / (t + B)^C

                    Duration of storm  =  4.00 hrs
                    Storm time step    =  5.00 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    1.47 |  1.00    6.93 |  2.00    4.30 |  3.00
1.98
              0.08    1.56 |  1.08   10.85 |  2.08    3.90 |  3.08
1.90
              0.17    1.67 |  1.17   25.24 |  2.17    3.57 |  3.17
1.83
              0.25    1.80 |  1.25   74.87 |  2.25    3.29 |  3.25
1.76
              0.33    1.94 |  1.33   32.46 |  2.33    3.06 |  3.33
1.70
              0.42    2.12 |  1.42   18.05 |  2.42    2.86 |  3.42
1.64
              0.50    2.33 |  1.50   12.35 |  2.50    2.68 |  3.50
1.59
              0.58    2.60 |  1.58    9.37 |  2.58    2.53 |  3.58
1.54
              0.67    2.95 |  1.67    7.55 |  2.67    2.40 |  3.67
1.50
              0.75    3.42 |  1.75    6.33 |  2.75    2.28 |  3.75
1.45
              0.83    4.09 |  1.83    5.46 |  2.83    2.17 |  3.83
1.41
              0.92    5.13 |  1.92    4.81 |  2.92    2.07 |  3.92
1.37


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0101)|  Area    (ha)=   2.71   Curve Number
(CN)= 78.0
|ID= 1 DT= 5.0 min |  Ia      (mm)=   7.00   # of Linear
Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.47

    Unit Hyd Qpeak  (cms)=   0.220

    PEAK FLOW       (cms)=   0.015 (i)
    TIME TO PEAK    (hrs)=   2.083
    RUNOFF VOLUME    (mm)=   3.619
    TOTAL RAINFALL   (mm)=  25.015
    RUNOFF COEFFICIENT   =   0.145

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF
ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0102)|  Area    (ha)=   2.22   Curve Number
(CN)= 78.0
|ID= 1 DT= 5.0 min |  Ia      (mm)=   7.00   # of Linear
Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.40

    Unit Hyd Qpeak  (cms)=   0.212

    PEAK FLOW       (cms)=   0.014 (i)
    TIME TO PEAK    (hrs)=   1.917
    RUNOFF VOLUME    (mm)=   3.619
    TOTAL RAINFALL   (mm)=  25.015
    RUNOFF COEFFICIENT   =   0.145

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF
ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0100)|  Area    (ha)=  17.97   Curve Number
(CN)= 81.0
|ID= 1 DT= 5.0 min |  Ia      (mm)=   7.00   # of Linear
Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.61
```

```
    Unit Hyd Qpeak  (cms)=   1.125

    PEAK FLOW       (cms)=   0.101 (i)
    TIME TO PEAK    (hrs)=   2.250
    RUNOFF VOLUME    (mm)=   4.182
    TOTAL RAINFALL   (mm)=  25.015
    RUNOFF COEFFICIENT   =   0.167

   (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF
ANY.

---------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0103)|   Area    (ha)=   0.29
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=
1.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.17         0.12
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.90
    Length           (m)=      20.00       157.00
    Mannings n            =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=      74.87        25.21
             over (min)        5.00        30.00
    Storage Coeff.  (min)=       0.89 (ii)   25.77 (ii)
    Unit Hyd. Tpeak (min)=       5.00        30.00
    Unit Hyd. peak  (cms)=       0.34         0.04
                                    *TOTALS*
    PEAK FLOW       (cms)=       0.00         0.00          0.005
(iii)
    TIME TO PEAK    (hrs)=       1.33         1.83          1.83
    RUNOFF VOLUME    (mm)=      24.01         8.15
8.25
    TOTAL RAINFALL   (mm)=      25.01        25.01
25.01
    RUNOFF COEFFICIENT   =       0.96         0.33
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*  =  71.0    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  (  0001)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0100):    17.97   0.101     2.25     4.18
     + ID2= 2 (  0103):     0.29   0.005     1.83     8.25

================================================
=======
       ID = 3 (  0001):    18.26   0.104     2.25     4.25

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
---------------------------------------------------------------------------
================================================
================================================
===============

      V   V  I   SSSSS  U   U    A    L           (v 6.2.2015)
      V   V  I   SS     U   U   AA   L
       V V   I    SS    U   U  AAAAA  L
       V V   I     SS   U   U  A   A  L
        VV    I   SSSSS  UUUUU  A   A  LLLLL

       OOO   TTTTT  TTTTT  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    M 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 *****


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DATE: 05/26/2024                      TIME: 04:17:13

USER:


COMMENTS:
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---------------------------------------------------------------------------
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  ***********************************************
  ** SIMULATION : 2. 2-yr 3-hr Chicago Storm    **
  ***********************************************


--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 743.000
| Ptotal= 34.27 mm |                          B=   6.000
--------------------                          C=   0.799
                    used in:   INTENSITY =  A / (t + B)^C

                    Duration of storm  =  3.00 hrs
                    Storm time step    =  5.00 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    2.84 |  0.75   15.85 |  1.50    7.98 |  2.25
3.70
```

```
          0.08    3.09 |  0.83   36.89 |  1.58    7.03 |  2.33
3.50
          0.17    3.41 |  0.92  109.40 |  1.67    6.29 |  2.42
3.33
          0.25    3.80 |  1.00   47.44 |  1.75    5.69 |  2.50
3.17
          0.33    4.31 |  1.08   26.38 |  1.83    5.21 |  2.58
3.03
          0.42    5.00 |  1.17   18.05 |  1.92    4.81 |  2.67
2.90
          0.50    5.98 |  1.25   13.69 |  2.00    4.47 |  2.75
2.78
          0.58    7.49 |  1.33   11.03 |  2.08    4.17 |  2.83
2.68
          0.67   10.13 |  1.42    9.25 |  2.17    3.92 |  2.92
2.58


--------------------------------------------------------------------------------
--------------------
| CALIB           |
| NASHYD  (  0101)|  Area    (ha)=   2.71   Curve Number
(CN)= 78.0
|ID= 1 DT= 5.0 min |  Ia      (mm)=   7.00   # of Linear
Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.47

    Unit Hyd Qpeak  (cms)=   0.220

    PEAK FLOW       (cms)=   0.037 (i)
    TIME TO PEAK    (hrs)=   1.667
    RUNOFF VOLUME   (mm)=   7.518
    TOTAL RAINFALL  (mm)=  34.271
    RUNOFF COEFFICIENT  =   0.219

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF
ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB           |
| NASHYD  (  0102)|  Area    (ha)=   2.22   Curve Number
(CN)= 78.0
|ID= 1 DT= 5.0 min |  Ia      (mm)=   7.00   # of Linear
Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.40

    Unit Hyd Qpeak  (cms)=   0.212

    PEAK FLOW       (cms)=   0.033 (i)
    TIME TO PEAK    (hrs)=   1.583
    RUNOFF VOLUME   (mm)=   7.518
    TOTAL RAINFALL  (mm)=  34.271
    RUNOFF COEFFICIENT  =   0.219

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF
ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB           |
| NASHYD  (  0100)|  Area    (ha)=  17.97   Curve Number
(CN)= 81.0
|ID= 1 DT= 5.0 min |  Ia      (mm)=   7.00   # of Linear
Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.61

    Unit Hyd Qpeak  (cms)=   1.125

    PEAK FLOW       (cms)=   0.238 (i)
    TIME TO PEAK    (hrs)=   1.833
    RUNOFF VOLUME   (mm)=   8.563
    TOTAL RAINFALL  (mm)=  34.271
    RUNOFF COEFFICIENT  =   0.250

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF
ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB           |
| STANDHYD (  0103)|  Area    (ha)=   0.29
|ID= 1 DT= 5.0 min |  Total Imp(%)=  60.00   Dir. Conn.(%)=
1.00
---------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.17         0.12
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope    (%)=        2.00         2.90
    Length           (m)=       20.00       157.00
    Mannings n       =          0.013        0.250

    Max.Eff.Inten.(mm/hr)=     109.40        54.49
          over (min)        5.00        20.00
    Storage Coeff.  (min)=       0.76 (ii)   19.04 (ii)
    Unit Hyd. Tpeak (min)=       5.00        20.00
    Unit Hyd. peak  (cms)=       0.34         0.06
                                  *TOTALS*
    PEAK FLOW       (cms)=       0.00         0.01         0.011
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.33         1.33
    RUNOFF VOLUME   (mm)=       33.27        14.02
14.18
    TOTAL RAINFALL  (mm)=       34.27        34.27
34.27
    RUNOFF COEFFICIENT  =        0.97         0.41
0.41

***** 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*  =  71.0    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  (  0001)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
-------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0100):    17.97   0.238     1.83     8.56
     + ID2= 2 (  0103):     0.29   0.011     1.33    14.18

================================================
======
       ID = 3 (  0001):    18.26   0.244     1.83     8.65

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
```

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================================================================================
================================================================================

     V   V  I   SSSSS  U   U   A   L          (v 6.2.2015)
     V   V  I   SS     U   U  AA   L
      V V   I    SS    U   U AAAAA  L
      V V   I     SS   U   U A   A  L
       VV   I   SSSSS  UUUUU A   A  LLLLL

      OOO   TTTTT  TTTTT  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    M 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 *****


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6.2\VO2\voin.dat
  Output  filename:
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be6e777afa2b\s


DATE: 05/26/2024                      TIME: 04:17:13

USER:


COMMENTS:
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--------------------------------------------------------------------------------
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  ************************************************
  ** SIMULATION : 3. 5-yr 3-hr Chicago Storm    **
  ************************************************


--------------------
| CHICAGO STORM    |    IDF curve parameters:
A=1593.000
| Ptotal= 47.26 mm |                    B=  11.000
--------------------                    C=   0.879
                    used in:   INTENSITY =  A / (t + B)^C

                    Duration of storm  =  3.00 hrs
                    Storm time step    =  5.00 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    3.03 |  0.75   24.60 |  1.50   11.05 |  2.25
4.23
              0.08    3.38 |  0.83   57.39 |  1.58    9.46 |  2.33
3.95
              0.17    3.82 |  0.92  139.29 |  1.67    8.24 |  2.42
3.70
              0.25    4.39 |  1.00   72.74 |  1.75    7.29 |  2.50
3.48
              0.33    5.14 |  1.08   42.12 |  1.83    6.52 |  2.58
3.29
              0.42    6.20 |  1.17   28.38 |  1.92    5.89 |  2.67
3.11
              0.50    7.75 |  1.25   20.88 |  2.00    5.37 |  2.75
2.96
              0.58   10.24 |  1.33   16.28 |  2.08    4.93 |  2.83
2.82
              0.67   14.73 |  1.42   13.22 |  2.17    4.55 |  2.92
2.69


--------------------------------------------------------------------------------
----------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=   2.71   Curve Number
(CN)= 78.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear
Res.(N)= 3.00
----------------------  U.H. Tp(hrs)=   0.47

    Unit Hyd Qpeak  (cms)=   0.220

    PEAK FLOW       (cms)=   0.079 (i)
    TIME TO PEAK    (hrs)=   1.667
    RUNOFF VOLUME    (mm)=  14.482
    TOTAL RAINFALL   (mm)=  47.258
    RUNOFF COEFFICIENT   =   0.306

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF
ANY.

--------------------------------------------------------------------------------
----------------------
| CALIB            |
| NASHYD   (  0102)|   Area    (ha)=   2.22   Curve Number
(CN)= 78.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear
Res.(N)= 3.00
----------------------  U.H. Tp(hrs)=   0.40

    Unit Hyd Qpeak  (cms)=   0.212

    PEAK FLOW       (cms)=   0.072 (i)
    TIME TO PEAK    (hrs)=   1.500
    RUNOFF VOLUME    (mm)=  14.481
    TOTAL RAINFALL   (mm)=  47.258
    RUNOFF COEFFICIENT   =   0.306

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF
ANY.

--------------------------------------------------------------------------------
----------------------
| CALIB            |
| NASHYD   (  0100)|   Area    (ha)=  17.97   Curve Number
(CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear
Res.(N)= 3.00
----------------------  U.H. Tp(hrs)=   0.61

    Unit Hyd Qpeak  (cms)=   1.125

    PEAK FLOW       (cms)=   0.495 (i)
    TIME TO PEAK    (hrs)=   1.833
    RUNOFF VOLUME    (mm)=  16.233
```

```
    TOTAL RAINFALL   (mm)=  47.258
    RUNOFF COEFFICIENT   =   0.343

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF
ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0103)|   Area    (ha)=   0.29
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=
1.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.17         0.12
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.90
    Length           (m)=      20.00       157.00
    Mannings n           =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     139.29       111.63
             over (min)        5.00        15.00
    Storage Coeff.  (min)=       0.69 (ii)   14.41 (ii)
    Unit Hyd. Tpeak (min)=       5.00        15.00
    Unit Hyd. peak  (cms)=       0.34         0.08
                                          *TOTALS*
    PEAK FLOW       (cms)=       0.00         0.02          0.023
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.25          1.25
    RUNOFF VOLUME    (mm)=      46.26        23.48
23.68
    TOTAL RAINFALL   (mm)=      47.26        47.26
47.26
    RUNOFF COEFFICIENT   =       0.98         0.50
0.50

***** 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*  =  71.0    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  (  0001)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0100):    17.97   0.495     1.83    16.23
     + ID2= 2 (  0103):     0.29   0.023     1.25    23.68

================================================
======
       ID = 3 (  0001):    18.26   0.504     1.83    16.35

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
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      V   V  I   SSSSS  U   U    A    L           (v 6.2.2015)
      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   SSSSS  UUUUU  A   A  LLLLL

       OOO   TTTTT  TTTTT  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    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 *****


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d94d166d1f5d\s


DATE: 05/26/2024                      TIME: 04:17:13

USER:


COMMENTS:
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  ***********************************************
  ** SIMULATION : 4. 25-yr 3-hr Chicago Storm   **
  ***********************************************


--------------------
| CHICAGO STORM    |    IDF curve parameters:
A=3158.000
| Ptotal= 68.26 mm |                    B=  15.000
--------------------                    C=   0.936
                    used in:   INTENSITY =  A / (t + B)^C

                    Duration of storm  =  3.00 hrs
                    Storm time step    =  5.00 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    3.57 |  0.75   38.32 |  1.50   16.26 |  2.25
5.34
              0.08    4.07 |  0.83   87.43 |  1.58   13.65 |  2.33
4.91
              0.17    4.72 |  0.92  191.56 |  1.67   11.67 |  2.42
4.54
```

```
          0.25    5.57 |  1.00  109.32 |  1.75   10.13 |  2.50
4.22
          0.33    6.73 |  1.08   65.64 |  1.83    8.90 |  2.58
3.94
          0.42    8.39 |  1.17   44.39 |  1.92    7.91 |  2.67
3.69
          0.50   10.88 |  1.25   32.36 |  2.00    7.09 |  2.75
3.46
          0.58   14.93 |  1.33   24.85 |  2.08    6.41 |  2.83
3.26
          0.67   22.29 |  1.42   19.81 |  2.17    5.83 |  2.92
3.08


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=   2.71   Curve Number
(CN)= 78.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear
Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.47

    Unit Hyd Qpeak  (cms)=   0.220

    PEAK FLOW       (cms)=   0.163 (i)
    TIME TO PEAK    (hrs)=   1.583
    RUNOFF VOLUME    (mm)=  28.233
    TOTAL RAINFALL   (mm)=  68.257
    RUNOFF COEFFICIENT   =   0.414

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF
ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0102)|   Area    (ha)=   2.22   Curve Number
(CN)= 78.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear
Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.40

    Unit Hyd Qpeak  (cms)=   0.212

    PEAK FLOW       (cms)=   0.149 (i)
    TIME TO PEAK    (hrs)=   1.500
    RUNOFF VOLUME    (mm)=  28.231
    TOTAL RAINFALL   (mm)=  68.257
    RUNOFF COEFFICIENT   =   0.414

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF
ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0100)|   Area    (ha)=  17.97   Curve Number
(CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear
Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.61

    Unit Hyd Qpeak  (cms)=   1.125

    PEAK FLOW       (cms)=   1.000 (i)
    TIME TO PEAK    (hrs)=   1.750
    RUNOFF VOLUME    (mm)=  31.052
    TOTAL RAINFALL   (mm)=  68.257
    RUNOFF COEFFICIENT   =   0.455

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF
ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0103)|   Area    (ha)=   0.29
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=
1.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.17         0.12
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.90
    Length           (m)=      20.00       157.00
    Mannings n          =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     191.56       196.32
             over (min)        5.00        15.00
    Storage Coeff.  (min)=       0.61 (ii)   11.56 (ii)
    Unit Hyd. Tpeak (min)=       5.00        15.00
    Unit Hyd. peak  (cms)=       0.34         0.09
                                    *TOTALS*
    PEAK FLOW       (cms)=       0.00         0.04          0.044
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.25          1.25
    RUNOFF VOLUME    (mm)=      67.26        40.56
40.81
    TOTAL RAINFALL   (mm)=      68.26        68.26
68.26
    RUNOFF COEFFICIENT   =       0.99         0.59
0.60

***** 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*  =  71.0    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  (  0001)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0100):    17.97   1.000     1.75    31.05
     + ID2= 2 (  0103):     0.29   0.044     1.25    40.81

================================================
======
       ID = 3 (  0001):    18.26   1.015     1.75    31.21

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
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 FINISH
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     V   V  I   SSSSS  U   U   A   L          (v 6.2.2015)
     V   V  I   SS     U   U  AA   L
      V V   I    SS    U   U AAAAA  L
      V V   I     SS   U   U A   A  L
       VV   I   SSSSS  UUUUU A   A  LLLLL

      OOO   TTTTT  TTTTT  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    M 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\myavarikia\AppData\Local\Civica\VH5\4aff2f07-
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C:\Users\myavarikia\AppData\Local\Civica\VH5\4aff2f07-
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29e48b62b16a\s


DATE: 05/26/2024                      TIME: 04:17:13

USER:


COMMENTS:
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----------------------------
  ************************************************
  ** SIMULATION : 5. 50-yr 3-hr Chicago Storm   **
  ************************************************


--------------------
| CHICAGO STORM    |    IDF curve parameters:
A=3886.000
| Ptotal= 77.64 mm |                    B=  16.000
--------------------                    C=   0.950
                    used in:   INTENSITY =  A / (t + B)^C

                    Duration of storm  =  3.00 hrs
                    Storm time step    =  5.00 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    3.84 |  0.75   44.32 |  1.50   18.58 |  2.25
5.86
              0.08    4.41 |  0.83  100.50 |  1.58   15.53 |  2.33
5.37
              0.17    5.15 |  0.92  215.80 |  1.67   13.21 |  2.42
4.95
              0.25    6.13 |  1.00  125.29 |  1.75   11.41 |  2.50
4.58
              0.33    7.47 |  1.08   75.84 |  1.83    9.99 |  2.58
4.26
              0.42    9.39 |  1.17   51.37 |  1.92    8.83 |  2.67
3.97
              0.50   12.29 |  1.25   37.40 |  2.00    7.88 |  2.75
3.72
              0.58   17.02 |  1.33   28.63 |  2.08    7.09 |  2.83
3.49
              0.67   25.64 |  1.42   22.74 |  2.17    6.43 |  2.92
3.28


--------------------------------------------------------------------------------
----------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=   2.71   Curve Number
(CN)= 78.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear
Res.(N)= 3.00
----------------------  U.H. Tp(hrs)=   0.47

    Unit Hyd Qpeak  (cms)=   0.220

    PEAK FLOW       (cms)=   0.206 (i)
    TIME TO PEAK    (hrs)=   1.583
    RUNOFF VOLUME    (mm)=  35.066
    TOTAL RAINFALL   (mm)=  77.637
    RUNOFF COEFFICIENT   =   0.452

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF
ANY.

--------------------------------------------------------------------------------
----------------------
| CALIB            |
| NASHYD   (  0102)|   Area    (ha)=   2.22   Curve Number
(CN)= 78.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear
Res.(N)= 3.00
----------------------  U.H. Tp(hrs)=   0.40

    Unit Hyd Qpeak  (cms)=   0.212

    PEAK FLOW       (cms)=   0.188 (i)
    TIME TO PEAK    (hrs)=   1.500
    RUNOFF VOLUME    (mm)=  35.064
    TOTAL RAINFALL   (mm)=  77.637
    RUNOFF COEFFICIENT   =   0.452

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF
ANY.

--------------------------------------------------------------------------------
----------------------
| CALIB            |
| NASHYD   (  0100)|   Area    (ha)=  17.97   Curve Number
(CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear
Res.(N)= 3.00
----------------------  U.H. Tp(hrs)=   0.61

    Unit Hyd Qpeak  (cms)=   1.125

    PEAK FLOW       (cms)=   1.251 (i)
    TIME TO PEAK    (hrs)=   1.750
    RUNOFF VOLUME    (mm)=  38.316
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```
    TOTAL RAINFALL   (mm)=  77.637
    RUNOFF COEFFICIENT   =   0.494

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF
ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0103)|   Area    (ha)=   0.29
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=
1.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.17         0.12
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.90
    Length           (m)=      20.00       157.00
    Mannings n          =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     215.80       280.64
             over (min)        5.00        15.00
    Storage Coeff.  (min)=       0.58 (ii)   10.07 (ii)
    Unit Hyd. Tpeak (min)=       5.00        15.00
    Unit Hyd. peak  (cms)=       0.34         0.10
                                          *TOTALS*
    PEAK FLOW       (cms)=       0.00         0.06          0.056
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.17          1.17
    RUNOFF VOLUME    (mm)=      76.64        48.65
48.90
    TOTAL RAINFALL   (mm)=      77.64        77.64
77.64
    RUNOFF COEFFICIENT   =       0.99         0.63
0.63

***** 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*  =  71.0    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  (  0001)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0100):    17.97    1.251     1.75    38.32
     + ID2= 2 (  0103):     0.29    0.056     1.17    48.90

================================================
======
       ID = 3 (  0001):    18.26    1.268     1.75    38.48

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
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```
      V   V  I   SSSSS  U   U   A   L          (v 6.2.2015)
      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   SSSSS  UUUUU  A   A  LLLLL

       OOO   TTTTT  TTTTT  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    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\myavarikia\AppData\Local\Civica\VH5\4aff2f07-
f9c0-4d18-a808-84a804cb6cce\658f0ab3-c3b0-4cf1-92a4-
ef6a1abb3db1\s
  Summary filename:
C:\Users\myavarikia\AppData\Local\Civica\VH5\4aff2f07-
f9c0-4d18-a808-84a804cb6cce\658f0ab3-c3b0-4cf1-92a4-
ef6a1abb3db1\s


DATE: 05/26/2024                      TIME: 04:17:13

USER:


COMMENTS:
_____
_____


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  ***********************************************
  ** SIMULATION : 6. 100-yr 3-hr Chicago Storm  **
  ***********************************************


--------------------
| CHICAGO STORM    |    IDF curve parameters:
A=4688.000
| Ptotal= 87.07 mm |                    B=  17.000
--------------------                    C=   0.962
                    used in:   INTENSITY =  A / (t + B)^C

                    Duration of storm  =  3.00 hrs
                    Storm time step    =  5.00 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    4.09 |  0.75   50.50 |  1.50   20.97 |  2.25
6.37
              0.08    4.73 |  0.83  113.67 |  1.58   17.46 |  2.33
5.82
              0.17    5.57 |  0.92  239.35 |  1.67   14.80 |  2.42
5.34
```

```
            0.25    6.68 |  1.00  141.25 |  1.75   12.73 |  2.50
4.93
            0.33    8.21 |  1.08   86.23 |  1.83   11.09 |  2.58
4.56
            0.42   10.40 |  1.17   58.55 |  1.92    9.76 |  2.67
4.24
            0.50   13.73 |  1.25   42.60 |  2.00    8.68 |  2.75
3.95
            0.58   19.18 |  1.33   32.53 |  2.08    7.78 |  2.83
3.70
            0.67   29.10 |  1.42   25.76 |  2.17    7.02 |  2.92
3.47


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--------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=   2.71   Curve Number
(CN)= 78.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear
Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.47

    Unit Hyd Qpeak  (cms)=   0.220

    PEAK FLOW       (cms)=   0.251 (i)
    TIME TO PEAK    (hrs)=   1.583
    RUNOFF VOLUME    (mm)=  42.254
    TOTAL RAINFALL   (mm)=  87.067
    RUNOFF COEFFICIENT   =   0.485

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF
ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0102)|   Area    (ha)=   2.22   Curve Number
(CN)= 78.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear
Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.40

    Unit Hyd Qpeak  (cms)=   0.212

    PEAK FLOW       (cms)=   0.230 (i)
    TIME TO PEAK    (hrs)=   1.500
    RUNOFF VOLUME    (mm)=  42.251
    TOTAL RAINFALL   (mm)=  87.067
    RUNOFF COEFFICIENT   =   0.485

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF
ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0100)|   Area    (ha)=  17.97   Curve Number
(CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear
Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.61

    Unit Hyd Qpeak  (cms)=   1.125

    PEAK FLOW       (cms)=   1.514 (i)
    TIME TO PEAK    (hrs)=   1.750
    RUNOFF VOLUME    (mm)=  45.906
    TOTAL RAINFALL   (mm)=  87.067
    RUNOFF COEFFICIENT   =   0.527

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF
ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0103)|   Area    (ha)=   0.29
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=
1.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.17         0.12
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.90
    Length           (m)=      20.00       157.00
    Mannings n          =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     239.35       328.77
            over (min)        5.00        10.00
    Storage Coeff.  (min)=       0.56 (ii)    9.47 (ii)
    Unit Hyd. Tpeak (min)=       5.00        10.00
    Unit Hyd. peak  (cms)=       0.34         0.12
                                    *TOTALS*
    PEAK FLOW       (cms)=       0.00         0.07         0.071
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.17         1.17
    RUNOFF VOLUME    (mm)=      86.07        56.97
57.24
    TOTAL RAINFALL   (mm)=      87.07        87.07
87.07
    RUNOFF COEFFICIENT   =       0.99         0.65
0.66

***** 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*  =  71.0    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  (  0001)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0100):    17.97   1.514     1.75    45.91
     + ID2= 2 (  0103):     0.29   0.071     1.17    57.24

================================================
======
       ID = 3 (  0001):    18.26   1.531     1.75    46.09

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
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 V   V  I   SSSSS  U   U   A   L          (v 6.2.2015)
 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   SSSSS  UUUUU  A   A LLLLL

  OOO   TTTTT  TTTTT  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    M M M  O   O
  OOO     T      T    H   H    Y    M   M   OOO
```


***** 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\myavarikia\AppData\Local\Civica\VH5\4aff2f07-f9c0-4d18-a808-84a804cb6cce\35809a74-30e8-4420-9a9d-940defb05aaf\s
Summary filename: C:\Users\myavarikia\AppData\Local\Civica\VH5\4aff2f07-f9c0-4d18-a808-84a804cb6cce\35809a74-30e8-4420-9a9d-940defb05aaf\s

DATE: 05/26/2024 TIME: 04:17:13

USER:

COMMENTS:
_____
_____

****
** SIMULATION : Hazel **
****

| READ STORM | Filename: C:\Users\myavarikia\AppData\Local\Temp\
| | 6ad958f3-705e-421a-b77f-2839255a4165\cf020c6b
| Ptotal=212.00 mm | Comments: Hazel

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	6.00	3.00	13.00	6.00	23.00	9.00	53.00
1.00	4.00	4.00	17.00	7.00	13.00	10.00	38.00
2.00	6.00	5.00	13.00	8.00	13.00	11.00	13.00

| CALIB |
| NASHYD (0101)| Area (ha)= 2.71 Curve Number (CN)= 78.0
|ID= 1 DT= 5.0 min | Ia (mm)= 7.00 # of Linear Res.(N)= 3.00
---------- U.H. Tp(hrs)= 0.47

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 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
0.083	6.00	3.083	13.00	6.083	23.00	9.08	53.00
0.167	6.00	3.167	13.00	6.167	23.00	9.17	53.00
0.250	6.00	3.250	13.00	6.250	23.00	9.25	53.00
0.333	6.00	3.333	13.00	6.333	23.00	9.33	53.00
0.417	6.00	3.417	13.00	6.417	23.00	9.42	53.00
0.500	6.00	3.500	13.00	6.500	23.00	9.50	53.00
0.583	6.00	3.583	13.00	6.583	23.00	9.58	53.00
0.667	6.00	3.667	13.00	6.667	23.00	9.67	53.00
0.750	6.00	3.750	13.00	6.750	23.00	9.75	53.00
0.833	6.00	3.833	13.00	6.833	23.00	9.83	53.00
0.917	6.00	3.917	13.00	6.917	23.00	9.92	53.00
1.000	6.00	4.000	13.00	7.000	23.00	10.00	53.00
1.083	4.00	4.083	17.00	7.083	13.00	10.08	38.00
1.167	4.00	4.167	17.00	7.167	13.00	10.17	38.00
1.250	4.00	4.250	17.00	7.250	13.00	10.25	38.00
1.333	4.00	4.333	17.00	7.333	13.00	10.33	38.00
1.417	4.00	4.417	17.00	7.417	13.00	10.42	38.00
1.500	4.00	4.500	17.00	7.500	13.00	10.50	38.00
1.583	4.00	4.583	17.00	7.583	13.00	10.58	38.00
1.667	4.00	4.667	17.00	7.667	13.00	10.67	38.00
1.750	4.00	4.750	17.00	7.750	13.00	10.75	38.00
1.833	4.00	4.833	17.00	7.833	13.00	10.83	38.00
1.917	4.00	4.917	17.00	7.917	13.00	10.92	38.00
2.000	4.00	5.000	17.00	8.000	13.00	11.00	38.00
2.083	6.00	5.083	13.00	8.083	13.00	11.08	13.00
2.167	6.00	5.167	13.00	8.167	13.00	11.17	13.00
2.250	6.00	5.250	13.00	8.250	13.00	11.25	13.00

```
          2.333   6.00 | 5.333   13.00 | 8.333   13.00 | 11.33
13.00
          2.417   6.00 | 5.417   13.00 | 8.417   13.00 | 11.42
13.00
          2.500   6.00 | 5.500   13.00 | 8.500   13.00 | 11.50
13.00
          2.583   6.00 | 5.583   13.00 | 8.583   13.00 | 11.58
13.00
          2.667   6.00 | 5.667   13.00 | 8.667   13.00 | 11.67
13.00
          2.750   6.00 | 5.750   13.00 | 8.750   13.00 | 11.75
13.00
          2.833   6.00 | 5.833   13.00 | 8.833   13.00 | 11.83
13.00
          2.917   6.00 | 5.917   13.00 | 8.917   13.00 | 11.92
13.00
          3.000   6.00 | 6.000   13.00 | 9.000   13.00 | 12.00
13.00

    Unit Hyd Qpeak  (cms)=   0.220

    PEAK FLOW       (cms)=   0.314 (i)
    TIME TO PEAK    (hrs)=  10.250
    RUNOFF VOLUME    (mm)= 151.902
    TOTAL RAINFALL   (mm)= 212.000
    RUNOFF COEFFICIENT   =   0.717

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF
ANY.

---------------------------------------------------------------------------
-------------------
| CALIB            |
| NASHYD   (  0102)|   Area    (ha)=   2.22   Curve Number
(CN)= 78.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear
Res.(N)= 3.00
-------------------  U.H. Tp(hrs)=   0.40

       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   6.00 | 3.083   13.00 | 6.083   23.00 |  9.08
53.00
          0.167   6.00 | 3.167   13.00 | 6.167   23.00 |  9.17
53.00
          0.250   6.00 | 3.250   13.00 | 6.250   23.00 |  9.25
53.00
          0.333   6.00 | 3.333   13.00 | 6.333   23.00 |  9.33
53.00
          0.417   6.00 | 3.417   13.00 | 6.417   23.00 |  9.42
53.00
          0.500   6.00 | 3.500   13.00 | 6.500   23.00 |  9.50
53.00
          0.583   6.00 | 3.583   13.00 | 6.583   23.00 |  9.58
53.00
          0.667   6.00 | 3.667   13.00 | 6.667   23.00 |  9.67
53.00
          0.750   6.00 | 3.750   13.00 | 6.750   23.00 |  9.75
53.00
          0.833   6.00 | 3.833   13.00 | 6.833   23.00 |  9.83
53.00
          0.917   6.00 | 3.917   13.00 | 6.917   23.00 |  9.92
53.00
          1.000   6.00 | 4.000   13.00 | 7.000   23.00 | 10.00
53.00
          1.083   4.00 | 4.083   17.00 | 7.083   13.00 | 10.08
38.00
          1.167   4.00 | 4.167   17.00 | 7.167   13.00 | 10.17
38.00
          1.250   4.00 | 4.250   17.00 | 7.250   13.00 | 10.25
38.00
          1.333   4.00 | 4.333   17.00 | 7.333   13.00 | 10.33
38.00
          1.417   4.00 | 4.417   17.00 | 7.417   13.00 | 10.42
38.00
          1.500   4.00 | 4.500   17.00 | 7.500   13.00 | 10.50
38.00
          1.583   4.00 | 4.583   17.00 | 7.583   13.00 | 10.58
38.00
          1.667   4.00 | 4.667   17.00 | 7.667   13.00 | 10.67
38.00
          1.750   4.00 | 4.750   17.00 | 7.750   13.00 | 10.75
38.00
          1.833   4.00 | 4.833   17.00 | 7.833   13.00 | 10.83
38.00
          1.917   4.00 | 4.917   17.00 | 7.917   13.00 | 10.92
38.00
          2.000   4.00 | 5.000   17.00 | 8.000   13.00 | 11.00
38.00
          2.083   6.00 | 5.083   13.00 | 8.083   13.00 | 11.08
13.00
          2.167   6.00 | 5.167   13.00 | 8.167   13.00 | 11.17
13.00
          2.250   6.00 | 5.250   13.00 | 8.250   13.00 | 11.25
13.00
          2.333   6.00 | 5.333   13.00 | 8.333   13.00 | 11.33
13.00
          2.417   6.00 | 5.417   13.00 | 8.417   13.00 | 11.42
13.00
          2.500   6.00 | 5.500   13.00 | 8.500   13.00 | 11.50
13.00
          2.583   6.00 | 5.583   13.00 | 8.583   13.00 | 11.58
13.00
          2.667   6.00 | 5.667   13.00 | 8.667   13.00 | 11.67
13.00
          2.750   6.00 | 5.750   13.00 | 8.750   13.00 | 11.75
13.00
          2.833   6.00 | 5.833   13.00 | 8.833   13.00 | 11.83
13.00
          2.917   6.00 | 5.917   13.00 | 8.917   13.00 | 11.92
13.00
          3.000   6.00 | 6.000   13.00 | 9.000   13.00 | 12.00
13.00

    Unit Hyd Qpeak  (cms)=   0.212

    PEAK FLOW       (cms)=   0.267 (i)
    TIME TO PEAK    (hrs)=  10.167
    RUNOFF VOLUME    (mm)= 151.893
    TOTAL RAINFALL   (mm)= 212.000
    RUNOFF COEFFICIENT   =   0.716

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF
ANY.

---------------------------------------------------------------------------
-------------------
| CALIB            |
| NASHYD   (  0100)|   Area    (ha)=  17.97   Curve Number
(CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear
Res.(N)= 3.00
-------------------  U.H. Tp(hrs)=   0.61
```

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 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
0.083	6.00	3.083	13.00	6.083	23.00	9.08	53.00
0.167	6.00	3.167	13.00	6.167	23.00	9.17	53.00
0.250	6.00	3.250	13.00	6.250	23.00	9.25	53.00
0.333	6.00	3.333	13.00	6.333	23.00	9.33	53.00
0.417	6.00	3.417	13.00	6.417	23.00	9.42	53.00
0.500	6.00	3.500	13.00	6.500	23.00	9.50	53.00
0.583	6.00	3.583	13.00	6.583	23.00	9.58	53.00
0.667	6.00	3.667	13.00	6.667	23.00	9.67	53.00
0.750	6.00	3.750	13.00	6.750	23.00	9.75	53.00
0.833	6.00	3.833	13.00	6.833	23.00	9.83	53.00
0.917	6.00	3.917	13.00	6.917	23.00	9.92	53.00
1.000	6.00	4.000	13.00	7.000	23.00	10.00	53.00
1.083	4.00	4.083	17.00	7.083	13.00	10.08	38.00
1.167	4.00	4.167	17.00	7.167	13.00	10.17	38.00
1.250	4.00	4.250	17.00	7.250	13.00	10.25	38.00
1.333	4.00	4.333	17.00	7.333	13.00	10.33	38.00
1.417	4.00	4.417	17.00	7.417	13.00	10.42	38.00
1.500	4.00	4.500	17.00	7.500	13.00	10.50	38.00
1.583	4.00	4.583	17.00	7.583	13.00	10.58	38.00
1.667	4.00	4.667	17.00	7.667	13.00	10.67	38.00
1.750	4.00	4.750	17.00	7.750	13.00	10.75	38.00
1.833	4.00	4.833	17.00	7.833	13.00	10.83	38.00
1.917	4.00	4.917	17.00	7.917	13.00	10.92	38.00
2.000	4.00	5.000	17.00	8.000	13.00	11.00	38.00
2.083	6.00	5.083	13.00	8.083	13.00	11.08	13.00
2.167	6.00	5.167	13.00	8.167	13.00	11.17	13.00
2.250	6.00	5.250	13.00	8.250	13.00	11.25	13.00
2.333	6.00	5.333	13.00	8.333	13.00	11.33	13.00
2.417	6.00	5.417	13.00	8.417	13.00	11.42	13.00
2.500	6.00	5.500	13.00	8.500	13.00	11.50	13.00
2.583	6.00	5.583	13.00	8.583	13.00	11.58	13.00
2.667	6.00	5.667	13.00	8.667	13.00	11.67	13.00
2.750	6.00	5.750	13.00	8.750	13.00	11.75	13.00
2.833	6.00	5.833	13.00	8.833	13.00	11.83	13.00
2.917	6.00	5.917	13.00	8.917	13.00	11.92	13.00
3.000	6.00	6.000	13.00	9.000	13.00	12.00	13.00

Unit Hyd Qpeak (cms)= 1.125

PEAK FLOW (cms)= 2.002 (i)
TIME TO PEAK (hrs)= 10.500
RUNOFF VOLUME (mm)= 158.833
TOTAL RAINFALL (mm)= 212.000
RUNOFF COEFFICIENT = 0.749

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0103)	Area (ha)= 0.29
ID= 1 DT= 5.0 min	Total Imp(%)= 60.00 Dir. Conn.(%)= 1.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.17	0.12
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	2.00	2.90
Length (m)=	20.00	157.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 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
0.083	6.00	3.083	13.00	6.083	23.00	9.08	53.00
0.167	6.00	3.167	13.00	6.167	23.00	9.17	53.00
0.250	6.00	3.250	13.00	6.250	23.00	9.25	53.00
0.333	6.00	3.333	13.00	6.333	23.00	9.33	53.00
0.417	6.00	3.417	13.00	6.417	23.00	9.42	53.00
0.500	6.00	3.500	13.00	6.500	23.00	9.50	53.00
0.583	6.00	3.583	13.00	6.583	23.00	9.58	53.00
0.667	6.00	3.667	13.00	6.667	23.00	9.67	53.00
0.750	6.00	3.750	13.00	6.750	23.00	9.75	53.00
0.833	6.00	3.833	13.00	6.833	23.00	9.83	53.00
0.917	6.00	3.917	13.00	6.917	23.00	9.92	53.00

```
          1.000    6.00 | 4.000   13.00 | 7.000   23.00 | 10.00
53.00
          1.083    4.00 | 4.083   17.00 | 7.083   13.00 | 10.08
38.00
          1.167    4.00 | 4.167   17.00 | 7.167   13.00 | 10.17
38.00
          1.250    4.00 | 4.250   17.00 | 7.250   13.00 | 10.25
38.00
          1.333    4.00 | 4.333   17.00 | 7.333   13.00 | 10.33
38.00
          1.417    4.00 | 4.417   17.00 | 7.417   13.00 | 10.42
38.00
          1.500    4.00 | 4.500   17.00 | 7.500   13.00 | 10.50
38.00
          1.583    4.00 | 4.583   17.00 | 7.583   13.00 | 10.58
38.00
          1.667    4.00 | 4.667   17.00 | 7.667   13.00 | 10.67
38.00
          1.750    4.00 | 4.750   17.00 | 7.750   13.00 | 10.75
38.00
          1.833    4.00 | 4.833   17.00 | 7.833   13.00 | 10.83
38.00
          1.917    4.00 | 4.917   17.00 | 7.917   13.00 | 10.92
38.00
          2.000    4.00 | 5.000   17.00 | 8.000   13.00 | 11.00
38.00
          2.083    6.00 | 5.083   13.00 | 8.083   13.00 | 11.08
13.00
          2.167    6.00 | 5.167   13.00 | 8.167   13.00 | 11.17
13.00
          2.250    6.00 | 5.250   13.00 | 8.250   13.00 | 11.25
13.00
          2.333    6.00 | 5.333   13.00 | 8.333   13.00 | 11.33
13.00
          2.417    6.00 | 5.417   13.00 | 8.417   13.00 | 11.42
13.00
          2.500    6.00 | 5.500   13.00 | 8.500   13.00 | 11.50
13.00
          2.583    6.00 | 5.583   13.00 | 8.583   13.00 | 11.58
13.00
          2.667    6.00 | 5.667   13.00 | 8.667   13.00 | 11.67
13.00
          2.750    6.00 | 5.750   13.00 | 8.750   13.00 | 11.75
13.00
          2.833    6.00 | 5.833   13.00 | 8.833   13.00 | 11.83
13.00
          2.917    6.00 | 5.917   13.00 | 8.917   13.00 | 11.92
13.00
          3.000    6.00 | 6.000   13.00 | 9.000   13.00 | 12.00
13.00

    Max.Eff.Inten.(mm/hr)=      53.00       125.06
             over (min)        5.00        15.00
    Storage Coeff.  (min)=       1.02 (ii)   14.13 (ii)
    Unit Hyd. Tpeak (min)=       5.00        15.00
    Unit Hyd. peak  (cms)=       0.34         0.08
                                      *TOTALS*
    PEAK FLOW      (cms)=       0.00         0.04          0.040
(iii)
    TIME TO PEAK    (hrs)=       9.25        10.00         10.00
    RUNOFF VOLUME    (mm)=     211.00       175.04
175.37
    TOTAL RAINFALL   (mm)=     212.00       212.00
212.00
    RUNOFF COEFFICIENT   =       1.00         0.83
0.83

***** 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*  =  71.0    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.

--------------------------------------------------------------------------------

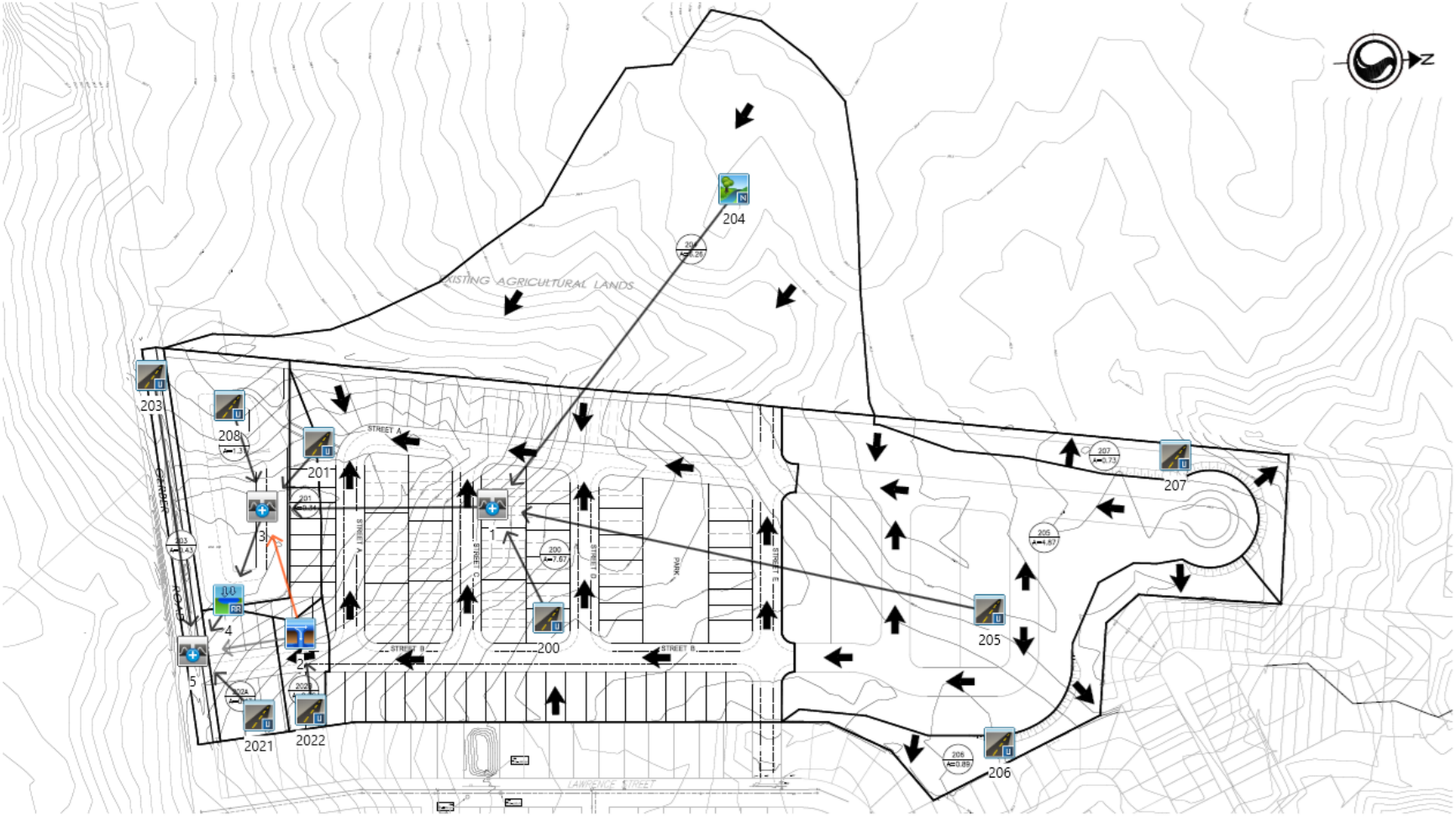
--------------------
| ADD HYD  (  0001)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0100):    17.97   2.002    10.50   158.83
     + ID2= 2 (  0103):     0.29   0.040    10.00   175.37

================================================
======
       ID = 3 (  0001):    18.26   2.033    10.50   159.10

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------
```

Proposed Conditions VO6 Model:

Project Number: 161413217



```
================================================================================
================================================================================

     V   V  I   SSSSS  U   U   A   L          (v 6.2.2015)
     V   V  I   SS     U   U  AA   L
      V V   I    SS    U   U AAAAA  L
      V V   I     SS   U   U A   A  L
       VV   I   SSSSS  UUUUU A   A  LLLLL

      OOO   TTTTT  TTTTT  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    M 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\myavarikia\AppData\Local\Civica\VH5\4aff2f07-
f9c0-4d18-a808-84a804cb6cce\e2681aac-6f50-4545-987e-
14ff9d80c29a\s
  Summary filename:
C:\Users\myavarikia\AppData\Local\Civica\VH5\4aff2f07-
f9c0-4d18-a808-84a804cb6cce\e2681aac-6f50-4545-987e-
14ff9d80c29a\s


DATE: 05/30/2024                      TIME: 12:39:23

USER:



COMMENTS:
_____
_____


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  ************************************************
  ** SIMULATION : 1. 25mm 4hr Chicago Storm     **
  ************************************************


---------------------
| CHICAGO STORM    |    IDF curve parameters: A= 508.500
| Ptotal= 25.01 mm |                          B=   6.000
---------------------                     C=   0.799
                    used in:   INTENSITY =  A / (t + B)^C

                    Duration of storm  =  4.00 hrs
                    Storm time step    =  5.00 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    1.47 |  1.00    6.93 |  2.00    4.30 |  3.00
1.98
              0.08    1.56 |  1.08   10.85 |  2.08    3.90 |  3.08
1.90
              0.17    1.67 |  1.17   25.24 |  2.17    3.57 |  3.17
1.83
              0.25    1.80 |  1.25   74.87 |  2.25    3.29 |  3.25
1.76
              0.33    1.94 |  1.33   32.46 |  2.33    3.06 |  3.33
1.70
              0.42    2.12 |  1.42   18.05 |  2.42    2.86 |  3.42
1.64
              0.50    2.33 |  1.50   12.35 |  2.50    2.68 |  3.50
1.59
              0.58    2.60 |  1.58    9.37 |  2.58    2.53 |  3.58
1.54
              0.67    2.95 |  1.67    7.55 |  2.67    2.40 |  3.67
1.50
              0.75    3.42 |  1.75    6.33 |  2.75    2.28 |  3.75
1.45
              0.83    4.09 |  1.83    5.46 |  2.83    2.17 |  3.83
1.41
              0.92    5.13 |  1.92    4.81 |  2.92    2.07 |  3.92
1.37


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0206)|   Area    (ha)=   0.89
|ID= 1 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=
1.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.36         0.53
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope    (%)=        2.00         2.00
     Length           (m)=       10.00        20.00
     Mannings n           =       0.013        0.250

     Max.Eff.Inten.(mm/hr)=      74.87        15.83
              over (min)         5.00        15.00
     Storage Coeff.  (min)=       0.59 (ii)   10.32 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.34         0.09
                                            *TOTALS*
     PEAK FLOW        (cms)=      0.00         0.01          0.014
(iii)
     TIME TO PEAK     (hrs)=      1.33         1.58          1.58
     RUNOFF VOLUME    (mm)=      24.01         5.12
5.30
     TOTAL RAINFALL   (mm)=      25.01        25.01
25.01
     RUNOFF COEFFICIENT   =       0.96         0.20
0.21

***** 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*  =  68.0    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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--------------------
| CALIB            |
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```
| STANDHYD (  0207)|   Area    (ha)=   0.73
|ID= 1 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=
1.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.29         0.44
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope    (%)=        2.00         2.00
    Length           (m)=       10.00        20.00
    Mannings n           =       0.013        0.250

    Max.Eff.Inten.(mm/hr)=      74.87        15.83
             over (min)        5.00        15.00
    Storage Coeff.  (min)=       0.59 (ii)   10.32 (ii)
    Unit Hyd. Tpeak (min)=       5.00        15.00
    Unit Hyd. peak  (cms)=       0.34         0.09
                                          *TOTALS*
    PEAK FLOW       (cms)=       0.00         0.01          0.011
(iii)
    TIME TO PEAK    (hrs)=       1.33         1.58          1.58
    RUNOFF VOLUME    (mm)=      24.01         5.12
5.30
    TOTAL RAINFALL   (mm)=      25.01        25.01
25.01
    RUNOFF COEFFICIENT   =       0.96         0.20
0.21

***** 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*  =  68.0    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            |
| NASHYD   (  0204)|   Area    (ha)=   6.26   Curve Number
(CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear
Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.41

    Unit Hyd Qpeak  (cms)=   0.583

    PEAK FLOW       (cms)=   0.044 (i)
    TIME TO PEAK    (hrs)=   2.000
    RUNOFF VOLUME    (mm)=   4.182
    TOTAL RAINFALL   (mm)=  25.015
    RUNOFF COEFFICIENT   =   0.167

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF
ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0200)|   Area    (ha)=   7.67
|ID= 1 DT= 5.0 min |   Total Imp(%)=  64.00   Dir. Conn.(%)=
51.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       4.91         2.76
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope    (%)=        2.00         2.00
    Length           (m)=      100.00        20.00
    Mannings n           =       0.013        0.250

    Max.Eff.Inten.(mm/hr)=      74.87        11.56
             over (min)        5.00        10.00
    Storage Coeff.  (min)=       2.33 (ii)    6.88 (ii)
    Unit Hyd. Tpeak (min)=       5.00        10.00
    Unit Hyd. peak  (cms)=       0.30         0.14
                                          *TOTALS*
    PEAK FLOW       (cms)=       0.75         0.06          0.773
(iii)
    TIME TO PEAK    (hrs)=       1.33         1.50          1.33
    RUNOFF VOLUME    (mm)=      24.01         4.67
14.53
    TOTAL RAINFALL   (mm)=      25.01        25.01
25.01
    RUNOFF COEFFICIENT   =       0.96         0.19
0.58

***** WARNING: STORAGE COEFF. IS SMALLER THAN
TIME STEP!

      (i) CN PROCEDURE SELECTED FOR PERVIOUS
LOSSES:
          CN*  =  71.0    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 (  0205)|   Area    (ha)=   4.87
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=
52.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       3.21         1.66
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope    (%)=        2.00         2.00
    Length           (m)=      100.00        20.00
    Mannings n           =       0.013        0.250

    Max.Eff.Inten.(mm/hr)=      74.87        11.13
             over (min)        5.00        10.00
    Storage Coeff.  (min)=       2.33 (ii)    6.74 (ii)
    Unit Hyd. Tpeak (min)=       5.00        10.00
    Unit Hyd. peak  (cms)=       0.30         0.14
                                          *TOTALS*
    PEAK FLOW       (cms)=       0.48         0.04          0.499
(iii)
    TIME TO PEAK    (hrs)=       1.33         1.50          1.33
    RUNOFF VOLUME    (mm)=      24.01         4.34
14.57
    TOTAL RAINFALL   (mm)=      25.01        25.01
25.01
    RUNOFF COEFFICIENT   =       0.96         0.17
0.58

***** WARNING: STORAGE COEFF. IS SMALLER THAN
TIME STEP!

      (i) CN PROCEDURE SELECTED FOR PERVIOUS
LOSSES:
          CN*  =  68.0    Ia = Dep. Storage  (Above)
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     (ii) TIME STEP (DT) SHOULD BE SMALLER OR
EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF
ANY.

--------------------------------------------------------------------------------


--------------------
| ADD HYD  (  0001)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0200):     7.67   0.773     1.33    14.53
     + ID2= 2 (  0204):     6.26   0.044     2.00     4.18

================================================
======
       ID = 3 (  0001):    13.93   0.776     1.33     9.88

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------


--------------------
| ADD HYD  (  0001)|
|   3 +  2 =  1    |        AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0001):    13.93   0.776     1.33     9.88
     + ID2= 2 (  0205):     4.87   0.499     1.33    14.57

================================================
======
       ID = 1 (  0001):    18.80   1.275     1.33    11.10

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  2022)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  59.00   Dir. Conn.(%)=
47.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.15         0.11
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      35.00        20.00
    Mannings n          =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=      74.87        11.15
             over (min)        5.00        10.00
    Storage Coeff.  (min)=       1.24 (ii)    6.19 (ii)
    Unit Hyd. Tpeak (min)=       5.00        10.00
    Unit Hyd. peak  (cms)=       0.33         0.15
                                        *TOTALS*
    PEAK FLOW       (cms)=       0.03         0.00          0.026
(iii)
    TIME TO PEAK    (hrs)=       1.33         1.50          1.33
    RUNOFF VOLUME    (mm)=      24.01         4.77
13.80
    TOTAL RAINFALL   (mm)=      25.01        25.01
25.01
    RUNOFF COEFFICIENT   =       0.96         0.19
0.55

***** WARNING: STORAGE COEFF. IS SMALLER THAN
TIME STEP!

     (i) CN PROCEDURE SELECTED FOR PERVIOUS
LOSSES:
          CN*  =  73.0    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.

--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0002)|
| Inlet Cap.= 0.060|
| #of Inlets=     1|
| Total(cms)=   0.1|     AREA     QPEAK     TPEAK    R.V.
--------------------       (ha)     (cms)     (hrs)    (mm)
    TOTAL HYD.(ID= 1):    0.26      0.03      1.33   13.80

================================================
=======
    MAJOR SYS.(ID= 2):    0.00      0.00      0.00    0.00
    MINOR SYS.(ID= 3):    0.26      0.03      1.33   13.80

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   0.34
|ID= 1 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=
1.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.14         0.20
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      10.00        20.00
    Mannings n          =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=      74.87        18.56
             over (min)        5.00        10.00
    Storage Coeff.  (min)=       0.59 (ii)    9.72 (ii)
    Unit Hyd. Tpeak (min)=       5.00        10.00
    Unit Hyd. peak  (cms)=       0.34         0.11
                                        *TOTALS*
    PEAK FLOW       (cms)=       0.00         0.01          0.007
(iii)
    TIME TO PEAK    (hrs)=       1.33         1.50          1.50
    RUNOFF VOLUME    (mm)=      24.01         5.90
6.07
    TOTAL RAINFALL   (mm)=      25.01        25.01
25.01
    RUNOFF COEFFICIENT   =       0.96         0.24
0.24

***** 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*  =  72.0    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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--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0208)|   Area    (ha)=   1.31
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=
1.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.65         0.65
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00        20.00
    Length           (m)=     130.00        35.00
    Mannings n          =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=      74.87        26.18
              over (min)        5.00        10.00
    Storage Coeff.  (min)=      2.73 (ii)    8.31 (ii)
    Unit Hyd. Tpeak (min)=      5.00        10.00
    Unit Hyd. peak  (cms)=      0.29         0.13
                                        *TOTALS*
    PEAK FLOW       (cms)=      0.00         0.03         0.032
(iii)
    TIME TO PEAK    (hrs)=      1.33         1.50          1.50
    RUNOFF VOLUME    (mm)=     24.01         6.75
6.92
    TOTAL RAINFALL   (mm)=     25.01        25.01
25.01
    RUNOFF COEFFICIENT   =      0.96         0.27
0.28

***** 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*  =  71.0    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  (  0003)|
|   1 +  2 =  3    |       AREA    QPEAK    TPEAK     R.V.
--------------------        (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0001):    18.80   1.275     1.33    11.10
     + ID2= 2 (  0002):     0.26   0.026     1.33    13.80

================================================
======
       ID = 3 (  0003):    19.06   1.301     1.33    11.13

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   3 +  2 =  1    |       AREA    QPEAK    TPEAK     R.V.
--------------------        (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0003):    19.06   1.301     1.33    11.13
     + ID2= 2 (  0201):     0.34   0.007     1.50     6.07

================================================
======
       ID = 1 (  0003):    19.40   1.304     1.33    11.05

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |       AREA    QPEAK    TPEAK     R.V.
--------------------        (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0003):    19.40   1.304     1.33    11.05
     + ID2= 2 (  0208):     1.31   0.032     1.50     6.92

================================================
======
       ID = 3 (  0003):    20.71   1.321     1.33    10.78

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0004)|     OVERFLOW IS ON
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |    OUTFLOW    STORAGE    | OUTFLOW
STORAGE
--------------------      (cms)     (ha.m.)   |  (cms)     (ha.m.)
     **** WARNING : FIRST OUTFLOW IS NOT ZERO.
                      0.0070     0.0461   |  0.9620      0.6177
                      0.0170     0.0942   |  1.0060      0.6862
                      0.0220     0.1442   |  1.0480      0.7567
                      0.0270     0.1961   |  1.0880      0.8292
                      0.0310     0.2501   |  1.1270      0.9036
                      0.0340     0.3061   |  1.1650      0.9800
                      0.1970     0.3642   |  1.2010      1.0583
                      0.5080     0.4243   |  1.2370      1.1388
                      0.8680     0.4866   |  1.2710      1.2212
                      0.9160     0.5509   |  1.3050      1.3058

                           AREA     QPEAK     TPEAK      R.V.
                           (ha)     (cms)     (hrs)      (mm)
  INFLOW : ID= 2 (  0003)     20.710      1.321      1.33
10.78
  OUTFLOW: ID= 1 (  0004)     20.710      0.027      4.08
10.70
  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](%)=
2.05
             TIME SHIFT OF PEAK FLOW        (min)=165.00
             MAXIMUM  STORAGE   USED       (ha.m.)=
0.1967

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  2021)|   Area    (ha)=   0.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  51.00   Dir. Conn.(%)=
41.00
--------------------
```

```
                    IMPERVIOUS    PERVIOUS (i)
   Surface Area     (ha)=       0.22         0.21
   Dep. Storage     (mm)=       1.00         5.00
   Average Slope    (%)=        2.00         2.00
   Length           (m)=       50.00        20.00
   Mannings n       =          0.013        0.250

   Max.Eff.Inten.(mm/hr)=      74.87         8.39
            over (min)         5.00        15.00
   Storage Coeff.  (min)=       1.54 (ii)   14.08 (ii)
   Unit Hyd. Tpeak (min)=       5.00        15.00
   Unit Hyd. peak  (cms)=       0.33         0.08
                                      *TOTALS*
   PEAK FLOW       (cms)=       0.04         0.00          0.036
(iii)
   TIME TO PEAK    (hrs)=       1.33         1.58          1.33
   RUNOFF VOLUME   (mm)=       24.01         4.58
12.53
   TOTAL RAINFALL  (mm)=       25.01        25.01
25.01
   RUNOFF COEFFICIENT  =        0.96         0.18
0.50

***** WARNING: STORAGE COEFF. IS SMALLER THAN
TIME STEP!

     (i) CN PROCEDURE SELECTED FOR PERVIOUS
LOSSES:
         CN*  =  74.0    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 (  0203)|  Area    (ha)=   0.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  65.00   Dir. Conn.(%)=
1.00
--------------------
                    IMPERVIOUS    PERVIOUS (i)
   Surface Area     (ha)=       0.28         0.15
   Dep. Storage     (mm)=       1.00         5.00
   Average Slope    (%)=        2.00         2.00
   Length           (m)=       20.00       157.00
   Mannings n       =          0.013        0.250

   Max.Eff.Inten.(mm/hr)=      74.87        35.45
            over (min)         5.00        30.00
   Storage Coeff.  (min)=       0.89 (ii)   25.16 (ii)
   Unit Hyd. Tpeak (min)=       5.00        30.00
   Unit Hyd. peak  (cms)=       0.34         0.04
                                      *TOTALS*
   PEAK FLOW       (cms)=       0.00         0.01          0.009
(iii)
   TIME TO PEAK    (hrs)=       1.33         1.83          1.83
   RUNOFF VOLUME   (mm)=       24.01         9.86
9.97
   TOTAL RAINFALL  (mm)=       25.01        25.01
25.01
   RUNOFF COEFFICIENT  =        0.96         0.39
0.40

***** 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*  =  74.0    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)
*** W A R N I N G :  HYDROGRAPH   0002 <ID= 1> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0005 =
HYDROGRAPH 2021
      ID1= 1 (  0002):     0.00   0.000     0.00     0.00
    + ID2= 2 (  2021):     0.43   0.036     1.33    12.53

================================================
======
      ID = 3 (  0005):     0.43   0.036     1.33    12.53

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0005)|
|  3 +  2 =  1   |       AREA    QPEAK    TPEAK     R.V.
--------------------       (ha)    (cms)    (hrs)     (mm)
      ID1= 3 (  0005):     0.43   0.036     1.33    12.53
    + ID2= 2 (  0203):     0.43   0.009     1.83     9.97

================================================
======
      ID = 1 (  0005):     0.86   0.038     1.33    11.25

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0005)|
|  1 +  2 =  3   |       AREA    QPEAK    TPEAK     R.V.
--------------------       (ha)    (cms)    (hrs)     (mm)
      ID1= 1 (  0005):     0.86   0.038     1.33    11.25
    + ID2= 2 (  0004):    20.71   0.027     4.08    10.70

================================================
======
      ID = 3 (  0005):    21.57   0.046     1.33    10.73

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.

================================================
================================================
===============

     V   V  I   SSSSS  U   U   A   L          (v 6.2.2015)
     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   SSSSS  UUUUU  A   A  LLLLL

     OOO   TTTTT  TTTTT  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    M  M  O  O
      OOO   T    T  H  H   Y    M  M   OOO
```


***** 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\myavarikia\AppData\Local\Civica\VH5\4aff2f07-f9c0-4d18-a808-84a804cb6cce\4913297e-e1fe-4984-bb3b-ad9d002e7e9a\s
Summary filename: C:\Users\myavarikia\AppData\Local\Civica\VH5\4aff2f07-f9c0-4d18-a808-84a804cb6cce\4913297e-e1fe-4984-bb3b-ad9d002e7e9a\s

DATE: 05/30/2024 TIME: 12:39:23

USER:

COMMENTS:
_____
_____

** SIMULATION : 2. 2-yr 3hr Chicago Storm **

| CHICAGO STORM | IDF curve parameters: A= 743.000
| Ptotal= 34.27 mm | B= 6.000
C= 0.799
used in: INTENSITY = A / (t + B)^C

Duration of storm = 3.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	2.84	0.75	15.85	1.50	7.98	2.25	3.70
0.08	3.09	0.83	36.89	1.58	7.03	2.33	3.50
0.17	3.41	0.92	109.40	1.67	6.29	2.42	3.33
0.25	3.80	1.00	47.44	1.75	5.69	2.50	3.17
0.33	4.31	1.08	26.38	1.83	5.21	2.58	3.03
0.42	5.00	1.17	18.05	1.92	4.81	2.67	2.90
0.50	5.98	1.25	13.69	2.00	4.47	2.75	2.78
0.58	7.49	1.33	11.03	2.08	4.17	2.83	2.68
0.67	10.13	1.42	9.25	2.17	3.92	2.92	2.58

| CALIB |
| STANDHYD (0206)| Area (ha)= 0.89
|ID= 1 DT= 5.0 min | Total Imp(%)= 40.00 Dir. Conn.(%)= 1.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.36	0.53
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	2.00	2.00
Length (m)=	10.00	20.00
Mannings n =	0.013	0.250

Max.Eff.Inten.(mm/hr)= 109.40 32.99
over (min) 5.00 10.00
Storage Coeff. (min)= 0.50 (ii) 7.76 (ii)
Unit Hyd. Tpeak (min)= 5.00 10.00
Unit Hyd. peak (cms)= 0.34 0.13

		TOTALS	
PEAK FLOW (cms)=	0.00	0.03	0.033 (iii)
TIME TO PEAK (hrs)=	1.00	1.17	1.08
RUNOFF VOLUME (mm)=	33.27	9.41	9.65
TOTAL RAINFALL (mm)=	34.27	34.27	34.27
RUNOFF COEFFICIENT =	0.97	0.27	0.28

***** 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* = 68.0 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 (0207)| Area (ha)= 0.73
|ID= 1 DT= 5.0 min | Total Imp(%)= 40.00 Dir. Conn.(%)= 1.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.29	0.44
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	2.00	2.00
Length (m)=	10.00	20.00
Mannings n =	0.013	0.250

Max.Eff.Inten.(mm/hr)= 109.40 32.99
over (min) 5.00 10.00
Storage Coeff. (min)= 0.50 (ii) 7.76 (ii)
Unit Hyd. Tpeak (min)= 5.00 10.00
Unit Hyd. peak (cms)= 0.34 0.13

TOTALS

```
    PEAK FLOW      (cms)=      0.00         0.03          0.027
(iii)
    TIME TO PEAK   (hrs)=      1.00         1.17          1.08
    RUNOFF VOLUME  (mm)=      33.27         9.41
9.64
    TOTAL RAINFALL (mm)=      34.27        34.27
34.27
    RUNOFF COEFFICIENT  =      0.97         0.27
0.28

***** 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*  =  68.0    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            |
| NASHYD   (  0204)|   Area    (ha)=   6.26   Curve Number
(CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear
Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.41

    Unit Hyd Qpeak  (cms)=   0.583

    PEAK FLOW      (cms)=   0.106 (i)
    TIME TO PEAK   (hrs)=   1.583
    RUNOFF VOLUME  (mm)=   8.562
    TOTAL RAINFALL (mm)=  34.271
    RUNOFF COEFFICIENT  =   0.250

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF
ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0200)|   Area    (ha)=   7.67
|ID= 1 DT= 5.0 min |   Total Imp(%)=  64.00   Dir. Conn.(%)=
51.00
--------------------
                         IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       4.91         2.76
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=     100.00        20.00
    Mannings n          =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     109.40        24.94
             over (min)        5.00        10.00
    Storage Coeff.  (min)=       2.00 (ii)    5.91 (ii)
    Unit Hyd. Tpeak (min)=       5.00        10.00
    Unit Hyd. peak  (cms)=       0.31         0.15
                                      *TOTALS*
    PEAK FLOW      (cms)=       1.12         0.14          1.186
(iii)
    TIME TO PEAK   (hrs)=       1.00         1.08          1.00
    RUNOFF VOLUME  (mm)=      33.27         8.76
21.26
    TOTAL RAINFALL (mm)=      34.27        34.27
34.27
    RUNOFF COEFFICIENT  =      0.97         0.26
0.62

***** WARNING: STORAGE COEFF. IS SMALLER THAN
TIME STEP!

      (i) CN PROCEDURE SELECTED FOR PERVIOUS
LOSSES:
          CN*  =  71.0    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 (  0205)|   Area    (ha)=   4.87
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=
52.00
--------------------
                         IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       3.21         1.66
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=     100.00        20.00
    Mannings n          =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     109.40        24.00
             over (min)        5.00        10.00
    Storage Coeff.  (min)=       2.00 (ii)    5.79 (ii)
    Unit Hyd. Tpeak (min)=       5.00        10.00
    Unit Hyd. peak  (cms)=       0.31         0.15
                                      *TOTALS*
    PEAK FLOW      (cms)=       0.73         0.08          0.764
(iii)
    TIME TO PEAK   (hrs)=       1.00         1.08          1.00
    RUNOFF VOLUME  (mm)=      33.27         8.18
21.23
    TOTAL RAINFALL (mm)=      34.27        34.27
34.27
    RUNOFF COEFFICIENT  =      0.97         0.24
0.62

***** WARNING: STORAGE COEFF. IS SMALLER THAN
TIME STEP!

      (i) CN PROCEDURE SELECTED FOR PERVIOUS
LOSSES:
          CN*  =  68.0    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  (  0001)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0200):     7.67   1.186     1.00     21.26
     + ID2= 2 (  0204):     6.26   0.106     1.58      8.56

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======
```

```
      ID = 3 (  0001):    13.93   1.194     1.00    15.56

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------


--------------------
| ADD HYD  (  0001)|
|   3 +  2 =  1    |        AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
      ID1= 3 (  0001):    13.93   1.194     1.00    15.56
     + ID2= 2 (  0205):     4.87   0.764     1.00    21.23

================================================
======
      ID = 1 (  0001):    18.80   1.958     1.00    17.02

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  2022)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  59.00   Dir. Conn.(%)=
47.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.15         0.11
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      35.00        20.00
    Mannings n            =     0.013        0.250

    Max.Eff.Inten.(mm/hr)=     109.40        24.25
            over (min)        5.00        10.00
    Storage Coeff.  (min)=       1.07 (ii)    5.32 (ii)
    Unit Hyd. Tpeak (min)=       5.00        10.00
    Unit Hyd. peak  (cms)=       0.34         0.16
                                          *TOTALS*
    PEAK FLOW       (cms)=       0.04         0.01          0.039
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.08          1.00
    RUNOFF VOLUME    (mm)=      33.27         8.97
20.38
    TOTAL RAINFALL   (mm)=      34.27        34.27
34.27
    RUNOFF COEFFICIENT   =       0.97         0.26
0.59

***** WARNING: STORAGE COEFF. IS SMALLER THAN
TIME STEP!

      (i) CN PROCEDURE SELECTED FOR PERVIOUS
LOSSES:
          CN*  =  73.0    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.

--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0002)|
| Inlet Cap.= 0.060|
| #of Inlets=     1|
| Total(cms)=   0.1|     AREA     QPEAK     TPEAK     R.V.
--------------------      (ha)     (cms)     (hrs)     (mm)
    TOTAL HYD.(ID= 1):   0.26      0.04      1.00   20.38
================================================
=======
    MAJOR SYS.(ID= 2):   0.00      0.00      0.00    0.00
    MINOR SYS.(ID= 3):   0.26      0.04      1.00   20.38

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   0.34
|ID= 1 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=
1.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.14         0.20
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      10.00        20.00
    Mannings n            =     0.013        0.250

    Max.Eff.Inten.(mm/hr)=     109.40        38.18
            over (min)        5.00        10.00
    Storage Coeff.  (min)=       0.50 (ii)    7.35 (ii)
    Unit Hyd. Tpeak (min)=       5.00        10.00
    Unit Hyd. peak  (cms)=       0.34         0.13
                                          *TOTALS*
    PEAK FLOW       (cms)=       0.00         0.01          0.015
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.08          1.08
    RUNOFF VOLUME    (mm)=      33.27        10.71
10.93
    TOTAL RAINFALL   (mm)=      34.27        34.27
34.27
    RUNOFF COEFFICIENT   =       0.97         0.31
0.32

***** 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*  =  72.0    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 (  0208)|   Area    (ha)=   1.31
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=
1.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.65         0.65
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00        20.00
    Length           (m)=     130.00        35.00
    Mannings n            =     0.013        0.250

    Max.Eff.Inten.(mm/hr)=     109.40        52.19
            over (min)        5.00        10.00
```

```
    Storage Coeff.  (min)=       2.34 (ii)    6.58 (ii)
    Unit Hyd. Tpeak (min)=       5.00         10.00
    Unit Hyd. peak  (cms)=       0.30         0.14
                                 *TOTALS*
    PEAK FLOW       (cms)=       0.00         0.07          0.071
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.08          1.08
    RUNOFF VOLUME   (mm)=        33.27        11.98
12.19
    TOTAL RAINFALL  (mm)=        34.27        34.27
34.27
    RUNOFF COEFFICIENT  =        0.97         0.35
0.36

***** 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*  =  71.0    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):    18.80   1.958     1.00    17.02
     + ID2= 2 (  0002):     0.26   0.039     1.00    20.38

================================================
======
       ID = 3 (  0003):    19.06   1.997     1.00    17.07

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   3 +  2 =  1    |        AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0003):    19.06   1.997     1.00    17.07
     + ID2= 2 (  0201):     0.34   0.015     1.08    10.93

================================================
======
       ID = 1 (  0003):    19.40   2.005     1.00    16.96

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0003):    19.40   2.005     1.00    16.96
     + ID2= 2 (  0208):     1.31   0.071     1.08    12.19

================================================
======
       ID = 3 (  0003):    20.71   2.042     1.00    16.66

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0004)|    OVERFLOW IS ON
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |    OUTFLOW    STORAGE   | OUTFLOW
STORAGE
--------------------      (cms)     (ha.m.)  |  (cms)     (ha.m.)
   **** WARNING : FIRST OUTFLOW IS NOT ZERO.
                  0.0070    0.0461   |  0.9620    0.6177
                  0.0170    0.0942   |  1.0060    0.6862
                  0.0220    0.1442   |  1.0480    0.7567
                  0.0270    0.1961   |  1.0880    0.8292
                  0.0310    0.2501   |  1.1270    0.9036
                  0.0340    0.3061   |  1.1650    0.9800
                  0.1970    0.3642   |  1.2010    1.0583
                  0.5080    0.4243   |  1.2370    1.1388
                  0.8680    0.4866   |  1.2710    1.2212
                  0.9160    0.5509   |  1.3050    1.3058

                       AREA    QPEAK    TPEAK      R.V.
                       (ha)    (cms)    (hrs)      (mm)
  INFLOW : ID= 2 (  0003)    20.710     2.042     1.00
16.66
  OUTFLOW: ID= 1 (  0004)    20.710     0.056     3.08
16.58
  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](%)=
2.73
            TIME SHIFT OF PEAK FLOW        (min)=125.00
            MAXIMUM  STORAGE   USED      (ha.m.)=
0.3139

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  2021)|   Area    (ha)=   0.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  51.00   Dir. Conn.(%)=
41.00
--------------------
                         IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.22         0.21
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope    (%)=        2.00         2.00
    Length           (m)=       50.00        20.00
    Mannings n           =       0.013        0.250

    Max.Eff.Inten.(mm/hr)=      109.40        21.74
            over (min)          5.00         10.00
    Storage Coeff.  (min)=       1.32 (ii)    6.14 (ii)
    Unit Hyd. Tpeak (min)=       5.00         10.00
    Unit Hyd. peak  (cms)=       0.33         0.15
                                 *TOTALS*
    PEAK FLOW       (cms)=       0.05         0.01          0.057
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.08          1.00
    RUNOFF VOLUME   (mm)=        33.27        8.70
18.77
```

```
    TOTAL RAINFALL   (mm)=      34.27        34.27
34.27
    RUNOFF COEFFICIENT   =       0.97         0.25
0.55

***** WARNING: STORAGE COEFF. IS SMALLER THAN
TIME STEP!

      (i) CN PROCEDURE SELECTED FOR PERVIOUS
LOSSES:
          CN*  =  74.0    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 (  0203)|   Area    (ha)=   0.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  65.00   Dir. Conn.(%)=
1.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.28         0.15
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      20.00       157.00
    Mannings n          =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     109.40        74.30
             over (min)        5.00        20.00
    Storage Coeff.  (min)=       0.76 (ii)   18.82 (ii)
    Unit Hyd. Tpeak (min)=       5.00        20.00
    Unit Hyd. peak  (cms)=       0.34         0.06
                                          *TOTALS*
    PEAK FLOW       (cms)=       0.00         0.02          0.019
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.33          1.33
    RUNOFF VOLUME    (mm)=      33.27        16.49
16.64
    TOTAL RAINFALL   (mm)=      34.27        34.27
34.27
    RUNOFF COEFFICIENT   =       0.97         0.48
0.49

***** 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*  =  74.0    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)
*** W A R N I N G :  HYDROGRAPH   0002 <ID= 1> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0005 =
HYDROGRAPH 2021
       ID1= 1 (  0002):     0.00   0.000     0.00     0.00
     + ID2= 2 (  2021):     0.43   0.057     1.00    18.77

==============================================
======
       ID = 3 (  0005):     0.43   0.057     1.00    18.77

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------


--------------------
| ADD HYD  (  0005)|
|   3 +  2 =  1    |       AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0005):     0.43   0.057     1.00    18.77
     + ID2= 2 (  0203):     0.43   0.019     1.33    16.64

==============================================
======
       ID = 1 (  0005):     0.86   0.062     1.00    17.70

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------


--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |       AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0005):     0.86   0.062     1.00    17.70
     + ID2= 2 (  0004):    20.71   0.056     3.08    16.58

==============================================
======
       ID = 3 (  0005):    21.57   0.076     1.00    16.62

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
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==============================================
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      V   V  I   SSSSS  U   U    A    L            (v 6.2.2015)
      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   SSSSS  UUUUU  A   A  LLLLL

      OOO   TTTTT  TTTTT  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    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\myavarikia\AppData\Local\Civica\VH5\4aff2f07-
f9c0-4d18-a808-84a804cb6cce\f1370ffc-2c52-4ca2-975c-
d9b5935548dc\s
```

Summary filename:
C:\Users\myavarikia\AppData\Local\Civica\VH5\4aff2f07-f9c0-4d18-a808-84a804cb6cce\f1370ffc-2c52-4ca2-975c-d9b5935548dc\s

DATE: 05/30/2024 TIME: 12:39:23

USER:

COMMENTS:
_____
_____

****
** SIMULATION : 3. 5-yr 3hr Chicago Storm **
****

| CHICAGO STORM | IDF curve parameters:
A=1593.000
| Ptotal= 47.26 mm | B= 11.000

C= 0.879
used in: INTENSITY = A / (t + B)^C

Duration of storm = 3.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	3.03	0.75	24.60	1.50	11.05	2.25	4.23
0.08	3.38	0.83	57.39	1.58	9.46	2.33	3.95
0.17	3.82	0.92	139.29	1.67	8.24	2.42	3.70
0.25	4.39	1.00	72.74	1.75	7.29	2.50	3.48
0.33	5.14	1.08	42.12	1.83	6.52	2.58	3.29
0.42	6.20	1.17	28.38	1.92	5.89	2.67	3.11
0.50	7.75	1.25	20.88	2.00	5.37	2.75	2.96
0.58	10.24	1.33	16.28	2.08	4.93	2.83	2.82
0.67	14.73	1.42	13.22	2.17	4.55	2.92	2.69

| CALIB |
| STANDHYD (0206)| Area (ha)= 0.89
|ID= 1 DT= 5.0 min | Total Imp(%)= 40.00 Dir. Conn.(%)= 1.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.36	0.53
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	2.00	2.00
Length (m)=	10.00	20.00
Mannings n =	0.013	0.250

Max.Eff.Inten.(mm/hr)= 139.29 60.41
over (min) 5.00 10.00
Storage Coeff. (min)= 0.46 (ii) 6.15 (ii)
Unit Hyd. Tpeak (min)= 5.00 10.00
Unit Hyd. peak (cms)= 0.34 0.15

	TOTALS		
PEAK FLOW (cms)=	0.00	0.07	0.068 (iii)
TIME TO PEAK (hrs)=	1.00	1.08	1.08
RUNOFF VOLUME (mm)=	46.26	16.77	17.06
TOTAL RAINFALL (mm)=	47.26	47.26	47.26
RUNOFF COEFFICIENT =	0.98	0.35	0.36

***** 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* = 68.0 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 (0207)| Area (ha)= 0.73
|ID= 1 DT= 5.0 min | Total Imp(%)= 40.00 Dir. Conn.(%)= 1.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.29	0.44
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	2.00	2.00
Length (m)=	10.00	20.00
Mannings n =	0.013	0.250

Max.Eff.Inten.(mm/hr)= 139.29 60.41
over (min) 5.00 10.00
Storage Coeff. (min)= 0.46 (ii) 6.15 (ii)
Unit Hyd. Tpeak (min)= 5.00 10.00
Unit Hyd. peak (cms)= 0.34 0.15

	TOTALS		
PEAK FLOW (cms)=	0.00	0.05	0.056 (iii)
TIME TO PEAK (hrs)=	1.00	1.08	1.08
RUNOFF VOLUME (mm)=	46.26	16.77	17.06
TOTAL RAINFALL (mm)=	47.26	47.26	47.26
RUNOFF COEFFICIENT =	0.98	0.35	0.36

***** 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*  =  68.0    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            |
| NASHYD   (  0204)|   Area    (ha)=   6.26   Curve Number
(CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear
Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.41

    Unit Hyd Qpeak  (cms)=   0.583

    PEAK FLOW       (cms)=   0.224 (i)
    TIME TO PEAK    (hrs)=   1.583
    RUNOFF VOLUME    (mm)=  16.231
    TOTAL RAINFALL   (mm)=  47.258
    RUNOFF COEFFICIENT   =   0.343

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF
ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0200)|   Area    (ha)=   7.67
|ID= 1 DT= 5.0 min |   Total Imp(%)=  64.00   Dir. Conn.(%)=
51.00
--------------------
                         IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       4.91         2.76
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=     100.00        20.00
    Mannings n          =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     139.29        46.71
             over (min)        5.00        10.00
    Storage Coeff.  (min)=       1.82 (ii)    5.37 (ii)
    Unit Hyd. Tpeak (min)=       5.00        10.00
    Unit Hyd. peak  (cms)=       0.32         0.16
                                        *TOTALS*
    PEAK FLOW       (cms)=       1.46         0.28          1.590
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.08          1.00
    RUNOFF VOLUME    (mm)=      46.26        15.86
31.36
    TOTAL RAINFALL   (mm)=      47.26        47.26
47.26
    RUNOFF COEFFICIENT   =       0.98         0.34
0.66

***** WARNING: STORAGE COEFF. IS SMALLER THAN
TIME STEP!

      (i) CN PROCEDURE SELECTED FOR PERVIOUS
LOSSES:
          CN*  =  71.0    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 (  0205)|   Area    (ha)=   4.87
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=
52.00
--------------------
                         IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       3.21         1.66
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=     100.00        20.00
    Mannings n          =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     139.29        45.11
             over (min)        5.00        10.00
    Storage Coeff.  (min)=       1.82 (ii)    5.26 (ii)
    Unit Hyd. Tpeak (min)=       5.00        10.00
    Unit Hyd. peak  (cms)=       0.32         0.16
                                        *TOTALS*
    PEAK FLOW       (cms)=       0.94         0.16          1.021
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.08          1.00
    RUNOFF VOLUME    (mm)=      46.26        14.89
31.20
    TOTAL RAINFALL   (mm)=      47.26        47.26
47.26
    RUNOFF COEFFICIENT   =       0.98         0.31
0.66

***** WARNING: STORAGE COEFF. IS SMALLER THAN
TIME STEP!

      (i) CN PROCEDURE SELECTED FOR PERVIOUS
LOSSES:
          CN*  =  68.0    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  (  0001)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0200):     7.67   1.590     1.00    31.36
     + ID2= 2 (  0204):     6.26   0.224     1.58    16.23

================================================
======
       ID = 3 (  0001):    13.93   1.609     1.00    24.56

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------


--------------------
| ADD HYD  (  0001)|
|   3 +  2 =  1    |        AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0001):    13.93   1.609     1.00    24.56
     + ID2= 2 (  0205):     4.87   1.021     1.00    31.20

================================================
======
       ID = 1 (  0001):    18.80   2.630     1.00    26.28
```

```
    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  2022)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  59.00   Dir. Conn.(%)=
47.00
--------------------
                         IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.15         0.11
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope    (%)=        2.00         2.00
    Length           (m)=       35.00        20.00
    Mannings n       =           0.013        0.250

    Max.Eff.Inten.(mm/hr)=     139.29        45.51
            over (min)         5.00         5.00
    Storage Coeff.  (min)=       0.97 (ii)    4.83 (ii)
    Unit Hyd. Tpeak (min)=       5.00         5.00
    Unit Hyd. peak  (cms)=       0.34         0.22
                                          *TOTALS*
    PEAK FLOW       (cms)=       0.05         0.01          0.058
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.08          1.00
    RUNOFF VOLUME   (mm)=       46.26        16.22
30.32
    TOTAL RAINFALL  (mm)=       47.26        47.26
47.26
    RUNOFF COEFFICIENT  =        0.98         0.34
0.64

***** WARNING: STORAGE COEFF. IS SMALLER THAN
TIME STEP!

      (i) CN PROCEDURE SELECTED FOR PERVIOUS
LOSSES:
          CN*  =  73.0    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.

--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0002)|
| Inlet Cap.= 0.060|
| #of Inlets=     1|
| Total(cms)=  0.1|     AREA     QPEAK     TPEAK     R.V.
--------------------      (ha)      (cms)      (hrs)     (mm)
    TOTAL HYD.(ID= 1):   0.26      0.06      1.00   30.32

================================================
=======
    MAJOR SYS.(ID= 2):   0.00      0.00      0.00    0.00
    MINOR SYS.(ID= 3):   0.26      0.06      1.00   30.32

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   0.34
|ID= 1 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=
1.00
--------------------
                         IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.14         0.20
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope    (%)=        2.00         2.00
    Length           (m)=       10.00        20.00
    Mannings n       =           0.013        0.250

    Max.Eff.Inten.(mm/hr)=     139.29        68.87
            over (min)         5.00        10.00
    Storage Coeff.  (min)=       0.46 (ii)    5.86 (ii)
    Unit Hyd. Tpeak (min)=       5.00        10.00
    Unit Hyd. peak  (cms)=       0.34         0.15
                                          *TOTALS*
    PEAK FLOW       (cms)=       0.00         0.03          0.030
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.08          1.08
    RUNOFF VOLUME   (mm)=       46.26        18.79
19.06
    TOTAL RAINFALL  (mm)=       47.26        47.26
47.26
    RUNOFF COEFFICIENT  =        0.98         0.40
0.40

***** 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*  =  72.0    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 (  0208)|   Area    (ha)=   1.31
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=
1.00
--------------------
                         IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.65         0.65
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope    (%)=        2.00        20.00
    Length           (m)=      130.00        35.00
    Mannings n       =           0.013        0.250

    Max.Eff.Inten.(mm/hr)=     139.29        91.86
            over (min)         5.00        10.00
    Storage Coeff.  (min)=       2.13 (ii)    5.50 (ii)
    Unit Hyd. Tpeak (min)=       5.00        10.00
    Unit Hyd. peak  (cms)=       0.31         0.16
                                          *TOTALS*
    PEAK FLOW       (cms)=       0.00         0.13          0.134
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.08          1.08
    RUNOFF VOLUME   (mm)=       46.26        20.60
20.86
    TOTAL RAINFALL  (mm)=       47.26        47.26
47.26
    RUNOFF COEFFICIENT  =        0.98         0.44
0.44

***** 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*  =  71.0    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):    18.80   2.630     1.00    26.28
     + ID2= 2 (  0002):     0.26   0.058     1.00    30.32

================================================
======
       ID = 3 (  0003):    19.06   2.688     1.00    26.34

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   3 +  2 =  1    |        AREA    QPEAK    TPEAK     R.V.
--------------------        (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0003):    19.06   2.688     1.00    26.34
     + ID2= 2 (  0201):     0.34   0.030     1.08    19.06

================================================
======
       ID = 1 (  0003):    19.40   2.704     1.00    26.21

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------        (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0003):    19.40   2.704     1.00    26.21
     + ID2= 2 (  0208):     1.31   0.134     1.08    20.86

================================================
======
       ID = 3 (  0003):    20.71   2.776     1.00    25.87

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0004)|    OVERFLOW IS ON
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |    OUTFLOW    STORAGE   | OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)  |  (cms)     (ha.m.)
    **** WARNING : FIRST OUTFLOW IS NOT ZERO.
                    0.0070     0.0461   |   0.9620     0.6177
                    0.0170     0.0942   |   1.0060     0.6862
                    0.0220     0.1442   |   1.0480     0.7567
                    0.0270     0.1961   |   1.0880     0.8292
                    0.0310     0.2501   |   1.1270     0.9036
                    0.0340     0.3061   |   1.1650     0.9800
                    0.1970     0.3642   |   1.2010     1.0583
                    0.5080     0.4243   |   1.2370     1.1388
                    0.8680     0.4866   |   1.2710     1.2212
                    0.9160     0.5509   |   1.3050     1.3058

                         AREA     QPEAK     TPEAK      R.V.
                         (ha)     (cms)     (hrs)      (mm)
  INFLOW : ID= 2 (  0003)     20.710      2.776      1.00
25.87
  OUTFLOW: ID= 1 (  0004)     20.710      0.329      2.08
25.79
  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](%)=
11.86
          TIME SHIFT OF PEAK FLOW        (min)= 65.00
          MAXIMUM  STORAGE   USED       (ha.m.)=
0.3899

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  2021)|   Area    (ha)=   0.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  51.00   Dir. Conn.(%)=
41.00
--------------------
                         IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.22         0.21
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      50.00        20.00
    Mannings n          =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     139.29        41.25
            over (min)        5.00        10.00
    Storage Coeff.  (min)=       1.20 (ii)    5.58 (ii)
    Unit Hyd. Tpeak (min)=       5.00        10.00
    Unit Hyd. peak  (cms)=       0.33         0.16
                                    *TOTALS*
    PEAK FLOW      (cms)=       0.07         0.02          0.076
(iii)
    TIME TO PEAK    (hrs)=      1.00         1.08          1.00
    RUNOFF VOLUME   (mm)=      46.26        15.85
28.31
    TOTAL RAINFALL   (mm)=     47.26        47.26
47.26
    RUNOFF COEFFICIENT   =      0.98         0.34
0.60

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN*  =  74.0    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 (  0203)|   Area    (ha)=   0.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  65.00   Dir. Conn.(%)=
1.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.28         0.15
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      20.00       157.00
    Mannings n          =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     139.29       147.94
              over (min)        5.00        15.00
    Storage Coeff.  (min)=       0.69 (ii)   14.40 (ii)
    Unit Hyd. Tpeak (min)=       5.00        15.00
    Unit Hyd. peak  (cms)=       0.34         0.08
                                          *TOTALS*
    PEAK FLOW       (cms)=       0.00         0.04          0.039
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.25          1.25
    RUNOFF VOLUME   (mm)=       46.26        26.86
27.04
    TOTAL RAINFALL  (mm)=       47.26        47.26
47.26
    RUNOFF COEFFICIENT  =        0.98         0.57
0.57

***** 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*  =  74.0    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)
*** W A R N I N G :  HYDROGRAPH   0002 <ID= 1> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0005 =
HYDROGRAPH 2021
       ID1= 1 (  0002):     0.00   0.000     0.00     0.00
     + ID2= 2 (  2021):     0.43   0.076     1.00    28.31

================================================
======
       ID = 3 (  0005):     0.43   0.076     1.00    28.31

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0005)|
|   3 +  2 =  1    |       AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0005):     0.43   0.076     1.00    28.31
     + ID2= 2 (  0203):     0.43   0.039     1.25    27.04

================================================
======
       ID = 1 (  0005):     0.86   0.090     1.00    27.67

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |       AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0005):     0.86   0.090     1.00    27.67
     + ID2= 2 (  0004):    20.71   0.329     2.08    25.79

================================================
======
       ID = 3 (  0005):    21.57   0.344     2.00    25.86

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
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================================================
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===============

      V   V  I   SSSSS  U   U   A   L           (v 6.2.2015)
      V   V  I   SS     U   U  AA  L
       V V   I    SS    U   U  AAAAA  L
       V V   I     SS   U   U  A   A  L
        VV   I   SSSSS  UUUUU  A   A  LLLLL

      OOO   TTTTT  TTTTT  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    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\myavarikia\AppData\Local\Civica\VH5\4aff2f07-
f9c0-4d18-a808-84a804cb6cce\c891e896-5cea-432f-90f4-
9cedeb5994ef\s
  Summary filename:
C:\Users\myavarikia\AppData\Local\Civica\VH5\4aff2f07-
f9c0-4d18-a808-84a804cb6cce\c891e896-5cea-432f-90f4-
9cedeb5994ef\s


DATE: 05/30/2024                      TIME: 12:39:23

USER:


COMMENTS:
_____
_____________
```

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-------------------------
  ************************************************
  ** SIMULATION : 4. 25-yr 3hr Chicago Storm    **
  ************************************************

---------------------
| CHICAGO STORM    |    IDF curve parameters:
A=3158.000
| Ptotal= 68.26 mm |                        B=  15.000
---------------------                    C=   0.936
                    used in:   INTENSITY =  A / (t + B)^C

                    Duration of storm  =  3.00 hrs
                    Storm time step    =  5.00 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    3.57 |  0.75   38.32 |  1.50   16.26 |  2.25
5.34
              0.08    4.07 |  0.83   87.43 |  1.58   13.65 |  2.33
4.91
              0.17    4.72 |  0.92  191.56 |  1.67   11.67 |  2.42
4.54
              0.25    5.57 |  1.00  109.32 |  1.75   10.13 |  2.50
4.22
              0.33    6.73 |  1.08   65.64 |  1.83    8.90 |  2.58
3.94
              0.42    8.39 |  1.17   44.39 |  1.92    7.91 |  2.67
3.69
              0.50   10.88 |  1.25   32.36 |  2.00    7.09 |  2.75
3.46
              0.58   14.93 |  1.33   24.85 |  2.08    6.41 |  2.83
3.26
              0.67   22.29 |  1.42   19.81 |  2.17    5.83 |  2.92
3.08


--------------------------------------------------------------------------------
---------------------
| CALIB            |
| STANDHYD (  0206)|   Area    (ha)=   0.89
|ID= 1 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=
1.00
---------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.36         0.53
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      10.00        20.00
    Mannings n          =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     191.56       113.67
             over (min)        5.00         5.00
    Storage Coeff.  (min)=       0.40 (ii)    4.83 (ii)
    Unit Hyd. Tpeak (min)=       5.00         5.00
    Unit Hyd. peak  (cms)=       0.34         0.22
                                      *TOTALS*
    PEAK FLOW       (cms)=       0.00         0.14          0.145
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.08          1.08
    RUNOFF VOLUME    (mm)=      67.26        30.90
31.26
    TOTAL RAINFALL   (mm)=      68.26        68.26
68.26
    RUNOFF COEFFICIENT   =       0.99         0.45
0.46

***** 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*  =  68.0    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 (  0207)|   Area    (ha)=   0.73
|ID= 1 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=
1.00
---------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.29         0.44
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      10.00        20.00
    Mannings n          =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     191.56       113.67
             over (min)        5.00         5.00
    Storage Coeff.  (min)=       0.40 (ii)    4.83 (ii)
    Unit Hyd. Tpeak (min)=       5.00         5.00
    Unit Hyd. peak  (cms)=       0.34         0.22
                                      *TOTALS*
    PEAK FLOW       (cms)=       0.00         0.12          0.119
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.08          1.08
    RUNOFF VOLUME    (mm)=      67.26        30.90
31.26
    TOTAL RAINFALL   (mm)=      68.26        68.26
68.26
    RUNOFF COEFFICIENT   =       0.99         0.45
0.46

***** 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*  =  68.0    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            |
| NASHYD   (  0204)|   Area    (ha)=   6.26   Curve Number
(CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear
Res.(N)= 3.00
---------------------   U.H. Tp(hrs)=   0.41
```

```
    Unit Hyd Qpeak  (cms)=   0.583

    PEAK FLOW       (cms)=   0.459 (i)
    TIME TO PEAK    (hrs)=   1.500
    RUNOFF VOLUME    (mm)=  31.050
    TOTAL RAINFALL   (mm)=  68.257
    RUNOFF COEFFICIENT   =   0.455

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF
ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0200)|   Area    (ha)=   7.67
|ID= 1 DT= 5.0 min |   Total Imp(%)=  64.00   Dir. Conn.(%)=
51.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       4.91         2.76
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=     100.00        20.00
    Mannings n            =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     191.56        89.42
             over (min)        5.00         5.00
    Storage Coeff.  (min)=       1.60 (ii)    4.72 (ii)
    Unit Hyd. Tpeak (min)=       5.00         5.00
    Unit Hyd. peak  (cms)=       0.32         0.22
                                      *TOTALS*
    PEAK FLOW       (cms)=       2.03         0.58          2.586
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.08          1.00
    RUNOFF VOLUME    (mm)=      67.26        29.62
48.82
    TOTAL RAINFALL   (mm)=      68.26        68.26
68.26
    RUNOFF COEFFICIENT   =       0.99         0.43
0.72

***** WARNING: STORAGE COEFF. IS SMALLER THAN
TIME STEP!

      (i) CN PROCEDURE SELECTED FOR PERVIOUS
LOSSES:
          CN*  =  71.0    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 (  0205)|   Area    (ha)=   4.87
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=
52.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       3.21         1.66
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=     100.00        20.00
    Mannings n            =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     191.56        87.00
             over (min)        5.00         5.00
    Storage Coeff.  (min)=       1.60 (ii)    4.63 (ii)
    Unit Hyd. Tpeak (min)=       5.00         5.00
    Unit Hyd. peak  (cms)=       0.32         0.22
                                      *TOTALS*
    PEAK FLOW       (cms)=       1.31         0.34          1.640
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.08          1.00
    RUNOFF VOLUME    (mm)=      67.26        28.04
48.43
    TOTAL RAINFALL   (mm)=      68.26        68.26
68.26
    RUNOFF COEFFICIENT   =       0.99         0.41
0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN
TIME STEP!

      (i) CN PROCEDURE SELECTED FOR PERVIOUS
LOSSES:
          CN*  =  68.0    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  (  0001)|
|  1 +  2 =  3   |        AREA    QPEAK    TPEAK     R.V.
--------------------        (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0200):     7.67   2.586     1.00    48.82
     + ID2= 2 (  0204):     6.26   0.459     1.50    31.05

================================================
======
       ID = 3 (  0001):    13.93   2.636     1.00    40.83

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0001)|
|  3 +  2 =  1   |        AREA    QPEAK    TPEAK     R.V.
--------------------        (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0001):    13.93   2.636     1.00    40.83
     + ID2= 2 (  0205):     4.87   1.640     1.00    48.43

================================================
======
       ID = 1 (  0001):    18.80   4.276     1.00    42.80

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  2022)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  59.00   Dir. Conn.(%)=
47.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.15         0.11
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      35.00        20.00
    Mannings n            =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     191.56        87.05
```

```
            over (min)        5.00         5.00
    Storage Coeff.  (min)=       0.85 (ii)    4.25 (ii)
    Unit Hyd. Tpeak (min)=       5.00         5.00
    Unit Hyd. peak  (cms)=       0.34         0.23
                                      *TOTALS*
    PEAK FLOW       (cms)=       0.06         0.02          0.087
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.08          1.00
    RUNOFF VOLUME   (mm)=       67.26        30.25
47.63
    TOTAL RAINFALL  (mm)=       68.26        68.26
68.26
    RUNOFF COEFFICIENT  =       0.99         0.44
0.70

***** WARNING: STORAGE COEFF. IS SMALLER THAN
TIME STEP!

      (i) CN PROCEDURE SELECTED FOR PERVIOUS
LOSSES:
          CN*  =  73.0    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.

--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0002)|
| Inlet Cap.= 0.060|
| #of Inlets=     1|
| Total(cms)=  0.1|     AREA     QPEAK     TPEAK     R.V.
--------------------       (ha)     (cms)     (hrs)     (mm)
    TOTAL HYD.(ID= 1):   0.26      0.09      1.00   47.63

================================================
=======
    MAJOR SYS.(ID= 2):   0.02      0.03      1.00   47.63
    MINOR SYS.(ID= 3):   0.24      0.06      1.00   47.63

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   0.34
|ID= 1 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=
1.00
---------------------
                         IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.14         0.20
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      10.00        20.00
    Mannings n            =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     191.56       127.10
            over (min)        5.00         5.00
    Storage Coeff.  (min)=       0.40 (ii)    4.63 (ii)
    Unit Hyd. Tpeak (min)=       5.00         5.00
    Unit Hyd. peak  (cms)=       0.34         0.22
                                      *TOTALS*
    PEAK FLOW       (cms)=       0.00         0.06          0.062
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.08          1.00
    RUNOFF VOLUME   (mm)=       67.26        34.01
34.33
    TOTAL RAINFALL  (mm)=       68.26        68.26
68.26
    RUNOFF COEFFICIENT  =       0.99         0.50
0.50

***** 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*  =  72.0    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 (  0208)|   Area    (ha)=   1.31
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=
1.00
---------------------
                         IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.65         0.65
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00        20.00
    Length           (m)=     130.00        35.00
    Mannings n            =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     191.56       165.69
            over (min)        5.00         5.00
    Storage Coeff.  (min)=       1.87 (ii)    4.54 (ii)
    Unit Hyd. Tpeak (min)=       5.00         5.00
    Unit Hyd. peak  (cms)=       0.32         0.23
                                      *TOTALS*
    PEAK FLOW       (cms)=       0.01         0.26          0.265
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.00          1.00
    RUNOFF VOLUME   (mm)=       67.26        36.58
36.88
    TOTAL RAINFALL  (mm)=       68.26        68.26
68.26
    RUNOFF COEFFICIENT  =       0.99         0.54
0.54

***** 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*  =  71.0    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):    18.80   4.276     1.00    42.80
     + ID2= 2 (  0002):     0.24   0.060     1.00    47.63

================================================
======
       ID = 3 (  0003):    19.04   4.336     1.00    42.86

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   3 +  2 =  1    |        AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0003):    19.04   4.336     1.00    42.86
     + ID2= 2 (  0201):     0.34   0.062     1.00    34.33

================================================
======
       ID = 1 (  0003):    19.38   4.398     1.00    42.71

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0003):    19.38   4.398     1.00    42.71
     + ID2= 2 (  0208):     1.31   0.265     1.00    36.88

================================================
======
       ID = 3 (  0003):    20.69   4.663     1.00    42.34

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0004)|     OVERFLOW IS ON
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW
STORAGE
--------------------       (cms)     (ha.m.)   |  (cms)     (ha.m.)
    **** WARNING : FIRST OUTFLOW IS NOT ZERO.
                      0.0070     0.0461   |  0.9620      0.6177
                      0.0170     0.0942   |  1.0060      0.6862
                      0.0220     0.1442   |  1.0480      0.7567
                      0.0270     0.1961   |  1.0880      0.8292
                      0.0310     0.2501   |  1.1270      0.9036
                      0.0340     0.3061   |  1.1650      0.9800
                      0.1970     0.3642   |  1.2010      1.0583
                      0.5080     0.4243   |  1.2370      1.1388
                      0.8680     0.4866   |  1.2710      1.2212
                      0.9160     0.5509   |  1.3050      1.3058

                          AREA     QPEAK     TPEAK       R.V.
                          (ha)     (cms)     (hrs)       (mm)
  INFLOW : ID= 2 (  0003)     20.693      4.663      1.00
42.34
  OUTFLOW: ID= 1 (  0004)     20.693      0.886      1.67
42.26
  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](%)=
19.00
              TIME SHIFT OF PEAK FLOW        (min)= 40.00
              MAXIMUM  STORAGE   USED       (ha.m.)=
0.5109

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  2021)|   Area    (ha)=   0.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  51.00   Dir. Conn.(%)=
41.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.22         0.21
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      50.00        20.00
    Mannings n            =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     191.56        79.51
            over (min)        5.00         5.00
    Storage Coeff.  (min)=       1.06 (ii)    4.91 (ii)
    Unit Hyd. Tpeak (min)=       5.00         5.00
    Unit Hyd. peak  (cms)=       0.34         0.22
                                          *TOTALS*
    PEAK FLOW       (cms)=       0.09         0.04          0.130
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.08          1.00
    RUNOFF VOLUME   (mm)=       67.26        29.73
45.11
    TOTAL RAINFALL  (mm)=       68.26        68.26
68.26
    RUNOFF COEFFICIENT   =       0.99         0.44
0.66

***** WARNING: STORAGE COEFF. IS SMALLER THAN
TIME STEP!

      (i) CN PROCEDURE SELECTED FOR PERVIOUS
LOSSES:
           CN*  =  74.0    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 (  0203)|   Area    (ha)=   0.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  65.00   Dir. Conn.(%)=
1.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.28         0.15
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      20.00       157.00
    Mannings n            =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     191.56       251.26
            over (min)        5.00        15.00
    Storage Coeff.  (min)=       0.61 (ii)   11.70 (ii)
```

```
    Unit Hyd. Tpeak (min)=       5.00        15.00
    Unit Hyd. peak  (cms)=       0.34        0.09
                                *TOTALS*
    PEAK FLOW      (cms)=       0.00        0.07         0.073
(iii)
    TIME TO PEAK   (hrs)=       1.00        1.25         1.25
    RUNOFF VOLUME  (mm)=       67.26       45.09
45.30
    TOTAL RAINFALL (mm)=       68.26       68.26
68.26
    RUNOFF COEFFICIENT  =       0.99        0.66
0.66

***** 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*  =  74.0    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 (  0002):     0.02   0.027     1.00    47.63
    + ID2= 2 (  2021):     0.43   0.130     1.00    45.11

================================================
======
      ID = 3 (  0005):     0.45   0.157     1.00    45.20

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------


--------------------
| ADD HYD  (  0005)|
|  3 +  2 =  1   |       AREA    QPEAK    TPEAK     R.V.
-------------------       (ha)    (cms)    (hrs)     (mm)
      ID1= 3 (  0005):     0.45   0.157     1.00    45.20
    + ID2= 2 (  0203):     0.43   0.073     1.25    45.30

================================================
======
      ID = 1 (  0005):     0.88   0.186     1.00    45.25

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------


--------------------
| ADD HYD  (  0005)|
|  1 +  2 =  3   |       AREA    QPEAK    TPEAK     R.V.
-------------------       (ha)    (cms)    (hrs)     (mm)
      ID1= 1 (  0005):     0.88   0.186     1.00    45.25
    + ID2= 2 (  0004):    20.69   0.886     1.67    42.26

================================================
======
      ID = 3 (  0005):    21.57   0.952     1.42    42.38

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------
================================================
================================================
===============

     V   V  I   SSSSS  U   U   A   L          (v 6.2.2015)
     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   SSSSS  UUUUU  A   A LLLLL

      OOO   TTTTT  TTTTT  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    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\myavarikia\AppData\Local\Civica\VH5\4aff2f07-
f9c0-4d18-a808-84a804cb6cce\15dcb970-1278-48f8-813e-
90a98f610584\s
  Summary filename:
C:\Users\myavarikia\AppData\Local\Civica\VH5\4aff2f07-
f9c0-4d18-a808-84a804cb6cce\15dcb970-1278-48f8-813e-
90a98f610584\s


DATE: 05/30/2024                      TIME: 12:39:24

USER:


COMMENTS:
_____
_____


--------------------------------------------------------------------------------
--------------------------
  ************************************************
  ** SIMULATION : 5. 50-yr 3hr Chicago Storm    **
  ************************************************


--------------------
| CHICAGO STORM    |    IDF curve parameters:
A=3886.000
| Ptotal= 77.64 mm |                    B=  16.000
--------------------                    C=   0.950
                  used in:   INTENSITY =  A / (t + B)^C

                  Duration of storm  =  3.00 hrs
                  Storm time step    =  5.00 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    3.84 |  0.75   44.32 |  1.50   18.58 |  2.25
5.86
            0.08    4.41 |  0.83  100.50 |  1.58   15.53 |  2.33
5.37
            0.17    5.15 |  0.92  215.80 |  1.67   13.21 |  2.42
4.95
            0.25    6.13 |  1.00  125.29 |  1.75   11.41 |  2.50
4.58
            0.33    7.47 |  1.08   75.84 |  1.83    9.99 |  2.58
4.26
            0.42    9.39 |  1.17   51.37 |  1.92    8.83 |  2.67
3.97
            0.50   12.29 |  1.25   37.40 |  2.00    7.88 |  2.75
3.72
            0.58   17.02 |  1.33   28.63 |  2.08    7.09 |  2.83
3.49
            0.67   25.64 |  1.42   22.74 |  2.17    6.43 |  2.92
3.28


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0206)|   Area    (ha)=   0.89
|ID= 1 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=
1.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.36         0.53
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      10.00        20.00
    Mannings n          =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     215.80       140.35
            over (min)        5.00         5.00
    Storage Coeff.  (min)=       0.38 (ii)    4.45 (ii)
    Unit Hyd. Tpeak (min)=       5.00         5.00
    Unit Hyd. peak  (cms)=       0.34         0.23
                                    *TOTALS*
    PEAK FLOW       (cms)=       0.01         0.18          0.182
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.08          1.00
    RUNOFF VOLUME    (mm)=      76.64        37.85
38.24
    TOTAL RAINFALL   (mm)=      77.64        77.64
77.64
    RUNOFF COEFFICIENT   =       0.99         0.49
0.49

***** 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*  =  68.0    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 (  0207)|   Area    (ha)=   0.73
|ID= 1 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=
1.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.29         0.44
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      10.00        20.00
    Mannings n          =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     215.80       140.35
            over (min)        5.00         5.00
    Storage Coeff.  (min)=       0.38 (ii)    4.45 (ii)
    Unit Hyd. Tpeak (min)=       5.00         5.00
    Unit Hyd. peak  (cms)=       0.34         0.23
                                    *TOTALS*
    PEAK FLOW       (cms)=       0.00         0.15          0.149
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.08          1.00
    RUNOFF VOLUME    (mm)=      76.64        37.85
38.24
    TOTAL RAINFALL   (mm)=      77.64        77.64
77.64
    RUNOFF COEFFICIENT   =       0.99         0.49
0.49

***** 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*  =  68.0    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            |
| NASHYD   (  0204)|   Area    (ha)=   6.26   Curve Number
(CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear
Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.41

    Unit Hyd Qpeak  (cms)=   0.583

    PEAK FLOW       (cms)=   0.575 (i)
    TIME TO PEAK    (hrs)=   1.500
    RUNOFF VOLUME    (mm)=  38.313
    TOTAL RAINFALL   (mm)=  77.637
    RUNOFF COEFFICIENT   =   0.493

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF
ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0200)|   Area    (ha)=   7.67
|ID= 1 DT= 5.0 min |   Total Imp(%)=  64.00   Dir. Conn.(%)=
51.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       4.91         2.76
```

```
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=     100.00        20.00
    Mannings n          =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     215.80       110.93
             over (min)        5.00         5.00
    Storage Coeff.  (min)=       1.53 (ii)    4.50 (ii)
    Unit Hyd. Tpeak (min)=       5.00         5.00
    Unit Hyd. peak  (cms)=       0.33         0.23
                                      *TOTALS*
    PEAK FLOW       (cms)=       2.30         0.73          3.007
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.08          1.00
    RUNOFF VOLUME    (mm)=      76.64        36.43
56.93
    TOTAL RAINFALL   (mm)=      77.64        77.64
77.64
    RUNOFF COEFFICIENT   =       0.99         0.47
0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN
TIME STEP!

      (i) CN PROCEDURE SELECTED FOR PERVIOUS
LOSSES:
          CN*  =  71.0    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 (  0205)|   Area    (ha)=   4.87
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=
52.00
--------------------
                       IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       3.21         1.66
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=     100.00        20.00
    Mannings n          =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     215.80       108.28
             over (min)        5.00         5.00
    Storage Coeff.  (min)=       1.53 (ii)    4.41 (ii)
    Unit Hyd. Tpeak (min)=       5.00         5.00
    Unit Hyd. peak  (cms)=       0.33         0.23
                                      *TOTALS*
    PEAK FLOW       (cms)=       1.49         0.43          1.904
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.08          1.00
    RUNOFF VOLUME    (mm)=      76.64        34.58
56.45
    TOTAL RAINFALL   (mm)=      77.64        77.64
77.64
    RUNOFF COEFFICIENT   =       0.99         0.45
0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN
TIME STEP!

      (i) CN PROCEDURE SELECTED FOR PERVIOUS
LOSSES:
          CN*  =  68.0    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  (  0001)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0200):     7.67    3.007     1.00     56.93
     + ID2= 2 (  0204):     6.26    0.575     1.50     38.31

==============================================
======
       ID = 3 (  0001):    13.93    3.074     1.00     48.57

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0001)|
|   3 +  2 =  1    |        AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0001):    13.93    3.074     1.00     48.57
     + ID2= 2 (  0205):     4.87    1.904     1.00     56.45

==============================================
======
       ID = 1 (  0001):    18.80    4.978     1.00     50.61

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  2022)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  59.00   Dir. Conn.(%)=
47.00
--------------------
                       IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.15         0.11
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      35.00        20.00
    Mannings n          =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     215.80       107.90
             over (min)        5.00         5.00
    Storage Coeff.  (min)=       0.81 (ii)    4.05 (ii)
    Unit Hyd. Tpeak (min)=       5.00         5.00
    Unit Hyd. peak  (cms)=       0.34         0.24
                                      *TOTALS*
    PEAK FLOW       (cms)=       0.07         0.03          0.101
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.00          1.00
    RUNOFF VOLUME    (mm)=      76.64        37.16
55.70
    TOTAL RAINFALL   (mm)=      77.64        77.64
77.64
    RUNOFF COEFFICIENT   =       0.99         0.48
0.72

***** WARNING: STORAGE COEFF. IS SMALLER THAN
TIME STEP!
```

```
      (i) CN PROCEDURE SELECTED FOR PERVIOUS
LOSSES:
          CN*  =  73.0    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.

--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0002)|
| Inlet Cap.= 0.060|
| #of Inlets=     1|
| Total(cms)=   0.1|     AREA     QPEAK     TPEAK     R.V.
--------------------       (ha)     (cms)     (hrs)     (mm)
    TOTAL HYD.(ID= 1):   0.26      0.10      1.00   55.70

================================================
=======
    MAJOR SYS.(ID= 2):   0.03      0.04      1.00   55.70
    MINOR SYS.(ID= 3):   0.23      0.06      1.00   55.70

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   0.34
|ID= 1 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=
1.00
--------------------
                         IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.14         0.20
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      10.00        20.00
    Mannings n            =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     215.80       155.80
              over (min)        5.00         5.00
    Storage Coeff.  (min)=       0.38 (ii)    4.28 (ii)
    Unit Hyd. Tpeak (min)=       5.00         5.00
    Unit Hyd. peak  (cms)=       0.34         0.23
                                          *TOTALS*
    PEAK FLOW       (cms)=       0.00         0.08          0.079
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.00          1.00
    RUNOFF VOLUME    (mm)=      76.64        41.39
41.74
    TOTAL RAINFALL   (mm)=      77.64        77.64
77.64
    RUNOFF COEFFICIENT   =       0.99         0.53
0.54

***** 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*  =  72.0    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 (  0208)|   Area    (ha)=   1.31
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=
1.00
--------------------
                         IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.65         0.65
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00        20.00
    Length           (m)=     130.00        35.00
    Mannings n            =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     215.80       201.63
              over (min)        5.00         5.00
    Storage Coeff.  (min)=       1.79 (ii)    4.25 (ii)
    Unit Hyd. Tpeak (min)=       5.00         5.00
    Unit Hyd. peak  (cms)=       0.32         0.23
                                          *TOTALS*
    PEAK FLOW       (cms)=       0.01         0.33          0.333
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.00          1.00
    RUNOFF VOLUME    (mm)=      76.64        44.25
44.57
    TOTAL RAINFALL   (mm)=      77.64        77.64
77.64
    RUNOFF COEFFICIENT   =       0.99         0.57
0.57

***** 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*  =  71.0    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):    18.80   4.978     1.00    50.61
    + ID2= 2 (  0002):     0.23   0.060     1.00    55.70

================================================
======
      ID = 3 (  0003):    19.03   5.038     1.00    50.67

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   3 +  2 =  1    |       AREA    QPEAK    TPEAK     R.V.
--------------------       (ha)    (cms)    (hrs)     (mm)
      ID1= 3 (  0003):    19.03   5.038     1.00    50.67
    + ID2= 2 (  0201):     0.34   0.079     1.00    41.74
```

```
================================================================================
      ID = 1 (  0003):    19.37   5.117     1.00    50.51

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0003):    19.37   5.117     1.00    50.51
     + ID2= 2 (  0208):     1.31   0.333     1.00    44.57

================================================================================
      ID = 3 (  0003):    20.68   5.450     1.00    50.14

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0004)|     OVERFLOW IS ON
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |   (cms)     (ha.m.)
    **** WARNING : FIRST OUTFLOW IS NOT ZERO.
                      0.0070     0.0461   |   0.9620      0.6177
                      0.0170     0.0942   |   1.0060      0.6862
                      0.0220     0.1442   |   1.0480      0.7567
                      0.0270     0.1961   |   1.0880      0.8292
                      0.0310     0.2501   |   1.1270      0.9036
                      0.0340     0.3061   |   1.1650      0.9800
                      0.1970     0.3642   |   1.2010      1.0583
                      0.5080     0.4243   |   1.2370      1.1388
                      0.8680     0.4866   |   1.2710      1.2212
                      0.9160     0.5509   |   1.3050      1.3058

                           AREA     QPEAK     TPEAK      R.V.
                           (ha)     (cms)     (hrs)      (mm)
  INFLOW : ID= 2 (  0003)     20.682      5.450      1.00
50.14
  OUTFLOW: ID= 1 (  0004)     20.682      0.952      1.75
50.06
  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](%)=
17.47
               TIME SHIFT OF PEAK FLOW         (min)= 45.00
               MAXIMUM  STORAGE   USED       (ha.m.)=
0.6036

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  2021)|   Area    (ha)=   0.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  51.00   Dir. Conn.(%)=
41.00
--------------------
                         IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.22         0.21
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      50.00        20.00
    Mannings n            =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     215.80        98.77
            over (min)        5.00         5.00
    Storage Coeff.  (min)=       1.01 (ii)    4.68 (ii)
    Unit Hyd. Tpeak (min)=       5.00         5.00
    Unit Hyd. peak  (cms)=       0.34         0.22
                                          *TOTALS*
    PEAK FLOW       (cms)=       0.11         0.05          0.153
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.08          1.00
    RUNOFF VOLUME   (mm)=       76.64        36.58
53.00
    TOTAL RAINFALL  (mm)=       77.64        77.64
77.64
    RUNOFF COEFFICIENT   =       0.99         0.47
0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  74.0    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 (  0203)|   Area    (ha)=   0.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  65.00   Dir. Conn.(%)=
1.00
--------------------
                         IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.28         0.15
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      20.00       157.00
    Mannings n            =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     215.80       357.75
            over (min)        5.00        15.00
    Storage Coeff.  (min)=       0.58 (ii)   10.21 (ii)
    Unit Hyd. Tpeak (min)=       5.00        15.00
    Unit Hyd. peak  (cms)=       0.34         0.09
                                          *TOTALS*
    PEAK FLOW       (cms)=       0.00         0.09          0.093
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.17          1.17
    RUNOFF VOLUME   (mm)=       76.64        53.59
53.80
    TOTAL RAINFALL  (mm)=       77.64        77.64
77.64
    RUNOFF COEFFICIENT   =       0.99         0.69
0.69

***** 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* = 74.0 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 (0002): 0.03 0.041 1.00 55.70
+ ID2= 2 (2021): 0.43 0.153 1.00 53.00

==========
ID = 3 (0005): 0.46 0.194 1.00 53.16

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD (0005)|
| 3 + 2 = 1 | AREA QPEAK TPEAK R.V.
---------- (ha) (cms) (hrs) (mm)
ID1= 3 (0005): 0.46 0.194 1.00 53.16
+ ID2= 2 (0203): 0.43 0.093 1.17 53.80

==========
ID = 1 (0005): 0.89 0.231 1.00 53.47

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD (0005)|
| 1 + 2 = 3 | AREA QPEAK TPEAK R.V.
---------- (ha) (cms) (hrs) (mm)
ID1= 1 (0005): 0.89 0.231 1.00 53.47
+ ID2= 2 (0004): 20.68 0.952 1.75 50.06

==========
ID = 3 (0005): 21.57 1.029 1.25 50.20

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

==========

V V I SSSSS U U A L (v 6.2.2015)
V V I SS U U AA L
V V I SS U U AAAAA L
V V I SS U U A A L
VV I SSSSS UUUUU A A LLLLL

OOO TTTTT TTTTT 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 M M O O
OOO T T H H Y M M OOO
Developed and Distributed by Smart City Water Inc

***** 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\myavarikia\AppData\Local\Civica\VH5\4aff2f07-f9c0-4d18-a808-84a804cb6cce\925fcfcf-0308-4c99-a169-b3c1897b8b0a\s
Summary filename: C:\Users\myavarikia\AppData\Local\Civica\VH5\4aff2f07-f9c0-4d18-a808-84a804cb6cce\925fcfcf-0308-4c99-a169-b3c1897b8b0a\s

DATE: 05/30/2024 TIME: 12:39:24

USER:

COMMENTS:
_____
_____

****
** SIMULATION : 6. 100-yr 3hr Chicago Storm **
****

| CHICAGO STORM | IDF curve parameters: A=4688.000
| Ptotal= 87.07 mm | B= 17.000
---------- C= 0.962
used in: INTENSITY = A / (t + B)^C

Duration of storm = 3.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	4.09	0.75	50.50	1.50	20.97	2.25	6.37
0.08	4.73	0.83	113.67	1.58	17.46	2.33	5.82
0.17	5.57	0.92	239.35	1.67	14.80	2.42	5.34
0.25	6.68	1.00	141.25	1.75	12.73	2.50	4.93
0.33	8.21	1.08	86.23	1.83	11.09	2.58	4.56
0.42	10.40	1.17	58.55	1.92	9.76	2.67	4.24
0.50	13.73	1.25	42.60	2.00	8.68	2.75	3.95
0.58	19.18	1.33	32.53	2.08	7.78	2.83	3.70

```
            0.67   29.10 |  1.42   25.76 |  2.17    7.02 |  2.92
3.47


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0206)|   Area    (ha)=   0.89
|ID= 1 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=
1.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.36         0.53
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      10.00        20.00
    Mannings n          =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     239.35       168.03
            over (min)        5.00         5.00
    Storage Coeff.  (min)=       0.37 (ii)    4.15 (ii)
    Unit Hyd. Tpeak (min)=       5.00         5.00
    Unit Hyd. peak  (cms)=       0.34         0.24
                                      *TOTALS*
    PEAK FLOW       (cms)=       0.01         0.22          0.224
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.00          1.00
    RUNOFF VOLUME    (mm)=      86.07        45.13
45.54
    TOTAL RAINFALL   (mm)=      87.07        87.07
87.07
    RUNOFF COEFFICIENT   =       0.99         0.52
0.52

***** 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*  =  68.0    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 (  0207)|   Area    (ha)=   0.73
|ID= 1 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=
1.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.29         0.44
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      10.00        20.00
    Mannings n          =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     239.35       168.03
            over (min)        5.00         5.00
    Storage Coeff.  (min)=       0.37 (ii)    4.15 (ii)
    Unit Hyd. Tpeak (min)=       5.00         5.00
    Unit Hyd. peak  (cms)=       0.34         0.24
                                      *TOTALS*
    PEAK FLOW       (cms)=       0.00         0.18          0.184
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.00          1.00
    RUNOFF VOLUME    (mm)=      86.07        45.13
45.54
    TOTAL RAINFALL   (mm)=      87.07        87.07
87.07
    RUNOFF COEFFICIENT   =       0.99         0.52
0.52

***** 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*  =  68.0    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            |
| NASHYD   (  0204)|   Area    (ha)=   6.26   Curve Number
(CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear
Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.41

    Unit Hyd Qpeak  (cms)=   0.583

    PEAK FLOW       (cms)=   0.697 (i)
    TIME TO PEAK    (hrs)=   1.500
    RUNOFF VOLUME    (mm)=  45.901
    TOTAL RAINFALL   (mm)=  87.067
    RUNOFF COEFFICIENT   =   0.527

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF
ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0200)|   Area    (ha)=   7.67
|ID= 1 DT= 5.0 min |   Total Imp(%)=  64.00   Dir. Conn.(%)=
51.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       4.91         2.76
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=     100.00        20.00
    Mannings n          =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     239.35       133.33
            over (min)        5.00         5.00
    Storage Coeff.  (min)=       1.46 (ii)    4.32 (ii)
    Unit Hyd. Tpeak (min)=       5.00         5.00
    Unit Hyd. peak  (cms)=       0.33         0.23
                                      *TOTALS*
    PEAK FLOW       (cms)=       2.56         0.88          3.430
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.08          1.00
    RUNOFF VOLUME    (mm)=      86.07        43.57
65.24
```

```
    TOTAL RAINFALL   (mm)=      87.07        87.07
87.07
    RUNOFF COEFFICIENT   =       0.99         0.50
0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN
TIME STEP!

      (i) CN PROCEDURE SELECTED FOR PERVIOUS
LOSSES:
          CN*  =  71.0    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 (  0205)|   Area    (ha)=   4.87
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=
52.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       3.21         1.66
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=     100.00        20.00
    Mannings n          =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     239.35       130.53
            over (min)        5.00         5.00
    Storage Coeff.  (min)=       1.46 (ii)    4.23 (ii)
    Unit Hyd. Tpeak (min)=       5.00         5.00
    Unit Hyd. peak  (cms)=       0.33         0.24
                                          *TOTALS*
    PEAK FLOW       (cms)=       1.65         0.52          2.169
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.08          1.00
    RUNOFF VOLUME    (mm)=      86.07        41.48
64.66
    TOTAL RAINFALL   (mm)=      87.07        87.07
87.07
    RUNOFF COEFFICIENT   =       0.99         0.48
0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN
TIME STEP!

      (i) CN PROCEDURE SELECTED FOR PERVIOUS
LOSSES:
          CN*  =  68.0    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  (  0001)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
      ID1= 1 (  0200):     7.67   3.430     1.00    65.24
     + ID2= 2 (  0204):     6.26   0.697     1.50    45.90

================================================
======
      ID = 3 (  0001):    13.93   3.518     1.00    56.55

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0001)|
|   3 +  2 =  1    |        AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
      ID1= 3 (  0001):    13.93   3.518     1.00    56.55
     + ID2= 2 (  0205):     4.87   2.169     1.00    64.66

================================================
======
      ID = 1 (  0001):    18.80   5.687     1.00    58.65

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  2022)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  59.00   Dir. Conn.(%)=
47.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.15         0.11
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      35.00        20.00
    Mannings n          =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     239.35       129.57
            over (min)        5.00         5.00
    Storage Coeff.  (min)=       0.78 (ii)    3.89 (ii)
    Unit Hyd. Tpeak (min)=       5.00         5.00
    Unit Hyd. peak  (cms)=       0.34         0.25
                                          *TOTALS*
    PEAK FLOW       (cms)=       0.08         0.03          0.115
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.00          1.00
    RUNOFF VOLUME    (mm)=      86.07        44.41
63.98
    TOTAL RAINFALL   (mm)=      87.07        87.07
87.07
    RUNOFF COEFFICIENT   =       0.99         0.51
0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN
TIME STEP!

      (i) CN PROCEDURE SELECTED FOR PERVIOUS
LOSSES:
          CN*  =  73.0    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.

--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0002)|
| Inlet Cap.= 0.060|
| #of Inlets=     1|
| Total(cms)=  0.1|     AREA    QPEAK     TPEAK    R.V.
-------------------          (ha)    (cms)     (hrs)    (mm)
    TOTAL HYD.(ID= 1):   0.26      0.12      1.00   63.98
```

```
==========================================================
=======
    MAJOR SYS.(ID= 2):   0.04      0.06      1.00   63.98
    MINOR SYS.(ID= 3):   0.22      0.06      1.00   63.98

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   0.34
|ID= 1 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=
1.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.14         0.20
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      10.00        20.00
    Mannings n            =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     239.35       185.31
             over (min)        5.00         5.00
    Storage Coeff.  (min)=       0.37 (ii)    4.01 (ii)
    Unit Hyd. Tpeak (min)=       5.00         5.00
    Unit Hyd. peak  (cms)=       0.34         0.24
                                          *TOTALS*
    PEAK FLOW       (cms)=       0.00         0.09          0.097
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.00          1.00
    RUNOFF VOLUME    (mm)=      86.07        49.08
49.44
    TOTAL RAINFALL   (mm)=      87.07        87.07
87.07
    RUNOFF COEFFICIENT   =       0.99         0.56
0.57

***** 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*  =  72.0    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 (  0208)|   Area    (ha)=   1.31
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=
1.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.65         0.65
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00        20.00
    Length           (m)=     130.00        35.00
    Mannings n            =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     239.35       238.36
             over (min)        5.00         5.00
    Storage Coeff.  (min)=       1.71 (ii)    4.02 (ii)
    Unit Hyd. Tpeak (min)=       5.00         5.00
    Unit Hyd. peak  (cms)=       0.32         0.24
                                          *TOTALS*
    PEAK FLOW       (cms)=       0.01         0.40          0.404
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.00          1.00
    RUNOFF VOLUME    (mm)=      86.07        52.19
52.53
    TOTAL RAINFALL   (mm)=      87.07        87.07
87.07
    RUNOFF COEFFICIENT   =       0.99         0.60
0.60

***** 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*  =  71.0    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):    18.80   5.687     1.00    58.65
    + ID2= 2 (  0002):     0.22   0.060     1.00    63.98

==========================================================
======
      ID = 3 (  0003):    19.02   5.747     1.00    58.72

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   3 +  2 =  1    |        AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
      ID1= 3 (  0003):    19.02   5.747     1.00    58.72
    + ID2= 2 (  0201):     0.34   0.097     1.00    49.44

==========================================================
======
      ID = 1 (  0003):    19.36   5.843     1.00    58.55

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
      ID1= 1 (  0003):    19.36   5.843     1.00    58.55
    + ID2= 2 (  0208):     1.31   0.404     1.00    52.53

==========================================================
======
```

```
      ID = 3 (  0003):    20.67   6.247     1.00    58.17

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0004)|     OVERFLOW IS ON
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   | OUTFLOW
STORAGE
---------------------      (cms)     (ha.m.)  |  (cms)     (ha.m.)
    **** WARNING : FIRST OUTFLOW IS NOT ZERO.
                    0.0070     0.0461   |  0.9620      0.6177
                    0.0170     0.0942   |  1.0060      0.6862
                    0.0220     0.1442   |  1.0480      0.7567
                    0.0270     0.1961   |  1.0880      0.8292
                    0.0310     0.2501   |  1.1270      0.9036
                    0.0340     0.3061   |  1.1650      0.9800
                    0.1970     0.3642   |  1.2010      1.0583
                    0.5080     0.4243   |  1.2370      1.1388
                    0.8680     0.4866   |  1.2710      1.2212
                    0.9160     0.5509   |  1.3050      1.3058

                         AREA     QPEAK     TPEAK       R.V.
                         (ha)     (cms)     (hrs)       (mm)
  INFLOW : ID= 2 (  0003)     20.674      6.247      1.00
58.17
  OUTFLOW: ID= 1 (  0004)     20.674      1.021      1.83
58.09
  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](%)=
16.34
              TIME SHIFT OF PEAK FLOW         (min)= 50.00
              MAXIMUM  STORAGE   USED       (ha.m.)=
0.7114

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  2021)|   Area    (ha)=   0.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  51.00   Dir. Conn.(%)=
41.00
---------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.22         0.21
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      50.00        20.00
    Mannings n          =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     239.35       118.80
            over (min)        5.00         5.00
    Storage Coeff.  (min)=       0.97 (ii)    4.49 (ii)
    Unit Hyd. Tpeak (min)=       5.00         5.00
    Unit Hyd. peak  (cms)=       0.34         0.23
                                    *TOTALS*
    PEAK FLOW       (cms)=       0.12         0.06         0.175
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.08         1.00
    RUNOFF VOLUME    (mm)=      86.07        43.78
61.11
    TOTAL RAINFALL   (mm)=      87.07        87.07
87.07
    RUNOFF COEFFICIENT   =       0.99         0.50
0.70

***** WARNING: STORAGE COEFF. IS SMALLER THAN
TIME STEP!

      (i) CN PROCEDURE SELECTED FOR PERVIOUS
LOSSES:
          CN*  =  74.0    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 (  0203)|   Area    (ha)=   0.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  65.00   Dir. Conn.(%)=
1.00
---------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.28         0.15
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      20.00       157.00
    Mannings n          =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     239.35       414.96
            over (min)        5.00        10.00
    Storage Coeff.  (min)=       0.56 (ii)    9.63 (ii)
    Unit Hyd. Tpeak (min)=       5.00        10.00
    Unit Hyd. peak  (cms)=       0.34         0.11
                                    *TOTALS*
    PEAK FLOW       (cms)=       0.00         0.11         0.115
(iii)
    TIME TO PEAK    (hrs)=       1.00         1.17         1.17
    RUNOFF VOLUME    (mm)=      86.07        62.27
62.49
    TOTAL RAINFALL   (mm)=      87.07        87.07
87.07
    RUNOFF COEFFICIENT   =       0.99         0.72
0.72

***** 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*  =  74.0    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 (  0002):     0.04    0.055     1.00    63.98
    + ID2= 2 (  2021):     0.43    0.175     1.00    61.11
```

```
================================================================================
      ID = 3 (  0005):     0.47   0.231     1.00    61.33

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0005)|
|   3 +  2 =  1    |        AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0005):     0.47   0.231     1.00    61.33
     + ID2= 2 (  0203):     0.43   0.115     1.17    62.49

================================================================================
      ID = 1 (  0005):     0.90   0.299     1.00    61.89

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0005):     0.90   0.299     1.00    61.89
     + ID2= 2 (  0004):    20.67   1.021     1.83    58.09

================================================================================
      ID = 3 (  0005):    21.57   1.097     1.25    58.25

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------


================================================================================
================================================================================

      V   V  I   SSSSS  U   U   A   L           (v 6.2.2015)
      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   SSSSS  UUUUU  A   A  LLLLL

      OOO   TTTTT  TTTTT  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    M 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\myavarikia\AppData\Local\Civica\VH5\4aff2f07-f9c0-4d18-a808-84a804cb6cce\27f30f8c-51e4-43a7-8fca-f4b89ecc0ebf\s
  Summary filename: C:\Users\myavarikia\AppData\Local\Civica\VH5\4aff2f07-f9c0-4d18-a808-84a804cb6cce\27f30f8c-51e4-43a7-8fca-f4b89ecc0ebf\s

  DATE: 05/30/2024                      TIME: 12:39:24

  USER:


  COMMENTS:
  ________________________________________________________
  _____________


--------------------------------------------------------------------------------
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  ***********************************************
  ** SIMULATION : Hazel                        **
  ***********************************************


--------------------
|    READ STORM    |  Filename: C:\Users\myavarikia\AppD
|                  |            ata\Local\Temp\
|                  |            0b8e0731-fa8e-4681-98b5-3a584fec8e14\cf020c6b
| Ptotal=212.00 mm |  Comments: Hazel
--------------------
            TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
             hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
            0.00    6.00 |  3.00   13.00 |  6.00   23.00 |  9.00   53.00
            1.00    4.00 |  4.00   17.00 |  7.00   13.00 | 10.00   38.00
            2.00    6.00 |  5.00   13.00 |  8.00   13.00 | 11.00   13.00

--------------------------------------------------------------------------------


--------------------
| CALIB            |
| STANDHYD (  0206)|  Area    (ha)=   0.89
|ID= 1 DT= 5.0 min |  Total Imp(%)=  40.00   Dir. Conn.(%)=  1.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.36         0.53
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      10.00        20.00
    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    6.00 | 3.083   13.00 | 6.083   23.00 |  9.08   53.00
           0.167    6.00 | 3.167   13.00 | 6.167   23.00 |  9.17   53.00
           0.250    6.00 | 3.250   13.00 | 6.250   23.00 |  9.25   53.00
```

```
          0.333   6.00 | 3.333   13.00 | 6.333   23.00 |  9.33
53.00
          0.417   6.00 | 3.417   13.00 | 6.417   23.00 |  9.42
53.00
          0.500   6.00 | 3.500   13.00 | 6.500   23.00 |  9.50
53.00
          0.583   6.00 | 3.583   13.00 | 6.583   23.00 |  9.58
53.00
          0.667   6.00 | 3.667   13.00 | 6.667   23.00 |  9.67
53.00
          0.750   6.00 | 3.750   13.00 | 6.750   23.00 |  9.75
53.00
          0.833   6.00 | 3.833   13.00 | 6.833   23.00 |  9.83
53.00
          0.917   6.00 | 3.917   13.00 | 6.917   23.00 |  9.92
53.00
          1.000   6.00 | 4.000   13.00 | 7.000   23.00 | 10.00
53.00
          1.083   4.00 | 4.083   17.00 | 7.083   13.00 | 10.08
38.00
          1.167   4.00 | 4.167   17.00 | 7.167   13.00 | 10.17
38.00
          1.250   4.00 | 4.250   17.00 | 7.250   13.00 | 10.25
38.00
          1.333   4.00 | 4.333   17.00 | 7.333   13.00 | 10.33
38.00
          1.417   4.00 | 4.417   17.00 | 7.417   13.00 | 10.42
38.00
          1.500   4.00 | 4.500   17.00 | 7.500   13.00 | 10.50
38.00
          1.583   4.00 | 4.583   17.00 | 7.583   13.00 | 10.58
38.00
          1.667   4.00 | 4.667   17.00 | 7.667   13.00 | 10.67
38.00
          1.750   4.00 | 4.750   17.00 | 7.750   13.00 | 10.75
38.00
          1.833   4.00 | 4.833   17.00 | 7.833   13.00 | 10.83
38.00
          1.917   4.00 | 4.917   17.00 | 7.917   13.00 | 10.92
38.00
          2.000   4.00 | 5.000   17.00 | 8.000   13.00 | 11.00
38.00
          2.083   6.00 | 5.083   13.00 | 8.083   13.00 | 11.08
13.00
          2.167   6.00 | 5.167   13.00 | 8.167   13.00 | 11.17
13.00
          2.250   6.00 | 5.250   13.00 | 8.250   13.00 | 11.25
13.00
          2.333   6.00 | 5.333   13.00 | 8.333   13.00 | 11.33
13.00
          2.417   6.00 | 5.417   13.00 | 8.417   13.00 | 11.42
13.00
          2.500   6.00 | 5.500   13.00 | 8.500   13.00 | 11.50
13.00
          2.583   6.00 | 5.583   13.00 | 8.583   13.00 | 11.58
13.00
          2.667   6.00 | 5.667   13.00 | 8.667   13.00 | 11.67
13.00
          2.750   6.00 | 5.750   13.00 | 8.750   13.00 | 11.75
13.00
          2.833   6.00 | 5.833   13.00 | 8.833   13.00 | 11.83
13.00
          2.917   6.00 | 5.917   13.00 | 8.917   13.00 | 11.92
13.00
          3.000   6.00 | 6.000   13.00 | 9.000   13.00 | 12.00
13.00

    Max.Eff.Inten.(mm/hr)=      53.00       78.46
              over (min)        5.00       10.00
    Storage Coeff.  (min)=      0.67 (ii)   5.80 (ii)
    Unit Hyd. Tpeak (min)=      5.00       10.00
    Unit Hyd. peak  (cms)=      0.34       0.15
                                  *TOTALS*
    PEAK FLOW      (cms)=       0.00       0.12        0.117
(iii)
    TIME TO PEAK    (hrs)=      9.25       10.00       10.00
    RUNOFF VOLUME   (mm)=     211.00      155.18
155.73
    TOTAL RAINFALL  (mm)=     212.00      212.00
212.00
    RUNOFF COEFFICIENT  =       1.00       0.73
0.73

***** 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*  =  68.0    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 (  0207)|   Area    (ha)=   0.73
|ID= 1 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=
1.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.29         0.44
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      10.00        20.00
    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    6.00 | 3.083   13.00 | 6.083   23.00 |  9.08
53.00
          0.167    6.00 | 3.167   13.00 | 6.167   23.00 |  9.17
53.00
          0.250    6.00 | 3.250   13.00 | 6.250   23.00 |  9.25
53.00
          0.333    6.00 | 3.333   13.00 | 6.333   23.00 |  9.33
53.00
          0.417    6.00 | 3.417   13.00 | 6.417   23.00 |  9.42
53.00
          0.500    6.00 | 3.500   13.00 | 6.500   23.00 |  9.50
53.00
          0.583    6.00 | 3.583   13.00 | 6.583   23.00 |  9.58
53.00
          0.667    6.00 | 3.667   13.00 | 6.667   23.00 |  9.67
53.00
          0.750    6.00 | 3.750   13.00 | 6.750   23.00 |  9.75
53.00
```

```
          0.833   6.00 | 3.833   13.00 | 6.833   23.00 |  9.83
53.00
          0.917   6.00 | 3.917   13.00 | 6.917   23.00 |  9.92
53.00
          1.000   6.00 | 4.000   13.00 | 7.000   23.00 | 10.00
53.00
          1.083   4.00 | 4.083   17.00 | 7.083   13.00 | 10.08
38.00
          1.167   4.00 | 4.167   17.00 | 7.167   13.00 | 10.17
38.00
          1.250   4.00 | 4.250   17.00 | 7.250   13.00 | 10.25
38.00
          1.333   4.00 | 4.333   17.00 | 7.333   13.00 | 10.33
38.00
          1.417   4.00 | 4.417   17.00 | 7.417   13.00 | 10.42
38.00
          1.500   4.00 | 4.500   17.00 | 7.500   13.00 | 10.50
38.00
          1.583   4.00 | 4.583   17.00 | 7.583   13.00 | 10.58
38.00
          1.667   4.00 | 4.667   17.00 | 7.667   13.00 | 10.67
38.00
          1.750   4.00 | 4.750   17.00 | 7.750   13.00 | 10.75
38.00
          1.833   4.00 | 4.833   17.00 | 7.833   13.00 | 10.83
38.00
          1.917   4.00 | 4.917   17.00 | 7.917   13.00 | 10.92
38.00
          2.000   4.00 | 5.000   17.00 | 8.000   13.00 | 11.00
38.00
          2.083   6.00 | 5.083   13.00 | 8.083   13.00 | 11.08
13.00
          2.167   6.00 | 5.167   13.00 | 8.167   13.00 | 11.17
13.00
          2.250   6.00 | 5.250   13.00 | 8.250   13.00 | 11.25
13.00
          2.333   6.00 | 5.333   13.00 | 8.333   13.00 | 11.33
13.00
          2.417   6.00 | 5.417   13.00 | 8.417   13.00 | 11.42
13.00
          2.500   6.00 | 5.500   13.00 | 8.500   13.00 | 11.50
13.00
          2.583   6.00 | 5.583   13.00 | 8.583   13.00 | 11.58
13.00
          2.667   6.00 | 5.667   13.00 | 8.667   13.00 | 11.67
13.00
          2.750   6.00 | 5.750   13.00 | 8.750   13.00 | 11.75
13.00
          2.833   6.00 | 5.833   13.00 | 8.833   13.00 | 11.83
13.00
          2.917   6.00 | 5.917   13.00 | 8.917   13.00 | 11.92
13.00
          3.000   6.00 | 6.000   13.00 | 9.000   13.00 | 12.00
13.00

    Max.Eff.Inten.(mm/hr)=      53.00       78.46
             over (min)        5.00       10.00
    Storage Coeff.  (min)=      0.67 (ii)   5.80 (ii)
    Unit Hyd. Tpeak (min)=      5.00       10.00
    Unit Hyd. peak  (cms)=      0.34        0.15
                                  *TOTALS*
    PEAK FLOW      (cms)=       0.00        0.10         0.096
(iii)
    TIME TO PEAK    (hrs)=      9.25       10.00        10.00
    RUNOFF VOLUME   (mm)=     211.00      155.18
155.73
    TOTAL RAINFALL  (mm)=     212.00      212.00
212.00
    RUNOFF COEFFICIENT  =       1.00        0.73
0.73

***** 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*  =  68.0    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            |
| NASHYD   (  0204)|   Area    (ha)=   6.26   Curve Number
(CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear
Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.41

        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   6.00 | 3.083   13.00 | 6.083   23.00 |  9.08
53.00
          0.167   6.00 | 3.167   13.00 | 6.167   23.00 |  9.17
53.00
          0.250   6.00 | 3.250   13.00 | 6.250   23.00 |  9.25
53.00
          0.333   6.00 | 3.333   13.00 | 6.333   23.00 |  9.33
53.00
          0.417   6.00 | 3.417   13.00 | 6.417   23.00 |  9.42
53.00
          0.500   6.00 | 3.500   13.00 | 6.500   23.00 |  9.50
53.00
          0.583   6.00 | 3.583   13.00 | 6.583   23.00 |  9.58
53.00
          0.667   6.00 | 3.667   13.00 | 6.667   23.00 |  9.67
53.00
          0.750   6.00 | 3.750   13.00 | 6.750   23.00 |  9.75
53.00
          0.833   6.00 | 3.833   13.00 | 6.833   23.00 |  9.83
53.00
          0.917   6.00 | 3.917   13.00 | 6.917   23.00 |  9.92
53.00
          1.000   6.00 | 4.000   13.00 | 7.000   23.00 | 10.00
53.00
          1.083   4.00 | 4.083   17.00 | 7.083   13.00 | 10.08
38.00
          1.167   4.00 | 4.167   17.00 | 7.167   13.00 | 10.17
38.00
          1.250   4.00 | 4.250   17.00 | 7.250   13.00 | 10.25
38.00
          1.333   4.00 | 4.333   17.00 | 7.333   13.00 | 10.33
38.00
          1.417   4.00 | 4.417   17.00 | 7.417   13.00 | 10.42
38.00
          1.500   4.00 | 4.500   17.00 | 7.500   13.00 | 10.50
38.00
```

1.583 4.00 | 4.583 17.00 | 7.583 13.00 | 10.58
38.00
1.667 4.00 | 4.667 17.00 | 7.667 13.00 | 10.67
38.00
1.750 4.00 | 4.750 17.00 | 7.750 13.00 | 10.75
38.00
1.833 4.00 | 4.833 17.00 | 7.833 13.00 | 10.83
38.00
1.917 4.00 | 4.917 17.00 | 7.917 13.00 | 10.92
38.00
2.000 4.00 | 5.000 17.00 | 8.000 13.00 | 11.00
38.00
2.083 6.00 | 5.083 13.00 | 8.083 13.00 | 11.08
13.00
2.167 6.00 | 5.167 13.00 | 8.167 13.00 | 11.17
13.00
2.250 6.00 | 5.250 13.00 | 8.250 13.00 | 11.25
13.00
2.333 6.00 | 5.333 13.00 | 8.333 13.00 | 11.33
13.00
2.417 6.00 | 5.417 13.00 | 8.417 13.00 | 11.42
13.00
2.500 6.00 | 5.500 13.00 | 8.500 13.00 | 11.50
13.00
2.583 6.00 | 5.583 13.00 | 8.583 13.00 | 11.58
13.00
2.667 6.00 | 5.667 13.00 | 8.667 13.00 | 11.67
13.00
2.750 6.00 | 5.750 13.00 | 8.750 13.00 | 11.75
13.00
2.833 6.00 | 5.833 13.00 | 8.833 13.00 | 11.83
13.00
2.917 6.00 | 5.917 13.00 | 8.917 13.00 | 11.92
13.00
3.000 6.00 | 6.000 13.00 | 9.000 13.00 | 12.00
13.00

Unit Hyd Qpeak (cms)= 0.583

PEAK FLOW (cms)= 0.772 (i)
TIME TO PEAK (hrs)= 10.167
RUNOFF VOLUME (mm)= 158.819
TOTAL RAINFALL (mm)= 212.000
RUNOFF COEFFICIENT = 0.749

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF
ANY.

| CALIB |
| STANDHYD (0200)| Area (ha)= 7.67
|ID= 1 DT= 5.0 min | Total Imp(%)= 64.00 Dir. Conn.(%)=
51.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	4.91	2.76
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	2.00	2.00
Length (m)=	100.00	20.00
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 6.00 | 3.083 13.00 | 6.083 23.00 | 9.08
53.00
0.167 6.00 | 3.167 13.00 | 6.167 23.00 | 9.17
53.00
0.250 6.00 | 3.250 13.00 | 6.250 23.00 | 9.25
53.00
0.333 6.00 | 3.333 13.00 | 6.333 23.00 | 9.33
53.00
0.417 6.00 | 3.417 13.00 | 6.417 23.00 | 9.42
53.00
0.500 6.00 | 3.500 13.00 | 6.500 23.00 | 9.50
53.00
0.583 6.00 | 3.583 13.00 | 6.583 23.00 | 9.58
53.00
0.667 6.00 | 3.667 13.00 | 6.667 23.00 | 9.67
53.00
0.750 6.00 | 3.750 13.00 | 6.750 23.00 | 9.75
53.00
0.833 6.00 | 3.833 13.00 | 6.833 23.00 | 9.83
53.00
0.917 6.00 | 3.917 13.00 | 6.917 23.00 | 9.92
53.00
1.000 6.00 | 4.000 13.00 | 7.000 23.00 | 10.00
53.00
1.083 4.00 | 4.083 17.00 | 7.083 13.00 | 10.08
38.00
1.167 4.00 | 4.167 17.00 | 7.167 13.00 | 10.17
38.00
1.250 4.00 | 4.250 17.00 | 7.250 13.00 | 10.25
38.00
1.333 4.00 | 4.333 17.00 | 7.333 13.00 | 10.33
38.00
1.417 4.00 | 4.417 17.00 | 7.417 13.00 | 10.42
38.00
1.500 4.00 | 4.500 17.00 | 7.500 13.00 | 10.50
38.00
1.583 4.00 | 4.583 17.00 | 7.583 13.00 | 10.58
38.00
1.667 4.00 | 4.667 17.00 | 7.667 13.00 | 10.67
38.00
1.750 4.00 | 4.750 17.00 | 7.750 13.00 | 10.75
38.00
1.833 4.00 | 4.833 17.00 | 7.833 13.00 | 10.83
38.00
1.917 4.00 | 4.917 17.00 | 7.917 13.00 | 10.92
38.00
2.000 4.00 | 5.000 17.00 | 8.000 13.00 | 11.00
38.00
2.083 6.00 | 5.083 13.00 | 8.083 13.00 | 11.08
13.00
2.167 6.00 | 5.167 13.00 | 8.167 13.00 | 11.17
13.00
2.250 6.00 | 5.250 13.00 | 8.250 13.00 | 11.25
13.00
2.333 6.00 | 5.333 13.00 | 8.333 13.00 | 11.33
13.00
2.417 6.00 | 5.417 13.00 | 8.417 13.00 | 11.42
13.00
2.500 6.00 | 5.500 13.00 | 8.500 13.00 | 11.50
13.00
2.583 6.00 | 5.583 13.00 | 8.583 13.00 | 11.58
13.00
2.667 6.00 | 5.667 13.00 | 8.667 13.00 | 11.67
13.00
2.750 6.00 | 5.750 13.00 | 8.750 13.00 | 11.75
13.00
2.833 6.00 | 5.833 13.00 | 8.833 13.00 | 11.83
13.00

```
          2.917    6.00 | 5.917   13.00 | 8.917   13.00 | 11.92
13.00
          3.000    6.00 | 6.000   13.00 | 9.000   13.00 | 12.00
13.00

    Max.Eff.Inten.(mm/hr)=      53.00        64.15
            over (min)        5.00        10.00
    Storage Coeff.  (min)=       2.67 (ii)    8.24 (ii)
    Unit Hyd. Tpeak (min)=       5.00        10.00
    Unit Hyd. peak  (cms)=       0.29        0.13
                                      *TOTALS*
    PEAK FLOW       (cms)=       0.58        0.49         1.064
(iii)
    TIME TO PEAK    (hrs)=       9.75        10.00        10.00
    RUNOFF VOLUME   (mm)=     211.00       152.52
182.35
    TOTAL RAINFALL  (mm)=     212.00       212.00
212.00
    RUNOFF COEFFICIENT   =       1.00        0.72
0.86

***** WARNING: STORAGE COEFF. IS SMALLER THAN
TIME STEP!

      (i) CN PROCEDURE SELECTED FOR PERVIOUS
LOSSES:
           CN*  =  71.0    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 (  0205)|   Area    (ha)=   4.87
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=
52.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       3.21         1.66
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=     100.00        20.00
    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    6.00 | 3.083   13.00 | 6.083   23.00 |  9.08
53.00
          0.167    6.00 | 3.167   13.00 | 6.167   23.00 |  9.17
53.00
          0.250    6.00 | 3.250   13.00 | 6.250   23.00 |  9.25
53.00
          0.333    6.00 | 3.333   13.00 | 6.333   23.00 |  9.33
53.00
          0.417    6.00 | 3.417   13.00 | 6.417   23.00 |  9.42
53.00
          0.500    6.00 | 3.500   13.00 | 6.500   23.00 |  9.50
53.00
          0.583    6.00 | 3.583   13.00 | 6.583   23.00 |  9.58
53.00
          0.667    6.00 | 3.667   13.00 | 6.667   23.00 |  9.67
53.00
          0.750    6.00 | 3.750   13.00 | 6.750   23.00 |  9.75
53.00
          0.833    6.00 | 3.833   13.00 | 6.833   23.00 |  9.83
53.00
          0.917    6.00 | 3.917   13.00 | 6.917   23.00 |  9.92
53.00
          1.000    6.00 | 4.000   13.00 | 7.000   23.00 | 10.00
53.00
          1.083    4.00 | 4.083   17.00 | 7.083   13.00 | 10.08
38.00
          1.167    4.00 | 4.167   17.00 | 7.167   13.00 | 10.17
38.00
          1.250    4.00 | 4.250   17.00 | 7.250   13.00 | 10.25
38.00
          1.333    4.00 | 4.333   17.00 | 7.333   13.00 | 10.33
38.00
          1.417    4.00 | 4.417   17.00 | 7.417   13.00 | 10.42
38.00
          1.500    4.00 | 4.500   17.00 | 7.500   13.00 | 10.50
38.00
          1.583    4.00 | 4.583   17.00 | 7.583   13.00 | 10.58
38.00
          1.667    4.00 | 4.667   17.00 | 7.667   13.00 | 10.67
38.00
          1.750    4.00 | 4.750   17.00 | 7.750   13.00 | 10.75
38.00
          1.833    4.00 | 4.833   17.00 | 7.833   13.00 | 10.83
38.00
          1.917    4.00 | 4.917   17.00 | 7.917   13.00 | 10.92
38.00
          2.000    4.00 | 5.000   17.00 | 8.000   13.00 | 11.00
38.00
          2.083    6.00 | 5.083   13.00 | 8.083   13.00 | 11.08
13.00
          2.167    6.00 | 5.167   13.00 | 8.167   13.00 | 11.17
13.00
          2.250    6.00 | 5.250   13.00 | 8.250   13.00 | 11.25
13.00
          2.333    6.00 | 5.333   13.00 | 8.333   13.00 | 11.33
13.00
          2.417    6.00 | 5.417   13.00 | 8.417   13.00 | 11.42
13.00
          2.500    6.00 | 5.500   13.00 | 8.500   13.00 | 11.50
13.00
          2.583    6.00 | 5.583   13.00 | 8.583   13.00 | 11.58
13.00
          2.667    6.00 | 5.667   13.00 | 8.667   13.00 | 11.67
13.00
          2.750    6.00 | 5.750   13.00 | 8.750   13.00 | 11.75
13.00
          2.833    6.00 | 5.833   13.00 | 8.833   13.00 | 11.83
13.00
          2.917    6.00 | 5.917   13.00 | 8.917   13.00 | 11.92
13.00
          3.000    6.00 | 6.000   13.00 | 9.000   13.00 | 12.00
13.00

    Max.Eff.Inten.(mm/hr)=      53.00        65.33
            over (min)        5.00        10.00
    Storage Coeff.  (min)=       2.67 (ii)    8.20 (ii)
    Unit Hyd. Tpeak (min)=       5.00        10.00
    Unit Hyd. peak  (cms)=       0.29        0.13
                                      *TOTALS*
    PEAK FLOW       (cms)=       0.37        0.30         0.671
(iii)
    TIME TO PEAK    (hrs)=       9.75        10.00        10.00
    RUNOFF VOLUME   (mm)=     211.00       148.25
180.88
```

```
    TOTAL RAINFALL   (mm)=     212.00       212.00
212.00
    RUNOFF COEFFICIENT   =       1.00         0.70
0.85

***** WARNING: STORAGE COEFF. IS SMALLER THAN
TIME STEP!

      (i) CN PROCEDURE SELECTED FOR PERVIOUS
LOSSES:
          CN*  =  68.0    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  (  0001)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
---------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0200):     7.67   1.064    10.00   182.35
     + ID2= 2 (  0204):     6.26   0.772    10.17   158.82

================================================
======
       ID = 3 (  0001):    13.93   1.817    10.00   171.77

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------


--------------------
| ADD HYD  (  0001)|
|   3 +  2 =  1    |        AREA    QPEAK    TPEAK     R.V.
---------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0001):    13.93   1.817    10.00   171.77
     + ID2= 2 (  0205):     4.87   0.671    10.00   180.88

================================================
======
       ID = 1 (  0001):    18.80   2.488    10.00   174.13

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  2022)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  59.00   Dir. Conn.(%)=
47.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.15         0.11
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      35.00        20.00
    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    6.00 | 3.083   13.00 | 6.083   23.00 |  9.08
53.00
      0.167    6.00 | 3.167   13.00 | 6.167   23.00 |  9.17
53.00
      0.250    6.00 | 3.250   13.00 | 6.250   23.00 |  9.25
53.00
      0.333    6.00 | 3.333   13.00 | 6.333   23.00 |  9.33
53.00
      0.417    6.00 | 3.417   13.00 | 6.417   23.00 |  9.42
53.00
      0.500    6.00 | 3.500   13.00 | 6.500   23.00 |  9.50
53.00
      0.583    6.00 | 3.583   13.00 | 6.583   23.00 |  9.58
53.00
      0.667    6.00 | 3.667   13.00 | 6.667   23.00 |  9.67
53.00
      0.750    6.00 | 3.750   13.00 | 6.750   23.00 |  9.75
53.00
      0.833    6.00 | 3.833   13.00 | 6.833   23.00 |  9.83
53.00
      0.917    6.00 | 3.917   13.00 | 6.917   23.00 |  9.92
53.00
      1.000    6.00 | 4.000   13.00 | 7.000   23.00 | 10.00
53.00
      1.083    4.00 | 4.083   17.00 | 7.083   13.00 | 10.08
38.00
      1.167    4.00 | 4.167   17.00 | 7.167   13.00 | 10.17
38.00
      1.250    4.00 | 4.250   17.00 | 7.250   13.00 | 10.25
38.00
      1.333    4.00 | 4.333   17.00 | 7.333   13.00 | 10.33
38.00
      1.417    4.00 | 4.417   17.00 | 7.417   13.00 | 10.42
38.00
      1.500    4.00 | 4.500   17.00 | 7.500   13.00 | 10.50
38.00
      1.583    4.00 | 4.583   17.00 | 7.583   13.00 | 10.58
38.00
      1.667    4.00 | 4.667   17.00 | 7.667   13.00 | 10.67
38.00
      1.750    4.00 | 4.750   17.00 | 7.750   13.00 | 10.75
38.00
      1.833    4.00 | 4.833   17.00 | 7.833   13.00 | 10.83
38.00
      1.917    4.00 | 4.917   17.00 | 7.917   13.00 | 10.92
38.00
      2.000    4.00 | 5.000   17.00 | 8.000   13.00 | 11.00
38.00
      2.083    6.00 | 5.083   13.00 | 8.083   13.00 | 11.08
13.00
      2.167    6.00 | 5.167   13.00 | 8.167   13.00 | 11.17
13.00
      2.250    6.00 | 5.250   13.00 | 8.250   13.00 | 11.25
13.00
      2.333    6.00 | 5.333   13.00 | 8.333   13.00 | 11.33
13.00
      2.417    6.00 | 5.417   13.00 | 8.417   13.00 | 11.42
13.00
      2.500    6.00 | 5.500   13.00 | 8.500   13.00 | 11.50
13.00
      2.583    6.00 | 5.583   13.00 | 8.583   13.00 | 11.58
13.00
      2.667    6.00 | 5.667   13.00 | 8.667   13.00 | 11.67
13.00
      2.750    6.00 | 5.750   13.00 | 8.750   13.00 | 11.75
13.00
      2.833    6.00 | 5.833   13.00 | 8.833   13.00 | 11.83
13.00
      2.917    6.00 | 5.917   13.00 | 8.917   13.00 | 11.92
13.00
```

```
          3.000    6.00 | 6.000   13.00 | 9.000   13.00 | 12.00
13.00

    Max.Eff.Inten.(mm/hr)=      53.00        61.39
           over (min)        5.00        10.00
    Storage Coeff.  (min)=       1.42 (ii)    7.08 (ii)
    Unit Hyd. Tpeak (min)=       5.00        10.00
    Unit Hyd. peak  (cms)=       0.33        0.14
                                        *TOTALS*
    PEAK FLOW       (cms)=       0.02        0.02         0.036
(iii)
    TIME TO PEAK    (hrs)=       9.42        10.00        10.00
    RUNOFF VOLUME   (mm)=     211.00       154.27
180.92
    TOTAL RAINFALL  (mm)=     212.00       212.00
212.00
    RUNOFF COEFFICIENT  =       1.00        0.73
0.85

***** WARNING: STORAGE COEFF. IS SMALLER THAN
TIME STEP!

      (i) CN PROCEDURE SELECTED FOR PERVIOUS
LOSSES:
          CN*  =  73.0    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.

--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0002)|
| Inlet Cap.= 0.060|
| #of Inlets=     1|
| Total(cms)=  0.1|     AREA     QPEAK     TPEAK     R.V.
--------------------      (ha)     (cms)     (hrs)     (mm)
    TOTAL HYD.(ID= 1):   0.26      0.04      10.00  180.92

================================================
=======
    MAJOR SYS.(ID= 2):   0.00      0.00      0.00    0.00
    MINOR SYS.(ID= 3):   0.26      0.04      10.00  180.92

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   0.34
|ID= 1 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=
1.00
---------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.14         0.20
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      10.00        20.00
    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    6.00 | 3.083   13.00 | 6.083   23.00 |  9.08
53.00
          0.167    6.00 | 3.167   13.00 | 6.167   23.00 |  9.17
53.00
          0.250    6.00 | 3.250   13.00 | 6.250   23.00 |  9.25
53.00
          0.333    6.00 | 3.333   13.00 | 6.333   23.00 |  9.33
53.00
          0.417    6.00 | 3.417   13.00 | 6.417   23.00 |  9.42
53.00
          0.500    6.00 | 3.500   13.00 | 6.500   23.00 |  9.50
53.00
          0.583    6.00 | 3.583   13.00 | 6.583   23.00 |  9.58
53.00
          0.667    6.00 | 3.667   13.00 | 6.667   23.00 |  9.67
53.00
          0.750    6.00 | 3.750   13.00 | 6.750   23.00 |  9.75
53.00
          0.833    6.00 | 3.833   13.00 | 6.833   23.00 |  9.83
53.00
          0.917    6.00 | 3.917   13.00 | 6.917   23.00 |  9.92
53.00
          1.000    6.00 | 4.000   13.00 | 7.000   23.00 | 10.00
53.00
          1.083    4.00 | 4.083   17.00 | 7.083   13.00 | 10.08
38.00
          1.167    4.00 | 4.167   17.00 | 7.167   13.00 | 10.17
38.00
          1.250    4.00 | 4.250   17.00 | 7.250   13.00 | 10.25
38.00
          1.333    4.00 | 4.333   17.00 | 7.333   13.00 | 10.33
38.00
          1.417    4.00 | 4.417   17.00 | 7.417   13.00 | 10.42
38.00
          1.500    4.00 | 4.500   17.00 | 7.500   13.00 | 10.50
38.00
          1.583    4.00 | 4.583   17.00 | 7.583   13.00 | 10.58
38.00
          1.667    4.00 | 4.667   17.00 | 7.667   13.00 | 10.67
38.00
          1.750    4.00 | 4.750   17.00 | 7.750   13.00 | 10.75
38.00
          1.833    4.00 | 4.833   17.00 | 7.833   13.00 | 10.83
38.00
          1.917    4.00 | 4.917   17.00 | 7.917   13.00 | 10.92
38.00
          2.000    4.00 | 5.000   17.00 | 8.000   13.00 | 11.00
38.00
          2.083    6.00 | 5.083   13.00 | 8.083   13.00 | 11.08
13.00
          2.167    6.00 | 5.167   13.00 | 8.167   13.00 | 11.17
13.00
          2.250    6.00 | 5.250   13.00 | 8.250   13.00 | 11.25
13.00
          2.333    6.00 | 5.333   13.00 | 8.333   13.00 | 11.33
13.00
          2.417    6.00 | 5.417   13.00 | 8.417   13.00 | 11.42
13.00
          2.500    6.00 | 5.500   13.00 | 8.500   13.00 | 11.50
13.00
          2.583    6.00 | 5.583   13.00 | 8.583   13.00 | 11.58
13.00
          2.667    6.00 | 5.667   13.00 | 8.667   13.00 | 11.67
13.00
          2.750    6.00 | 5.750   13.00 | 8.750   13.00 | 11.75
13.00
          2.833    6.00 | 5.833   13.00 | 8.833   13.00 | 11.83
13.00
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```
          2.917    6.00 | 5.917   13.00 | 8.917   13.00 | 11.92
13.00
          3.000    6.00 | 6.000   13.00 | 9.000   13.00 | 12.00
13.00

    Max.Eff.Inten.(mm/hr)=      53.00        80.57
            over (min)        5.00        10.00
    Storage Coeff.  (min)=       0.67 (ii)    5.75 (ii)
    Unit Hyd. Tpeak (min)=       5.00        10.00
    Unit Hyd. peak  (cms)=       0.34        0.15
                                      *TOTALS*
    PEAK FLOW       (cms)=       0.00        0.05         0.046
(iii)
    TIME TO PEAK    (hrs)=       9.25        10.00        10.00
    RUNOFF VOLUME    (mm)=     211.00       162.44
162.91
    TOTAL RAINFALL   (mm)=     212.00       212.00
212.00
    RUNOFF COEFFICIENT   =       1.00        0.77
0.77

***** 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*  =  72.0    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 (  0208)|   Area    (ha)=   1.31
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=
1.00
--------------------
                         IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.65         0.65
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00        20.00
    Length           (m)=     130.00        35.00
    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    6.00 | 3.083   13.00 | 6.083   23.00 |  9.08
53.00
          0.167    6.00 | 3.167   13.00 | 6.167   23.00 |  9.17
53.00
          0.250    6.00 | 3.250   13.00 | 6.250   23.00 |  9.25
53.00
          0.333    6.00 | 3.333   13.00 | 6.333   23.00 |  9.33
53.00
          0.417    6.00 | 3.417   13.00 | 6.417   23.00 |  9.42
53.00
          0.500    6.00 | 3.500   13.00 | 6.500   23.00 |  9.50
53.00
          0.583    6.00 | 3.583   13.00 | 6.583   23.00 |  9.58
53.00
          0.667    6.00 | 3.667   13.00 | 6.667   23.00 |  9.67
53.00
          0.750    6.00 | 3.750   13.00 | 6.750   23.00 |  9.75
53.00
          0.833    6.00 | 3.833   13.00 | 6.833   23.00 |  9.83
53.00
          0.917    6.00 | 3.917   13.00 | 6.917   23.00 |  9.92
53.00
          1.000    6.00 | 4.000   13.00 | 7.000   23.00 | 10.00
53.00
          1.083    4.00 | 4.083   17.00 | 7.083   13.00 | 10.08
38.00
          1.167    4.00 | 4.167   17.00 | 7.167   13.00 | 10.17
38.00
          1.250    4.00 | 4.250   17.00 | 7.250   13.00 | 10.25
38.00
          1.333    4.00 | 4.333   17.00 | 7.333   13.00 | 10.33
38.00
          1.417    4.00 | 4.417   17.00 | 7.417   13.00 | 10.42
38.00
          1.500    4.00 | 4.500   17.00 | 7.500   13.00 | 10.50
38.00
          1.583    4.00 | 4.583   17.00 | 7.583   13.00 | 10.58
38.00
          1.667    4.00 | 4.667   17.00 | 7.667   13.00 | 10.67
38.00
          1.750    4.00 | 4.750   17.00 | 7.750   13.00 | 10.75
38.00
          1.833    4.00 | 4.833   17.00 | 7.833   13.00 | 10.83
38.00
          1.917    4.00 | 4.917   17.00 | 7.917   13.00 | 10.92
38.00
          2.000    4.00 | 5.000   17.00 | 8.000   13.00 | 11.00
38.00
          2.083    6.00 | 5.083   13.00 | 8.083   13.00 | 11.08
13.00
          2.167    6.00 | 5.167   13.00 | 8.167   13.00 | 11.17
13.00
          2.250    6.00 | 5.250   13.00 | 8.250   13.00 | 11.25
13.00
          2.333    6.00 | 5.333   13.00 | 8.333   13.00 | 11.33
13.00
          2.417    6.00 | 5.417   13.00 | 8.417   13.00 | 11.42
13.00
          2.500    6.00 | 5.500   13.00 | 8.500   13.00 | 11.50
13.00
          2.583    6.00 | 5.583   13.00 | 8.583   13.00 | 11.58
13.00
          2.667    6.00 | 5.667   13.00 | 8.667   13.00 | 11.67
13.00
          2.750    6.00 | 5.750   13.00 | 8.750   13.00 | 11.75
13.00
          2.833    6.00 | 5.833   13.00 | 8.833   13.00 | 11.83
13.00
          2.917    6.00 | 5.917   13.00 | 8.917   13.00 | 11.92
13.00
          3.000    6.00 | 6.000   13.00 | 9.000   13.00 | 12.00
13.00

    Max.Eff.Inten.(mm/hr)=      53.00        98.18
            over (min)        5.00        10.00
    Storage Coeff.  (min)=       3.13 (ii)    6.42 (ii)
    Unit Hyd. Tpeak (min)=       5.00        10.00
    Unit Hyd. peak  (cms)=       0.27        0.14
                                      *TOTALS*
```

```
    PEAK FLOW      (cms)=      0.00         0.18         0.180
(iii)
    TIME TO PEAK   (hrs)=      9.58        10.00         10.00
    RUNOFF VOLUME  (mm)=     211.00       167.56
167.99
    TOTAL RAINFALL (mm)=     212.00       212.00
212.00
    RUNOFF COEFFICIENT  =      1.00         0.79
0.79

***** 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*  =  71.0    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):    18.80   2.488    10.00   174.13
     + ID2= 2 (  0002):     0.26   0.036    10.00   180.92

==============================================
======
       ID = 3 (  0003):    19.06   2.524    10.00   174.22

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|  3 +  2 =  1   |       AREA    QPEAK    TPEAK     R.V.
---------------------       (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0003):    19.06   2.524    10.00   174.22
     + ID2= 2 (  0201):     0.34   0.046    10.00   162.91

==============================================
======
       ID = 1 (  0003):    19.40   2.570    10.00   174.03

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|  1 +  2 =  3   |       AREA    QPEAK    TPEAK     R.V.
---------------------       (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0003):    19.40   2.570    10.00   174.03
     + ID2= 2 (  0208):     1.31   0.180    10.00   167.99

==============================================
======
       ID = 3 (  0003):    20.71   2.750    10.00   173.64

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0004)|    OVERFLOW IS ON
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |    OUTFLOW    STORAGE   | OUTFLOW
STORAGE
---------------------      (cms)     (ha.m.)  |  (cms)     (ha.m.)
    **** WARNING : FIRST OUTFLOW IS NOT ZERO.
                   0.0070    0.0461  |  0.9620     0.6177
                   0.0170    0.0942  |  1.0060     0.6862
                   0.0220    0.1442  |  1.0480     0.7567
                   0.0270    0.1961  |  1.0880     0.8292
                   0.0310    0.2501  |  1.1270     0.9036
                   0.0340    0.3061  |  1.1650     0.9800
                   0.1970    0.3642  |  1.2010     1.0583
                   0.5080    0.4243  |  1.2370     1.1388
                   0.8680    0.4866  |  1.2710     1.2212
                   0.9160    0.5509  |  1.3050     1.3058

                        AREA     QPEAK     TPEAK      R.V.
                        (ha)     (cms)     (hrs)      (mm)
  INFLOW : ID= 2 (  0003)     20.710      2.750     10.00
173.64
  OUTFLOW: ID= 1 (  0004)     20.393      1.304     11.17
176.27
  OVERFLOW:ID= 3 (  0003)      0.317      0.805     11.00
176.27

            TOTAL NUMBER OF SIMULATION OVERFLOW
=    0
            CUMULATIVE TIME OF OVERFLOW  (HOURS)
= 0.00
            PERCENTAGE OF TIME OVERFLOWING   (%)
= 0.00

            PEAK   FLOW   REDUCTION [Qout/Qin](%)=
47.43
            TIME SHIFT OF PEAK FLOW        (min)= 70.00
            MAXIMUM  STORAGE   USED        (ha.m.)=
1.3058

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  2021)|  Area    (ha)=   0.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  51.00   Dir. Conn.(%)=
41.00
---------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.22         0.21
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      50.00        20.00
    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    6.00 | 3.083   13.00 | 6.083   23.00 |  9.08
53.00
           0.167    6.00 | 3.167   13.00 | 6.167   23.00 |  9.17
53.00
           0.250    6.00 | 3.250   13.00 | 6.250   23.00 |  9.25
53.00
```

```
          0.333   6.00 | 3.333   13.00 | 6.333   23.00 |  9.33
53.00
          0.417   6.00 | 3.417   13.00 | 6.417   23.00 |  9.42
53.00
          0.500   6.00 | 3.500   13.00 | 6.500   23.00 |  9.50
53.00
          0.583   6.00 | 3.583   13.00 | 6.583   23.00 |  9.58
53.00
          0.667   6.00 | 3.667   13.00 | 6.667   23.00 |  9.67
53.00
          0.750   6.00 | 3.750   13.00 | 6.750   23.00 |  9.75
53.00
          0.833   6.00 | 3.833   13.00 | 6.833   23.00 |  9.83
53.00
          0.917   6.00 | 3.917   13.00 | 6.917   23.00 |  9.92
53.00
          1.000   6.00 | 4.000   13.00 | 7.000   23.00 | 10.00
53.00
          1.083   4.00 | 4.083   17.00 | 7.083   13.00 | 10.08
38.00
          1.167   4.00 | 4.167   17.00 | 7.167   13.00 | 10.17
38.00
          1.250   4.00 | 4.250   17.00 | 7.250   13.00 | 10.25
38.00
          1.333   4.00 | 4.333   17.00 | 7.333   13.00 | 10.33
38.00
          1.417   4.00 | 4.417   17.00 | 7.417   13.00 | 10.42
38.00
          1.500   4.00 | 4.500   17.00 | 7.500   13.00 | 10.50
38.00
          1.583   4.00 | 4.583   17.00 | 7.583   13.00 | 10.58
38.00
          1.667   4.00 | 4.667   17.00 | 7.667   13.00 | 10.67
38.00
          1.750   4.00 | 4.750   17.00 | 7.750   13.00 | 10.75
38.00
          1.833   4.00 | 4.833   17.00 | 7.833   13.00 | 10.83
38.00
          1.917   4.00 | 4.917   17.00 | 7.917   13.00 | 10.92
38.00
          2.000   4.00 | 5.000   17.00 | 8.000   13.00 | 11.00
38.00
          2.083   6.00 | 5.083   13.00 | 8.083   13.00 | 11.08
13.00
          2.167   6.00 | 5.167   13.00 | 8.167   13.00 | 11.17
13.00
          2.250   6.00 | 5.250   13.00 | 8.250   13.00 | 11.25
13.00
          2.333   6.00 | 5.333   13.00 | 8.333   13.00 | 11.33
13.00
          2.417   6.00 | 5.417   13.00 | 8.417   13.00 | 11.42
13.00
          2.500   6.00 | 5.500   13.00 | 8.500   13.00 | 11.50
13.00
          2.583   6.00 | 5.583   13.00 | 8.583   13.00 | 11.58
13.00
          2.667   6.00 | 5.667   13.00 | 8.667   13.00 | 11.67
13.00
          2.750   6.00 | 5.750   13.00 | 8.750   13.00 | 11.75
13.00
          2.833   6.00 | 5.833   13.00 | 8.833   13.00 | 11.83
13.00
          2.917   6.00 | 5.917   13.00 | 8.917   13.00 | 11.92
13.00
          3.000   6.00 | 6.000   13.00 | 9.000   13.00 | 12.00
13.00

    Max.Eff.Inten.(mm/hr)=      53.00        56.98
              over (min)        5.00        10.00
    Storage Coeff.  (min)=      1.76 (ii)    7.60 (ii)
    Unit Hyd. Tpeak (min)=      5.00        10.00
    Unit Hyd. peak  (cms)=      0.32        0.13
                                    *TOTALS*
    PEAK FLOW      (cms)=       0.03        0.03         0.059
(iii)
    TIME TO PEAK    (hrs)=      9.50        10.00        10.00
    RUNOFF VOLUME   (mm)=     211.00       153.21
176.90
    TOTAL RAINFALL  (mm)=     212.00       212.00
212.00
    RUNOFF COEFFICIENT  =       1.00        0.72
0.83

***** WARNING: STORAGE COEFF. IS SMALLER THAN
TIME STEP!

      (i) CN PROCEDURE SELECTED FOR PERVIOUS
LOSSES:
           CN*  =  74.0    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 (  0203)|   Area    (ha)=   0.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  65.00   Dir. Conn.(%)=
1.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.28         0.15
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       2.00         2.00
    Length           (m)=      20.00       157.00
    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    6.00 | 3.083   13.00 | 6.083   23.00 |  9.08
53.00
          0.167    6.00 | 3.167   13.00 | 6.167   23.00 |  9.17
53.00
          0.250    6.00 | 3.250   13.00 | 6.250   23.00 |  9.25
53.00
          0.333    6.00 | 3.333   13.00 | 6.333   23.00 |  9.33
53.00
          0.417    6.00 | 3.417   13.00 | 6.417   23.00 |  9.42
53.00
          0.500    6.00 | 3.500   13.00 | 6.500   23.00 |  9.50
53.00
          0.583    6.00 | 3.583   13.00 | 6.583   23.00 |  9.58
53.00
          0.667    6.00 | 3.667   13.00 | 6.667   23.00 |  9.67
53.00
          0.750    6.00 | 3.750   13.00 | 6.750   23.00 |  9.75
53.00
          0.833    6.00 | 3.833   13.00 | 6.833   23.00 |  9.83
53.00
          0.917    6.00 | 3.917   13.00 | 6.917   23.00 |  9.92
53.00
```

```
          1.000    6.00 | 4.000   13.00 | 7.000   23.00 | 10.00
53.00
          1.083    4.00 | 4.083   17.00 | 7.083   13.00 | 10.08
38.00
          1.167    4.00 | 4.167   17.00 | 7.167   13.00 | 10.17
38.00
          1.250    4.00 | 4.250   17.00 | 7.250   13.00 | 10.25
38.00
          1.333    4.00 | 4.333   17.00 | 7.333   13.00 | 10.33
38.00
          1.417    4.00 | 4.417   17.00 | 7.417   13.00 | 10.42
38.00
          1.500    4.00 | 4.500   17.00 | 7.500   13.00 | 10.50
38.00
          1.583    4.00 | 4.583   17.00 | 7.583   13.00 | 10.58
38.00
          1.667    4.00 | 4.667   17.00 | 7.667   13.00 | 10.67
38.00
          1.750    4.00 | 4.750   17.00 | 7.750   13.00 | 10.75
38.00
          1.833    4.00 | 4.833   17.00 | 7.833   13.00 | 10.83
38.00
          1.917    4.00 | 4.917   17.00 | 7.917   13.00 | 10.92
38.00
          2.000    4.00 | 5.000   17.00 | 8.000   13.00 | 11.00
38.00
          2.083    6.00 | 5.083   13.00 | 8.083   13.00 | 11.08
13.00
          2.167    6.00 | 5.167   13.00 | 8.167   13.00 | 11.17
13.00
          2.250    6.00 | 5.250   13.00 | 8.250   13.00 | 11.25
13.00
          2.333    6.00 | 5.333   13.00 | 8.333   13.00 | 11.33
13.00
          2.417    6.00 | 5.417   13.00 | 8.417   13.00 | 11.42
13.00
          2.500    6.00 | 5.500   13.00 | 8.500   13.00 | 11.50
13.00
          2.583    6.00 | 5.583   13.00 | 8.583   13.00 | 11.58
13.00
          2.667    6.00 | 5.667   13.00 | 8.667   13.00 | 11.67
13.00
          2.750    6.00 | 5.750   13.00 | 8.750   13.00 | 11.75
13.00
          2.833    6.00 | 5.833   13.00 | 8.833   13.00 | 11.83
13.00
          2.917    6.00 | 5.917   13.00 | 8.917   13.00 | 11.92
13.00
          3.000    6.00 | 6.000   13.00 | 9.000   13.00 | 12.00
13.00

    Max.Eff.Inten.(mm/hr)=      53.00       145.51
             over (min)        5.00        15.00
    Storage Coeff.  (min)=       1.02 (ii)   14.82 (ii)
    Unit Hyd. Tpeak (min)=       5.00        15.00
    Unit Hyd. peak  (cms)=       0.34        0.08
                                    *TOTALS*
    PEAK FLOW       (cms)=       0.00        0.06         0.060
(iii)
    TIME TO PEAK    (hrs)=       9.25        10.00        10.00
    RUNOFF VOLUME    (mm)=     211.00      182.80
183.06
    TOTAL RAINFALL   (mm)=     212.00      212.00
212.00
    RUNOFF COEFFICIENT   =       1.00        0.86
0.86

***** 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*  =  74.0    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)
*** W A R N I N G :  HYDROGRAPH   0002 <ID= 1> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0005 =
HYDROGRAPH 2021
       ID1= 1 (  0002):     0.00   0.000     0.00     0.00
     + ID2= 2 (  2021):     0.43   0.059    10.00   176.90

================================================
======
       ID = 3 (  0005):     0.43   0.059    10.00   176.90

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0005)|
|   3 +  2 =  1    |        AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0005):     0.43   0.059    10.00   176.90
     + ID2= 2 (  0203):     0.43   0.060    10.00   183.06

================================================
======
       ID = 1 (  0005):     0.86   0.119    10.00   179.98

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0005):     0.86   0.119    10.00   179.98
     + ID2= 2 (  0004):    20.39   1.304    11.17   176.27

================================================
======
       ID = 3 (  0005):    21.25   1.384    11.00   176.42

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS
IF ANY.
--------------------------------------------------------------------------------

 FINISH
================================================
================================================
===============
```

Monthly Water Balance Analysis - Main Site

161413217 - Strohvest Ontario

Pre-Development

Main Site Area (ha)	16.50

Land Description Factors	
Topography	0.15
Soils	0.30
Cover[1]	0.05
Sum (Infiltration Factor)	0.50
Soil Moisture Capacity (mm)[2]	75
Site Area	16.5
Percentage of Total Site Area	100%

100% **OK**

Land Cover Descriptions

Shallow rooted crops

Topsoil: Sandy silt

Glacial till with non-cohesive sands and silts

Relatively flat with gentle undulating rolling hill features

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Comment
Climate Data (Data from Waterloo Wellington A - Climate Normals from 1981-2010)														
Average Daily Temperature (°C)	-6.5	-5.5	-1.0	6.2	12.5	17.6	20.0	18.9	14.5	8.2	2.5	-3.3		Daily average temperature in each month
Precipitation (mm)	65.2	54.9	61.0	74.5	82.3	82.4	98.6	83.9	87.8	67.4	87.1	71.2	**916.3**	
Evapotranspiration Analysis														
Saturation Vapour Pressure (mb)	3.75	4.05	5.68	9.49	14.52	20.17	23.45	21.89	16.55	10.89	7.32	4.79		
PET (Malstrom, 1969) (mm/month)	0.00	0.00	0.00	38.82	59.39	82.51	95.89	89.54	67.67	44.54	29.93	0.00	**508.3**	
Infiltration - PET (mm)	65.20	54.90	61.00	35.68	22.91	-0.11	2.71	-5.64	20.13	22.86	57.17	71.20		
Weighted Soil Storage Capacity (mm)	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00		
Actual Soil Moisture (mm)	75.00	75.00	75.00	75.00	75.00	74.89	75.00	69.36	75.00	75.00	75.00	75.00		Assume April soil moisture is at max capacity (i.e., saturated)
Change in Soil Moisture (mm)	0.00	0.00	0.00	0.00	0.00	-0.11	0.11	-5.64	5.64	0.00	0.00	0.00		
Actual Evapotranspiration (mm)	**0.00**	**0.00**	**0.00**	**38.82**	**59.39**	**82.51**	**95.89**	**89.54**	**67.67**	**44.54**	**29.93**	**0.00**	**508.3**	
Recharge/Runoff Analysis														
Surplus	65.2	54.9	61.0	35.7	22.9	0.0	2.6	0.0	14.5	22.9	57.2	71.2	**408.0**	
Deficit	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**	
Weighted Infiltration Factor	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50		Based on MOE SWM Manual (2003)
Runoff (mm)	**0.00**	**0.00**	**0.00**	**143.99**	**11.45**	**0.00**	**1.30**	**0.00**	**7.24**	**11.43**	**28.59**	**0.00**	**204.0**	Assume no runoff in sub-zero months
Recharge (mm)	**0.00**	**0.00**	**0.00**	**143.99**	**11.45**	**0.00**	**1.30**	**0.00**	**7.24**	**11.43**	**28.59**	**0.00**	**204.0**	
													0	Balance Check

Volume-Based Balance (m^3)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Precipitation	10,758	9,059	10,065	12,293	13,580	13,596	16,269	13,844	14,487	11,121	14,372	11,748	151,190	916 mm/year
Evapotranspiration	0	0	0	6,405	9,800	13,615	15,822	14,774	11,166	7,349	4,938	0	83,869	508 mm/year
Runoff	0	0	0	23,758	1,890	0	214	0	1,195	1,886	4,717	0	33,660	204 mm/year
Groundwater Recharge	0	0	0	23,758	1,890	0	214	0	1,195	1,886	4,717	0	33,660	204 mm/year

Summary of Existing Conditions		
	Volume-Based Balance (m^3)	**mm/year**
Runoff	33,660	204
Groundwater Recharge	33,660	204

Notes:

1 - cover for the whole subject site is agricultural land

2 - soil moisture capacity is based on coverage

Monthly Water Balance Analysis - Main Site
161413217 - Strohvest Ontario
Post-Development

Main Site Area (ha)	16.50
Impervious Cover	60%

Land Description Factors			**Impervious**	**Perm. Pool**
Topography	0.15		-	-
Soils	0.30		-	-
Cover[3]	0.05		-	-
Sum (Infiltration Factor)	0.50		-	-
Soil Moisture Capacity (mm)[2]	75		-	-
Pervious Site Area	6.6		9.45	0.45
Percentage of Total Site Area	40%		57%	3%

100% **OK**

Land Cover Descriptions
Urban lawn
Glacial till with non-cohesive sands and silts
Relatively flat with gentle undulating rolling hill features

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Comment
Climate Data (Data from Waterloo Wellington A - Climate Normals from 1981-2010)														
Average Daily Temperature (°C)	-6.5	-5.5	-1.0	6.2	12.5	17.6	20.0	18.9	14.5	8.2	2.5	-3.3		Daily average temperature in each month
Precipitation (mm)	65.2	54.9	61.0	74.5	82.3	82.4	98.6	83.9	87.8	67.4	87.1	71.2	**916.3**	
Evapotranspiration Analysis														
Saturation Vapour Pressure (mb)	3.75	4.05	5.68	9.49	14.52	20.17	23.45	21.89	16.55	10.89	7.32	4.79		
PET (Malstrom, 1969) (mm/month)	0.00	0.00	0.00	38.82	59.39	82.51	95.89	89.54	67.67	44.54	29.93	0.00	**508.3**	
Infiltration - PET (mm)	65.20	54.90	61.00	35.68	22.91	-0.11	2.71	-5.64	20.13	22.86	57.17	71.20		
Weighted Soil Storage Capacity (mm)	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00		
Actual Soil Moisture (mm)	75.00	75.00	75.00	75.00	75.00	74.89	75.00	69.36	75.00	75.00	75.00	75.00		Assume April soil moisture is at max capacity (i.e., saturated)
Change in Soil Moisture (mm)	0.00	0.00	0.00	0.00	0.00	-0.11	0.11	-5.64	5.64	0.00	0.00	0.00		
Actual Evapotranspiration (mm)	**0.00**	**0.00**	**0.00**	**38.82**	**59.39**	**82.51**	**95.89**	**89.54**	**67.67**	**44.54**	**29.93**	**0.00**	**508.3**	
Recharge/Runoff Analysis - Pervious Areas														
Surplus	65.2	54.9	61.0	35.7	22.9	0.0	2.6	0.0	14.5	22.9	57.2	71.2	**408.0**	
Deficit	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**	
Weighted Infiltration Factor	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50		Based on MOE SWM Manual (2003)
Runoff (mm)	**0.00**	**0.00**	**0.00**	**143.99**	**11.45**	**0.00**	**1.30**	**0.00**	**7.24**	**11.43**	**28.59**	**0.00**	**204.0**	Assume no runoff in sub-zero months
Recharge (mm)	**0.00**	**0.00**	**0.00**	**143.99**	**11.45**	**0.00**	**1.30**	**0.00**	**7.24**	**11.43**	**28.59**	**0.00**	**204.0**	
													0	Balance Check
Pond														
Pond Evaporation (mm)	0.00	0.00	0.00	75.00	105.40	123.00	133.30	108.50	66.00	27.00	0.00	0.00	**638.2**	
Runoff (mm)	0.0	0.0	0.0	251.8	-23.1	-40.6	-34.7	-24.6	21.8	40.4	87.1	0.0	**278.1**	

Volume-Based Balance (m^3)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Precipitation	**10,758**	**9,059**	**10,065**	**12,293**	**13,580**	**13,596**	**16,269**	**13,844**	**14,487**	**11,121**	**14,372**	**11,748**	**151,190**	
Evapotranspiration	0	0	0	2,562	3,920	5,446	6,329	5,910	4,466	2,939	1,975	0	33,548	
Pond Evaporation	0	0	0	339	477	557	603	491	299	122	0	0	2,888	
Total Evap	**0**	**0**	**0**	**2,902**	**4,397**	**6,003**	**6,932**	**6,401**	**4,765**	**3,062**	**1,975**	**0**	**36,436**	221 mm/year
Pervious Runoff	0	0	0	9,503	756	0	86	0	478	754	1,887	0	13,464	82 mm/year
Impervious Runoff	0	0	0	30,874	7,775	7,785	9,315	7,926	8,295	6,368	8,229	0	86,567	525 mm/year
Pond Runoff	0	0	0	1,140	-105	-184	-157	-111	99	183	394	0	1,259	8 mm/year
Total Runoff	**0**	**0**	**0**	**41,517**	**8,427**	**7,601**	**9,244**	**7,815**	**8,871**	**7,305**	**10,510**	**0**	**101,289**	614 mm/year
Groundwater Recharge from Pervious Areas	**0**	**0**	**0**	**9,503**	**756**	**0**	**86**	**0**	**478**	**754**	**1,887**	**0**	**13,464**	82 mm/year
													0	Balance Check

Infiltration Augmentation														
Rooftop Recharge[4]	0	0	0	4,468	1,125	1,127	1,348	1,147	1,200	922	1,191	0	12,529	76 mm/year - Assuming 80% of roof top runoff is captured and infiltrated and the first 25 mm of rainfall accounts for 80% of the annual rainfall volume
Final Recharge	**0**	**0**	**0**	**13,972**	**1,881**	**1,127**	**1,434**	**1,147**	**1,678**	**1,676**	**3,078**	**0**	**25,993**	158 mm/year - Including infiltration from pervious and rooftop areas
Final Runoff	**0**	**0**	**0**	**37,049**	**7,301**	**6,474**	**7,896**	**6,668**	**7,671**	**6,383**	**9,319**	**0**	**88,761**	538 mm/year - assuming infiltration of rooftop areas
Final Recharge Surplus	0	0	0	-9,787	-9	1,127	1,220	1,147	483	-210	-1,639	0	-7,667	-46 mm/year
Final Runoff Surplus	0	0	0	13,290	5,411	6,474	7,681	6,668	6,476	4,497	4,602	0	55,101	334 mm/year

Summary of Proposed Conditions		
Without Any Infiltration Augmentation	**Volume-Based Balance (m^3)**	**mm/year**
Runoff	101,289	614
Groundwater Recharge	13,464	82
Runoff Surplus	67,629	410
Recharge Deficit	-20,196	-122
With Infiltration Augmentation	**Volume-Based Balance (m^3)**	**mm/year**
Runoff	88,761	538
Groundwater Recharge	25,993	158
Runoff Surplus	55,101	334
Recharge Deficit	-7,667	-46

Notes:
1 - cover for the whole subject site is agricultural land
2 - soil moisture capacity is based on coverage
3 - cover is considered to be fully developed as the northern portion of the subject site is planned to be developed in future (and is modeled as a developed area)
4 - The residential lots and blocks are assumed to have an average rooftop coverage of 40%; 80% of rooftop reaches infiltration and the 25 mm rainfall event accounts for 80% of the average annual rainfall.

Cross-section A-A

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.005 m/m
Discharge	1.563 m³/s

Section Definitions

Station (m)	Elevation (m)
0+00.00	356.021
0+01.80	355.985
0+02.75	355.947
0+05.25	355.847
0+05.26	355.847
0+05.28	355.847
0+05.33	355.833
0+05.48	355.797
0+05.67	355.815
0+05.75	355.822
0+06.91	355.845
0+10.00	355.907
0+11.16	355.883
0+14.25	355.822
0+14.45	355.803
0+14.52	355.797
0+14.58	355.810
0+14.72	355.847
0+14.73	355.847
0+14.75	355.847
0+15.70	355.884
0+18.20	355.985
0+19.29	356.006
0+19.70	356.015
0+19.78	356.016
0+20.00	356.021

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 356.021)	(0+01.80, 355.985)	0.025
(0+01.80, 355.985)	(0+18.20, 355.985)	0.013
(0+18.20, 355.985)	(0+20.00, 356.021)	0.025

Options	
Current Roughness Weighted Method	Pavlovskii's Method

Cross-section A-A

Options	
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results		
Normal Depth	172.301	mm
Roughness Coefficient	0.013	
Elevation	355.969	m
Elevation Range	355.797 to 356.021	m
Flow Area	1.4	m²
Wetted Perimeter	15.640	m
Hydraulic Radius	90.886	mm
Top Width	15.619	m
Normal Depth	172.301	mm
Critical Depth	182.944	mm
Critical Slope	0.004	m/m
Velocity	1.10	m/s
Velocity Head	0.062	m
Specific Energy	0.234	m
Froude Number	1.164	
Flow Type	Supercritical	

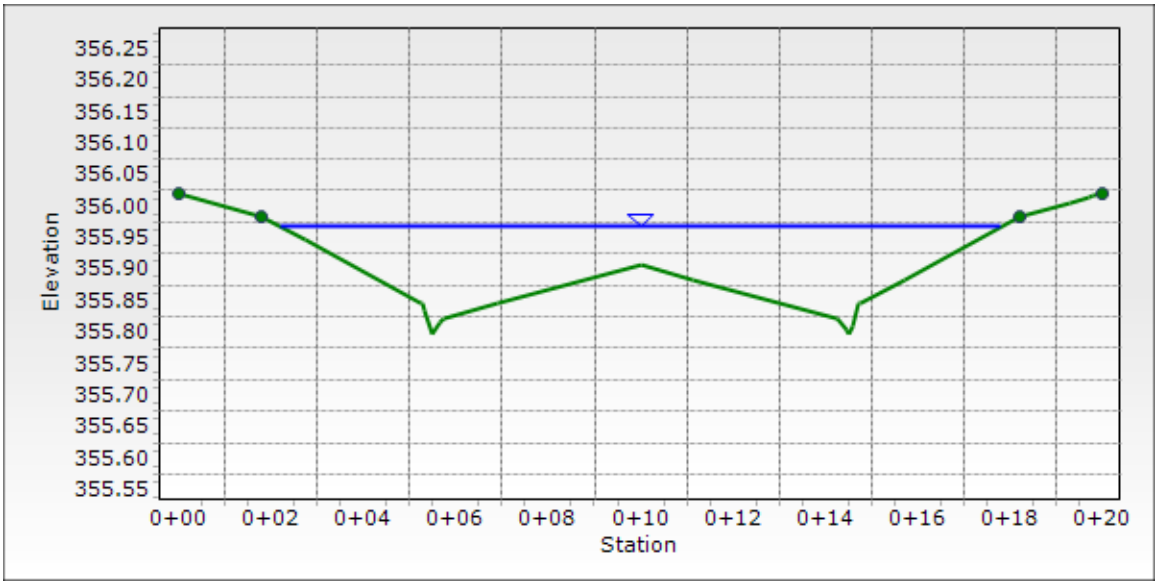
GVF Input Data		
Downstream Depth	0.000	mm
Length	0.000	m
Number Of Steps	0	

GVF Output Data		
Upstream Depth	0.000	mm
Profile Description	N/A	
Profile Headloss	0.000	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	172.301	mm
Critical Depth	182.944	mm
Channel Slope	0.005	m/m
Critical Slope	0.004	m/m

Cross-section for A-A

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.005 m/m
Normal Depth	172.301 mm
Discharge	1.563 m³/s



Cross-section B-B

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.006 m/m
Discharge	1.110 m³/s

Section Definitions

Station (m)	Elevation (m)
0+00.00	355.991
0+00.24	355.986
0+00.30	355.985
0+01.50	355.961
0+01.80	355.955
0+04.57	355.845
0+05.25	355.817
0+05.28	355.817
0+05.31	355.807
0+05.48	355.767
0+05.70	355.787
0+05.75	355.792
0+06.59	355.809
0+10.00	355.877
0+10.84	355.860
0+14.25	355.792
0+14.47	355.792
0+14.53	355.767
0+14.56	355.777
0+14.73	355.817
0+14.75	355.817
0+17.52	355.928
0+18.20	355.955
0+19.40	355.979
0+19.70	355.985
0+19.94	355.990
0+20.00	355.991

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 355.991)	(0+01.80, 355.955)	0.025
(0+01.80, 355.955)	(0+18.20, 355.955)	0.013
(0+18.20, 355.955)	(0+20.00, 355.991)	0.025

Options

Cross-section B-B

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results		
Normal Depth	147.698	mm
Roughness Coefficient	0.013	
Elevation	355.915	m
Elevation Range	355.767 to 355.991	m
Flow Area	1.0	m²
Wetted Perimeter	14.397	m
Hydraulic Radius	72.546	mm
Top Width	14.373	m
Normal Depth	147.698	mm
Critical Depth	160.727	mm
Critical Slope	0.004	m/m
Velocity	1.06	m/s
Velocity Head	0.058	m
Specific Energy	0.205	m
Froude Number	1.259	
Flow Type	Supercritical	

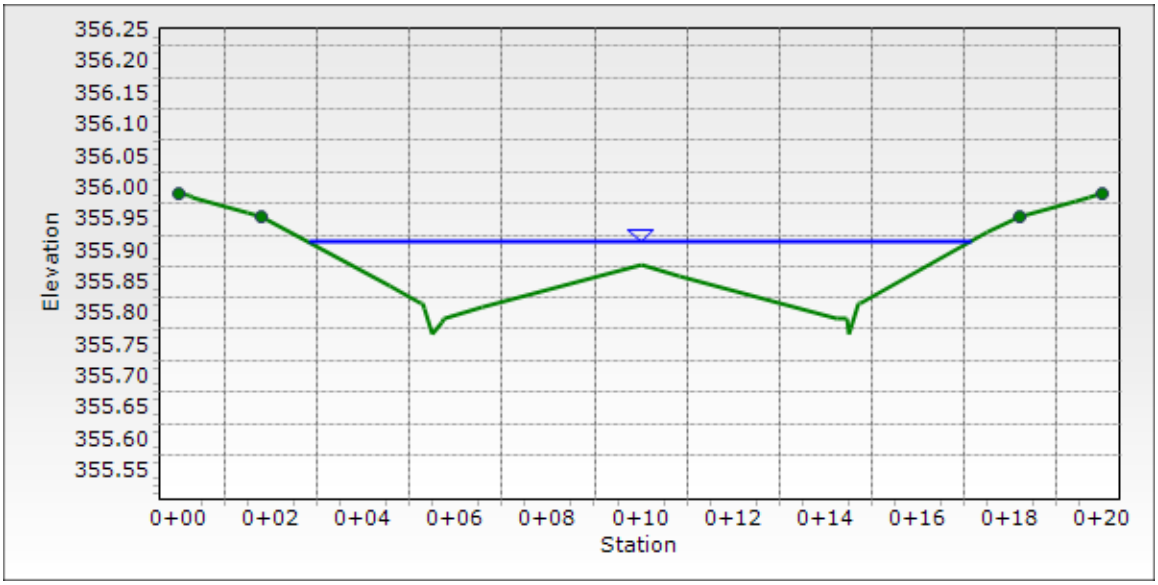
GVF Input Data		
Downstream Depth	0.000	mm
Length	0.000	m
Number Of Steps	0	

GVF Output Data		
Upstream Depth	0.000	mm
Profile Description	N/A	
Profile Headloss	0.000	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	147.698	mm
Critical Depth	160.727	mm
Channel Slope	0.006	m/m
Critical Slope	0.004	m/m

Cross-section for B-B

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.006 m/m
Normal Depth	147.698 mm
Discharge	1.110 m³/s



Cross-section C-C

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.013 m/m
Discharge	2.771 m³/s

Section Definitions

Station (m)	Elevation (m)
0+00.00	355.997
0+01.21	355.977
0+08.76	355.833
0+09.05	355.833
0+10.04	355.834
0+10.60	355.647
0+11.03	355.505
0+12.62	355.505
0+15.03	355.505
0+15.59	355.691
0+16.01	355.834
0+16.58	355.830
0+16.75	355.830
0+17.88	355.824
0+18.28	355.824
0+18.45	355.823
0+18.55	355.824
0+19.51	355.820
0+19.59	355.820
0+25.00	355.804

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 355.997)	(0+10.04, 355.834)	0.025
(0+10.04, 355.834)	(0+16.01, 355.834)	0.013
(0+16.01, 355.834)	(0+25.00, 355.804)	0.025

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Cross-section C-C

Results		
Normal Depth	211.115	mm
Roughness Coefficient	0.013	
Elevation	355.716	m
Elevation Range	355.505 to 355.997	m
Flow Area	1.0	m²
Wetted Perimeter	5.339	m
Hydraulic Radius	183.353	mm
Top Width	5.271	m
Normal Depth	211.115	mm
Critical Depth	365.830	mm
Critical Slope	0.003	m/m
Velocity	2.83	m/s
Velocity Head	0.409	m
Specific Energy	0.620	m
Froude Number	2.097	
Flow Type	Supercritical	

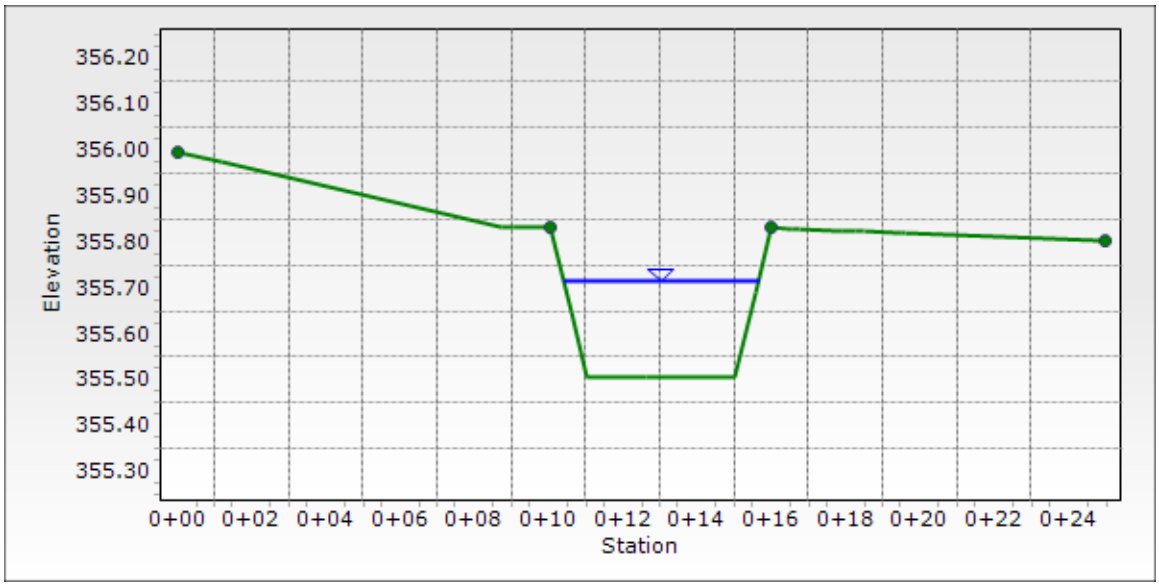
GVF Input Data		
Downstream Depth	0.000	mm
Length	0.000	m
Number Of Steps	0	

GVF Output Data		
Upstream Depth	0.000	mm
Profile Description	N/A	
Profile Headloss	0.000	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	211.115	mm
Critical Depth	365.830	mm
Channel Slope	0.013	m/m
Critical Slope	0.003	m/m

Cross-section for C-C

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.013 m/m
Normal Depth	211.115 mm
Discharge	2.771 m³/s



SPECIAL PROVISIONS – CONSTRUCTION NOTES

THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND, WHERE SHOWN, THE ACCURACY IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL BE INFORMED OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

BENCHMARK / VERTICAL DATUM
ELEVATIONS SHOWN ARE REFERENCED TO THE CANADIAN GEODETIC VERTICAL DATUM OF 1928 (CGVD28:78).
THE BENCHMARK **1234567U890** AT ELEVATION **000.000** WAS USED FOR THIS PROJECT.
BENCHMARK INFORMATION WAS ACQUIRED FROM THE **MNRF COSINE WEB-SITE.**

NOTES:
-ALL ROLL NUMBERS IN WELLESLEY BEGIN WITH 30-24
ie. 010-001-37200 IN FULL IS 30-24-010-001-37200

NOTES:
-ALL ROLL NUMBERS IN WILMOT BEGIN WITH 30-18-090-01
ie. 010-17600 IN FULL IS 30-18-090-010-17600

PLAN LEGEND

- — SMITH DRAIN (1999)
- — WATERSHED
- — SUBWATERSHED
- — PROPOSED WORK OR INCORPORATION
- — EXISTING DRAIN
- — DITCH OR WATERCOURSE
- ACCESS — ACCESS
- Z — DENOTES PROPERTY OWNERSHIP ON BOTH SIDES OF LOT LINE
- (12.8) — APPROXIMATE HECTARES IN WATERSHED
- 5.2 ha. — HECTARES OWNED
- (010-16200) — ASSESSMENT ROLL NUMBER
- — BUSH

NO.	DESCRIPTION	DATE
1	ISSUED FOR APPROVALS	
2	ISSUED FOR REPORT	
3	ISSUED FOR TENDER	
4	ISSUED FOR CONSTRUCTION	
5	AS BUILT	

DESIGNED BY: T.B.J.
CHECKED BY: C.J.M.
DRAWN BY: T.B.J.
CHECKED BY: C.J.M.

DRAFT

0 50 100m
SCALE 1 : 5,000
(ON 11"x17")

PAFF DRAIN

REGION OF WATERLOO — TOWNSHIP OF WELLESLEY

WATERSHED PLAN — APRIL 2024

K. SMART ASSOCIATES LIMITED
CONSULTING ENGINEERS AND PLANNERS
KITCHENER SUDBURY

REVISED:
JOB NUMBER: **23-175**
DRAWING 1 OF

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SPECIAL PROVISIONS – CONSTRUCTION NOTES

THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND, WHERE SHOWN, THE ACCURACY IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL BE INFORMED OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

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ie. 010-001-37200 IN FULL IS 30-24-010-001-37200

NOTES:
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ie. 010-17600 IN FULL IS 30-18-090-010-17600

PLAN LEGEND

- — SMITH DRAIN (1999)
- — WATERSHED
- — SUBWATERSHED
- — PROPOSED WORK OR INCORPORATION
- — EXISTING DRAIN
- — DITCH OR WATERCOURSE
- ACCESS — ACCESS
- Z — DENOTES PROPERTY OWNERSHIP ON BOTH SIDES OF LOT LINE
- (12.8) — APPROXIMATE HECTARES IN WATERSHED
- 5.2 ha. — HECTARES OWNED
- (010-16200) — ASSESSMENT ROLL NUMBER
- — BUSH

NO.	DESCRIPTION	DATE
1	ISSUED FOR APPROVALS	
2	ISSUED FOR REPORT	
3	ISSUED FOR TENDER	
4	ISSUED FOR CONSTRUCTION	
5	AS BUILT	

DESIGNED BY: T.B.J.
CHECKED BY: C.J.M.
DRAWN BY: T.B.J.
CHECKED BY: C.J.M.

DRAFT

0 25 50m
SCALE 1 : 2,500
(ON 11"x17")

PAFF DRAIN

REGION OF WATERLOO — TOWNSHIP OF WELLESLEY

ENLARGEMENT — APRIL 2024

K. SMART ASSOCIATES LIMITED
CONSULTING ENGINEERS AND PLANNERS
KITCHENER SUDBURY

REVISED:
JOB NUMBER: **23-175**
DRAWING
2 OF

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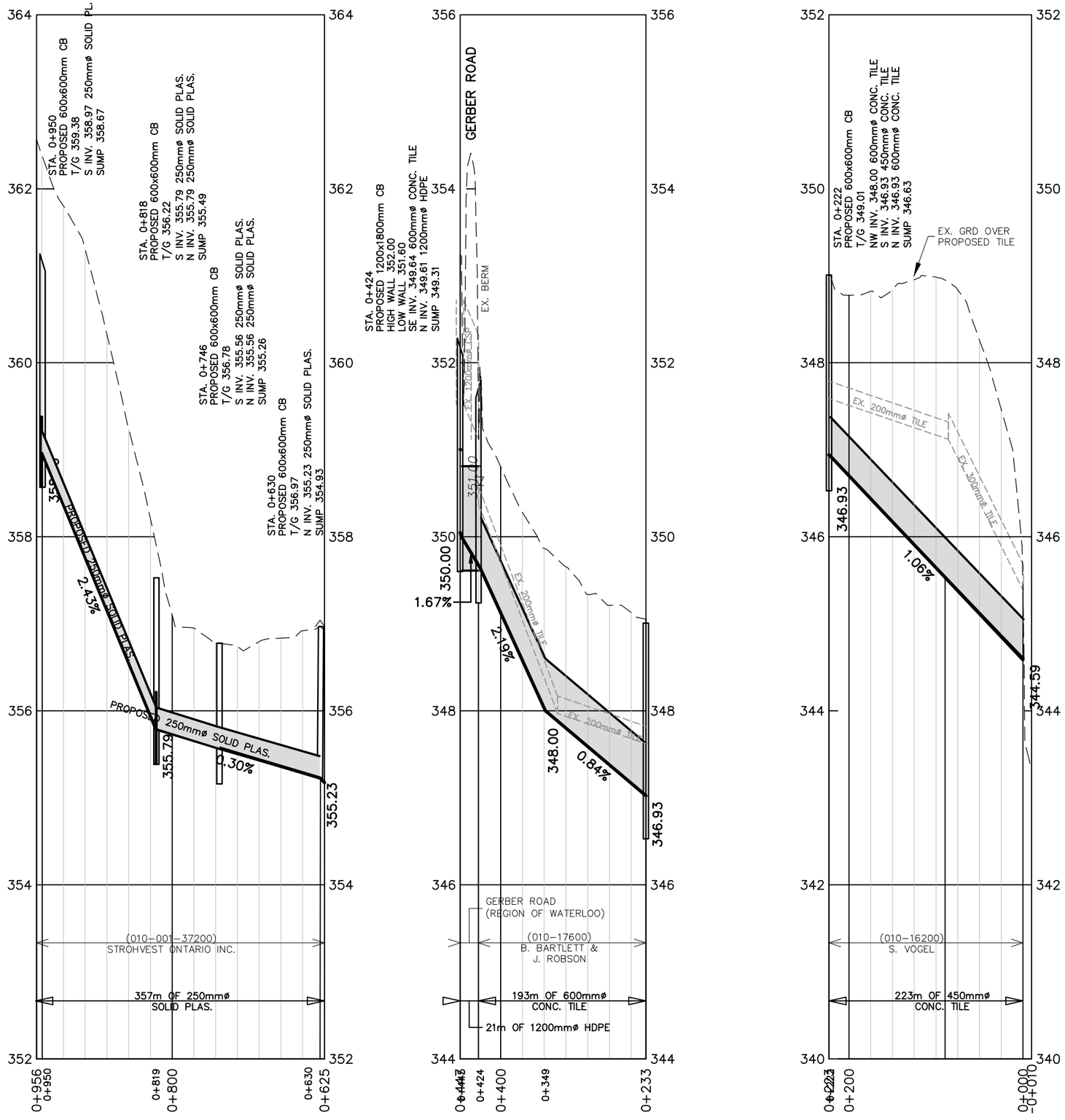

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No.	DESCRIPTION	DATE

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CHECKED BY: T.J.		
DRAWN BY: N.M.B.		
CHECKED BY: T.J.		

PAFF DRAIN

REGION OF WATERLOO — TOWNSHIP OF WELLESLEY

PROFILE

K. SMART ASSOCIATES LIMITED
CONSULTING ENGINEERS AND PLANNERS
KITCHENER SUDBURY

APRIL 2024
JOB NUMBER: 23-175
DRAWING
3 OF

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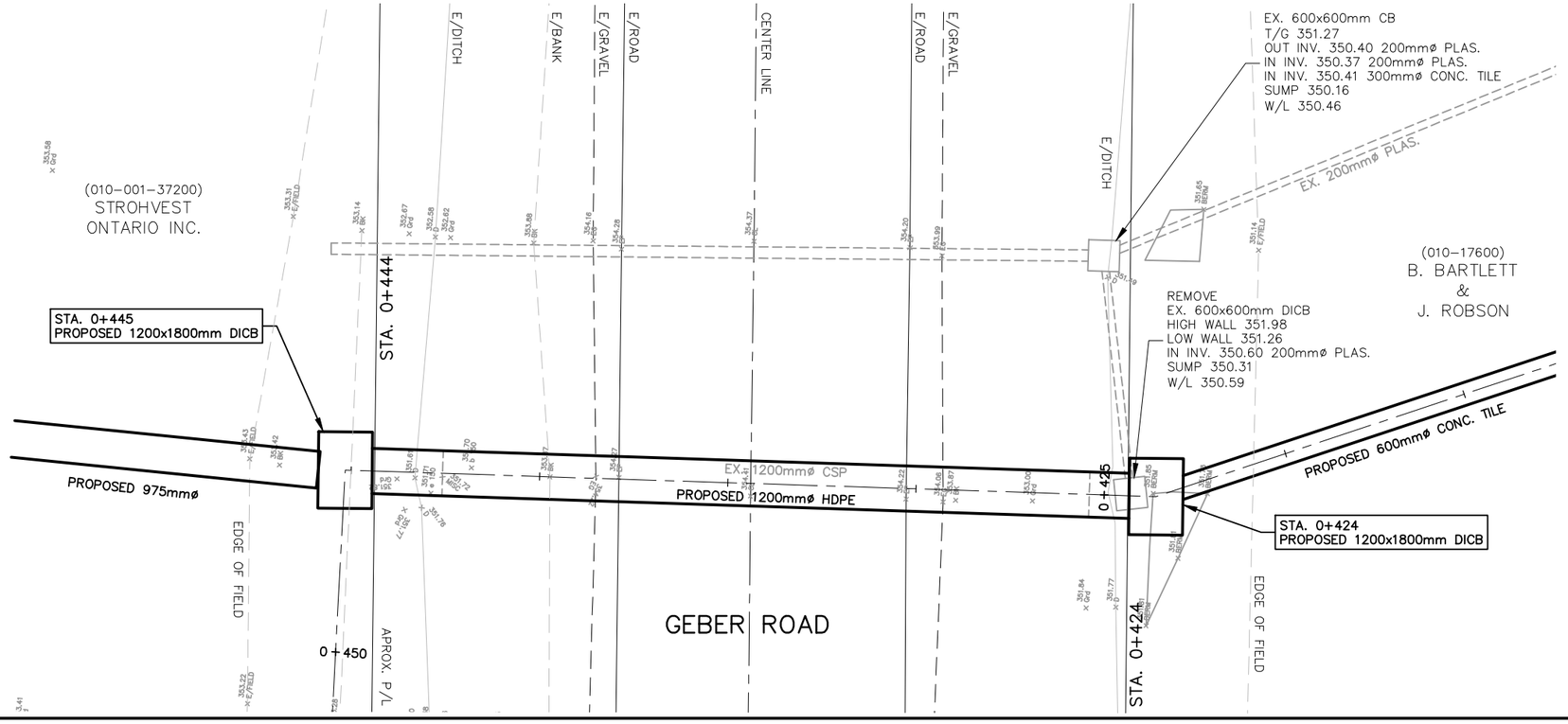

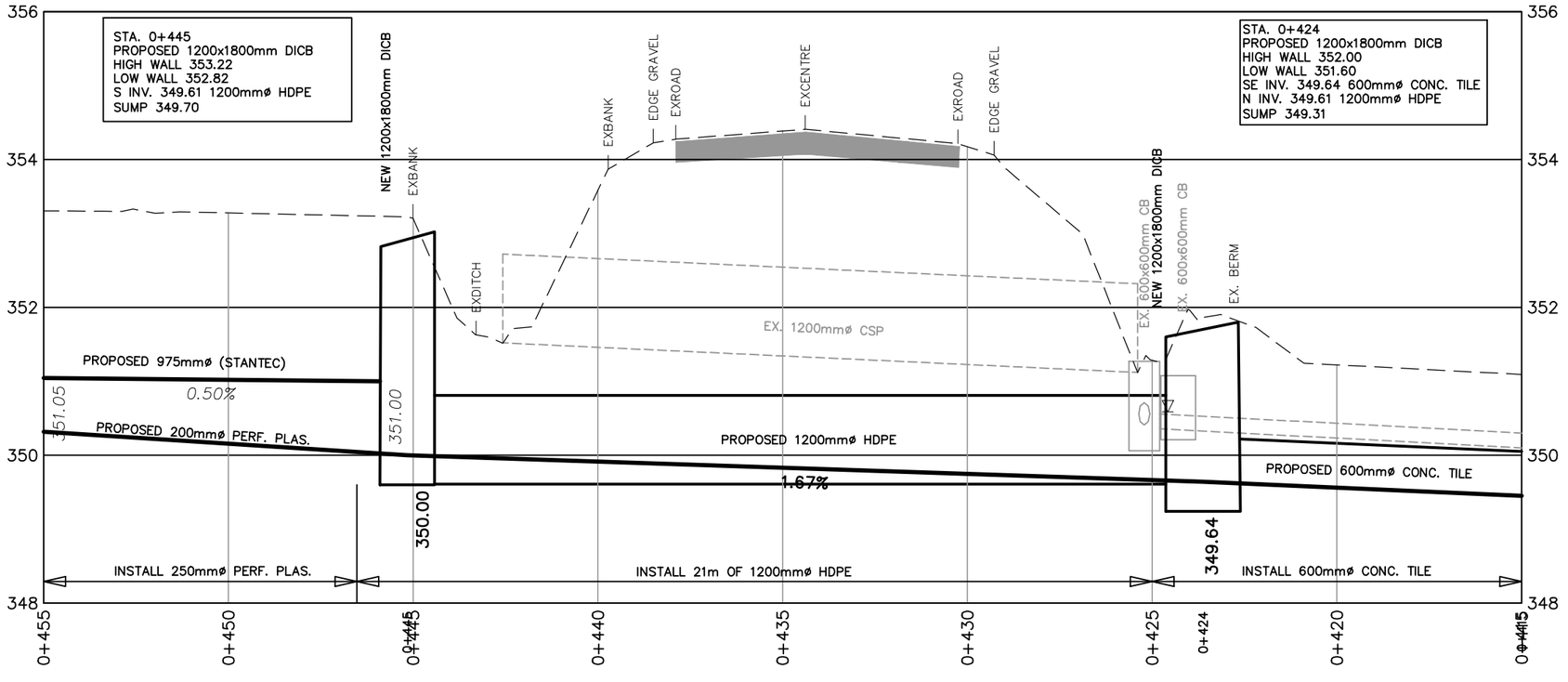

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CHECKED BY: T.J.		
DRAWN BY: N.M.B.		
CHECKED BY: T.J.		

PAFF DRAIN

REGION OF WATERLOO — TOWNSHIP OF WELLESLEY

GEBER ROAD DETAIL

K. SMART ASSOCIATES LIMITED
CONSULTING ENGINEERS AND PLANNERS
KITCHENER SUDBURY

APRIL 2024
JOB NUMBER: 23-175
DRAWING
4 OF

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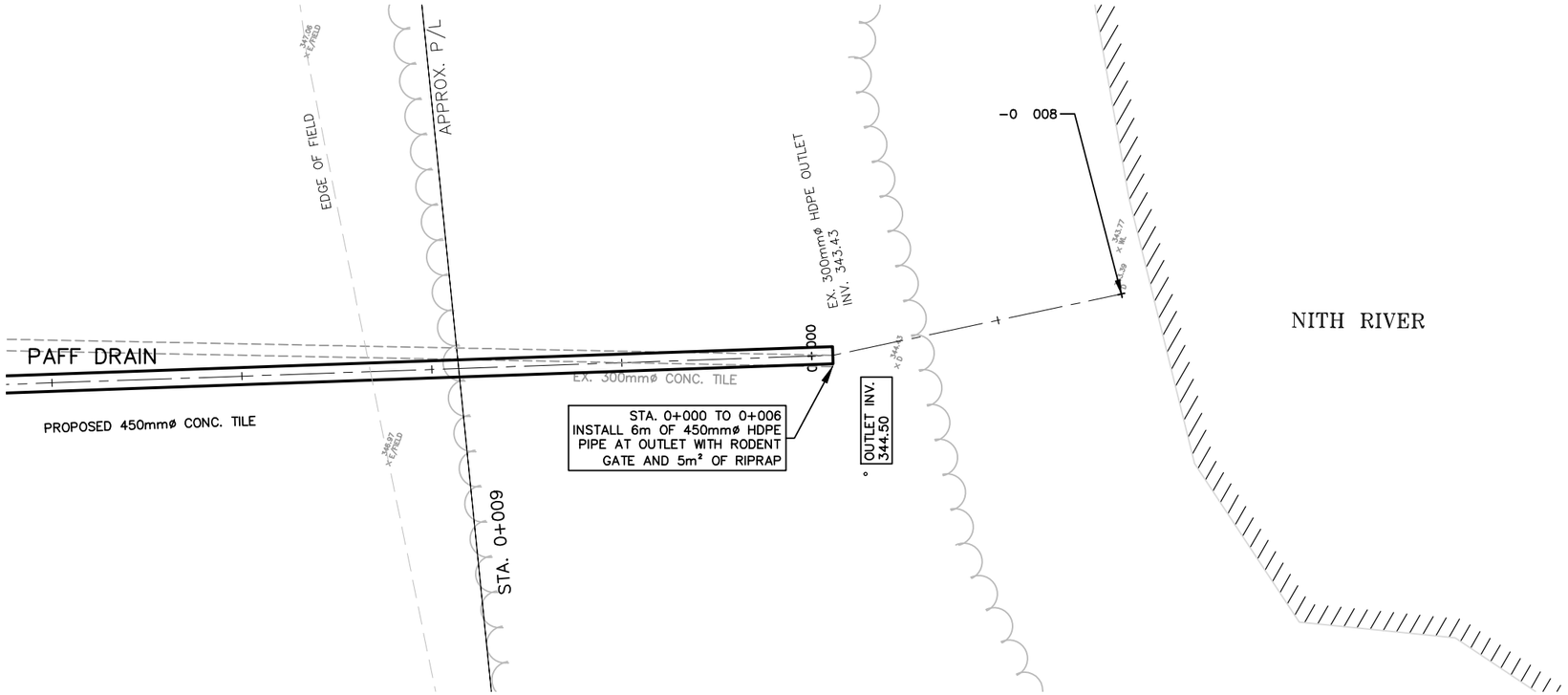

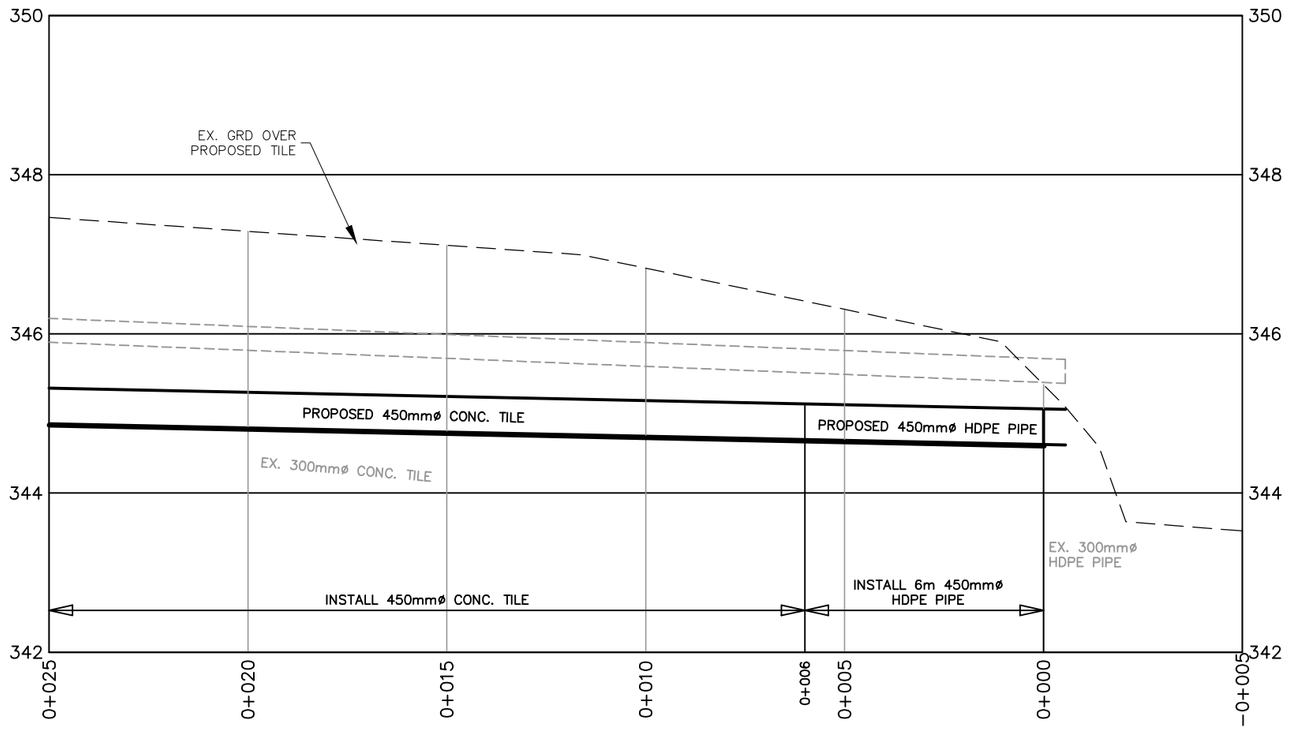

SPECIAL PROVISIONS – CONSTRUCTION NOTES:

No.	DESCRIPTION	DATE

DESIGNED BY: T.J.
CHECKED BY: T.J.
DRAWN BY: N.M.B.
CHECKED BY: T.J.

DRAFT

SCALE
0 1.5 3m
HORZ. 1:150
0 0.5 1m
VERT. 1:75
(ON 11"x17")

PAFF DRAIN

REGION OF WATERLOO — TOWNSHIP OF WELLESLEY

PROFILE

K. SMART ASSOCIATES LIMITED
CONSULTING ENGINEERS AND PLANNERS
KITCHENER SUDBURY

APRIL 2024
JOB NUMBER: 23-175
DRAWING 5 OF

S:\2023\23-175\Drafting\PROFILE 23-175.dwg OUTLET DETAIL 23-Apr-24 8:18:17 AM

APPENDIX G UTILITY PROVIDER CORRESPONDENCE

G.1 ENOVA POWER

G.2 ENBRIDGE

G.3 ROGERS COMMUNICATIONS

From: Cameron Aitkens
To: Lefaive, Joe
Cc: Wes Lesperance
Subject: Re: Strohvest Subdivision
Date: Tuesday, May 7, 2024 3:39:19 PM

> You don't often get email from cameron.aitkens@enovapower.com. Learn why this is important

Hi Joe,

I can confirm there is capacity on the circuit in the area to service the proposed subdivision. When available please submit CAD and PDF versions of your seconda draft plan submission so we can progress our design. We look forward to working with you.

Kind Regards,

Cameron Aitkens | Acting Underground Supervisor

Direct Number: 519-888-5528
cameron.aitkens@enovapower.com
enovapower.com

From: Lefaive, Joe <Joe.Lefaive@stantec.com>
Sent: Thursday, May 2, 2024 10:57 AM
To: Cameron Aitkens <cameron.aitkens@enovapower.com>
Cc: Wes Lesperance <wes.lesperance@enovapower.com>
Subject: RE: Strohvest Subdivision

Hi Cameron,

I appreciate the quick response. We're quite early in the design process. At this time, we're only looking to confirm that hydro service is feasible for the site at a conceptual level. There was an earlier version of a functional servicing report completed that identified that "according to Waterloo North Hydro there is residual capacity in the system to support the [development]". I'm hoping to confirm that is still the case.

Attached is the draft plan of subdivision for 157-169 units, which will be a mix of singles, semis and townhouses. There is a later phase 2 of approximately 6.5ha, that will be a similar design.

In terms of schedule, we are hoping to submit a draft plan of subdivision this June, work through any Municipal or agency comments over the summer and have draft plan approval by Fall 2024. We will then need to work through the detailed design at which time we will want to reengage with yourself/Enova Power to develop a composite utility plan. I would expect this work to occur early 2025, with construction as early as summer 2025 and hydro servicing maybe fall 2025 but likely not until 2026.

Please feel free to give me a call to further discuss the project.

Thanks,

Joe

Joe Lefaive, P.Eng.
Project Manager

226-220-0941
joe.lefaive@stantec.com

Stantec
100-300 Hagey Boulevard
Waterloo ON N2L 0A4

From: Cameron Aitkens <cameron.aitkens@enovapower.com>
Sent: Thursday, May 2, 2024 10:25 AM
To: Lefaive, Joe <Joe.Lefaive@stantec.com>
Cc: Wes Lesperance <wes.lesperance@enovapower.com>
Subject: Strohvest Subdivision

Hi Joe,

I was forwarded a service request you submitted for the planned Strohvest subdivision. We will need to issue a subdivision servicing agreement out lining cost and required easement once we have a progressed design. At this time, we do not have any CAD base files or recent submissions for this project, can you please send some of these files to me so we can begin our design process? Also, a high level time line for expected servicing date would be helpful for us to plan around.

Kind Regards,

Cameron Aitkens | Acting Underground Supervisor

Direct Number: 519-888-5528
cameron.aitkens@enovapower.com
enovapower.com

From: Mat Robson
To: Lefaive, Joe
Subject: RE: Strohvest, Wellesley (161413217) - Natural Gas Availability
Date: Tuesday, May 14, 2024 2:40:18 PM

Hi Joe,

I apologize for the delayed response.

There is main on Lawrence Street and Gerber Road that we would connect to for servicing this subdivision. I cannot see any issues in regards to capacity, however, I cannot guarantee there will be capacity until after a development application is submitted through GetConnected.

Do you have a rough idea on when they will break ground on this subdivision?

Thank you,

Mat Robson
Sr Analyst New Business Projects
Construction Waterloo

ENBRIDGE
TEL: 416-988-5142 Mat.Robson@Enbridge.com
603 Kumpf Drive, Waterloo, ON N2V 1K3
enbridge.com
Safety. Integrity. Respect. Inclusion.

** Please ensure you have applied for your gas service through GetConnected at least 4 to 6 months prior to requiring them to ensure it is installed on time. If your service requires a complex design or permit, more time may be required **

From: Lefaive, Joe <Joe.Lefaive@stantec.com>
Sent: Tuesday, April 30, 2024 8:56 AM
To: Mat Robson <Mat.Robson@enbridge.com>
Subject: [External] Strohvest, Wellesley (161413217) - Natural Gas Availability

Hi Mat,

We're assisting in the development of a new subdivision on the west side of the Township of Wellesley, the nearest intersection is Gerber Road and Lawrence Street. Attached is a draft plan of the proposed phase 1 of the subdivision. At this time, we're looking to confirm natural gas service is available in the area and can be delivered to the site to serve the proposed homes.

Stantec had previously completed a Functional Servicing Report (before my involvement in this project) and the report stated that "Union Gas" mapping records showed services on Lawrence Street and Gerber Road and that there were no capacity concerns at that time. I'm hoping we're able to confirm this is still the case.

Please feel free to call anytime if you'd like to further discuss the project.

From: Ash Neville
To: Lefaive, Joe
Subject: RE: New Subdivision Inquiry - Township of Wellesley
Date: Tuesday, April 30, 2024 1:03:01 PM
Attachments: image001.png
Greenfield MDU-SFU infrastrcuture specs.pdf
MDU Request Form - 2022_08_25.xlsm

Thank you, Joe. Appreciate this. ROGERS can service but inorder to meet construction timelines we need the attached checklist completed for ROGERS to start your project.

I have advised my team and provided all the details shared with me today. (Thank you!)
I have also attached are build specs as a reference for your design time.

NOTE: ALL labor and material costs associated with the installation of the Fibre distribution system will be paid for by Rogers. $0.00 cost to the owner and we only require ONE jack which we will supply and install with CAT6. Please note ROGERS PAYS for EVERYTHING!

Your partnership is very important to Rogers and we look forward to working with you!

Thanks In Advance

Ash M Neville

Major Accounts – Service Expansion
Rogers Communications
e ash.neville@rci.rogers.com
m 365-336-8132

From: Lefaive, Joe <Joe.Lefaive@stantec.com>
Sent: April 30, 2024 10:57 AM
To: Ash Neville <Ash.Neville@rci.rogers.com>
Subject: RE: New Subdivision Inquiry - Township of Wellesley

Hi Ash,

I appreciate the support. To answer your questions:

At a high level:

-Type of build(s): a mix of single, semi-detached and townhomes. There is also potential for a low-rise apartment (20-30 units). The target population density if 45 people per ha.
-How many units: Phase 1 of the development is targeting 157-169 units.
-Cross streets of development: the nearest intersection is Gerber Road and Lawrence Street
-Any other future development / phases / greenfield for future projects: There is a proposed future Phase 2 to the north (lands owned by the same entity) of approximately 6.5 ha.
-A site plan would be helpful but I know its draft approval – Please see attached draft plan of subdivision.

Let me know if you need anything else.

Thank you,

Joe

Joe Lefaive, P.Eng.
Project Manager

226-220-0941
joe.lefaive@stantec.com

Stantec
100-300 Hagey Boulevard
Waterloo ON N2L 0A4

From: Ash Neville <Ash.Neville@rci.rogers.com>
Sent: Tuesday, April 30, 2024 9:39 AM
To: Lefaive, Joe <Joe.Lefaive@stantec.com>
Subject: RE: New Subdivision Inquiry - Township of Wellesley

No problem Joe. Most welcome!

I know the info is overwhelming, but I require most of it to answer your question on if ROGERS can service.
Can you please answer the following just high-level:
-Type of build(s)
-How many units
-Cross streets of development
-Any other future development / phases / greenfield for future projects
-A site plan would be helpful but I know its draft approval

Thanks
Ash

From: Lefaive, Joe <Joe.Lefaive@stantec.com>
Sent: April 30, 2024 8:36 AM
To: Ash Neville <Ash.Neville@rci.rogers.com>
Subject: RE: New Subdivision Inquiry - Township of Wellesley

Hi Ash,

I appreciate the quick and detailed response. However, I think we're 6-12 months away from having all the info you're requesting. We're hoping to submit for draft plan approval in June, work through comments from the municipality over the summer months and hopefully have draft plan approval by Fall 2024. After draft plan approval we will be moving towards the level of detail you're requesting.

In the meantime, are you able to comment on whether or not Rogers service is available in the area?

Please feel free to give me a call if you'd like to discuss the project.

Thank you,

Joe

Joe Lefaive, P.Eng.

Project Manager

226-220-0941
joe.lefaive@stantec.com

Stantec
100-300 Hagey Boulevard
Waterloo ON N2L 0A4

From: Ash Neville <Ash.Neville@rci.rogers.com>
Sent: Monday, April 29, 2024 6:31 PM
To: Lefaive, Joe <Joe.Lefaive@stantec.com>
Subject: RE: New Subdivision Inquiry - Township of Wellesley

Hi Joe,

Absolutely, Happy to help!

To get started on ROGERS agreements (LOU/EASEMENT/ACCESS AGREEMENT); we need the following information to proceed with the budgeting and cabling for this project.

To draw up the agreement(s) to proceed; ROGERS requires the following information:

- Project/Building Name
  Municipal Address and postal code for this property
- Registered Owner (Legal Name)
- Name and Title of Signing Officers
- Legal Description
- Date of Highlevel Occupancy
- Ground breaking
- Type of build (Freehold Towns, Condo Towns, Highrise, Single Family)
- Number of Phases
- No. of Suites
- Bulk, Tenant Pay (Smart Community (1VALET)- Smart Building / Smart Homes- Doorlocks, swidgets etc
- HST Number (Doorfees to be paid out)

Can you please provide the following drawings:

Site Plans - showing customer duct to property line (AutoCAD drawings required)

Floor plans - Showing outlet location in-suite (AutoCAD drawings required)

Full Electrical drawings with riser diagrams (AutoCAD drawings required)

Please refer to our standard conduit specifications attached at this time for you to forward to your design team and engineers while early in the planning and design stages.

NOTE: ALL labor and material costs associated with the installation of the Fibre distribution system will be paid for by Rogers. $0.00 cost to the owner and we only require ONE jack which we will supply and install with CAT6. Please note ROGERS PAYS for EVERYTHING!

Your partnership is very important to Rogers and we look forward to working with you!

Thanks In Advance

Ash M Neville

Major Accounts – Service Expansion
Rogers Communications
e ash.neville@rci.rogers.com
m 365-336-8132

From: Lefaive, Joe <Joe.Lefaive@stantec.com>
Sent: April 29, 2024 4:31 PM
To: Ash Neville <Ash.Neville@rci.rogers.com>
Subject: New Subdivision Inquiry - Township of Wellesley

Hi Ash,

We're assisting a client through the Plan of Subdivision process in the Township of Wellesley, Region of Waterloo. We're looking to confirm telecommunication services can be made available to the site. Is this something you're able to assist with?

Thank you,

Joe

Joe Lefaive, P.Eng.
Project Manager

226-220-0941
joe.lefaive@stantec.com

Stantec
100-300 Hagey Boulevard
Waterloo ON N2L 0A4