TATHAM ENGINEERING

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24 Alfred Street Development

STORMWATER MANAGEMENT REPORT

Pheasant Run Realty Holdings Inc.

File 121108 | December 20, 2022

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Prepared by:

Tatham Engineering Limited
115 Sandford Fleming Drive, Suite 200
Collingwood, Ontario L9Y 5A6

T 705-444-2565
tathameng.com

Prepared for:

Pheasant Run Realty Holdings Inc.
10 Keith Avenue, Unit 101
Collingwood, Ontario L9Y 0W5

Authored by:	Reviewed by:
	
Kyle Gowanlock, B.A.Sc., P.Eng. Engineering Intern	Doris Casullo, B.A.Sc., P.Eng. Senior Project Manager

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Issue	Date	Description
1	February 14, 2022	Draft Plan of Submission Application
2	May 27, 2022	Incorporating DRC Comments
3	December 20, 2022	Resubmission for Draft Plan Approval

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1 Introduction

Tatham Engineering has been retained by Pheasant Run Realty Holdings Inc. to prepare a Stormwater Management Report for the proposed 24 Alfred Street Development in the Thornbury, Town of The Blue Mountains.

1.1 OBJECTIVE

The primary objective of this report is to investigate the existing and proposed drainage conditions of the subject property to develop a stormwater management plan that does not adversely affect local surface water quantity or water quality conditions. This will be accomplished by evaluating the effect of the development on local drainage conditions and, where necessary, providing solutions to mitigate any adverse impacts.

1.2 SUPPORTING REPORTS

This report was prepared recognizing provincial guidelines on water resources and the environment, including the following publications:

- The Ministry of the Environment, Conservation and Parks (MECP) Stormwater Management Practices Planning and Design Manual (2003); and
- Town of The Blue Mountains Engineering Standards (2018).

Additional reports have been prepared in conjunction with this report in support of the proposed residential development, including:

- *24 Alfred Street Development Functional Servicing Report* prepared by Tatham Engineering (December 2022); and
- *24 Alfred Street Development Traffic Impact Brief* prepared by Tatham Engineering (May 2022).

2 Development Site

2.1 SITE LOCATION & DESCRIPTION

The site is legally described as Lot 6/Part of Lot 5 of Registered Plan 107, and Part of Park Lots 5 and 6 NE of Alfred Street and is bounded by Alice Street West to the north, Bruce Street South to the east, Alfred Street West to the south and Elma Street South to the west. The subject property is zoned as R1-1 – *Residential One* and is not regulated by the Grey Sauble Conservation Authority (GSCA).

2.2 SURFACE CONDITIONS.

A topographic survey of the subject property was completed by GM Blueplan Engineering Ltd. on June 5, 2018 and December 5, 2011. The high spot of the subject site (199.29m) is 126 m south-west of Alice Street West. The subject property generally slopes from the south-west to the north-east at an average gradient of 2.4% to a low point at the rear of 21 Alice Street West, where water ponds and infiltrates into the ground. 21 Alice Street slopes toward the rear yard low point at an average gradient of 0.5%. The remainder of the subject property generally slopes from the high point towards the west at an average gradient of 0.7%, ultimately discharging to the Elma Street storm system. Refer to the Pre-Development Drainage Plan (DP01) for details on existing drainage areas.

While adjacent to numerous residential units on all property lines, the 1.09 ha site is currently vacant, and is primarily grass covered with a sparse number of trees.

2.3 SUBSURFACE CONDITIONS

A geotechnical investigation, submitted under separate cover, was completed by Cambium Inc. dated November 19, 2021. Fieldwork was conducted on August 27, 2021, consisting of four exploratory sampled boreholes. The boreholes extended to a maximum depth of 5 meters below existing ground surface. Subsurface conditions are as follows:

- 100 mm of surficial topsoil;
- silty sand deposit with traces of clay extends to a depth of 0.8 m below surface at boreholes BH102-21 and BH103-21 (this layer extends 1.5 m below surface at boreholes BH101-21 and BH104-21); and
- a layer of silt extends beyond the termination depth of all boreholes ranging from 4.6 m to 6.1 m below grade. The silt contains varying amounts of clay and trace sand and has a stiff to very hard consistency.

The geotechnical investigation established that all four borehole locations were dry upon drilling. Borehole BH102-21 was outfitted as a monitoring well and recorded a groundwater level 4 m below grade.

The soils have been classified as Brighton Sand (Type A) as per the *Soil Survey of Grey County - Report No. 17 of the Ontario Soil Survey*, completed by the Ontario Department of Agriculture. This soil group has low runoff potential and high infiltration rates even when thoroughly wetted. Pre-development land cover was established using aerial imagery.

2.4 PROPOSED DEVELOPMENT

The proposed development will feature 9 single family detached homes and 8 semi-detached units fronting a 249 m long 7.5 m private road, connecting Alice Street West and Alfred Steet West, between Elma Street South and Bruce Street South. Lots will have approximately 20 m frontages and varying depths around 30 m to 34 m. The proposed development is shown on the Site Grading Plan (SG01).

The existing municipal infrastructure along Alice Street, including the storm, sanitary and watermain networks are being replaced as part of the Thornbury Road Infrastructure Project and is scheduled to start in 2024. The proposed storm sewers servicing the proposed development will discharge into the future Alice Street West storm sewer system.

3 Existing Drainage Conditions

Information regarding the existing topography, ground cover and drainage patterns were obtained through collection of detailed topographic survey data, aerial photos and the review of relevant background.

3.1 SURFACE DRAINAGE & RUNOFF

3.1.1 Development Site

Surface runoff from the subject site flows overland as sheet flow towards either the northeast or northwest property lines, the dividing high point located approximately 125 m southwest of Alice Street West. These existing drainage conditions and catchment areas for the subject property are depicted in the Pre-Development Drainage Plan (DP01) and are described as follows.

Catchment 101: Encompasses the portion of the site southwest of the high point that is currently undeveloped and is primarily grassed with a sparse number of trees. The catchment generally slopes from the east to west at an average gradient of 1.5% towards Elma Street South. Surface runoff flows overland before draining onto Elma where it is collected by a 600 mm diameter storm sewer that flows north towards the Beaver River outlet.

Catchment 102: Encompasses the portion of the site northeast of the high point that is currently undeveloped and is primarily grassed with a sparse number of trees and a detached home (21 Alice Street West) that will be demolished as part of the proposed development. The catchment generally slopes northeast towards Alice Street West at an average gradient of 1.4%. Surface runoff flows overland and onto Alice Street West where it is collected by a 300 mm diameter storm sewer that conveys stormwater northwest towards Elma Street South.

3.1.2 Alfred Street West Properties

Catchment 301: The subject property borders four properties which front Alfred Street West. Surface runoff from these properties generally drain from the front towards the rear, through the subject property towards Elma Street South, and is collected by the 600 mm diameter storm sewer on Elma Street South. Ultimately, surface runoff will be conveyed to and discharged into the Beaver River. Refer to the Pre-Development Drainage Plan (DP01) for details on existing drainage area.

3.1.3 Bruce Street South Properties

Catchment 302: The subject property borders five properties that front Bruce Street South. Surface runoff from these properties generally flow overland towards the northeast and along the rear of the Bruce Street South properties, before draining through the subject property and towards the east end of Alice Street. Runoff is collected by catchbasins and is conveyed via a 375 mm diameter storm sewer towards Bruce Street. Ultimately, the surface runoff will discharge into the Little Beaver River. Under surcharged pipe conditions, water will also be conveyed overland towards Elma Street South, ultimately draining towards the Beaver River outlet. A 4.5m wide service easement is situated between the properties fronting Bruce Street South and the subject property. Refer to the Pre-Development Drainage Plan (DP01) for additional details.

3.1.4 Alice Street West Properties

Catchment 303: The subject property borders the back of two properties which front Alice Street West. Surface runoff from the front of these properties generally flow overland north towards Alice Street West, where runoff is collected by catchbasins that will convey stormwater towards Bruce Street via a 375 mm diameter storm sewer. Surface runoff from the rear yards will flow overland into the subject site before being conveyed back towards Alice Street West to be collected in the storm sewer that flows towards Elma Street South. Under surcharged pipe conditions, stormwater will be conveyed overland towards Elma Street South, ultimately draining towards the Beaver River outlet. Refer to Pre-Development Drainage Plan (DP01) for details on existing drainage area.

3.2 THORNBURY WEST RECONSTRUCTION PROJECT

As part of the Thornbury Road Infrastructure Program (TRIP), Tatham Engineering Limited has also been retained by the Town of The Blue Mountains to provide engineering services for the final design of the Thornbury West Reconstruction project. This project area includes sections of Elma Street, Alice Street, Louisa Street, Lorne Street and Park Lane.

The purpose of this project is to make improvements to the vertical alignment and grading of these streets, apply current design standards equally throughout the project limits, replace aged and deteriorated infrastructure with properly sized systems, develop proper major storm conveyance and enhance safety and continuity through a consistent level of service for streetlights, sidewalks and passive traffic calming. Elma Street and Alice Street will include a complete reconstruction of the existing roadway and buried municipal infrastructure, including all the services fronting the subject site.

3.3 PRE-DEVELOPMENT PEAK FLOWS

The existing conditions, considering the site's surface and subsurface conditions, have been modelled in Visual OTTHYMO to establish the pre-development peak flows from the Owen Sound 2- through 100-yer 3hr Chicago storm events as per the Town of Blue Mountains Development Standards. The pre-development flows results are summarized in Table 1 and supporting calculations are provided in Appendix A.

Table 1: Pre-Development Peak Flow Rate Summary

STORM EVENT	CATCHMENT 101/301 (m^3/s)	CATCHMENT 102/302/303 (m^3/s)	TOTAL (m^3/s)
2-year	0.008	0.007	0.014
5-year	0.014	0.014	0.027
25-year	0.027	0.032	0.057
100-year	0.040	0.051	0.091

4 Proposed Stormwater Management Plan

4.1 DESIGN CRITERIA

The proposed stormwater management plan is subject to the review and approval of the Town of The Blue Mountains. Criteria to be met regarding the development of the site are summarized below.

4.1.1 Stormwater Quantity Control

Proposed condition peak flow rates discharging into the Alice Street West storm sewer network must be controlled to the post Thornbury West Reconstruction Project 5-year peak flow rate for all storms up to and including the 100-year event to ensure no adverse impacts further downstream. Recognition of the receiving Alice Street storm sewer system capacity is required. Safe conveyance to a sufficient outlet must be provided for the Regulatory Storm event.

4.1.2 Stormwater Quality Control

Water quality controls must be provided to satisfy the MECP SWM Practices Planning and Design Manual. The Beaver River and Georgian Bay are the ultimate receiving waterbodies for site drainage. Enhanced Level water quality protection is required in the form of 80% total suspended solids (TSS) removal and treatment of 90% of the surface runoff generated from the contributing drainage area that occurs on a long-term average basis.

4.1.3 Siltation & Erosion Control

Recommendations for a siltation and erosion control strategy that will be implemented during construction are to be provided.

4.2 PROPOSED DRAINAGE CONDITIONS

The proposed stormwater management strategy identified for this development includes a proposed internal storm sewer network conveying runoff towards an underground storage system located immediately southwest of Alice Street West. The drainage catchment areas are depicted in the Post-Development Drainage Plan (DP02) and described as follows.

Catchment 201: Defines the drainage from the proposed 249m of 7.5m private road connecting Alice Street West to Alfred Street West, as well as the proposed 9 single family detached homes and 8 semi-detached units fronting the proposed through-street. Runoff from the proposed units will be collected by various catchbasins along the road and rear yards and conveyed to an

underground storage system, which will attenuate storms up to and including the 100-year storm to the post Thornbury West Reconstruction Project Alice Street 5-year peak flow rate.

Catchment 301: Defines the drainage from the external catchment southwest of the subject site along Alfred Street. For further details pertaining to the drainage patterns of the catchment, refer to section 3.1.2. The existing drainage conditions are generally maintained with runoff from catchment 301 flowing into the subject site, where it will be collected by the proposed internal storm sewer network and conveyed towards the underground storage system.

Catchment 302: Defines the drainage from the external catchment southeast of the subject site along Bruce Street. For further details pertaining to the drainage patterns of the catchment, refer to section 3.1.3. The existing drainage conditions are generally maintained with runoff from catchment 302 flowing parallel to the subject site and towards a proposed rear yard catchbasin, where runoff will be collected and conveyed to the underground storage system.

Catchment 303: Defines the drainage from the external catchment northeast of the subject site along Alice Street. For further details pertaining to the drainage patterns of the catchment, refer to section 3.1.4. The existing drainage conditions are generally maintained with runoff from catchment 303 flowing into the subject site, where it will be collected by the proposed internal storm sewer network and conveyed towards the underground storage system.

4.2.1 Proposed Internal Storm Sewer Network

A proposed stormwater management strategy includes various swales and catch basins along the internal road and within the rear yards of the residential buildings, which will collect and convey runoff to the internal storm sewer network. The internal storm sewer network will convey runoff from catchments 201, 301, 302 and 303 via approximately 160 m of storm sewer to a precast box culvert underground storage system (19 units – L2.438m x W3.048m x H1.219m) located immediately southwest of Alice Street West in the designated stormwater management block. The underground storage will outlet into the future 375 mm diameter Alice Street West storm sewer.

The internal storm sewer, swales and inlets will be sized to accommodate the 100-year storm. The inlet capacities for the twin grates (per OPSD 400.010) at DCBMH2B and DCB2B were calculated using the MTO Drainage Management Manual Design Chart 4.19. Assuming 50% blockage in the double catchbasin (combined total equal to one double catch basin), and a maximum ponding depth of 200 mm, the inlet capacity is 242 L/s. The 100-year storm for Catchment 201 is 198 L/s, therefore the capacity of the inlet during 50% blockage is sufficient. Refer to Appendix E for the storm sewer design sheets, swale conveyance capacities and catch basin inlet capacity calculations. Refer to the Storm Drainage Plan (STM01) for further details.

4.3 WATER QUANTITY

Proposed condition peak flow rates discharging into the Alice Street West storm sewer network will be controlled to the post Thornbury West Reconstruction Project 5-year peak flow rate for all storms up to and including the 100-year event via a concrete underground storage system in the northeast section of the subject site. The proposed underground storage system will connect to a future 300 mm diameter storm sewer along Alice Street West, 16 m southeast of future STM MH6. Along with an additional maintenance structure being required to tie into the future storm sewer, the 16 m of 300 mm diameter storm sewer between the tie-in location and STM MH6 will need to be upgraded to 375 mm in diameter. Downstream of STM MH6, the future storm sewer will continue as 450 mm in diameter.

The actual peak flow rate downstream of future STM MH6 is 0.180 m^3/s. This value is based on Catchment 306 of the Thornbury West Reconstruction Project, which contributes a total area of 25,032 m^2 (2.5 ha) including 24 Alfred Street West. See Appendix F for further details pertaining to the Thornbury West Reconstruction Project. The area within Catchment 306 that contributes to the runoff from the proposed 24 Alfred Street West Development is 12,733 m^2 (1.3 ha). The allowable peak flow of the future Alice Street West sewer was prorated to determine the controlled flow rate the proposed development can contribute to the future Alice Street West storm sewer. Refer to the calculation below.

$$(Q_{Catchment\ 306})(A_{24\ Alfred})/(A_{Catchment\ 306}) = (0.180 m^3/s) \times (12{,}733 m^2) / (25{,}032 m^2) = \mathbf{0.092 m^3/s}$$

A precast box culvert underground storage facility (19 units – L2.438m x W3.048m x H1.219m) will attenuate the peak flows up to and including the 100-year storm event to the receiving sewer 5-year storm event capacity by means of a 200mm orifice at the invert of the outlet sewer.

A Visual OTTHYMO model was developed to determine peak flow rates from the subject site under proposed conditions for the 2- though 100-year 3hr Chicago storm events, as well as the water quantity storage volume required to attenuate the proposed condition peak flow rates to the allowable 5-year flow (0.092m^3/s) in the Alice Street storm system. A summary of proposed condition peak flow rates is provided in Table 2. The proposed condition supporting calculations are provided in Appendix B.

Table 2: Post-Development Peak Flow Rate Summary

STORM EVENT	CATCHMENTS 201/301/302/303 (m^3/s)	ALLOWED FLOW RATE (m^3/s)
2-year	0.037	0.092
5-year	0.051	0.092
25-year	0.071	0.092
100-year	0.091	0.092

The results shown in Table 2 confirm that the proposed condition peak flow rates at the site outlet are maintained below the receiving storm sewer 5-year capacity for storms up to and including the 100-year storm event. The water quantity storage volume required to control the 100-year storm is 184 m^3 and the underground storage system and storm sewer provides 190 m^3. Refer to Table 3 for the storage volume requirements of the underground storage system for each given storm event, and the corresponding water level elevations.

Table 3: Stage-Storage Summary

STORM EVENT	UNDERGROUND STORAGE CHICAGO DESIGN STORM	
	VOL[1] (m^3)	ELEV[2] (m)
2-year	40	195.71
5-year	65	195.86
25-year	122	196.18
100-year	184	196.61

1. Underground Storage System Invert - 195.43
2. Maximum Underground Storage System Water Level – 196.65
3. Maximum Available Storage Volume – 190 m^3

The full stage-storage-discharge table for the underground storage facility is included in Appendix B. Further design details are provided on Site Servicing Plan (SS01) and the Storm Details and Cross-Sections (DE02).

4.3.1 Emergency Overland Flow

The internal storm sewer network has been sized for the 100-year storm to adequately convey runoff from major storm events into the underground storage system. However, in the event of a storm exceeding the capacity or a blockage in the internal storm sewer network, emergency overland flows will spill overland onto Alice Street West which ultimately will drain into the Beaver River. The maximum ponding depth within the subject site will be 300 mm. Refer to the Storm Drainage Plan (STM01) for further details pertaining to overland flow routes and the limits of ponding.

The northeast road entrance to the subject property line will allow for peak weir flow of 0.363 m^3/s at 100 mm of head, which can accommodate a 50% blockage in the modelled 100-year storm peak flows of 0.110 m^3/s. Refer to the Post-Development Drainage Plan (DP02) and the Plan and Profile (PP01) drawings for proposed drainage patterns. Weir flow calculations are detailed in Appendix C.

4.4 WATER QUALITY

An oil and grit separator (OGS) designed to provide at least 80% total solids removal (TSS) and treatment of 90% of the surface runoff generated from its contributing drainage area will be installed downstream of the underground storage system. A Stormceptor EFO6 treatment unit or approved equal is proposed to provide primary quality control for the site. The Stormceptor EFO6 treatment unit has been sized by using the verified sizing tool available from the manufacturer. This treatment unit will provide 82% total suspended solids removal for the site.

Additionally, Catch Basin (CB) Shields which will capture 43% TSS will be installed in the catch basins within the internal road, upstream of the OGS (See Appendix D - conservative assumption based on area = 0.60ha and percent imperviousness = 50%). CB Shields will not be required for the rear yard catch basins as runoff from roof and lawns are considered clean runoff. In combination, the CB Shields and OGS will create a water quality treatment train that will provide 87% TSS removal as shown in the calculation below. Therefore, the total suspended solids removed exceed 80%, satisfying Provincial standards for enhanced quality control. The Stormceptor EFO sizing calculations are attached in Appendix D for reference. The location of the oil and grit separator and the CB Shields are illustrated on the Site Servicing Drawing (SS01).

Treatment Train Calculations

Assuming that:

- TSS Load (M) = 1 unit/ha
- TSS Removal Rate of the CB Shield (TSS_{CB}) = 0.43 and OGS (TSS_{OGS}) = 0.82

$M_{CB} = [A_{road} (1.0 - TSS_{CB}) + (A_{site} - A_{road})] [1 \text{ unit/ha}]$

= [1.37ha(1.0 – 0.43) + (2.23ha – 1.37ha)] [1 unit/ha]

= 1.64 units

M_{OGS} = M_{CB}(1.0 - TSS_{OGS})

= 1.64 units (1.0 – 0.82)

= 0.30 units

TSS_{site} = 1.0 – M_{OGS}/[A_{site}(1 unit/ha)]

= 1.0 – (0.30 units)/[2.23ha(1 unit/ha)]

= 87%

4.5 GROUNDWATER

A geotechnical investigation, submitted under separate cover, was completed by Cambium Inc. dated November 19, 2021. Fieldwork was conducted on August 27, 2021, consisting of four exploratory sampled boreholes. The geotechnical investigation established that all four borehole locations were dry upon drilling. Borehole BH102-21 was outfitted as a monitoring well and recorded a groundwater level 4 m below grade (193.26). The underground storage system invert is set to 195.43, 2.17 m above the measured groundwater level.

4.6 CONSTRUCTABILITY

The designated stormwater management block is adjacent to 17 Alice Street West, with the existing residence located in close proximity to the property line. During the public consultation meeting, there were some concerns regarding the proximity of the proposed precast box culvert underground storage system to the existing building, and whether installation of the units would negatively impact the buildings foundation. As a result, the proposed underground storage system is located a minimum 3.0 m west of the existing building.

The justification behind this separation is that it ensures the box culvert is outside of the load dispersion zone of the building's foundation. This assumes that the load within the soil propagates at a 45° angle. The base elevation of the proposed precast box culvert is 195.18, while the grade at the existing building is 197.33 (2.15 m difference), as illustrated in the Details and Cross Sections (DE02) drawings. Conservatively assuming that the dispersion zone initiates at grade, the load dispersion zone is separated by 0.85 m from the base of the culvert. To ensure that the separation between the load dispersion zone and excavation is maintained, and to limit the effect of passive soil forces, a shoring wall may also be utilized during the installation of the underground storage system.

5 Siltation & Erosion Plan

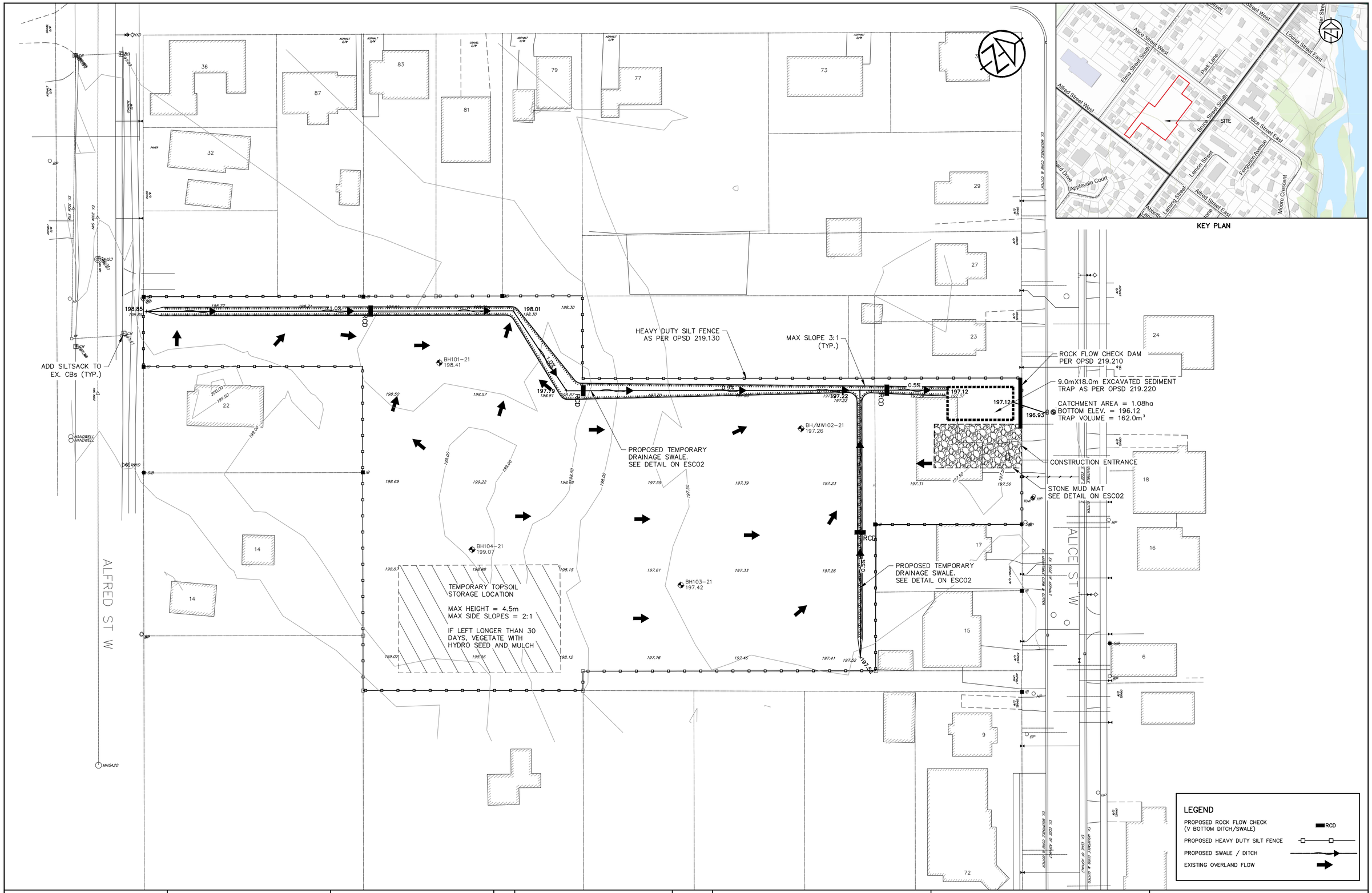
Siltation and erosion controls will be implemented for all construction activities, including topsoil stripping, material stockpiling, road construction and grading operations as per ESC01 and ESC02. Detailed erosion and sediment control measures to be implemented during and after construction are summarized as follows:

- heavy duty silt fence will be erected before the commencement of any grading operations to control sediment movement;
- a construction vehicle entrance will be constructed and maintained consisting of a stone mud mat to reduce off-site tracking of material;
- regular inspection of control measures will be instituted, and repairs will be made as necessary;
- temporary swales, sediment trap and rock flow check dam will be constructed to control runoff during construction; and
- long term siltation and erosion control will be enhanced with a revegetation strategy for disturbed areas.

6 Summary

As outlined above, the applicable runoff, quantity and quality targets of the proposed 24 Alfred Street Development in the Town of Thornbury will be met. A summary of the SWM servicing strategy is as follows:

- Enhanced water quality protection will be provided by a combination of CB Shields in the road catch basins and a Stormsceptor EFO6 unit downstream of the internal storm sewer network and underground storage system.
- Existing drainage patterns will generally be maintained, with stormwater runoff directed via storm sewers and the road network to a proposed precast box culvert underground storage facility to provide quantity control for the site. Stormwater runoff will be controlled to the 5-year storm capacity of the receiving storm sewer on Alice Street.
- Emergency overland flow routes will be conveyed south towards Alice Street West. The maximum ponding depth will not exceed 300 mm.
- Siltation and erosion controls will be implemented for all construction activities, including topsoil stripping, material stockpiling, road construction and grading operations as per Drawings ESC01 and ESC02.



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BENCHMARKS

TBM1 – ELEVATION 197.30
BASE OF SIB ON WEST SIDE OF ALICE ST W

TBM2 – ELEVATION 197.28
TOP OF LID OF MHSA15 ON ALICE ST W

NOTES

LEGAL SURVEY INFORMATION AND LOT DIMENSIONS SHOWN ON THIS PLAN ARE TAKEN FROM A SURVEY PLAN PREPARED BY ZUBEK, EMO, PATTEN & THOMSEN LIMITED, DATED APRIL 3, 2012. WHICH MAY NOT BE FINAL AND ARE NOT GUARANTEED. THE FINAL REGISTERED PLAN OF SUBDIVISION SHALL BE REFERRED TO FOR CONFIRMATION OF THE DATA.

TOPOGRAPHIC INFORMATION SHOWN ON THIS PLAN FROM SURVEY PREPARED BY QM BLUEPLAN ENGINEERING LIMITED DATED JUNE 5, 2018 AND DECEMBER 5, 2011.

No.	REVISION DESCRIPTION	DATE
1.	1ST SUBMISSION	2022-02-09
2.	REVISED AS PER DRC COMMENTS	2022-05-27
3.	UPDATED 1ST SUBMISSION	2022-12-20

ENGINEER STAMP

LICENSED PROFESSIONAL ENGINEER
2022.12.20
D. M. CASULLO
PROVINCE OF ONTARIO

24 ALFRED STREET
TOWN OF THE BLUE MOUNTAINS

TATHAM ENGINEERING

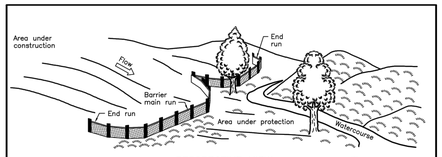
EROSION AND SEDIMENT CONTROL PLAN

DESIGN: KG	FILE: 121108	DWG: ESC01
DRAWN: KG	DATE: FEB 2022	
CHECK: DC	SCALE: 1:400	

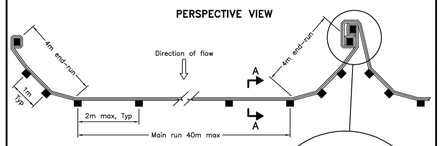
Drawing Name: 121108-ESC01.dwg, Plotted: Dec 20, 2022

NOTES

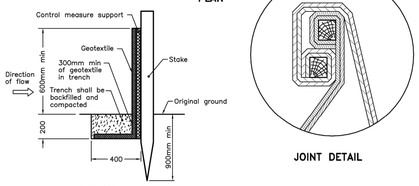
1. ALL SEDIMENT AND EROSION CONTROL MEASURES SHALL BE INSTALLED PRIOR TO THE COMMENCEMENT OF CONSTRUCTION. SEDIMENT AND EROSION CONTROL MEASURES THAT ARE DESIGNED TO CONTROL RUNOFF FROM SPECIFIC AREAS MUST BE INSTALLED PRIOR TO ANY DISTURBANCE OF THAT PART OF THE SITE. THE LOCATION OF ALL SILTATION AND EROSION CONTROL WORKS TO BE REVIEWED ON SITE AND MAY BE REVISED AS DIRECTED BY THE ENGINEER.
2. THE CONTRACTOR MAY CONSIDER ALTERNATIVE SEDIMENT AND EROSION CONTROL MEASURES. SUCH MEASURES MUST BE PRESENTED IN WRITING TO THE ENGINEER FOR APPROVAL BY THE TOWN OF THE BLUE MOUNTAINS.
3. THE CONTRACTOR SHALL HAVE MATERIALS AVAILABLE ON SITE TO REPAIR SEDIMENT AND EROSION CONTROL MEASURES IN THE EVENT OF UNFORESEEN CONDITIONS SUCH AS HIGH WATER, EXTREME RAINFALL EVENTS, ETC.
4. ALL EROSION AND SEDIMENT CONTROL MEASURES MUST BE INSPECTED, CLEANED AND MAINTAINED BY THE CONTRACTOR AFTER EACH STORM EVENT. ALL WORKS WILL BE INSPECTED BY THE ENGINEER BI-WEEKLY AND AFTER EACH MAJOR STORM EVENT.
5. CONSTRUCTION OF ALL SILTATION AND EROSION CONTROL WORK IS TO BE IN ACCORDANCE WITH THE FOLLOWING STEPS:
   - 5.1. INSTALL NEW OR MAINTAIN EXISTING STONE MUD MAT AS PER DETAIL.
   - 5.2. INSTALL SILT FENCE AS PER TOWN OF THE BLUE MOUNTAINS STANDARDS (OPSD 219.130)
   - 5.3. INSTALL TEMPORARY CATCH BASIN SEDIMENT TRAPS ON ALL NEW AND EXISTING CATCH BASINS. SEDIMENT TRAPS TO BE RECTANGULAR CBST BY LAYFIELD OR APPROVED EQUAL. ALL CATCH BASINS TO REMAIN SCREENED UNTIL BASE COURSE ASPHALT IS PLACED AND LOT GRADING IS COMPLETE.
6. ALL CONSTRUCTION VEHICLES TO ACCESS SITE USING THE DESIGNATED CONSTRUCTION ACCESS POINTS.
7. EROSION AND SEDIMENT CONTROL MEASURES TO BE REMOVED BY THE CONTRACTOR ONCE GROUND COVER IS ESTABLISHED AND LANDSCAPING IS COMPLETE AND APPROVED BY THE ENGINEER.
8. STOCKPILE LOCATIONS ARE TO BE APPROVED BY THE ENGINEER.
9. PROVIDE FENCE OR APPROVED EQUAL ACROSS ALL CONSTRUCTION ACCESSES DURING PERIODS OF INACTIVITY.
10. CONSTRUCTION AREAS THAT EXCEED 30 DAYS OF INACTIVITY SHALL BE STABILIZED BY SEEDING IN ACCORDANCE WITH TOWN STANDARDS. THIS IS TO INCLUDE STOCKPILES OF FILL AND TOPSOIL.



PERSPECTIVE VIEW



PLAN

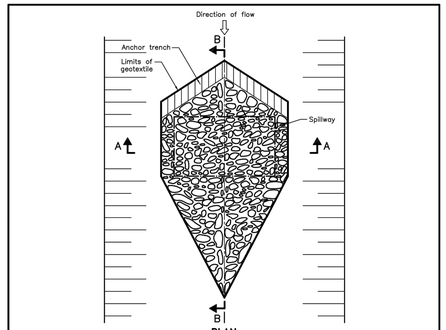


SECTION A–A

JOINT DETAIL

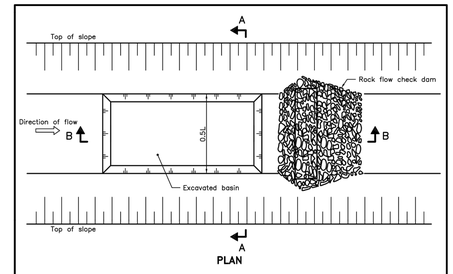
NOTE:
A All dimensions are in millimetres unless otherwise shown.

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



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

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 2
TEMPORARY ROCK FLOW CHECK DAM V–DITCH		OPSD 219.210



NOTES:
A Ditch cross–section upstream or downstream of sediment trap may be flat bottom or V–shaped. Flat bottom shown.
B This OPSD shall be read in conjuction with OPSD 219.210 or 219.211.
C All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 2
SEDIMENT TRAP IN DITCH		OPSD 219.220

STONE SIZE
THE STONE PAD SHALL BE A MIN. 450mm THICK. USE 50mmø STONE OR RECLAIMED CONCRETE EQUIVALENT FOR FIRST 10m FROM ADJACENT ROAD & 150mmø STONE FOR REMAINDER OF STONE PAD.

LENGTH
AS REQUIRED BUT NOT LESS THAN 20m.

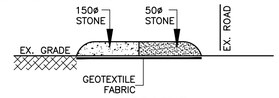
WIDTH
10m MIN. BUT NOT LESS THAN THE WIDTH AT POINTS WHERE INGRESS AND EGRESS OCCURS.

GEOTEXTILE FABRIC
TERRAFIX 270R OR APPROVED EQUIVALENT TO BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING STONE.

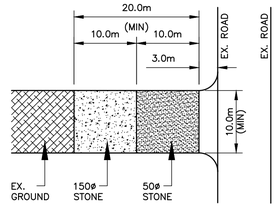
SURFACE WATER
ALL SURFACE WATER FLOWING OR DIRECTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE.

MAINTENANCE
THE CONTRACTOR SHALL MAINTAIN THE ENTRANCE IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT–OF–WAY. THIS MAY REQUIRE PERIODIC DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHT–OF–WAY MUST BE REMOVED IMMEDIATELY BY THE CONTRACTOR. UPON OBSERVATION OF CONTINUOUS MUD TRACKING ONTO ADJACENT STREETS, THE STONE MAT IS TO BE FULLY REPLACED. INSPECTION AND REQUIRED MAINTENANCE AFTER EACH RAIN EVENT SHALL BE PROVIDED BY THE CONTRACTOR.

WASHING
WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC RIGHT–OF–WAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.

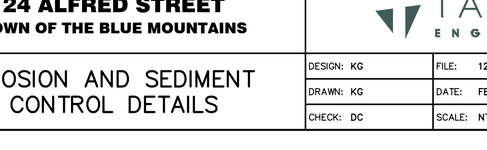


PROFILE



PLAN

STONE MUD MAT DETAIL
NTS



TYPICAL SILTSACK CONSTRUCTION DETAIL
NTS

DISCLAIMER AND COPYRIGHT

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BENCHMARKS

TBM1 – ELEVATION 197.30
BASE OF SIB ON WEST SIDE OF ALICE ST W

TBM2 – ELEVATION 197.28
TOP OF LID OF MHSA15 ON ALICE ST W

NOTES

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TOPOGRAPHIC INFORMATION SHOWN ON THIS PLAN FROM SURVEY PREPARED BY QM BLUEPLAN ENGINEERING LIMITED DATED JUNE 5, 2018 AND DECEMBER 5, 2011.

No.	REVISION DESCRIPTION	DATE
1.	1ST SUBMISSION	2022–02–09
2.	REVISED AS PER DRC COMMENTS	2022–05–27
3.	UPDATED 1ST SUBMISSION	2022–12–20

ENGINEER STAMP

LICENSED PROFESSIONAL ENGINEER — 2022.12.20 — D. M. CASULLO — PROVINCE OF ONTARIO

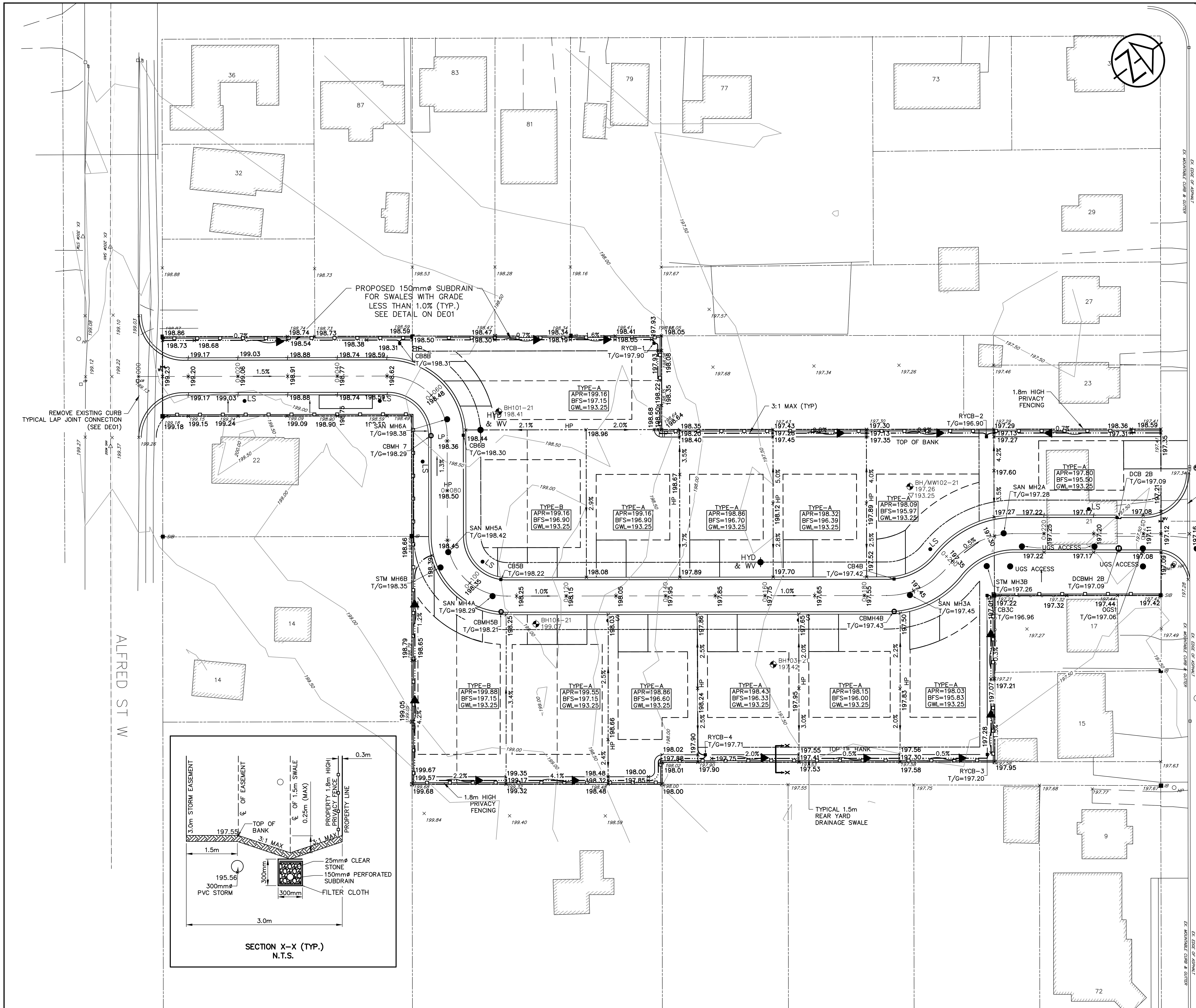
24 ALFRED STREET
TOWN OF THE BLUE MOUNTAINS

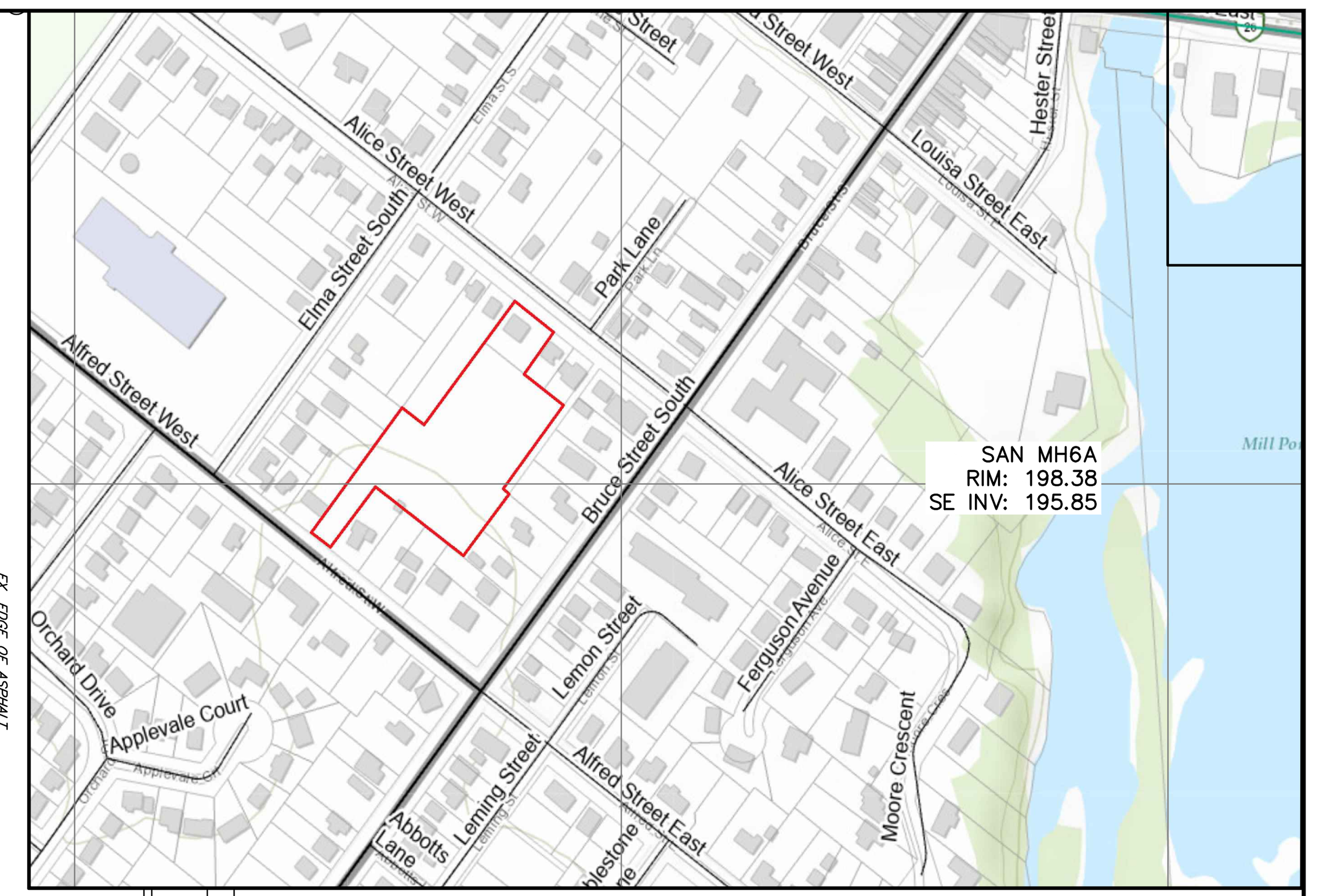
EROSION AND SEDIMENT CONTROL DETAILS

TATHAM ENGINEERING

DESIGN: KG	FILE: 121108	DWG: ESC02
DRAWN: KG	DATE: FEB 2022	
CHECK: DC	SCALE: NTS	

Drawing Name: 121108–ESC01.dwg, Plotted: Dec 20, 2022





KEY PLAN

SECTION X-X (TYP.)
N.T.S.

LEGEND

LOT GRADING TYPE (SEE SG02)	(A)
MINIMUM APRON GRADE (ONE LOCATION)	APR=192.00
MINIMUM BASEMENT FLOOR SLAB	BFS=189.70
SEASONAL HIGH GROUNDWATER LEVEL	GWL=189.40
EXISTING SPOT ELEVATION	× 191.50
PROPOSED SPOT ELEVATION	× 191.50
PROPOSED GRADING DIRECTION/SLOPE	2.0%
BOREHOLE/MONITORING WELL LOCATION	BH101 EL. 192.25 ▽ 189.8
PROPOSED PRIVACY FENCING (1.8m)	
EXISTING FENCING	
PROPOSED MAINTENANCE HOLE	
PROPOSED CATCH BASIN	CB
PROPOSED CATCH BASIN MAINTENANCE HOLE	CBMH
PROPOSED DOUBLE CATCH BASIN	DCB
PROPOSED LIGHT STANDARD	LS
PROPOSED FIRE HYDRANT	HYD & WV
TEMPORARY BENCHMARK	TBM

GENERAL NOTES:

1. THE GROUND WATER ELEVATIONS NOTED FOR LOTS 1–13 ARE BASED ON THE MONITORING WELL MEASUREMENTS AND TEST PIT INVESTIGATION FROM CAMBIUM INC. THE GROUND WATER LEVELS FOR EACH LOT IS TO BE CONFIRMED DURING THE INDIVIDUAL LOT GRADING PLANS AND PRIOR TO THE HOUSE CONSTRUCTION, TO ENSURE THE TOWN'S MINIMUM SEPARATION OF 0.3M BETWEEN THE SEASONAL HIGH GROUND WATER TABLE AND BASEMENT SLAB IS ACHIEVED.

BENCHMARKS

TBM1 – ELEVATION 197.30
BASE OF SIB ON WEST SIDE OF ALICE ST W

TBM2 – ELEVATION 197.28
TOP OF LID OF MHSA15 ON ALICE ST W

NOTES

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2.	REVISED AS PER DRC COMMENTS	2022–05–27
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ENGINEER STAMP

LICENSED PROFESSIONAL ENGINEER
2022.12.20
D. M. CASULLO
PROVINCE OF ONTARIO

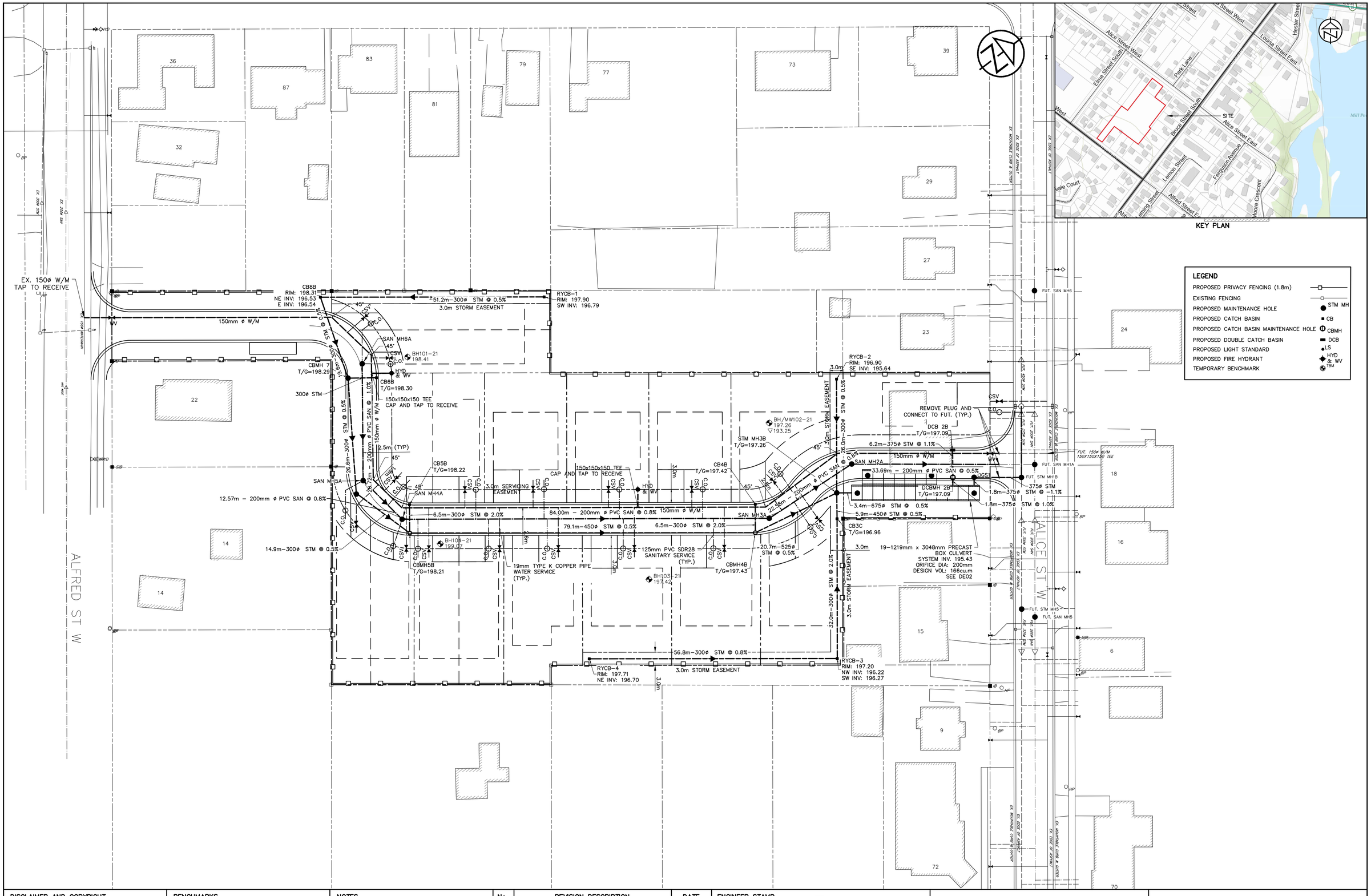
24 ALFRED STREET
TOWN OF THE BLUE MOUNTAINS

SITE GRADING PLAN

TATHAM ENGINEERING

DESIGN: ADM/KG	FILE: 121108	DWG: SG01
DRAWN: ADM	DATE: FEB 2022	
CHECK: DC	SCALE: 1:400	

Drawing Name: 121108–SG01.dwg, Plotted: Dec 21, 2022



KEY PLAN

LEGEND

- PROPOSED PRIVACY FENCING (1.8m)
- EXISTING FENCING
- PROPOSED MAINTENANCE HOLE — STM MH
- PROPOSED CATCH BASIN — CB
- PROPOSED CATCH BASIN MAINTENANCE HOLE — CBMH
- PROPOSED DOUBLE CATCH BASIN — DCB
- PROPOSED LIGHT STANDARD — LS
- PROPOSED FIRE HYDRANT — HYD & WV
- TEMPORARY BENCHMARK — TBM

DISCLAIMER AND COPYRIGHT

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ENGINEER STAMP

LICENSED PROFESSIONAL ENGINEER
2022.12.20
D. M. CASULO
PROVINCE OF ONTARIO

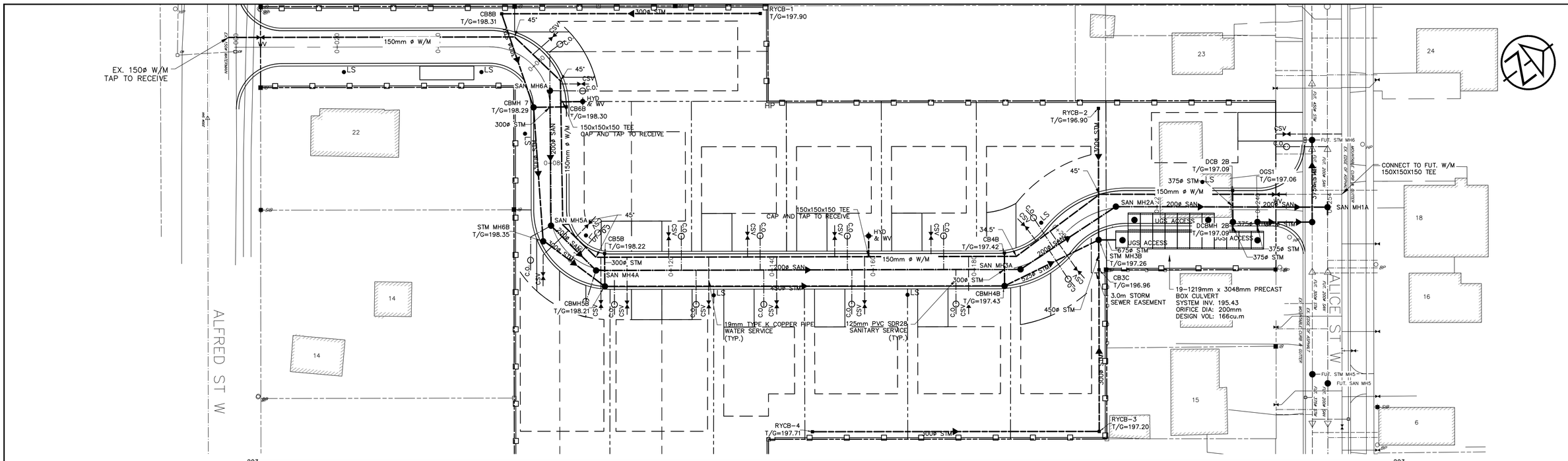
24 ALFRED STREET
TOWN OF THE BLUE MOUNTAINS

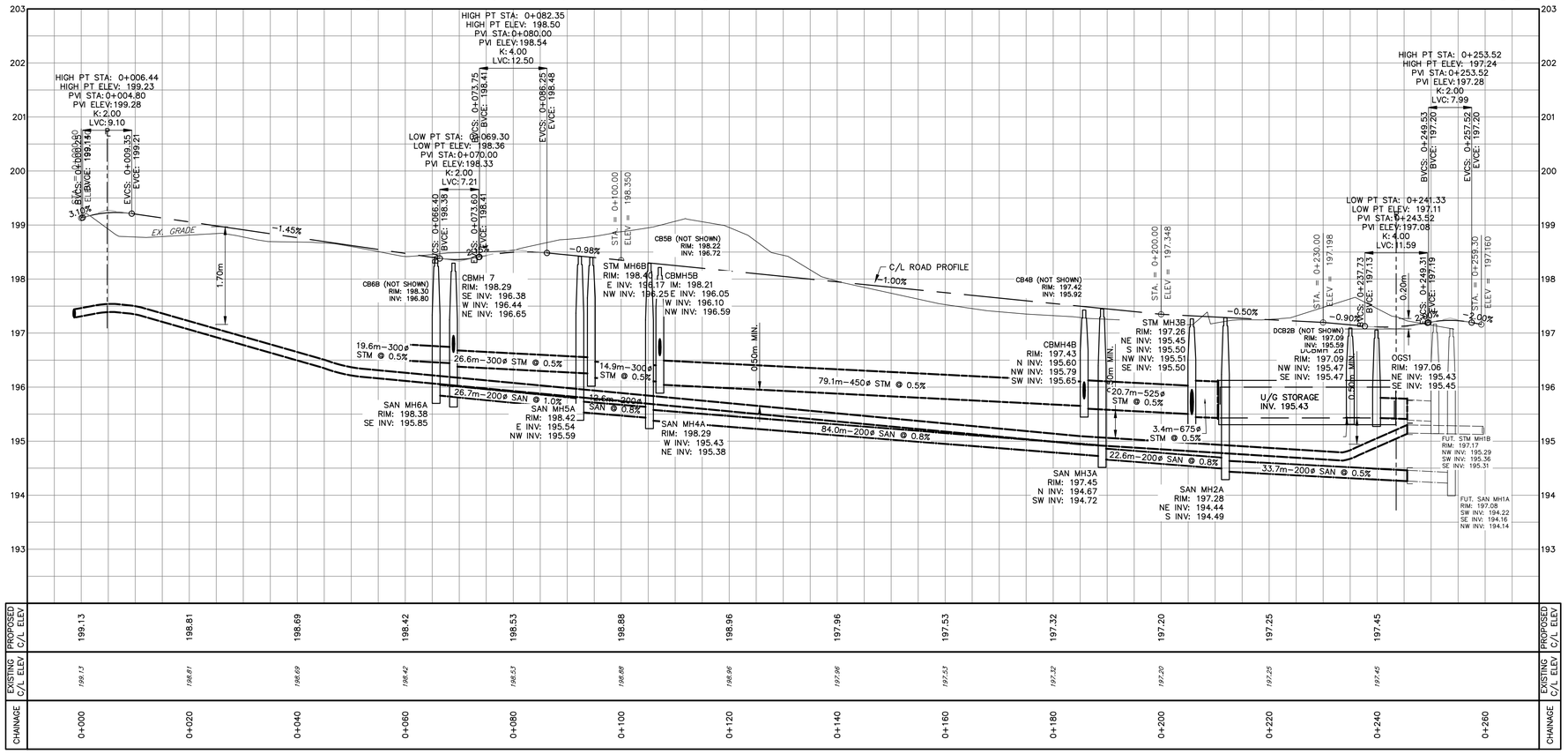
TATHAM ENGINEERING

SITE SERVICING PLAN

DESIGN: KG	FILE: 121108	DWG: SS01
DRAWN: ADM	DATE: FEB 2022	
CHECK: DC	SCALE: 1: 400	

Drawing Name: 121108–SS01.dwg, Plotted: Dec 22, 2022





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2.	REVISED AS PER DRC COMMENTS	2022-05-27
3.	UPDATED 1ST SUBMISSION	2022-12-20

ENGINEER STAMP

LICENSED PROFESSIONAL ENGINEER
2022.12.20
D. M. CASULLO
PROVINCE OF ONTARIO

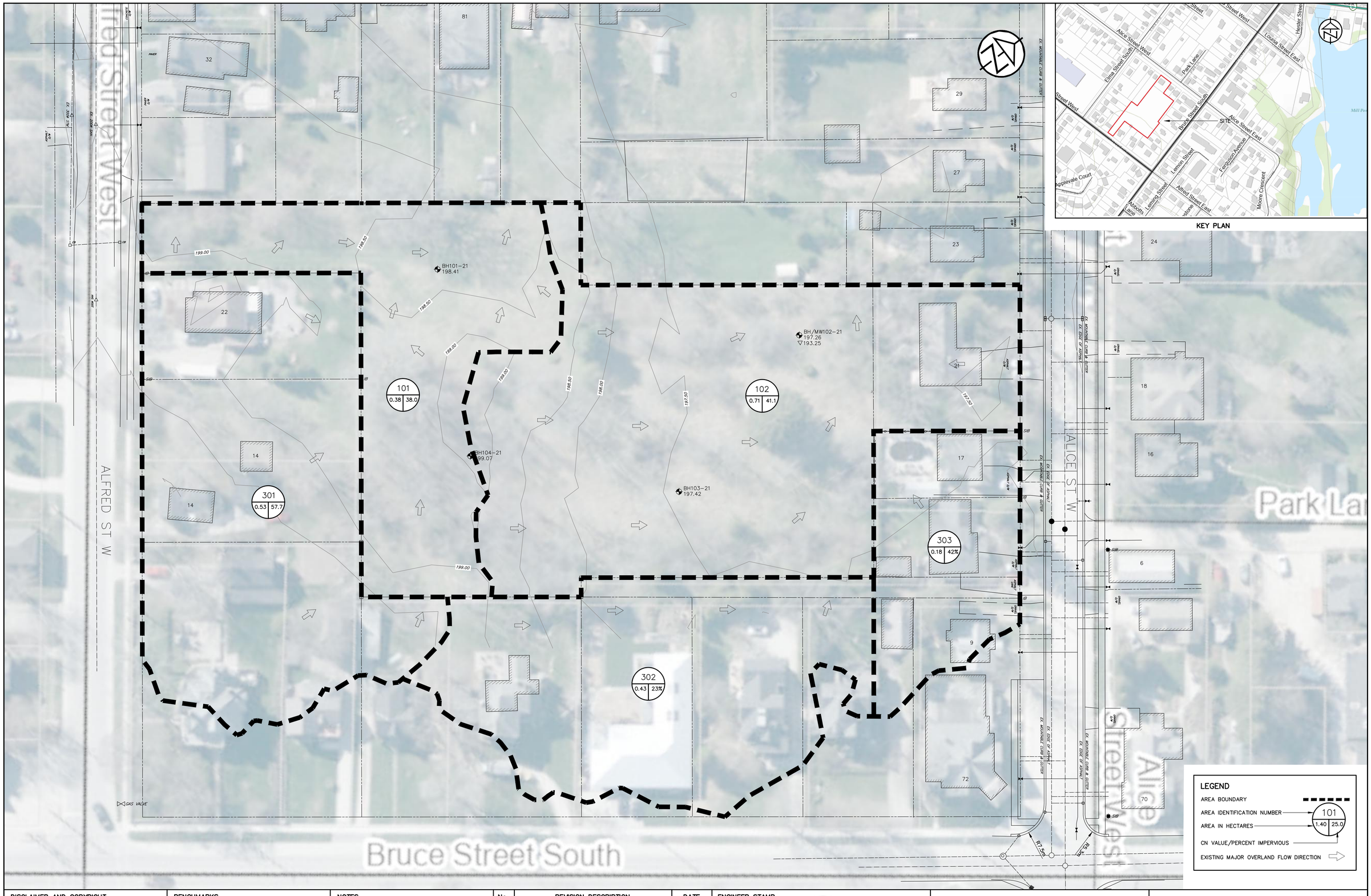
24 ALFRED STREET
TOWN OF THE BLUE MOUNTAINS

PLAN AND PROFILE
STREET A

TATHAM ENGINEERING

DESIGN: KG	FILE: 121108	DWG: PP01
DRAWN: ADM	DATE: FEB 2022	
CHECK: DC	SCALE: 1:400	

Drawing Name: 121108-PP01.dwg, Plotted: Dec 22, 2022



KEY PLAN

LEGEND

- AREA BOUNDARY
- AREA IDENTIFICATION NUMBER — 101
- AREA IN HECTARES — 1.40 | 25.0
- CN VALUE/PERCENT IMPERVIOUS
- EXISTING MAJOR OVERLAND FLOW DIRECTION

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No.	REVISION DESCRIPTION	DATE
1.	1ST SUBMISSION	2022–02–09
2.	REVISED AS PER DRC COMMENTS	2022–05–27
3.	UPDATED FIRST SUBMISSION	2022–11–20

ENGINEER STAMP

LICENSED PROFESSIONAL ENGINEER — 2022.12.20 — D. M. CASULLO — PROVINCE OF ONTARIO

24 ALFRED STREET
TOWN OF THE BLUE MOUNTAINS

PRE–DEVELOPMENT DRAINAGE PLAN

TATHAM ENGINEERING

DESIGN: KG	FILE: 121108	DWG: DP01
DRAWN: KG	DATE: FEB 2022	
CHECK: DC	SCALE: 1:400	

Drawing Name: 121108–DP01.dwg, Plotted: Dec 20, 2022

THORNBURY WEST RECONSRUCTION PROJECT
CATCHMENT 306
FOR REFERENCE ONLY

BLOCK 15

BLOCK 16

MAILBOX PAD

1L
1R
2L
2R
3
4
5
6
7
8
9
10
11
12L
12R
13L
13R

BH101-21
198.41

BH/MW102-21
197.26
▽193.25

BH104-21
199.07

BH103-21
197.42

STREET A

SWM BLOCK/SNOW STORAGE

ALICE ST W

ALFRED ST W

201
1.09 | 49%

301
0.53 | 17%

302
0.43 | 23%

303
0.18 | 42%

GAS VALVE

R7.50m

R5.50m

KEY PLAN

SITE

Alice Street West
Elma Street South
Park Lane
Louisa Street East
Hester Street
Bruce Street South
Alice Street East
Alfred Street West
Alfred Street East
Orchard Drive
Applevale Court
Abbotts Lane
Leming Street
Lemon Street
Fergusson Avenue
Magna Crescent

LEGEND

- AREA BOUNDARY
- AREA IDENTIFICATION NUMBER
- AREA IN HECTARES
- PERCENT IMPERVIOUS
- PROPOSED MAJOR OVERLAND FLOW DIRECTION
- PROPOSED SWALE FLOW DIRECTION
- EXISTING MAJOR OVERLAND FLOW DIRECTION

DISCLAIMER AND COPYRIGHT

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BENCHMARKS

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ENGINEER STAMP

LICENSED PROFESSIONAL ENGINEER
2022.12.20
D. M. CASULLO
PROVINCE OF ONTARIO

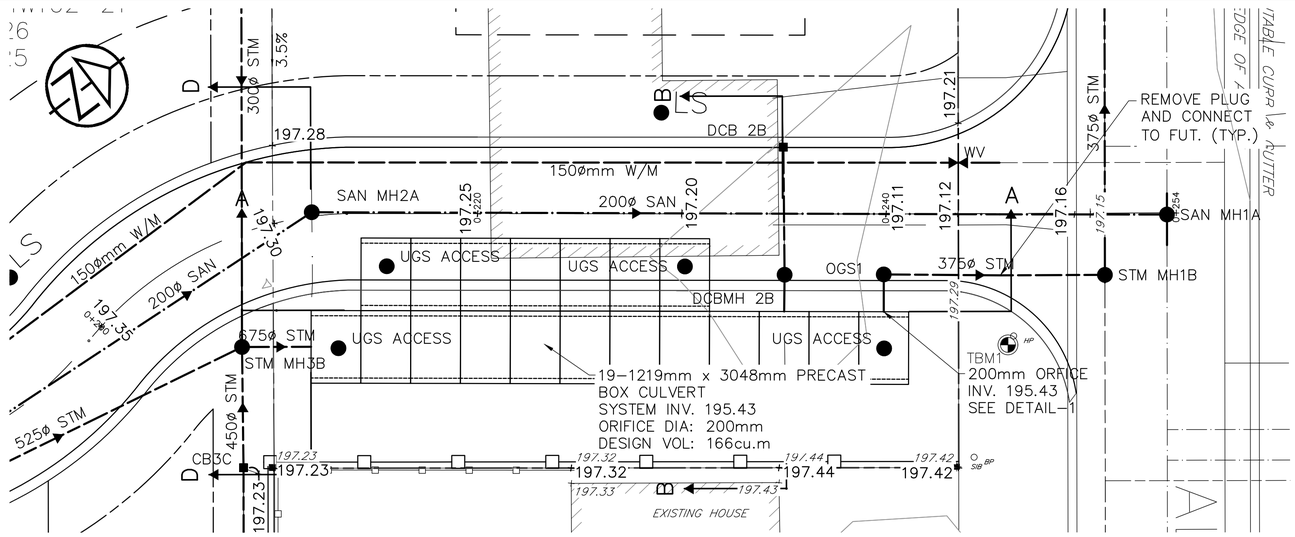
24 ALFRED STREET
TOWN OF THE BLUE MOUNTAINS

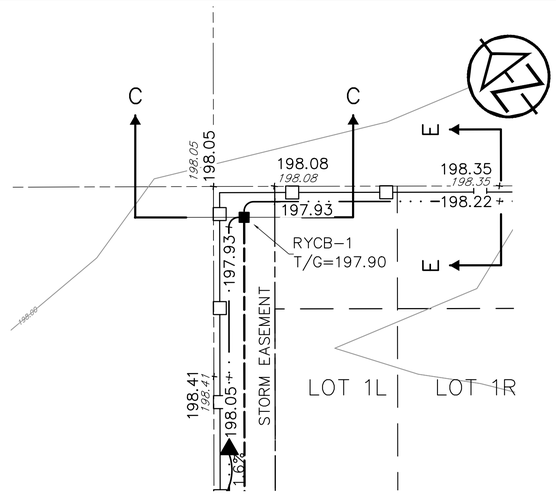
TATHAM ENGINEERING

POST-DEVELOPMENT DRAINAGE PLAN

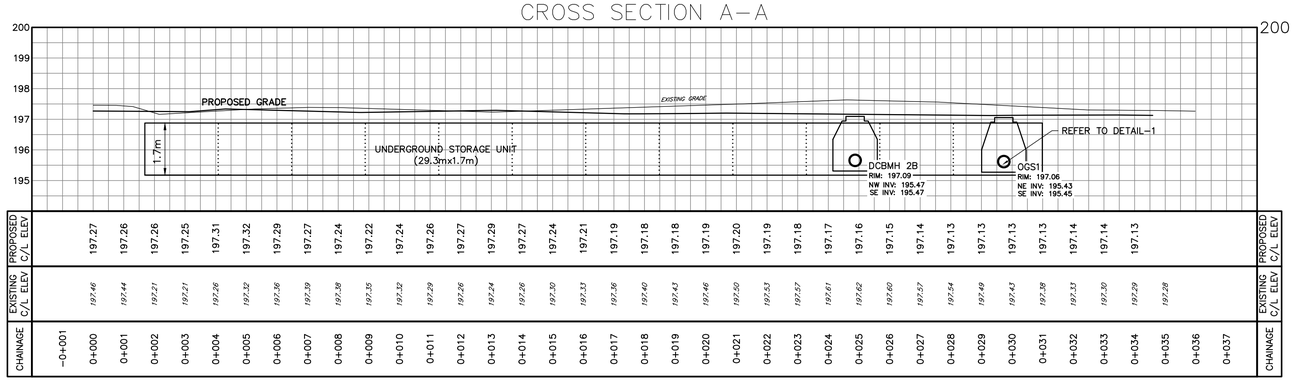
DESIGN: KG	FILE: 121108	DWG: DP02
DRAWN: KG	DATE: FEB 2022	
CHECK: DC	SCALE: 1:400	

Drawing Name: 121108-DP02.dwg, Plotted: Dec 20, 2022



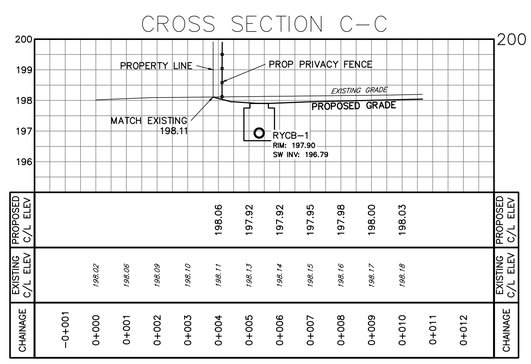


CROSS SECTION A-A



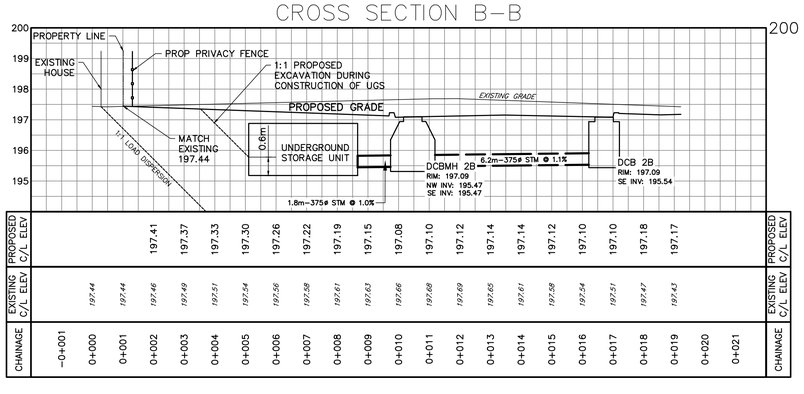
CHAINAGE	EXISTING C/L ELEV	PROPOSED C/L ELEV
-0+001	197.46	197.27
0+000	197.44	197.26
0+001	197.21	197.26
0+002	197.21	197.25
0+003	197.26	197.31
0+004	197.32	197.32
0+005	197.36	197.29
0+006	197.39	197.27
0+007	197.38	197.24
0+008	197.35	197.22
0+009	197.32	197.24
0+010	197.29	197.26
0+011	197.26	197.27
0+012	197.24	197.29
0+013	197.26	197.27
0+014	197.30	197.24
0+015	197.33	197.21
0+016	197.36	197.19
0+017	197.40	197.18
0+018	197.43	197.18
0+019	197.46	197.19
0+020	197.50	197.20
0+021	197.53	197.19
0+022	197.57	197.18
0+023	197.61	197.17
0+024	197.62	197.16
0+025	197.60	197.15
0+026	197.57	197.14
0+027	197.54	197.13
0+028	197.49	197.13
0+029	197.43	197.13
0+030	197.38	197.13
0+031	197.33	197.14
0+032	197.30	197.14
0+033	197.29	197.13
0+034	197.28	
0+035		
0+036		
0+037		

CROSS SECTION C-C



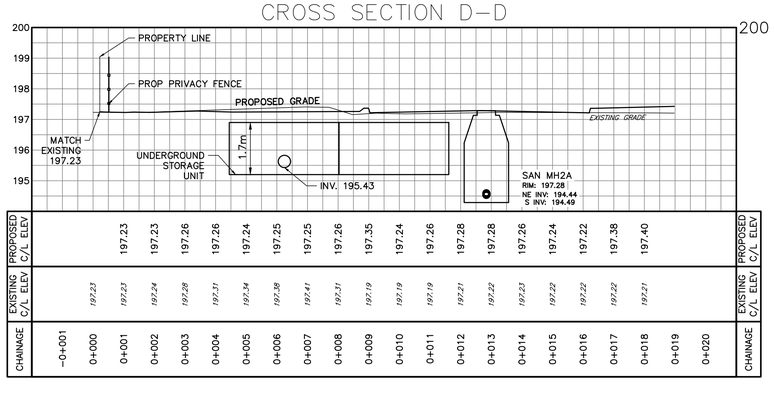
CHAINAGE	EXISTING C/L ELEV	PROPOSED C/L ELEV
-0+001	198.02	198.06
0+000	198.06	197.92
0+001	198.09	197.92
0+002	198.10	197.95
0+003	198.11	197.98
0+004	198.13	198.00
0+005	198.14	198.03
0+006	198.15	
0+007	198.16	
0+008	198.17	
0+009	198.18	
0+010		
0+011		
0+012		

CROSS SECTION B-B

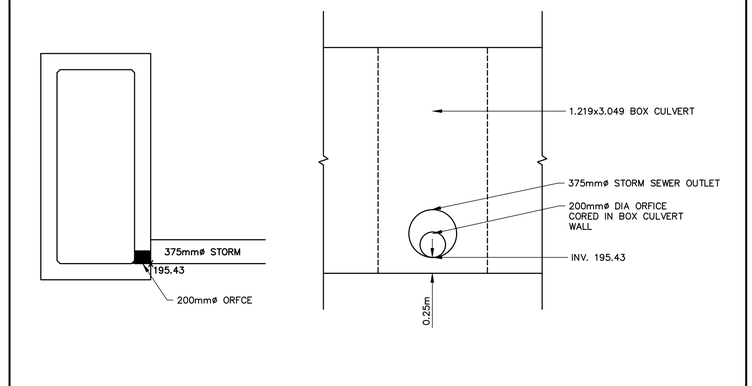


CHAINAGE	EXISTING C/L ELEV	PROPOSED C/L ELEV
-0+001	197.44	197.41
0+000	197.44	197.37
0+001	197.46	197.33
0+002	197.49	197.30
0+003	197.51	197.26
0+004	197.54	197.22
0+005	197.56	197.19
0+006	197.58	197.15
0+007	197.61	197.08
0+008	197.63	197.10
0+009	197.66	197.12
0+010	197.68	197.14
0+011	197.69	197.14
0+012	197.65	197.12
0+013	197.61	197.10
0+014	197.58	197.10
0+015	197.54	197.18
0+016	197.51	197.17
0+017	197.47	
0+018	197.43	
0+019		
0+020		
0+021		

CROSS SECTION D-D



CHAINAGE	EXISTING C/L ELEV	PROPOSED C/L ELEV
-0+001	197.23	197.23
0+000	197.23	197.23
0+001	197.24	197.26
0+002	197.28	197.26
0+003	197.31	197.24
0+004	197.34	197.25
0+005	197.38	197.25
0+006	197.41	197.26
0+007	197.51	197.35
0+008	197.19	197.24
0+009	197.19	197.26
0+010	197.19	197.28
0+011	197.21	197.28
0+012	197.22	197.26
0+013	197.23	197.24
0+014	197.22	197.22
0+015	197.22	197.38
0+016	197.22	197.40
0+017	197.21	
0+018		
0+019		
0+020		



DETAIL-1
NTS

DISCLAIMER AND COPYRIGHT

CONTRACTOR MUST VERIFY ALL DIMENSIONS AND BE RESPONSIBLE FOR SAME. ANY DISCREPANCIES MUST BE REPORTED TO THE ENGINEER BEFORE COMMENCING WORK. DRAWINGS ARE NOT TO BE SCALED.

BENCHMARKS

TBM1 – ELEVATION 197.30
BASE OF SIB ON WEST SIDE OF ALICE ST W

TBM2 – ELEVATION 197.28
TOP OF LID OF MHSA15 ON ALICE ST W

NOTES

LEGAL SURVEY INFORMATION AND LOT DIMENSIONS SHOWN ON THIS PLAN ARE TAKEN FROM A SURVEY PLAN PREPARED BY ZUBEK, EMO, PATTEN & THOMSEN LIMITED, DATED APRIL 3, 2012. WHICH MAY NOT BE FINAL AND ARE NOT GUARANTEED. THE FINAL REGISTERED PLAN OF SUBDIVISION SHALL BE REFERRED TO FOR CONFIRMATION OF THE DATA.

TOPOGRAPHIC INFORMATION SHOWN ON THIS PLAN FROM SURVEY PREPARED BY GM BLUEPLAN ENGINEERING LIMITED DATED JUNE 5, 2018 AND DECEMBER 5, 2011.

No.	REVISION DESCRIPTION	DATE
1.	1ST SUBMISSION	2022-02-09
2.	REVISED AS PER DRC COMMENTS	2022-05-27
3.	UPDATED 1ST SUBMISSION	2022-12-20

ENGINEER STAMP

LICENSED PROFESSIONAL ENGINEER
2022.12.20
D. M. CASULLO
PROVINCE OF ONTARIO

24 ALFRED STREET
TOWN OF THE BLUE MOUNTAINS

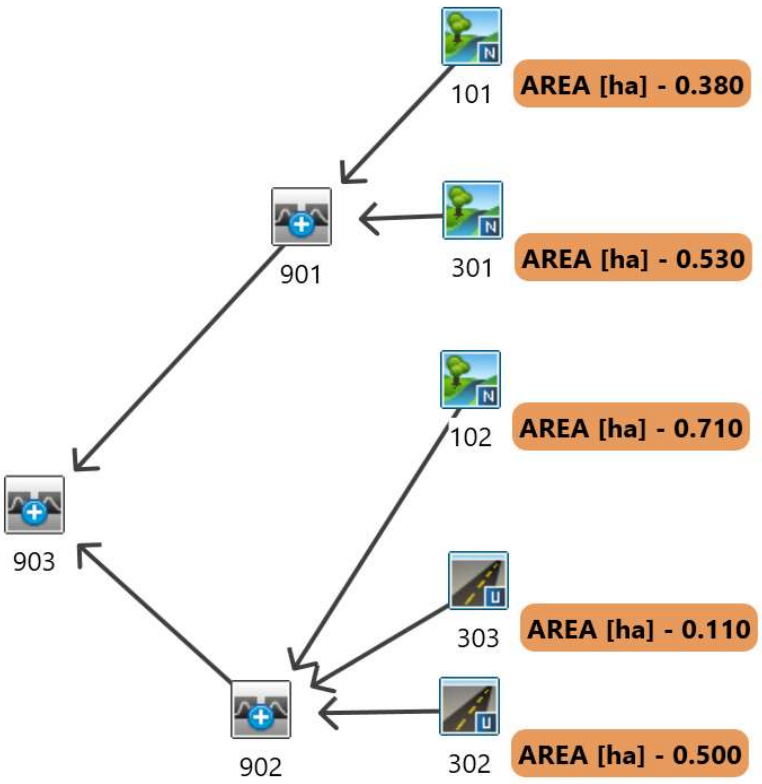
TATHAM ENGINEERING

STORM CROSS SECTION AND DETAILS

DESIGN: KG	FILE: 121108	DWG:	
DRAWN: ADM	DATE: FEB 2022		**DE02**
CHECK: DC	SCALE: PLAN 1:150 PROFILE 1:100		

Appendix A: Pre-Development SWM Calculations

24 ALFRED STREET DEVELOPMENT
PRE CONDITIONS



Nashyd		Route Pipe		Duhyd	
Standhyd		Route Channel		Diverthyd	
Addhyd		Route Reservoir			

TATHAM ENGINEERING

Project:	24 Alfred Street Development
File No.:	121108
Subject:	Otthymo Flow Schematic
Date:	Dec-22

TATHAM ENGINEERING

Visual OTTHYMO Model Parameter Calculations (NasHYD)

Project Details

24 Alfred Street	121108

Prepared By

Kyle Gowanlock	Dec 2022

Data Sources

Detailed Soil Survey Reports for Ontario, GSCA Policies for the Administration of the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation (2010), MTO Drainage Management Manual (1997)

Pre-Development Condition

Watershed:	GSCA
Catchment ID:	101
Catchment Area (ha):	0.38
Impervious %:	

Average Curve Number (CN), Runoff Coefficient (C) and Initial Abstraction (IA)

Soil Symbol		**Brs**											
Soil Series		Brighton											
Hydrologic Soils Group		A											
Soil Texture		Sand											
Runoff Coefficient Type		1											
Area (ha)		0.38											
Percentage of Catchment		100%											
Land Cover Category	**IA**	**A (ha)**	**CN**	**C**	**A (ha)**	**CN**	**C**	**A (ha)**	**CN**	**C**	**A (ha)**	**CN**	**C**
Impervious	2		100	0.95									
Gravel	3		89	0.09									
Woodland	10		32	0.08									
Pasture/Lawns	5		49	0.10									
Meadows	8	0.38	38	0.09									
Cultivated	7		62	0.22									
Waterbody	12		50	0.05									
Average CN		38.00											
Average C		0.09											
Average IA		8.00											

Time to Peak Calculations

Max. Catchment Elev. (m):	199.30
Min. Catchment Elev. (m):	198.30
Catchment Length (m):	95
Catchment Slope (%):	1.05%
Method: Airport Method	
Time of Concentration (mins):	31.55

Summary

Catchment CN:	38.0
Catchment C:	0.09
Catchment IA (mm):	8.00
Time of Concentration (hrs):	0.53
Catchment Time to Peak (hrs):	0.35
Catchment Time Step (mins):	4.21

TATHAM ENGINEERING

Visual OTTHYMO Model Parameter Calculations (NasHYD)

Project Details

24 Alfred Street	121108

Prepared By

Kyle Gowanlock	Dec 2022

Data Sources

Detailed Soil Survey Reports for Ontario, GSCA Policies for the Administration of the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation (2010), MTO Drainage Management Manual (1997)

Pre-Development Condition

Watershed:	GSCA
Catchment ID:	102
Catchment Area (ha):	0.71
Impervious %:	4%

Average Curve Number (CN), Runoff Coefficient (C) and Initial Abstraction (IA)

Soil Symbol		**Brs**											
Soil Series		Brighton											
Hydrologic Soils Group		A											
Soil Texture		Sand											
Runoff Coefficient Type		1											
Area (ha)		0.71											
Percentage of Catchment		100%											
Land Cover Category	**IA**	**A (ha)**	**CN**	**C**	**A (ha)**	**CN**	**C**	**A (ha)**	**CN**	**C**	**A (ha)**	**CN**	**C**
Impervious	2	0.03	100	0.95									
Gravel	3		89	0.09									
Woodland	10		32	0.08									
Pasture/Lawns	5	0.03	49	0.10									
Meadows	8	0.65	38	0.09									
Cultivated	7		62	0.22									
Waterbody	12		50	0.05									
Average CN		41.08											
Average C		0.13											
Average IA		7.62											

Time to Peak Calculations

Max. Catchment Elev. (m):	199.20
Min. Catchment Elev. (m):	197.20
Catchment Length (m):	89
Catchment Slope (%):	2.25%
Method: Airport Method	
Time of Concentration (mins):	22.91

Summary

Catchment CN:	41.1
Catchment C:	0.13
Catchment IA (mm):	7.62
Time of Concentration (hrs):	0.38
Catchment Time to Peak (hrs):	0.25
Catchment Time Step (mins):	3.06

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

       V    V   I    SSSSS  U   U    A    L             (v 6.1.2001)
       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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0d1a72b-6055-469a-bde2-35a6413f0e4d\s


DATE: 12-12-2022                          TIME: 01:30:44

USER:


COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------
  ***********************************************
  ** SIMULATION : 1. 2yr - CHI                 **
  ***********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 854.100
| Ptotal= 33.23 mm |                          B=   7.781
--------------------                          C=   0.830
```

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

                         Duration of storm  =  3.00 hrs
                         Storm time step    =  5.00 min
                         Time to peak ratio =  0.38

      TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
       hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
      0.08    2.37 |  0.83    8.07 |  1.58   10.29 |  2.33    3.57
      0.17    2.56 |  0.92   11.14 |  1.67    8.50 |  2.42    3.34
      0.25    2.79 |  1.00   17.74 |  1.75    7.24 |  2.50    3.13
      0.33    3.07 |  1.08   39.66 |  1.83    6.30 |  2.58    2.95
      0.42    3.41 |  1.17  103.05 |  1.92    5.58 |  2.67    2.79
      0.50    3.85 |  1.25   47.46 |  2.00    5.01 |  2.75    2.65
      0.58    4.42 |  1.33   26.04 |  2.08    4.55 |  2.83    2.52
      0.67    5.20 |  1.42   17.46 |  2.17    4.17 |  2.92    2.41
      0.75    6.32 |  1.50   12.99 |  2.25    3.85 |  3.00    2.30


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=   0.38   Curve Number   (CN)= 38.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.35

     Unit Hyd Qpeak  (cms)=   0.041

     PEAK FLOW       (cms)=   0.001 (i)
     TIME TO PEAK    (hrs)=   1.667
     RUNOFF VOLUME    (mm)=   1.445
     TOTAL RAINFALL   (mm)=  33.227
     RUNOFF COEFFICIENT   =   0.043

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0301)|   Area    (ha)=   0.53   Curve Number   (CN)= 57.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.49   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.19

     Unit Hyd Qpeak  (cms)=   0.107

     PEAK FLOW       (cms)=   0.007 (i)
     TIME TO PEAK    (hrs)=   1.417
     RUNOFF VOLUME    (mm)=   3.827
     TOTAL RAINFALL   (mm)=  33.227
     RUNOFF COEFFICIENT   =   0.115
```

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

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

--------------------
| ADD HYD  (  0901)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0101):     0.38   0.001     1.67     1.44
     + ID2= 2 (  0301):     0.53   0.007     1.42     3.83
       ================================================
       ID = 3 (  0901):     0.91   0.008     1.42     2.83

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0102)|   Area    (ha)=   0.71   Curve Number   (CN)= 41.1
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.62   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.25

     Unit Hyd Qpeak  (cms)=   0.108

     PEAK FLOW       (cms)=   0.003 (i)
     TIME TO PEAK    (hrs)=   1.500
     RUNOFF VOLUME    (mm)=   1.680
     TOTAL RAINFALL   (mm)=  33.227
     RUNOFF COEFFICIENT   =   0.051

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0303)|   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  42.00   Dir. Conn.(%)=   0.10
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.08         0.10
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         1.00
     Length            (m)=      34.64        50.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     103.05        11.93
                 over (min)        5.00        25.00
     Storage Coeff.  (min)=       1.09 (ii)   24.34 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.34         0.05
```

```
                                                              *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.00          0.002 (iii)
     TIME TO PEAK    (hrs)=       1.17         1.58           1.58
     RUNOFF VOLUME    (mm)=      31.23         5.00           4.96
     TOTAL RAINFALL   (mm)=      33.23        33.23          33.23
     RUNOFF COEFFICIENT   =       0.94         0.15           0.15

***** 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*  =  49.0    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 (  0302)|   Area    (ha)=   0.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  23.00   Dir. Conn.(%)=   0.10
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.10         0.33
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      53.54       100.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     103.05         4.61
                 over (min)        5.00        45.00
     Storage Coeff.  (min)=       1.41 (ii)   43.27 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=       0.33         0.03
                                                              *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.00          0.002 (iii)
     TIME TO PEAK    (hrs)=       1.17         2.00           2.00
     RUNOFF VOLUME    (mm)=      31.23         3.70           3.67
     TOTAL RAINFALL   (mm)=      33.23        33.23          33.23
     RUNOFF COEFFICIENT   =       0.94         0.11           0.11

***** 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*  =  49.0    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 (0902)					
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0102):	0.71	0.003	1.50	1.68
+ ID2= 2 (0302):	0.43	0.002	2.00	3.67
ID = 3 (0902):	1.14	0.005	1.75	2.43

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0902)					
3 + 2 = 1	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (0902):	1.14	0.005	1.75	2.43
+ ID2= 2 (0303):	0.18	0.002	1.58	4.96
ID = 1 (0902):	1.32	0.007	1.67	2.77

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0903)					
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0901):	0.91	0.008	1.42	2.83
+ ID2= 2 (0902):	1.32	0.007	1.67	2.77
ID = 3 (0903):	2.23	0.014	1.50	2.80

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
V    V   I    SSSSS  U   U    A    L              (v 6.1.2001)
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
```

```
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        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: 12-12-2022 TIME: 01:30:44

USER:

COMMENTS: _____

****
** SIMULATION : 2. 5yr - CHI **
****

CHICAGO STORM	Ptotal= 42.93 mm

IDF curve parameters: A=1234.576
B= 8.297
C= 0.851
used in: INTENSITY = A / (t + B)^C

Duration of storm = 3.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.38

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.08	2.80	0.83	10.17	1.58	13.13	2.33	4.31
0.17	3.04	0.92	14.27	1.67	10.75	2.42	4.01
0.25	3.33	1.00	23.16	1.75	9.08	2.50	3.75

```
                0.33    3.68 |  1.08   52.75 |  1.83    7.85 |  2.58    3.53
                0.42    4.11 |  1.17  136.52 |  1.92    6.91 |  2.67    3.33
                0.50    4.67 |  1.25   63.26 |  2.00    6.16 |  2.75    3.15
                0.58    5.40 |  1.33   34.39 |  2.08    5.57 |  2.83    2.99
                0.67    6.40 |  1.42   22.78 |  2.17    5.07 |  2.92    2.84
                0.75    7.87 |  1.50   16.75 |  2.25    4.66 |  3.00    2.71


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=   0.38   Curve Number   (CN)= 38.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.35

     Unit Hyd Qpeak  (cms)=   0.041

     PEAK FLOW       (cms)=   0.002 (i)
     TIME TO PEAK    (hrs)=   1.667
     RUNOFF VOLUME    (mm)=   2.712
     TOTAL RAINFALL   (mm)=  42.928
     RUNOFF COEFFICIENT   =   0.063

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0301)|   Area    (ha)=   0.53   Curve Number   (CN)= 57.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.49   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.19

     Unit Hyd Qpeak  (cms)=   0.107

     PEAK FLOW       (cms)=   0.012 (i)
     TIME TO PEAK    (hrs)=   1.417
     RUNOFF VOLUME    (mm)=   6.552
     TOTAL RAINFALL   (mm)=  42.928
     RUNOFF COEFFICIENT   =   0.153

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

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

--------------------
| ADD HYD  (  0901)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0101):     0.38   0.002     1.67     2.71
      + ID2= 2 (  0301):     0.53   0.012     1.42     6.55
```

```
        ================================================
        ID = 3 (  0901):     0.91   0.014     1.42     4.95

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0102)|   Area    (ha)=   0.71   Curve Number   (CN)= 41.1
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.62   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.25

     Unit Hyd Qpeak  (cms)=   0.108

     PEAK FLOW       (cms)=   0.006 (i)
     TIME TO PEAK    (hrs)=   1.500
     RUNOFF VOLUME    (mm)=   3.117
     TOTAL RAINFALL   (mm)=  42.928
     RUNOFF COEFFICIENT   =   0.073

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0303)|   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  42.00   Dir. Conn.(%)=   0.10
--------------------

                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.08         0.10
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         1.00
     Length            (m)=      34.64        50.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     136.52        23.31
               over (min)        5.00        20.00
     Storage Coeff.  (min)=       0.97 (ii)   18.76 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.34         0.06
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.00          0.004 (iii)
     TIME TO PEAK    (hrs)=       1.17         1.50           1.50
     RUNOFF VOLUME    (mm)=      40.93         8.28           8.25
     TOTAL RAINFALL   (mm)=      42.93        42.93          42.93
     RUNOFF COEFFICIENT   =       0.95         0.19           0.19

***** 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*  =  49.0    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 (  0302)|   Area    (ha)=   0.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  23.00   Dir. Conn.(%)=   0.10
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.10         0.33
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      53.54       100.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     136.52         9.44
               over (min)        5.00        35.00
     Storage Coeff.  (min)=       1.26 (ii)   32.69 (ii)
     Unit Hyd. Tpeak (min)=       5.00        35.00
     Unit Hyd. peak  (cms)=       0.33         0.03
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.01          0.005 (iii)
     TIME TO PEAK    (hrs)=       1.17         1.75           1.75
     RUNOFF VOLUME    (mm)=      40.93         6.29           6.28
     TOTAL RAINFALL   (mm)=      42.93        42.93          42.93
     RUNOFF COEFFICIENT   =       0.95         0.15           0.15

***** 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*  =  49.0    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  (  0902)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0102):     0.71   0.006     1.50     3.12
     + ID2= 2 (  0302):     0.43   0.005     1.75     6.28
       ================================================
       ID = 3 (  0902):     1.14   0.010     1.67     4.31

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

--------------------
| ADD HYD  (  0902)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0902):     1.14   0.010     1.67     4.31
     + ID2= 2 (  0303):     0.18   0.004     1.50     8.25
       ================================================
       ID = 1 (  0902):     1.32   0.014     1.58     4.85

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

--------------------
| ADD HYD  (  0903)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0901):     0.91   0.014     1.42     4.95
     + ID2= 2 (  0902):     1.32   0.014     1.58     4.85
       ================================================
       ID = 3 (  0903):     2.23   0.027     1.50     4.89

    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 6.1.2001)
      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 6.1\VO2\voin.dat

Output filename:
C:\Users\KGowanlock\AppData\Local\Civica\VH5\2c82a674-7dbe-4ff9-a174-9e37ec52cdac\2d982c1e-ef87-4317-a395-0196f3bb20d2\s
Summary filename:
C:\Users\KGowanlock\AppData\Local\Civica\VH5\2c82a674-7dbe-4ff9-a174-9e37ec52cdac\2d982c1e-ef87-4317-a395-0196f3bb20d2\s

DATE: 12-12-2022 TIME: 01:30:44

USER:

COMMENTS: _____

****
** SIMULATION : 3. 25yr - CHI **
****

| CHICAGO STORM |
| Ptotal= 57.45 mm |

IDF curve parameters: A=1750.276
B= 8.303
C= 0.862
used in: INTENSITY = A / (t + B)^C

Duration of storm = 3.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.38

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.08	3.54	0.83	13.31	1.58	17.28	2.33	5.51
0.17	3.85	0.92	18.82	1.67	14.08	2.42	5.12
0.25	4.23	1.00	30.89	1.75	11.84	2.50	4.78
0.33	4.68	1.08	71.60	1.83	10.19	2.58	4.49
0.42	5.25	1.17	188.05	1.92	8.94	2.67	4.22
0.50	5.98	1.25	86.10	2.00	7.95	2.75	3.99
0.58	6.94	1.33	46.26	2.08	7.16	2.83	3.78
0.67	8.27	1.42	30.37	2.17	6.51	2.92	3.60
0.75	10.22	1.50	22.17	2.25	5.97	3.00	3.43

CALIB NASHYD (0101) ID= 1 DT= 5.0 min

Area (ha)= 0.38 Curve Number (CN)= 38.0
Ia (mm)= 8.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.35

Unit Hyd Qpeak (cms)= 0.041

PEAK FLOW (cms)= 0.005 (i)
TIME TO PEAK (hrs)= 1.583
RUNOFF VOLUME (mm)= 5.268
TOTAL RAINFALL (mm)= 57.451
RUNOFF COEFFICIENT = 0.092

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

CALIB NASHYD (0301) ID= 1 DT= 5.0 min

Area (ha)= 0.53 Curve Number (CN)= 57.7
Ia (mm)= 4.49 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.19

Unit Hyd Qpeak (cms)= 0.107

PEAK FLOW (cms)= 0.023 (i)
TIME TO PEAK (hrs)= 1.417
RUNOFF VOLUME (mm)= 11.685
TOTAL RAINFALL (mm)= 57.451
RUNOFF COEFFICIENT = 0.203

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

ADD HYD (0901)

1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0101):	0.38	0.005	1.58	5.27
+ ID2= 2 (0301):	0.53	0.023	1.42	11.68
ID = 3 (0901):	0.91	0.027	1.42	9.01

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
| CALIB           |
| NASHYD   (  0102)|   Area    (ha)=   0.71   Curve Number   (CN)= 41.1
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.62   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.25

     Unit Hyd Qpeak  (cms)=   0.108

     PEAK FLOW       (cms)=   0.013 (i)
     TIME TO PEAK    (hrs)=   1.500
     RUNOFF VOLUME    (mm)=   5.991
     TOTAL RAINFALL   (mm)=  57.451
     RUNOFF COEFFICIENT   =   0.104

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

--------------------------------------------------------------------------------
--------------------
| CALIB           |
| STANDHYD (  0303)|   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  42.00   Dir. Conn.(%)=   0.10
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.08         0.10
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         1.00
     Length            (m)=      34.64        50.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     188.05        48.81
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       0.85 (ii)   14.09 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.34         0.08
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.01         0.009 (iii)
     TIME TO PEAK    (hrs)=       1.17         1.42          1.42
     RUNOFF VOLUME    (mm)=      55.45        14.30         14.30
     TOTAL RAINFALL   (mm)=      57.45        57.45         57.45
     RUNOFF COEFFICIENT   =       0.97         0.25          0.25

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  49.0    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 (  0302)|   Area    (ha)=   0.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  23.00   Dir. Conn.(%)=   0.10
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.10         0.33
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      53.54       100.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     188.05        21.19
               over (min)        5.00        25.00
     Storage Coeff.  (min)=       1.11 (ii)   23.86 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.34         0.05
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.01          0.012 (iii)
     TIME TO PEAK    (hrs)=       1.17         1.58           1.58
     RUNOFF VOLUME    (mm)=      55.45        11.16          11.18
     TOTAL RAINFALL   (mm)=      57.45        57.45          57.45
     RUNOFF COEFFICIENT   =       0.97         0.19           0.19

***** 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*  =  49.0    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  (  0902)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0102):     0.71   0.013     1.50     5.99
      + ID2= 2 (  0302):     0.43   0.012     1.58    11.18
        ================================================
        ID = 3 (  0902):     1.14   0.024     1.50     7.95

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

--------------------
```

```
| ADD HYD  (  0902)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0902):     1.14   0.024     1.50     7.95
     + ID2= 2 (  0303):     0.18   0.009     1.42    14.30
       ================================================
       ID = 1 (  0902):     1.32   0.032     1.50     8.81

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

--------------------
| ADD HYD  (  0903)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0901):     0.91   0.027     1.42     9.01
     + ID2= 2 (  0902):     1.32   0.032     1.50     8.81
       ================================================
       ID = 3 (  0903):     2.23   0.057     1.50     8.89

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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       V    V   I    SSSSS  U   U    A    L             (v 6.1.2001)
       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 6.1\VO2\voin.dat

  Output  filename:
C:\Users\KGowanlock\AppData\Local\Civica\VH5\2c82a674-7dbe-4ff9-a174-9e37ec52cdac\1
a042191-1d3b-4717-a6e3-404fd7d81e07\s
  Summary filename:
C:\Users\KGowanlock\AppData\Local\Civica\VH5\2c82a674-7dbe-4ff9-a174-9e37ec52cdac\1
```

```
a042191-1d3b-4717-a6e3-404fd7d81e07\s


DATE: 12-12-2022                          TIME: 01:30:44

USER:


COMMENTS: _____________________________________________________


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------------------------
  ***********************************************
  ** SIMULATION : 4. 100yr - CHI                **
  ***********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=2171.754
| Ptotal= 69.44 mm |                          B=   8.303
--------------------                          C=   0.867
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  3.00 hrs
                       Storm time step    =  5.00 min
                       Time to peak ratio =  0.38

     TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
      hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
     0.08    4.17 |  0.83   15.91 |  1.58   20.72 |  2.33    6.52
     0.17    4.54 |  0.92   22.59 |  1.67   16.84 |  2.42    6.05
     0.25    4.98 |  1.00   37.28 |  1.75   14.13 |  2.50    5.65
     0.33    5.53 |  1.08   87.10 |  1.83   12.15 |  2.58    5.29
     0.42    6.21 |  1.17  230.33 |  1.92   10.64 |  2.67    4.98
     0.50    7.08 |  1.25  104.88 |  2.00    9.45 |  2.75    4.70
     0.58    8.23 |  1.33   56.05 |  2.08    8.50 |  2.83    4.46
     0.67    9.83 |  1.42   36.64 |  2.17    7.72 |  2.92    4.23
     0.75   12.18 |  1.50   26.66 |  2.25    7.07 |  3.00    4.03


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=   0.38   Curve Number   (CN)= 38.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.35

     Unit Hyd Qpeak  (cms)=   0.041
```

```
     PEAK FLOW       (cms)=   0.008 (i)
     TIME TO PEAK    (hrs)=   1.583
     RUNOFF VOLUME    (mm)=   7.930
     TOTAL RAINFALL   (mm)=  69.443
     RUNOFF COEFFICIENT   =   0.114

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

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0301)|   Area    (ha)=   0.53   Curve Number   (CN)= 57.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.49   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.19

     Unit Hyd Qpeak  (cms)=   0.107

     PEAK FLOW       (cms)=   0.034 (i)
     TIME TO PEAK    (hrs)=   1.333
     RUNOFF VOLUME    (mm)=  16.737
     TOTAL RAINFALL   (mm)=  69.443
     RUNOFF COEFFICIENT   =   0.241

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

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

--------------------
| ADD HYD  (  0901)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0101):     0.38   0.008     1.58     7.93
     + ID2= 2 (  0301):     0.53   0.034     1.33    16.74
       ================================================
       ID = 3 (  0901):     0.91   0.040     1.42    13.06

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0102)|   Area    (ha)=   0.71   Curve Number   (CN)= 41.1
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.62   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.25

     Unit Hyd Qpeak  (cms)=   0.108

     PEAK FLOW       (cms)=   0.020 (i)
     TIME TO PEAK    (hrs)=   1.500
     RUNOFF VOLUME    (mm)=   8.961
     TOTAL RAINFALL   (mm)=  69.443
     RUNOFF COEFFICIENT   =   0.129

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

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0303)|   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  42.00   Dir. Conn.(%)=   0.10
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.08         0.10
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         1.00
     Length            (m)=      34.64        50.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     230.33        69.96
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       0.79 (ii)   12.25 (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          0.013 (iii)
     TIME TO PEAK    (hrs)=       1.17         1.42           1.42
     RUNOFF VOLUME    (mm)=      67.44        20.12          20.13
     TOTAL RAINFALL   (mm)=      69.44        69.44          69.44
     RUNOFF COEFFICIENT   =       0.97         0.29           0.29

***** 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*  =  49.0    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 (  0302)|   Area    (ha)=   0.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  23.00   Dir. Conn.(%)=   0.10
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.10         0.33
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      53.54       100.00
```

```
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     230.33        35.21
               over (min)        5.00        20.00
     Storage Coeff.  (min)=       1.02 (ii)   19.59 (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)=       1.17         1.50           1.50
     RUNOFF VOLUME    (mm)=      67.44        15.97          15.99
     TOTAL RAINFALL   (mm)=      69.44        69.44          69.44
     RUNOFF COEFFICIENT   =       0.97         0.23           0.23

***** 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*  =  49.0    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  (  0902)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0102):     0.71   0.020     1.50     8.96
     + ID2= 2 (  0302):     0.43   0.019     1.50    15.99
       ================================================
       ID = 3 (  0902):     1.14   0.039     1.50    11.61

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

--------------------
| ADD HYD  (  0902)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0902):     1.14   0.039     1.50    11.61
     + ID2= 2 (  0303):     0.18   0.013     1.42    20.13
       ================================================
       ID = 1 (  0902):     1.32   0.051     1.42    12.78

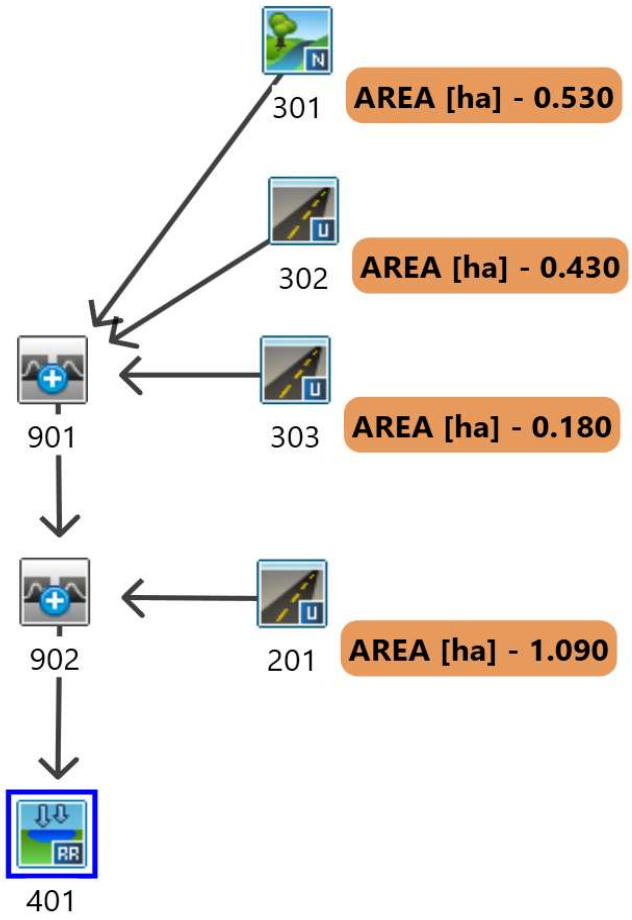
     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
```

```
--------------------
| ADD HYD  (  0903)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0901):     0.91   0.040     1.42    13.06
     + ID2= 2 (  0902):     1.32   0.051     1.42    12.78
       ================================================
       ID = 3 (  0903):     2.23   0.091     1.42    12.89

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

Appendix B: Post-Development SWM Calculations

24 ALFRED STREET DEVELOPMENT
PROPOSED CONDITIONS



Nashyd		Route Pipe		Duhyd	
Standhyd		Route Channel		Diverthyd	
Addhyd		Route Reservoir			

TATHAM ENGINEERING

Project:	24 Alfred Street Development
File No.:	121108
Subject:	Otthymo Flow Schematic
Date:	Dec-22

TATHAM ENGINEERING	Project: 24 Alfred Street	Date: Dec 2022
	File No.: 121108	Designed: KG
	Subject: Impervious Area Calculations	Checked DC

Site Area (Catchment 201) = 10,940 sq.m

LOT NO	MAX. LOT COVERAGE	LOT AREA (m^2)	MAX. BUILDING FOOTPRINT (m^2)	MIN. SETBACK REQUIREMENT (m)	6m/12m WIDE DRIVEWAY AREA (m^2)	TOTAL IMPERVIOUS AREA (m^2)
1	-	840	375	6	72	447
2	-	704	350	6	72	422
3	30%	558	167	7.5	45	212
4	30%	558	167	7.5	45	212
5	30%	558	167	7.5	45	212
6	30%	636	191	7.5	45	236
7	30%	580	174	7.5	45	219
8	30%	663	199	7.5	45	244
9	30%	606	182	7.5	45	227
10	30%	606	182	7.5	45	227
11	30%	583	175	7.5	45	220
12	-	700	375	6	72	260
13	-	751	375	6	72	447
ROAD						1800

Impervious Area	=	5,385	sq.m	(Roadway, Driveways & Rooftop)
Pervious Area	=	5,555	sq.m	
Directly Connected Area	=	2,493	sq.m	(Roadway and Driveways)
% Impervious	=	49		(Use StandHyd)
% Directly Connected	=	23		

TATHAM ENGINEERING	Project: 24 Alfred Street	Date: Dec 2022
	File No.: 121108	Designed: KG
	Subject: Impervious Area Calculations	Checked DC

Site Area (Catchment 301) = 5,300 sq.m

LOT NO	BUILDING FOOTPRINT (m^2)	SETBACK (m)	6m WIDE DRIVEWAY AREA (m^2)	TOTAL IMPERVIOUS AREA (m^2)
22 Alfred St. W.	161	10	60	221
14 Alfred St. W.	124	22	132	256
85 Bruce St. S.	85			85
100 Bruce Street S.	357			357

Impervious Area	=	919	sq.m	(Driveways & Rooftops)
Pervious Area	=	4,381	sq.m	
Directly Connected Area	=	0	sq.m	
% Impervious	=	17		(Use NasHyd)
% Directly Connected	=	0		

Site Area (Catchment 302) = 4,300 sq.m

LOT NO	BUILDING FOOTPRINT (m^2)	SETBACK (m)	6m WIDE DRIVEWAY AREA (m^2)	TOTAL IMPERVIOUS AREA (m^2)
84 Bruce Street S.	93	7	42	135
80 Bruce Street S.	450			450
78 Bruce Street S.	184	8.6	51.6	236
74 Bruce Street S.	82	14.5	87	169

Impervious Area	=	990	sq.m	(Rooftop)
Pervious Area	=	3,310	sq.m	
Directly Connected Area	=	0	sq.m	
% Impervious	=	23		(Use StandHyd)
% Directly Connected	=	0		

Site Area (Catchment 303) = 1,800 sq.m

LOT NO	BUILDING FOOTPRINT (m^2)	SETBACK (m)	6m WIDE DRIVEWAY AREA (m^2)	TOTAL IMPERVIOUS AREA (m^2)
9 Alice St. W	162		80	242
15 Alice St. W	245		96	341
17 Alice St. W	122		50	172

Impervious Area	=	755	sq.m	(Rooftop)
Pervious Area	=	1,045	sq.m	
Directly Connected Area	=	0	sq.m	
% Impervious	=	42		(Use StandHyd)
% Directly Connected	=	0		

TATHAM ENGINEERING

Visual OTTHYMO Model Parameter Calculations (StandHYD)

Project Details

24 Alfred Street	121108

Prepared By

Kyle Gowanlock	Dec 2022

Data Sources

Detailed Soil Survey Reports for Ontario, GSCA Policies for the Administration of the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation (2010), MTO Drainage Management Manual (1997)

Post Development Condition

Watershed:	GSCA
Catchment ID:	201
Catchment Area (ha):	1.09
Impervious %:	49%
Pervious Area (ha):	0.56

Average Curve Number (CN) and Initial Abstraction (IA) for Pervious Area

Soil Symbol		**Brs**							
Soil Series		Brighton							
Hydrologic Soils Group		A							
Soil Texture		Sand							
Runoff Coefficient Type		1							
Area (ha)		0.56							
Percentage of Catchment		100%							
Land Cover Category	**IA**	**A (ha)**	**CN**	**A (ha)**	**CN**	**A (ha)**	**CN**	**A (ha)**	**CN**
Impervious	2		100						
Gravel	3		89						
Woodland	10		32						
Pasture/Lawns	5	0.56	49						
Meadows	8		38						
Cultivated	7		62						
Waterbody	12		50						
Average CN		49.00							
Average IA		5.00							

Notes

CN and IA values have been calculated for the pervious area of the catchment only.

Summary

Catchment CN:	49.0
Catchment IA (mm):	5.00

TATHAM ENGINEERING

Visual OTTHYMO Model Parameter Calculations (StandHYD)

Project Details

24 Alfred Street	121108

Prepared By

Kyle Gowanlock	Dec 2022

Data Sources

Detailed Soil Survey Reports for Ontario, GSCA Policies for the Administration of the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation (2010), MTO Drainage Management Manual (1997)

Post Development Condition

Watershed:	GSCA
Catchment ID:	302
Catchment Area (ha):	0.43
Impervious %:	23%
Pervious Area (ha):	0.33

Average Curve Number (CN) and Initial Abstraction (IA) for Pervious Area

Soil Symbol		**Brs**							
Soil Series		Brighton							
Hydrologic Soils Group		A							
Soil Texture		Sand							
Runoff Coefficient Type		1							
Area (ha)		0.33							
Percentage of Catchment		100%							
Land Cover Category	**IA**	**A (ha)**	**CN**	**A (ha)**	**CN**	**A (ha)**	**CN**	**A (ha)**	**CN**
Impervious	2		100						
Gravel	3		89						
Woodland	10		32						
Pasture/Lawns	5	0.33	49						
Meadows	8		38						
Cultivated	7		62						
Waterbody	12		50						
Average CN		49.00							
Average IA		5.00							

Notes

CN and IA values have been calculated for the pervious area of the catchment only.

Summary

Catchment CN:	49.0
Catchment IA (mm):	5.00

TATHAM ENGINEERING

Visual OTTHYMO Model Parameter Calculations (StandHYD)

Project Details

24 Alfred Street	121108

Prepared By

Kyle Gowanlock	Dec 2022

Data Sources

Detailed Soil Survey Reports for Ontario, GSCA Policies for the Administration of the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation (2010), MTO Drainage Management Manual (1997)

Post Development Condition

Watershed:	GSCA
Catchment ID:	303
Catchment Area (ha):	0.18
Impervious %:	42%
Pervious Area (ha):	0.10

Average Curve Number (CN) and Initial Abstraction (IA) for Pervious Area

Soil Symbol		**Brs**							
Soil Series		Brighton							
Hydrologic Soils Group		A							
Soil Texture		Sand							
Runoff Coefficient Type		1							
Area (ha)		0.10							
Percentage of Catchment		100%							
Land Cover Category	**IA**	**A (ha)**	**CN**	**A (ha)**	**CN**	**A (ha)**	**CN**	**A (ha)**	**CN**
Impervious	2		100						
Gravel	3		89						
Woodland	10		32						
Pasture/Lawns	5	0.10	49						
Meadows	8		38						
Cultivated	7		62						
Waterbody	12		50						
Average CN		49.00							
Average IA		5.00							

Notes

CN and IA values have been calculated for the pervious area of the catchment only.

Summary

Catchment CN:	49.0
Catchment IA (mm):	5.00

TATHAM ENGINEERING

Visual OTTHYMO Model Parameter Calculations (NasHYD)

Project Details

24 Alfred Street	121108

Prepared By

Kyle Gowanlock	Dec 2022

Data Sources

Detailed Soil Survey Reports for Ontario, GSCA Policies for the Administration of the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation (2010), MTO Drainage Management Manual (1997)

Pre-Development Condition

Watershed:	GSCA
Catchment ID:	301
Catchment Area (ha):	0.53
Impervious %:	17%

Average Curve Number (CN), Runoff Coefficient (C) and Initial Abstraction (IA)

Soil Symbol		**Brs**											
Soil Series		Brighton											
Hydrologic Soils Group		A											
Soil Texture		Sand											
Runoff Coefficient Type		1											
Area (ha)		0.53											
Percentage of Catchment		100%											
Land Cover Category	**IA**	**A (ha)**	**CN**	**C**	**A (ha)**	**CN**	**C**	**A (ha)**	**CN**	**C**	**A (ha)**	**CN**	**C**
Impervious	2	0.09	100	0.95									
Gravel	3		89	0.09									
Woodland	10		32	0.08									
Pasture/Lawns	5	0.44	49	0.10									
Meadows	8		38	0.09									
Cultivated	7		62	0.22									
Waterbody	12		50	0.05									
Average CN		57.66											
Average C		0.24											
Average IA		4.49											

Time to Peak Calculations

Max. Catchment Elev. (m):	200.00
Min. Catchment Elev. (m):	198.50
Catchment Length (m):	65
Catchment Slope (%):	2.31%
Method: Airport Method	
Time of Concentration (mins):	17.07

Summary

Catchment CN:	57.7
Catchment C:	0.24
Catchment IA (mm):	4.49
Time of Concentration (hrs):	0.28
Catchment Time to Peak (hrs):	0.19
Catchment Time Step (mins):	2.28

TATHAM ENGINEERING	PROJECT 24 Alfred Street	FILE 121108
		DATE Dec 2022
	SUBJECT Pipe Storage Volumes	NAME KG
		PAGE 1

SUMMARY

Pipe Des.	Upstream Maintenance Hole	Downstream Maintenance Hole	Start Invert Elevation	End Invert Elevation	Max. Storage Elevation	Check (Max. Ponding Elev. > Pipe Inv. Elev.)	Sewer Length (m)	Sewer Slope (%)	Sewer Diameter (mm)	Full Volume (cu.m)	Full Volume (ha-m)
Pipe A	MH6B	CBMH5B	196.17	196.10	196.649	OK	14.9	0.5%	300	1.05	**0.0001**
Pipe B	CBMH5B	CBMH4B	196.05	195.65	196.649	OK	79.1	0.5%	450	12.58	**0.0013**
Pipe C	CBMH4B	MH3B	195.66	195.52	196.649	OK	15.1	0.5%	525	3.27	**0.0003**
Pipe D	MH3B	UGS	195.45	195.43	196.649	OK	3.4	0.5%	675	1.22	**0.0001**
Pipe E	CB5B	CBMH5B	196.45	196.42	196.649	OK	6.5	0.5%	300	0.46	**0.0000**
Pipe F	CB4B	CBMH4B	195.77	195.74	196.649	OK	6.5	0.5%	300	0.46	**0.0000**
Pipe G	DCB2B	DCBMH2B	195.54	195.47	196.649	OK	6.2	1.0%	375	0.68	**0.0001**
Pipe H	RYCB2	MH3B	195.65	195.52	196.649	OK	26.0	0.5%	300	1.84	**0.0002**
Pipe I	RYCB3	MH3B	196.22	195.58	196.649	OK	32.0	0.5%	300	2.26	**0.0002**

TOTAL	**0.0024**	**ha-m**

TATHAM ENGINEERING	PROJECT 24 Alfred Street	FILE 121108
		DATE Dec 2022
	SUBJECT Pipe Storage Volumes	NAME KG
		PAGE 1

PIPE STORAGE - WATER HEAD

Water Level	Head* (m)								
(m)	Pipe A	Pipe B	Pipe C	Pipe D	Pipe E	Pipe F	Pipe G	Pipe H	Pipe I
195.430	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
195.455	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00
195.480	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00
195.505	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00
195.530	0.00	0.00	0.00	0.09	0.00	0.00	0.03	0.00	0.00
195.555	0.00	0.00	0.00	0.12	0.00	0.00	0.05	0.00	0.00
195.580	0.00	0.00	0.00	0.14	0.00	0.00	0.08	0.00	0.00
195.605	0.00	0.00	0.02	0.17	0.00	0.00	0.10	0.02	0.00
195.630	0.00	0.00	0.04	0.19	0.00	0.00	0.13	0.05	0.00
195.655	0.00	0.00	0.07	0.22	0.00	0.00	0.15	0.07	0.00
195.680	0.00	0.00	0.09	0.24	0.00	0.00	0.18	0.10	0.00
195.705	0.00	0.00	0.12	0.27	0.00	0.00	0.20	0.12	0.00
195.730	0.00	0.00	0.14	0.29	0.00	0.00	0.23	0.15	0.00
195.755	0.00	0.00	0.17	0.32	0.00	0.00	0.25	0.17	0.00
195.780	0.00	0.00	0.19	0.34	0.00	0.03	0.28	0.20	0.00
195.805	0.00	0.00	0.22	0.37	0.00	0.05	0.30	0.22	0.00
195.830	0.00	0.00	0.24	0.39	0.00	0.08	0.33	0.25	0.00
195.855	0.00	0.01	0.27	0.42	0.00	0.10	0.35	0.27	0.00
195.880	0.00	0.03	0.29	0.44	0.00	0.13	0.38	0.30	0.00
195.905	0.00	0.06	0.32	0.47	0.00	0.15	0.40	0.32	0.01
195.930	0.00	0.08	0.34	0.49	0.00	0.18	0.43	0.35	0.03
195.955	0.00	0.11	0.37	0.52	0.00	0.20	0.45	0.37	0.06
195.980	0.00	0.13	0.39	0.54	0.00	0.23	0.48	0.40	0.08
196.005	0.00	0.16	0.42	0.57	0.00	0.25	0.50	0.42	0.11
196.030	0.00	0.18	0.44	0.59	0.00	0.28	0.53	0.45	0.13
196.055	0.00	0.21	0.47	0.62	0.00	0.30	0.55	0.47	0.16
196.080	0.00	0.23	0.49	0.64	0.00	0.33	0.58	0.50	0.18
196.105	0.00	0.26	0.52	0.67	0.00	0.35	0.60	0.52	0.21
196.130	0.00	0.28	0.54	0.69	0.00	0.38	0.63	0.55	0.23
196.155	0.02	0.31	0.57	0.72	0.00	0.40	0.65	0.57	0.26
196.180	0.05	0.33	0.59	0.74	0.00	0.43	0.68	0.60	0.28
196.205	0.07	0.36	0.62	0.77	0.00	0.45	0.70	0.62	0.31
196.230	0.10	0.38	0.64	0.79	0.00	0.48	0.73	0.65	0.33
196.255	0.12	0.41	0.67	0.82	0.00	0.50	0.75	0.67	0.36
196.280	0.15	0.43	0.69	0.84	0.00	0.53	0.78	0.70	0.38
196.305	0.17	0.46	0.72	0.87	0.00	0.55	0.80	0.72	0.41
196.330	0.20	0.48	0.74	0.89	0.00	0.58	0.83	0.75	0.43
196.355	0.22	0.51	0.77	0.92	0.00	0.60	0.85	0.77	0.46
196.380	0.25	0.53	0.79	0.94	0.00	0.63	0.88	0.80	0.48
196.405	0.27	0.56	0.82	0.97	0.00	0.65	0.90	0.82	0.51
196.430	0.30	0.58	0.84	0.99	0.00	0.68	0.93	0.85	0.53
196.455	0.32	0.61	0.87	1.02	0.02	0.70	0.95	0.87	0.56
196.480	0.35	0.63	0.89	1.04	0.05	0.73	0.98	0.90	0.58
196.505	0.37	0.66	0.92	1.07	0.07	0.75	1.00	0.92	0.61
196.530	0.40	0.68	0.94	1.09	0.10	0.78	1.03	0.95	0.63
196.555	0.42	0.71	0.97	1.12	0.12	0.80	1.05	0.97	0.66
196.580	0.45	0.73	0.99	1.14	0.15	0.83	1.08	1.00	0.68
196.605	0.47	0.76	1.02	1.17	0.17	0.85	1.10	1.02	0.71
196.630	0.50	0.78	1.04	1.19	0.20	0.88	1.13	1.05	0.73
196.655	0.52	0.81	1.07	1.22	0.22	0.90	1.15	1.07	0.76

**Head calculated using average depth of pipe*

TATHAM ENGINEERING	PROJECT 24 Alfred Street	FILE 121108
		DATE Dec 2022
	SUBJECT Pipe Storage Volumes	NAME KG
		PAGE 1

PIPE STAGE-STORAGE

Water Level	Cummulative Volume (ha-m)									
(m)	Pipe A	Pipe B	Pipe C	Pipe D	Pipe E	Pipe F	Pipe G	Pipe H	Pipe I	TOTAL
195.430	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	**0.0000**
195.455	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	**0.0000**
195.480	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	**0.0000**
195.505	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	**0.0000**
195.530	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	**0.0000**
195.555	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	**0.0000**
195.580	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	**0.0000**
195.605	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	**0.0000**
195.630	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	**0.0001**
195.655	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	**0.0001**
195.680	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	**0.0002**
195.705	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	**0.0002**
195.730	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	**0.0003**
195.755	0.0000	0.0000	0.0001	0.0001	0.0000	0.0000	0.0000	0.0001	0.0000	**0.0003**
195.780	0.0000	0.0000	0.0001	0.0001	0.0000	0.0000	0.0001	0.0001	0.0000	**0.0004**
195.805	0.0000	0.0000	0.0001	0.0001	0.0000	0.0000	0.0001	0.0001	0.0000	**0.0004**
195.830	0.0000	0.0000	0.0001	0.0001	0.0000	0.0000	0.0001	0.0002	0.0000	**0.0005**
195.855	0.0000	0.0000	0.0002	0.0001	0.0000	0.0000	0.0001	0.0002	0.0000	**0.0005**
195.880	0.0000	0.0000	0.0002	0.0001	0.0000	0.0000	0.0001	0.0002	0.0000	**0.0006**
195.905	0.0000	0.0001	0.0002	0.0001	0.0000	0.0000	0.0001	0.0002	0.0000	**0.0007**
195.930	0.0000	0.0002	0.0002	0.0001	0.0000	0.0000	0.0001	0.0002	0.0000	**0.0008**
195.955	0.0000	0.0002	0.0002	0.0001	0.0000	0.0000	0.0001	0.0002	0.0000	**0.0009**
195.980	0.0000	0.0003	0.0003	0.0001	0.0000	0.0000	0.0001	0.0002	0.0000	**0.0010**
196.005	0.0000	0.0004	0.0003	0.0001	0.0000	0.0000	0.0001	0.0002	0.0001	**0.0011**
196.030	0.0000	0.0005	0.0003	0.0001	0.0000	0.0000	0.0001	0.0002	0.0001	**0.0013**
196.055	0.0000	0.0006	0.0003	0.0001	0.0000	0.0000	0.0001	0.0002	0.0001	**0.0014**
196.080	0.0000	0.0006	0.0003	0.0001	0.0000	0.0000	0.0001	0.0002	0.0001	**0.0015**
196.105	0.0000	0.0007	0.0003	0.0001	0.0000	0.0000	0.0001	0.0002	0.0002	**0.0016**
196.130	0.0000	0.0008	0.0003	0.0001	0.0000	0.0000	0.0001	0.0002	0.0002	**0.0018**
196.155	0.0000	0.0009	0.0003	0.0001	0.0000	0.0000	0.0001	0.0002	0.0002	**0.0019**
196.180	0.0000	0.0010	0.0003	0.0001	0.0000	0.0000	0.0001	0.0002	0.0002	**0.0020**
196.205	0.0000	0.0011	0.0003	0.0001	0.0000	0.0000	0.0001	0.0002	0.0002	**0.0021**
196.230	0.0000	0.0011	0.0003	0.0001	0.0000	0.0000	0.0001	0.0002	0.0002	**0.0021**
196.255	0.0000	0.0012	0.0003	0.0001	0.0000	0.0000	0.0001	0.0002	0.0002	**0.0022**
196.280	0.0001	0.0012	0.0003	0.0001	0.0000	0.0000	0.0001	0.0002	0.0002	**0.0023**
196.305	0.0001	0.0013	0.0003	0.0001	0.0000	0.0000	0.0001	0.0002	0.0002	**0.0023**
196.330	0.0001	0.0013	0.0003	0.0001	0.0000	0.0000	0.0001	0.0002	0.0002	**0.0023**
196.355	0.0001	0.0013	0.0003	0.0001	0.0000	0.0000	0.0001	0.0002	0.0002	**0.0023**
196.380	0.0001	0.0013	0.0003	0.0001	0.0000	0.0000	0.0001	0.0002	0.0002	**0.0023**
196.405	0.0001	0.0013	0.0003	0.0001	0.0000	0.0000	0.0001	0.0002	0.0002	**0.0023**
196.430	0.0001	0.0013	0.0003	0.0001	0.0000	0.0000	0.0001	0.0002	0.0002	**0.0023**
196.455	0.0001	0.0013	0.0003	0.0001	0.0000	0.0000	0.0001	0.0002	0.0002	**0.0023**
196.480	0.0001	0.0013	0.0003	0.0001	0.0000	0.0000	0.0001	0.0002	0.0002	**0.0023**
196.505	0.0001	0.0013	0.0003	0.0001	0.0000	0.0000	0.0001	0.0002	0.0002	**0.0023**
196.530	0.0001	0.0013	0.0003	0.0001	0.0000	0.0000	0.0001	0.0002	0.0002	**0.0023**
196.555	0.0001	0.0013	0.0003	0.0001	0.0000	0.0000	0.0001	0.0002	0.0002	**0.0024**
196.580	0.0001	0.0013	0.0003	0.0001	0.0000	0.0000	0.0001	0.0002	0.0002	**0.0024**
196.605	0.0001	0.0013	0.0003	0.0001	0.0000	0.0000	0.0001	0.0002	0.0002	**0.0024**
196.630	0.0001	0.0013	0.0003	0.0001	0.0000	0.0000	0.0001	0.0002	0.0002	**0.0024**
196.655	0.0001	0.0013	0.0003	0.0001	0.0000	0.0000	0.0001	0.0002	0.0002	**0.0024**

TATHAM ENGINEERING

Project:	24 Alfred Street
Date:	December 2022
File No.:	121108
Designed By:	KG
Checked By:	DC
Subject:	Pond Discharge Table

ORIFICE CONTROL

	Orifice 1	Outlet Pipe
Orifice/Pipe Size (mm)	200	300
Cross-sectional Area (sq.m)	0.031	0.071
Orifice Coefficient	0.63	0.80
Invert Elevation (m)	195.43	195.43

WEIR CONTROL

	Overflow
Weir Width (m)	6.5
Sill elevation (m)	197.20
Weir Coefficient	1.65
Weir Side Slopes (H:V)	1
Weir Length (m)	1

U/G STORAGE PARAMETERS

Box Depth (m)	1.219
Box Width (m)	3.048
Box Length (m)	2.438
Volume (cu.m/m)	3.591
No. of Connected Systems	19
Volume (cu.m.)	166.4
Avg. Footprint (sq.m)	136

CONTROL STRUCTURE CONFIGURATION

Water Level	Outlet Structure				Overflow Weir		Total Discharge	Total Live Storage
	Orifice 1		Outlet Pipe 1					
	Head	Discharge	Head	Capacity	Head	Discharge		
(m)	(m)	(cms)	(m)	(cms)	(m)	(cms)	(cms)	(ha-m)
195.43	0.000	0.0000	0.000	0.0000	0.000	0.0000	0.0000	0.0000
195.46	0.025	**0.0006**	0.025	**0.0007**	0.000	0.0000	0.0006	0.0003
195.48	0.050	**0.0023**	0.050	**0.0029**	0.000	0.0000	0.0023	0.0007
195.51	0.075	**0.0049**	0.075	**0.0062**	0.000	0.0000	0.0049	0.0010
195.54	0.005	**0.0062**	0.105	**0.0118**	0.000	0.0000	0.0062	0.0014
195.56	0.025	**0.0139**	0.125	**0.0163**	0.000	0.0000	0.0139	0.0017
195.58	0.050	**0.0196**	0.150	**0.0226**	0.000	0.0000	0.0196	0.0021
195.61	0.075	**0.0240**	0.025	**0.0396**	0.000	0.0000	0.0240	0.0024
195.63	0.100	**0.0277**	0.050	**0.0560**	0.000	0.0000	0.0277	0.0028
195.66	0.125	**0.0310**	0.075	**0.0686**	0.000	0.0000	0.0310	0.0032
195.68	0.150	**0.0340**	0.100	**0.0792**	0.000	0.0000	0.0340	0.0036
195.71	0.175	**0.0367**	0.125	**0.0886**	0.000	0.0000	0.0367	0.0040
195.73	0.200	**0.0392**	0.150	**0.0970**	0.000	0.0000	0.0392	0.0043
195.76	0.225	**0.0416**	0.175	**0.1048**	0.000	0.0000	0.0416	0.0047
195.78	0.250	**0.0438**	0.200	**0.1120**	0.000	0.0000	0.0438	0.0051
195.81	0.275	**0.0460**	0.225	**0.1188**	0.000	0.0000	0.0460	0.0055
195.83	0.300	**0.0480**	0.250	**0.1252**	0.000	0.0000	0.0480	0.0059
195.86	0.325	**0.0500**	0.275	**0.1314**	0.000	0.0000	0.0500	0.0063
195.88	0.350	**0.0519**	0.300	**0.1372**	0.000	0.0000	0.0519	0.0067
195.91	0.375	**0.0537**	0.325	**0.1428**	0.000	0.0000	0.0537	0.0071
195.93	0.400	**0.0554**	0.350	**0.1482**	0.000	0.0000	0.0554	0.0076
195.96	0.425	**0.0572**	0.375	**0.1534**	0.000	0.0000	0.0572	0.0080
195.98	0.450	**0.0588**	0.400	**0.1584**	0.000	0.0000	0.0588	0.0085
196.01	0.475	**0.0604**	0.425	**0.1633**	0.000	0.0000	0.0604	0.0090
196.03	0.500	**0.0620**	0.450	**0.1680**	0.000	0.0000	0.0620	0.0095
196.06	0.525	**0.0635**	0.475	**0.1726**	0.000	0.0000	0.0635	0.0099
196.08	0.550	**0.0650**	0.500	**0.1771**	0.000	0.0000	0.0650	0.0104
196.11	0.575	**0.0665**	0.525	**0.1815**	0.000	0.0000	0.0665	0.0109
196.13	0.600	**0.0679**	0.550	**0.1858**	0.000	0.0000	0.0679	0.0113
196.16	0.625	**0.0693**	0.575	**0.1899**	0.000	0.0000	0.0693	0.0118
196.18	0.650	**0.0707**	0.600	**0.1940**	0.000	0.0000	0.0707	0.0122
196.21	0.675	**0.0720**	0.625	**0.1980**	0.000	0.0000	0.0720	0.0126
196.23	0.700	**0.0733**	0.650	**0.2020**	0.000	0.0000	0.0733	0.0131
196.26	0.725	**0.0746**	0.675	**0.2058**	0.000	0.0000	0.0746	0.0135
196.28	0.750	**0.0759**	0.700	**0.2096**	0.000	0.0000	0.0759	0.0139
196.31	0.775	**0.0772**	0.725	**0.2133**	0.000	0.0000	0.0772	0.0142
196.33	0.800	**0.0784**	0.750	**0.2169**	0.000	0.0000	0.0784	0.0146
196.36	0.825	**0.0796**	0.775	**0.2205**	0.000	0.0000	0.0796	0.0149
196.38	0.850	**0.0808**	0.800	**0.2240**	0.000	0.0000	0.0808	0.0153
196.41	0.875	**0.0820**	0.825	**0.2275**	0.000	0.0000	0.0820	0.0156
196.43	0.900	**0.0832**	0.850	**0.2309**	0.000	0.0000	0.0832	0.0160
196.46	0.925	**0.0843**	0.875	**0.2343**	0.000	0.0000	0.0843	0.0163
196.48	0.950	**0.0854**	0.900	**0.2376**	0.000	0.0000	0.0854	0.0167

TATHAM ENGINEERING

Project:	24 Alfred Street
Date:	December 2022
File No.:	121108
Designed By:	KG
Checked By:	DC
Subject:	Pond Discharge Table

ORIFICE CONTROL

	Orifice 1	Outlet Pipe
Orifice/Pipe Size (mm)	200	300
Cross-sectional Area (sq.m)	0.031	0.071
Orifice Coefficient	0.63	0.80
Invert Elevation (m)	195.43	195.43

WEIR CONTROL

	Overflow
Weir Width (m)	6.5
Sill elevation (m)	197.20
Weir Coefficient	1.65
Weir Side Slopes (H:V)	1
Weir Length (m)	1

U/G STORAGE PARAMETERS

Box Depth (m)	1.219
Box Width (m)	3.048
Box Length (m)	2.438
Volume (cu.m/m)	3.591
No. of Connected Systems	19
Volume (cu.m.)	166.4
Avg. Footprint (sq.m)	136

CONTROL STRUCTURE CONFIGURATION

Water Level	Outlet Structure				Overflow Weir		Total Discharge	Total Live Storage
	Orifice 1		Outlet Pipe 1					
	Head	Discharge	Head	Capacity	Head	Discharge		
(m)	(m)	(cms)	(m)	(cms)	(m)	(cms)	(cms)	(ha-m)
196.51	0.975	**0.0866**	0.925	**0.2409**	0.000	0.0000	0.0866	0.0170
196.53	1.000	**0.0877**	0.950	**0.2442**	0.000	0.0000	0.0877	0.0174
196.56	1.025	**0.0888**	0.975	**0.2473**	0.000	0.0000	0.0888	0.0177
196.58	1.050	**0.0898**	1.000	**0.2505**	0.000	0.0000	0.0898	0.0181
196.61	1.075	**0.0909**	1.025	**0.2536**	0.000	0.0000	0.0909	0.0184
196.63	1.100	**0.0919**	1.050	**0.2567**	0.000	0.0000	0.0919	0.0187
196.66	1.125	**0.0930**	1.075	**0.2597**	0.000	0.0000	0.0930	0.0190

Additional Notes:

NVCA Weir Flow Calculation Applied For Weir Flow Below Circular Orifice Centroid

$$Q_w = 1.65([(pi*(D^2)/4)(2*\cos^{-1}[(((D/2)-d)/(D/2))*(180/pi)]/360)-((D/2-d)(Dd-d^2)^{0.5})]/d)d^{1.5}$$

Where:
Q_w is weir flow (m^3/s)
D is orifice diameter (m)
d is depth of flow above the invert (m)

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

       V    V   I    SSSSS  U   U    A    L              (v 6.1.2001)
       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 6.1\VO2\voin.dat

  Output  filename:
C:\Users\KGowanlock\AppData\Local\Civica\VH5\2c82a674-7dbe-4ff9-a174-9e37ec52cdac\1
b650651-81d4-4b87-8988-f72381a672a4\s
  Summary filename:
C:\Users\KGowanlock\AppData\Local\Civica\VH5\2c82a674-7dbe-4ff9-a174-9e37ec52cdac\1
b650651-81d4-4b87-8988-f72381a672a4\s


DATE: 12-12-2022                          TIME: 03:23:08

USER:


COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------
  ***********************************************
  ** SIMULATION : 1. 2yr - CHI                 **
  ***********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 854.100
| Ptotal= 33.23 mm |                          B=   7.781
--------------------                          C=   0.830
```

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

                          Duration of storm  =  3.00 hrs
                          Storm time step    =  5.00 min
                          Time to peak ratio =  0.38

      TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
       hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
      0.08    2.37 |  0.83    8.07 |  1.58   10.29 |  2.33    3.57
      0.17    2.56 |  0.92   11.14 |  1.67    8.50 |  2.42    3.34
      0.25    2.79 |  1.00   17.74 |  1.75    7.24 |  2.50    3.13
      0.33    3.07 |  1.08   39.66 |  1.83    6.30 |  2.58    2.95
      0.42    3.41 |  1.17  103.05 |  1.92    5.58 |  2.67    2.79
      0.50    3.85 |  1.25   47.46 |  2.00    5.01 |  2.75    2.65
      0.58    4.42 |  1.33   26.04 |  2.08    4.55 |  2.83    2.52
      0.67    5.20 |  1.42   17.46 |  2.17    4.17 |  2.92    2.41
      0.75    6.32 |  1.50   12.99 |  2.25    3.85 |  3.00    2.30


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0301)|   Area    (ha)=   0.53   Curve Number   (CN)= 57.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.49   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.19

     Unit Hyd Qpeak  (cms)=   0.107

     PEAK FLOW       (cms)=   0.007 (i)
     TIME TO PEAK    (hrs)=   1.417
     RUNOFF VOLUME    (mm)=   3.827
     TOTAL RAINFALL   (mm)=  33.227
     RUNOFF COEFFICIENT   =   0.115

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0303)|   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  42.00   Dir. Conn.(%)=   0.10
--------------------

                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.08          0.10
     Dep. Storage     (mm)=       2.00          5.00
     Average Slope     (%)=       2.00          1.00
     Length            (m)=      34.64         50.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     103.05         11.93
```

```
                over (min)        5.00        25.00
     Storage Coeff.  (min)=       1.09 (ii)   24.34 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.34         0.05
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.00          0.002 (iii)
     TIME TO PEAK    (hrs)=       1.17         1.58          1.58
     RUNOFF VOLUME    (mm)=      31.23         5.00          4.96
     TOTAL RAINFALL   (mm)=      33.23        33.23         33.23
     RUNOFF COEFFICIENT   =       0.94         0.15          0.15

***** 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*  =  49.0    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 (  0302)|   Area    (ha)=   0.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  23.00   Dir. Conn.(%)=   0.10
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.10         0.33
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      53.54       100.00
     Mannings n            =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     103.05         4.61
                over (min)        5.00        45.00
     Storage Coeff.  (min)=       1.41 (ii)   43.27 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=       0.33         0.03
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.00          0.002 (iii)
     TIME TO PEAK    (hrs)=       1.17         2.00          2.00
     RUNOFF VOLUME    (mm)=      31.23         3.70          3.67
     TOTAL RAINFALL   (mm)=      33.23        33.23         33.23
     RUNOFF COEFFICIENT   =       0.94         0.11          0.11

***** 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*  =  49.0    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  (  0901)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0301):     0.53   0.007     1.42     3.83
     + ID2= 2 (  0302):     0.43   0.002     2.00     3.67
       ================================================
       ID = 3 (  0901):     0.96   0.008     1.42     3.75

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

--------------------
| ADD HYD  (  0901)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0901):     0.96   0.008     1.42     3.75
     + ID2= 2 (  0303):     0.18   0.002     1.58     4.96
       ================================================
       ID = 1 (  0901):     1.14   0.009     1.50     3.94

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   1.09
|ID= 1 DT= 5.0 min |   Total Imp(%)=  49.00   Dir. Conn.(%)=  23.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.53         0.56
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.50
     Length            (m)=      85.24        15.00
     Mannings n            =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     103.05        14.18
                over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.29 (ii)    7.27 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.30         0.14
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.07         0.02          0.074 (iii)
```

```
     TIME TO PEAK    (hrs)=       1.17         1.33          1.17
     RUNOFF VOLUME    (mm)=      31.23         4.37         10.54
     TOTAL RAINFALL   (mm)=      33.23        33.23         33.23
     RUNOFF COEFFICIENT   =       0.94         0.13          0.32

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  49.0    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  (  0902)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0201):     1.09   0.074     1.17    10.54
      + ID2= 2 (  0901):     1.14   0.009     1.50     3.94
        ================================================
        ID = 3 (  0902):     2.23   0.077     1.17     7.17

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0401)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0665     0.0108
                          0.0049     0.0010   |   0.0707     0.0122
                          0.0196     0.0021   |   0.0746     0.0134
                          0.0310     0.0032   |   0.0784     0.0145
                          0.0392     0.0043   |   0.0820     0.0156
                          0.0460     0.0055   |   0.0854     0.0166
                          0.0519     0.0067   |   0.0888     0.0177
                          0.0572     0.0080   |   0.0930     0.0190
                          0.0620     0.0094   |   0.0000     0.0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0902)     2.230      0.077      1.17       7.17
   OUTFLOW: ID= 1 (  0401)     2.230      0.037      1.42       7.15

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 48.26
                  TIME SHIFT OF PEAK FLOW         (min)= 15.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0040
```

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--------------------------------------------------------------------------------
================================================================================
========================

       V    V   I    SSSSS  U   U    A    L             (v 6.1.2001)
       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 6.1\VO2\voin.dat

  Output  filename:
C:\Users\KGowanlock\AppData\Local\Civica\VH5\2c82a674-7dbe-4ff9-a174-9e37ec52cdac\3
3757098-5b85-45c6-b2f1-7b0cfc9b6895\s
  Summary filename:
C:\Users\KGowanlock\AppData\Local\Civica\VH5\2c82a674-7dbe-4ff9-a174-9e37ec52cdac\3
3757098-5b85-45c6-b2f1-7b0cfc9b6895\s


DATE: 12-12-2022                          TIME: 03:23:08

USER:



COMMENTS: _____

--------------------------------------------------------------------------------
------------------------
  **********************************************
  ** SIMULATION : 2. 5yr - CHI                 **
  **********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1234.576
| Ptotal= 42.93 mm |                          B=   8.297
```

```
--------------------                          C=   0.851
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  3.00 hrs
                       Storm time step    =  5.00 min
                       Time to peak ratio =  0.38

                  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                  0.08    2.80 |  0.83   10.17 |  1.58   13.13 |  2.33    4.31
                  0.17    3.04 |  0.92   14.27 |  1.67   10.75 |  2.42    4.01
                  0.25    3.33 |  1.00   23.16 |  1.75    9.08 |  2.50    3.75
                  0.33    3.68 |  1.08   52.75 |  1.83    7.85 |  2.58    3.53
                  0.42    4.11 |  1.17  136.52 |  1.92    6.91 |  2.67    3.33
                  0.50    4.67 |  1.25   63.26 |  2.00    6.16 |  2.75    3.15
                  0.58    5.40 |  1.33   34.39 |  2.08    5.57 |  2.83    2.99
                  0.67    6.40 |  1.42   22.78 |  2.17    5.07 |  2.92    2.84
                  0.75    7.87 |  1.50   16.75 |  2.25    4.66 |  3.00    2.71


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0301)|   Area    (ha)=   0.53   Curve Number   (CN)= 57.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.49   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.19

     Unit Hyd Qpeak  (cms)=   0.107

     PEAK FLOW       (cms)=   0.012 (i)
     TIME TO PEAK    (hrs)=   1.417
     RUNOFF VOLUME    (mm)=   6.552
     TOTAL RAINFALL   (mm)=  42.928
     RUNOFF COEFFICIENT   =   0.153

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0303)|   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  42.00   Dir. Conn.(%)=   0.10
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.08         0.10
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         1.00
     Length            (m)=      34.64        50.00
     Mannings n           =      0.013        0.250
```

```
     Max.Eff.Inten.(mm/hr)=     136.52        23.31
               over (min)        5.00        20.00
     Storage Coeff.  (min)=       0.97 (ii)   18.76 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.34         0.06
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.00          0.004 (iii)
     TIME TO PEAK    (hrs)=       1.17         1.50           1.50
     RUNOFF VOLUME    (mm)=      40.93         8.28           8.25
     TOTAL RAINFALL   (mm)=      42.93        42.93          42.93
     RUNOFF COEFFICIENT   =       0.95         0.19           0.19

***** 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*  =  49.0    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 (  0302)|   Area    (ha)=   0.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  23.00   Dir. Conn.(%)=   0.10
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.10         0.33
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      53.54       100.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     136.52         9.44
               over (min)        5.00        35.00
     Storage Coeff.  (min)=       1.26 (ii)   32.69 (ii)
     Unit Hyd. Tpeak (min)=       5.00        35.00
     Unit Hyd. peak  (cms)=       0.33         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.01          0.005 (iii)
     TIME TO PEAK    (hrs)=       1.17         1.75           1.75
     RUNOFF VOLUME    (mm)=      40.93         6.29           6.28
     TOTAL RAINFALL   (mm)=      42.93        42.93          42.93
     RUNOFF COEFFICIENT   =       0.95         0.15           0.15

***** 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*  =  49.0    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  (  0901)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0301):     0.53   0.012     1.42     6.55
      + ID2= 2 (  0302):     0.43   0.005     1.75     6.28
        ================================================
        ID = 3 (  0901):     0.96   0.015     1.42     6.43

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

--------------------
| ADD HYD  (  0901)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0901):     0.96   0.015     1.42     6.43
      + ID2= 2 (  0303):     0.18   0.004     1.50     8.25
        ================================================
        ID = 1 (  0901):     1.14   0.019     1.42     6.72

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   1.09
|ID= 1 DT= 5.0 min |   Total Imp(%)=  49.00   Dir. Conn.(%)=  23.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.53         0.56
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.50
     Length            (m)=      85.24        15.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     136.52        25.04
                over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.05 (ii)    6.50 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.31         0.14
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.09         0.03          0.103 (iii)
     TIME TO PEAK    (hrs)=       1.17         1.25           1.17
     RUNOFF VOLUME    (mm)=      40.93         7.31          15.04
     TOTAL RAINFALL   (mm)=      42.93        42.93          42.93
     RUNOFF COEFFICIENT   =       0.95         0.17           0.35

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  49.0    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  (  0902)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0201):     1.09   0.103     1.17    15.04
      + ID2= 2 (  0901):     1.14   0.019     1.42     6.72
        ================================================
        ID = 3 (  0902):     2.23   0.110     1.17    10.78

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0401)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0665     0.0108
                          0.0049     0.0010   |   0.0707     0.0122
                          0.0196     0.0021   |   0.0746     0.0134
                          0.0310     0.0032   |   0.0784     0.0145
                          0.0392     0.0043   |   0.0820     0.0156
                          0.0460     0.0055   |   0.0854     0.0166
                          0.0519     0.0067   |   0.0888     0.0177
                          0.0572     0.0080   |   0.0930     0.0190
                          0.0620     0.0094   |   0.0000     0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0902)      2.230      0.110      1.17      10.78
   OUTFLOW: ID= 1 (  0401)      2.230      0.051      1.50      10.76

                PEAK   FLOW   REDUCTION [Qout/Qin](%)= 46.22
                TIME SHIFT OF PEAK FLOW         (min)= 20.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  0.0065
```

```
--------------------------------------------------------------------------------
================================================================================
========================

       V    V   I    SSSSS  U   U    A    L             (v 6.1.2001)
       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 6.1\VO2\voin.dat

  Output  filename:
C:\Users\KGowanlock\AppData\Local\Civica\VH5\2c82a674-7dbe-4ff9-a174-9e37ec52cdac\2
d62abb3-cad8-4a5e-b271-a1fc8c7b6dac\s
  Summary filename:
C:\Users\KGowanlock\AppData\Local\Civica\VH5\2c82a674-7dbe-4ff9-a174-9e37ec52cdac\2
d62abb3-cad8-4a5e-b271-a1fc8c7b6dac\s


DATE: 12-12-2022                          TIME: 03:23:08

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------
  ***********************************************
  ** SIMULATION : 3. 25yr - CHI                **
  ***********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1750.276
| Ptotal= 57.45 mm |                          B=   8.303
--------------------                          C=   0.862
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  3.00 hrs
                        Storm time step    =  5.00 min
                        Time to peak ratio =  0.38

                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.08    3.54 |  0.83   13.31 |  1.58   17.28 |  2.33    5.51
                0.17    3.85 |  0.92   18.82 |  1.67   14.08 |  2.42    5.12
                0.25    4.23 |  1.00   30.89 |  1.75   11.84 |  2.50    4.78
                0.33    4.68 |  1.08   71.60 |  1.83   10.19 |  2.58    4.49
                0.42    5.25 |  1.17  188.05 |  1.92    8.94 |  2.67    4.22
                0.50    5.98 |  1.25   86.10 |  2.00    7.95 |  2.75    3.99
                0.58    6.94 |  1.33   46.26 |  2.08    7.16 |  2.83    3.78
                0.67    8.27 |  1.42   30.37 |  2.17    6.51 |  2.92    3.60
                0.75   10.22 |  1.50   22.17 |  2.25    5.97 |  3.00    3.43


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0301)|   Area    (ha)=   0.53   Curve Number   (CN)= 57.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.49   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.19

     Unit Hyd Qpeak  (cms)=   0.107

     PEAK FLOW       (cms)=   0.023 (i)
     TIME TO PEAK    (hrs)=   1.417
     RUNOFF VOLUME    (mm)=  11.685
     TOTAL RAINFALL   (mm)=  57.451
     RUNOFF COEFFICIENT   =   0.203

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0303)|   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  42.00   Dir. Conn.(%)=   0.10
--------------------

                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.08          0.10
     Dep. Storage     (mm)=       2.00          5.00
     Average Slope     (%)=       2.00          1.00
     Length            (m)=      34.64         50.00
     Mannings n           =      0.013         0.250
```

```
     Max.Eff.Inten.(mm/hr)=     188.05        48.81
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       0.85 (ii)   14.09 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.34         0.08
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.01          0.009 (iii)
     TIME TO PEAK    (hrs)=       1.17         1.42           1.42
     RUNOFF VOLUME    (mm)=      55.45        14.30          14.30
     TOTAL RAINFALL   (mm)=      57.45        57.45          57.45
     RUNOFF COEFFICIENT   =       0.97         0.25           0.25

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  49.0    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 (  0302)|   Area    (ha)=   0.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  23.00   Dir. Conn.(%)=   0.10
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.10         0.33
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      53.54       100.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     188.05        21.19
                over (min)        5.00        25.00
     Storage Coeff.  (min)=       1.11 (ii)   23.86 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.34         0.05
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.01          0.012 (iii)
     TIME TO PEAK    (hrs)=       1.17         1.58           1.58
     RUNOFF VOLUME    (mm)=      55.45        11.16          11.18
     TOTAL RAINFALL   (mm)=      57.45        57.45          57.45
     RUNOFF COEFFICIENT   =       0.97         0.19           0.19

***** 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*  =  49.0    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  (  0901)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0301):     0.53   0.023     1.42    11.68
     + ID2= 2 (  0302):     0.43   0.012     1.58    11.18
       ================================================
       ID = 3 (  0901):     0.96   0.031     1.42    11.46

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

--------------------
| ADD HYD  (  0901)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0901):     0.96   0.031     1.42    11.46
     + ID2= 2 (  0303):     0.18   0.009     1.42    14.30
       ================================================
       ID = 1 (  0901):     1.14   0.040     1.42    11.91

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   1.09
|ID= 1 DT= 5.0 min |   Total Imp(%)=  49.00   Dir. Conn.(%)=  23.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.53         0.56
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.50
     Length            (m)=      85.24        15.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     188.05        45.94
                over (min)        5.00        10.00
     Storage Coeff.  (min)=       1.80 (ii)    5.72 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.32         0.15
```

```
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.13         0.05          0.153 (iii)
     TIME TO PEAK    (hrs)=       1.17         1.25           1.17
     RUNOFF VOLUME    (mm)=      55.45        12.79          22.60
     TOTAL RAINFALL   (mm)=      57.45        57.45          57.45
     RUNOFF COEFFICIENT   =       0.97         0.22           0.39

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  49.0    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  (  0902)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0201):     1.09   0.153     1.17    22.60
     + ID2= 2 (  0901):     1.14   0.040     1.42    11.91
       ================================================
       ID = 3 (  0902):     2.23   0.167     1.17    17.13

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0401)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           0.0000     0.0000   |   0.0665      0.0108
                           0.0049     0.0010   |   0.0707      0.0122
                           0.0196     0.0021   |   0.0746      0.0134
                           0.0310     0.0032   |   0.0784      0.0145
                           0.0392     0.0043   |   0.0820      0.0156
                           0.0460     0.0055   |   0.0854      0.0166
                           0.0519     0.0067   |   0.0888      0.0177
                           0.0572     0.0080   |   0.0930      0.0190
                           0.0620     0.0094   |   0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0902)      2.230      0.167      1.17      17.13
   OUTFLOW: ID= 1 (  0401)      2.230      0.071      1.58      17.11

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 42.36
                  TIME SHIFT OF PEAK FLOW         (min)= 25.00
```

```
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0122

--------------------------------------------------------------------------------
================================================================================
========================

       V    V   I    SSSSS  U   U    A    L              (v 6.1.2001)
       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 6.1\VO2\voin.dat

  Output  filename:
C:\Users\KGowanlock\AppData\Local\Civica\VH5\2c82a674-7dbe-4ff9-a174-9e37ec52cdac\e
83e73df-e976-4a5c-97fb-4c22a91d0e70\s
  Summary filename:
C:\Users\KGowanlock\AppData\Local\Civica\VH5\2c82a674-7dbe-4ff9-a174-9e37ec52cdac\e
83e73df-e976-4a5c-97fb-4c22a91d0e70\s


DATE: 12-12-2022                          TIME: 03:23:08

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------
  **********************************************
  ** SIMULATION : 4. 100yr - CHI               **
  **********************************************

--------------------
```

```
| CHICAGO STORM    |    IDF curve parameters: A=2171.754
| Ptotal= 69.44 mm |                          B=   8.303
--------------------                          C=   0.867
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  3.00 hrs
                       Storm time step    =  5.00 min
                       Time to peak ratio =  0.38

                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.08    4.17 |  0.83   15.91 |  1.58   20.72 |  2.33    6.52
                0.17    4.54 |  0.92   22.59 |  1.67   16.84 |  2.42    6.05
                0.25    4.98 |  1.00   37.28 |  1.75   14.13 |  2.50    5.65
                0.33    5.53 |  1.08   87.10 |  1.83   12.15 |  2.58    5.29
                0.42    6.21 |  1.17  230.33 |  1.92   10.64 |  2.67    4.98
                0.50    7.08 |  1.25  104.88 |  2.00    9.45 |  2.75    4.70
                0.58    8.23 |  1.33   56.05 |  2.08    8.50 |  2.83    4.46
                0.67    9.83 |  1.42   36.64 |  2.17    7.72 |  2.92    4.23
                0.75   12.18 |  1.50   26.66 |  2.25    7.07 |  3.00    4.03


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0301)|   Area    (ha)=   0.53   Curve Number   (CN)= 57.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.49   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.19

     Unit Hyd Qpeak  (cms)=   0.107

     PEAK FLOW       (cms)=   0.034 (i)
     TIME TO PEAK    (hrs)=   1.333
     RUNOFF VOLUME    (mm)=  16.737
     TOTAL RAINFALL   (mm)=  69.443
     RUNOFF COEFFICIENT   =   0.241

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0303)|   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  42.00   Dir. Conn.(%)=   0.10
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.08         0.10
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         1.00
     Length            (m)=      34.64        50.00
     Mannings n            =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     230.33        69.96
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       0.79 (ii)   12.25 (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          0.013 (iii)
     TIME TO PEAK    (hrs)=       1.17         1.42           1.42
     RUNOFF VOLUME    (mm)=      67.44        20.12          20.13
     TOTAL RAINFALL   (mm)=      69.44        69.44          69.44
     RUNOFF COEFFICIENT   =       0.97         0.29           0.29

***** 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*  =  49.0    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 (  0302)|   Area    (ha)=   0.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  23.00   Dir. Conn.(%)=   0.10
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.10         0.33
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      53.54       100.00
     Mannings n            =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     230.33        35.21
               over (min)        5.00        20.00
     Storage Coeff.  (min)=       1.02 (ii)   19.59 (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)=       1.17         1.50           1.50
     RUNOFF VOLUME    (mm)=      67.44        15.97          15.99
     TOTAL RAINFALL   (mm)=      69.44        69.44          69.44
     RUNOFF COEFFICIENT   =       0.97         0.23           0.23

***** 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*  =  49.0    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  (  0901)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0301):     0.53   0.034     1.33    16.74
     + ID2= 2 (  0302):     0.43   0.019     1.50    15.99
       ==================================================
       ID = 3 (  0901):     0.96   0.052     1.42    16.40

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

--------------------
| ADD HYD  (  0901)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0901):     0.96   0.052     1.42    16.40
     + ID2= 2 (  0303):     0.18   0.013     1.42    20.13
       ==================================================
       ID = 1 (  0901):     1.14   0.065     1.42    16.99

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   1.09
|ID= 1 DT= 5.0 min |   Total Imp(%)=  49.00   Dir. Conn.(%)=  23.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.53         0.56
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.50
     Length            (m)=      85.24        15.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     230.33        66.76
                over (min)        5.00        10.00
     Storage Coeff.  (min)=       1.66 (ii)    5.27 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.32         0.16
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.16         0.08          0.198 (iii)
     TIME TO PEAK    (hrs)=       1.17         1.25           1.17
     RUNOFF VOLUME    (mm)=      67.44        18.13          29.47
     TOTAL RAINFALL   (mm)=      69.44        69.44          69.44
     RUNOFF COEFFICIENT   =       0.97         0.26           0.42

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  49.0    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  (  0902)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0201):     1.09   0.198     1.17    29.47
     + ID2= 2 (  0901):     1.14   0.065     1.42    16.99
       ==================================================
       ID = 3 (  0902):     2.23   0.220     1.17    23.09

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0401)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0665      0.0108
                          0.0049     0.0010   |   0.0707      0.0122
                          0.0196     0.0021   |   0.0746      0.0134
                          0.0310     0.0032   |   0.0784      0.0145
                          0.0392     0.0043   |   0.0820      0.0156
                          0.0460     0.0055   |   0.0854      0.0166
                          0.0519     0.0067   |   0.0888      0.0177
                          0.0572     0.0080   |   0.0930      0.0190
                          0.0620     0.0094   |   0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0902)      2.230      0.220      1.17      23.09
   OUTFLOW: ID= 1 (  0401)      2.230      0.091      1.58      23.07

                PEAK   FLOW   REDUCTION [Qout/Qin](%)= 41.28
```

```
                  TIME SHIFT OF PEAK FLOW         (min)= 25.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0184

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

 FINISH
================================================================================
=======================
```

```
*********************************
** SIMULATION:1. 2yr - CHI    **
*********************************
--------------------
| RESERVOIR(  0401)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0665      0.0108
                          0.0049     0.0010   |   0.0707      0.0122
                          0.0196     0.0021   |   0.0746      0.0134
                          0.0310     0.0032   |   0.0784      0.0145
                          0.0392     0.0043   |   0.0820      0.0156
                          0.0460     0.0055   |   0.0854      0.0166
                          0.0519     0.0067   |   0.0888      0.0177
                          0.0572     0.0080   |   0.0930      0.0190
                          0.0620     0.0094   |   0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0902)      2.230      0.077      1.17       7.17
   OUTFLOW: ID= 1 (  0401)      2.230      0.037      1.42       7.15

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 48.26
                  TIME SHIFT OF PEAK FLOW         (min)= 15.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0040

--------------------------------------------------------------------------------
*********************************
** SIMULATION:2. 5yr - CHI    **
*********************************
--------------------
| RESERVOIR(  0401)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0665      0.0108
                          0.0049     0.0010   |   0.0707      0.0122
                          0.0196     0.0021   |   0.0746      0.0134
                          0.0310     0.0032   |   0.0784      0.0145
                          0.0392     0.0043   |   0.0820      0.0156
                          0.0460     0.0055   |   0.0854      0.0166
                          0.0519     0.0067   |   0.0888      0.0177
                          0.0572     0.0080   |   0.0930      0.0190
                          0.0620     0.0094   |   0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0902)      2.230      0.110      1.17      10.78
   OUTFLOW: ID= 1 (  0401)      2.230      0.051      1.50      10.76
```

```
                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 46.22
                  TIME SHIFT OF PEAK FLOW         (min)= 20.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0065

--------------------------------------------------------------------------------
*******************************
** SIMULATION:3. 25yr - CHI   **
*******************************
--------------------
| RESERVOIR(  0401)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0665      0.0108
                          0.0049     0.0010   |   0.0707      0.0122
                          0.0196     0.0021   |   0.0746      0.0134
                          0.0310     0.0032   |   0.0784      0.0145
                          0.0392     0.0043   |   0.0820      0.0156
                          0.0460     0.0055   |   0.0854      0.0166
                          0.0519     0.0067   |   0.0888      0.0177
                          0.0572     0.0080   |   0.0930      0.0190
                          0.0620     0.0094   |   0.0000      0.0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0902)      2.230      0.167      1.17      17.13
   OUTFLOW: ID= 1 (  0401)      2.230      0.071      1.58      17.11

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 42.36
                  TIME SHIFT OF PEAK FLOW         (min)= 25.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0122

--------------------------------------------------------------------------------
*******************************
** SIMULATION:4. 100yr - CHI  **
*******************************
--------------------
| RESERVOIR(  0401)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0665      0.0108
                          0.0049     0.0010   |   0.0707      0.0122
                          0.0196     0.0021   |   0.0746      0.0134
                          0.0310     0.0032   |   0.0784      0.0145
                          0.0392     0.0043   |   0.0820      0.0156
                          0.0460     0.0055   |   0.0854      0.0166
                          0.0519     0.0067   |   0.0888      0.0177
                          0.0572     0.0080   |   0.0930      0.0190
                          0.0620     0.0094   |   0.0000      0.0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0902)      2.230      0.220      1.17      23.09
   OUTFLOW: ID= 1 (  0401)      2.230      0.091      1.58      23.07

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 41.28
                  TIME SHIFT OF PEAK FLOW         (min)= 25.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0184

--------------------------------------------------------------------------------
```

Appendix C: Emergency Overflow Weir Calculations

TATHAM ENGINEERING	PROJECT	24 Alfred Street	FILE	121108
			DATE	Dec 2022
	SUBJECT	Emergency Overflow For 100yr Storm	NAME	KG
			PAGE	1 OF 1

Trapezoidal Broad Crested Weir

Source: Hydraulic Structures, C.D.Smith, University of Saskatchewan

Trapezoidal Weir

The trapezoidal weir is a combination of the rectangular weir and the triangular weir

Target Storm

50% of 100-year Storm Peak Flow For Catchments 201, 301, 302 and 303 (m^3/s) = 0.11

W	Weir Bottom Width (m)	8.2
H	Head (m)	0.10
L	Weir Downstream Length (m)	5.0
S	Side Slope (horizontal):1	0

Rectangular Weir $Q = CWH^{3/2}$

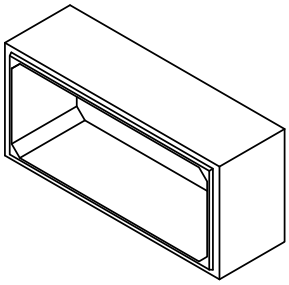
H/L 0.02

C 1.4

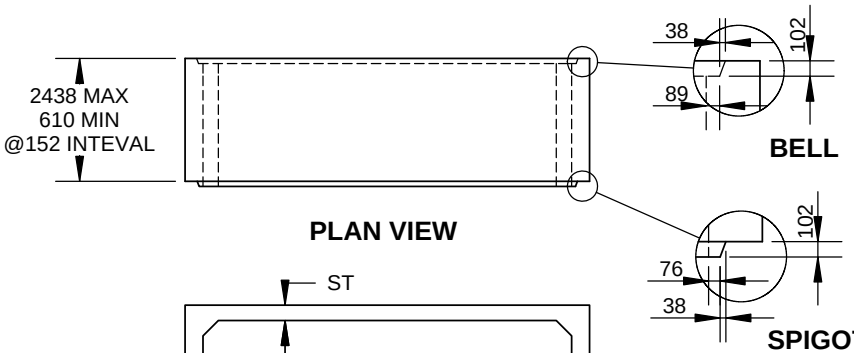
Result

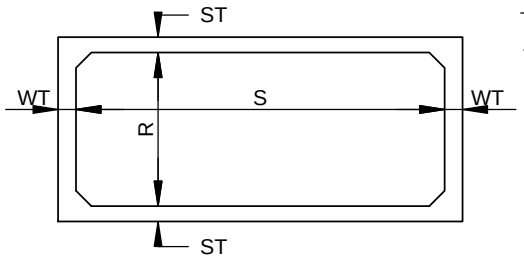
Q Rectangular Weir Flow (m^3/s) 0.363 > 0.11 Acceptable

Appendix D: Underground Storage & OGS Details



ISOMETRIC VIEW





TYPICAL SECTION

SPAN (S) = 1219, 1524, 1829, 2438								
S X R			ST	WT	HC	L (m)	MASS kg/m	kg/pc
1219	X	1219	203	203	0	2.438	2867	6990
1524	X	1219	203	203	0	3.438	3174	10914
1829	X	1524	203	203	305	4.438	4250	18860
1829	X	1829	203	203	305	4.438	4557	20223
2438	X	1219	203	203	305	4.438	4557	20223
2438	X	2134	203	203	305	4.438	5478	24313
2438	X	2438	254	254	305	4.438	7245	32152

SPAN (S) = 2743, 3048, 3353, 3648								
S X R			ST	WT	HC	L (m)	MASS kg/m	kg/pc
2743	X	1219	254	254	305	2.4384	6093	14857
2743	X	1524	254	254	305	2.4384	6477	15793
2743	X	1829	254	254	305	2.4384	6861	16729
2743	X	2134	254	254	305	2.4384	7245	17666
3048	X	1219	254	254	305	2.4384	6477	15793
3048	X	2743	254	254	305	2.4384	8397	20475
3048	X	3048	254	254	305	2.4384	8781	21411
3353	X	1219	305	305	305	2.4384	8294	20225
3353	X	1524	305	305	305	2.4384	8755	21349
3353	X	1829	305	305	305	2.4384	9216	22472
3353	X	2134	305	305	305	2.4384	9677	23596
3353	X	2438	305	305	305	2.4384	10138	24719
3658	X	1219	305	305	305	2.4384	8755	21349
3658	X	1524	305	305	305	2.4384	9216	22472
3658	X	1829	305	305	305	2.4384	9677	23596
3658	X	2134	305	305	305	2.4384	10138	24719
3658	X	2438	305	305	305	2.4384	10598	25843
3658	X	2743	305	305	305	2.4384	11059	26967
3658	X	3048	305	305	305	2.4384	11520	28090

GENERAL NOTES:

(1) CUSTOM SIZE NOT IN THE TABLE SHOWN IS AVALIABLE. S AND R ARE PREFERED TO HAVE 152 mm (6") INTERVAL. 51 mm (2") INTEVAL IS AVAILABLE UPON REQUEST.
(2) WALL (WT) AND SLAB THICKNESS (ST) HAVE INTERVAL OF 52 (2") BETWEEN 152 mm (6") - 610 mm (24")
(3) 406 mm (14") HC IS AVALIABLE. OTHER SIZE OF HANUCH IS AVALIABLE UPON REQUEST.
(4) WALL AND SLAB THICKNESS IN THE TABLE ARE TYPICAL FOR CHBDC CL625-ONT LOADING WITH EARTH COVER BETWEEN 0 - 3.6m.
(3) MASS IS APPROXIMATE BASED ON 2480 kg/m^3 DENSITY OF CONCRETE.
(4) SHIPPING CAPACITY GOVERNS MAXIMUM SIZE AND LAY LENGTH
(6) LIFTING DEVICES ARE DAYTON SWIFT LIFT ANCHOR OR EQUIVALENT
(7) LONGER LAY LENGTH (L UPTO 3658) IS AVAILABLE UPON REQUEST
(8) WHEN THE HEIGHT (R+2ST) IS LARGER THAN 2540, BOX UNIT WILL BE SHIPPED FLOWER POT AND TO BE ROTATED ON THE JOB SITE.
(9) CHAMFER EDGE IS AVAILABLE UPON REQUEST

SPAN (S) = 3962, 4267, 4877								
S X R			ST	WT	HC	L (m)	MASS kg/m	kg/pc
3962	X	1524	305	305	305	2.4384	9677	23596
3962	X	1829	305	305	305	2.4384	10138	24719
3962	X	2134	305	305	305	2.4384	10598	25843
3962	X	2438	305	305	305	2.4384	11059	26967
3962	X	2743	305	305	305	2.4384	11520	28090
3962	X	3048	305	305	305	2.4384	11981	29214
4267	X	1829	305	305	305	2.4384	10598	25843
4267	X	2134	305	305	305	2.4384	11059	26967
4267	X	2438	305	305	305	2.4384	11520	28090
4267	X	2743	305	305	305	2.4384	11981	29214
4267	X	3048	305	305	305	2.4384	12442	30338
4877	X	1829	305	305	305	2.4384	11520	28090
4877	X	2134	305	305	305	2.4384	11981	29214
4877	X	2438	305	305	305	2.4384	12442	30338
4877	X	2743	305	305	305	2.4384	12902	31461
4877	X	3048	305	305	305	2.4384	13363	32585

SPAN (S) = 5486, 6096, 6401								
S X R			ST	WT	HC	L (m)	MASS kg/m	kg/pc
5486	X	1524	305	305	305	2.4384	11981	29214
5486	X	1829	305	305	305	2.4384	12442	30338
5486	X	2134	305	305	305	2.4384	12902	31461
5486	X	2438	305	305	305	2.4384	13363	32585
5486	X	2743	305	305	305	2.4384	13824	33708
5486	X	3048	305	305	305	2.4384	14285	34832
6096	X	1524	305	305	305	2.4384	12902	31461
6096	X	1829	305	305	305	2.4384	13363	32585
6096	X	2134	406	406	305	2.1336	18688	39873
6096	X	2438	406	406	305	1.9812	19302	38242
6096	X	2743	406	406	305	1.9812	19917	39459
6096	X	3048	406	406	305	1.8288	20531	37547
6401	X	1524	406	406	305	2.1336	18074	38562
6401	X	1829	406	406	305	2.1336	18688	39873
6401	X	2134	406	406	305	1.9812	19302	38242
6401	X	2438	406	406	305	1.9812	19917	39459

ALL DIMENSIONS ARE IN mm UNLESS SPECIFIED
DRAWINGS ARE NOT TO SCALE

TOLERANCES TO CSA A23.4-09

CON CAST PIPE (CCP) STANDARD DRAWING

STD. CCP | ENG GUIDE B 6.1.3. | PART BA-SIZEGUIDE

TITLE

PRECAST BOX CULVERT SIZE GUIDE

REV.	DESCRIPTION	ENG.	DATE
1	INITIAL RELEASE	SW	14JUL14

DRAWN BY	CHECKED BY	DATE	FILE	PAGE
SW	AP	19/OCT/2011	Box Size Guide.SLDDRW	1 OF 1

CON CAST PIPE RR 3 Guelph, ON N1H 6H9 Fax: (519) 763-1956 1-800-668-7473 www.concastpipe.com

G:\Engineering\Library\Solidworks\Box\Box Size Guide\

Stormceptor®

FORTERRA

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

11/15/2022

Province:	Ontario
City:	Town of The Blue Mountains
Nearest Rainfall Station:	OWEN SOUND MOE
Climate Station Id:	6116132
Years of Rainfall Data:	40

Site Name:	24 Alfred Street
Drainage Area (ha):	2.23
% Imperviousness:	36.00

Runoff Coefficient 'c': 0.51

Particle Size Distribution:	Fine
Target TSS Removal (%):	70.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	43.46
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	Yes
Upstream Orifice Control Flow Rate to Stormceptor (L/s):	92.00
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Project Name:	24 Alfred Street
Project Number:	121108
Designer Name:	Kyle Gowanlock
Designer Company:	Tatham Engineering Ltd.
Designer Email:	kgowanlock@tathameng.com
Designer Phone:	705-444-2565
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	69
EFO6	82
EFO8	89
EFO10	93
EFO12	96

Recommended Stormceptor EFO Model: EFO6

Estimated Net Annual Sediment (TSS) Load Reduction (%): 82

Water Quality Runoff Volume Capture (%): > 90

imbrium

THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterwavs.

PARTICLE SIZE DISTRIBUTION (PSD)

►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

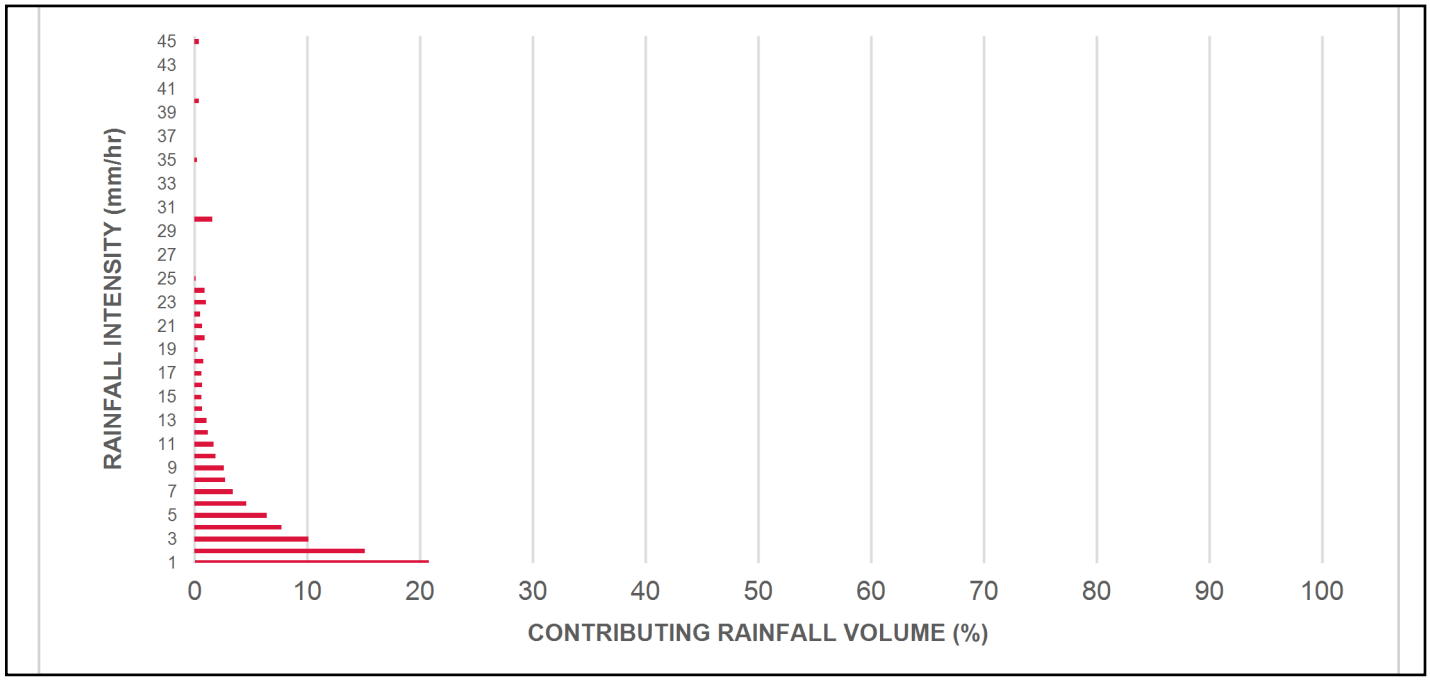
imbrium

Upstream Flow Controlled Results

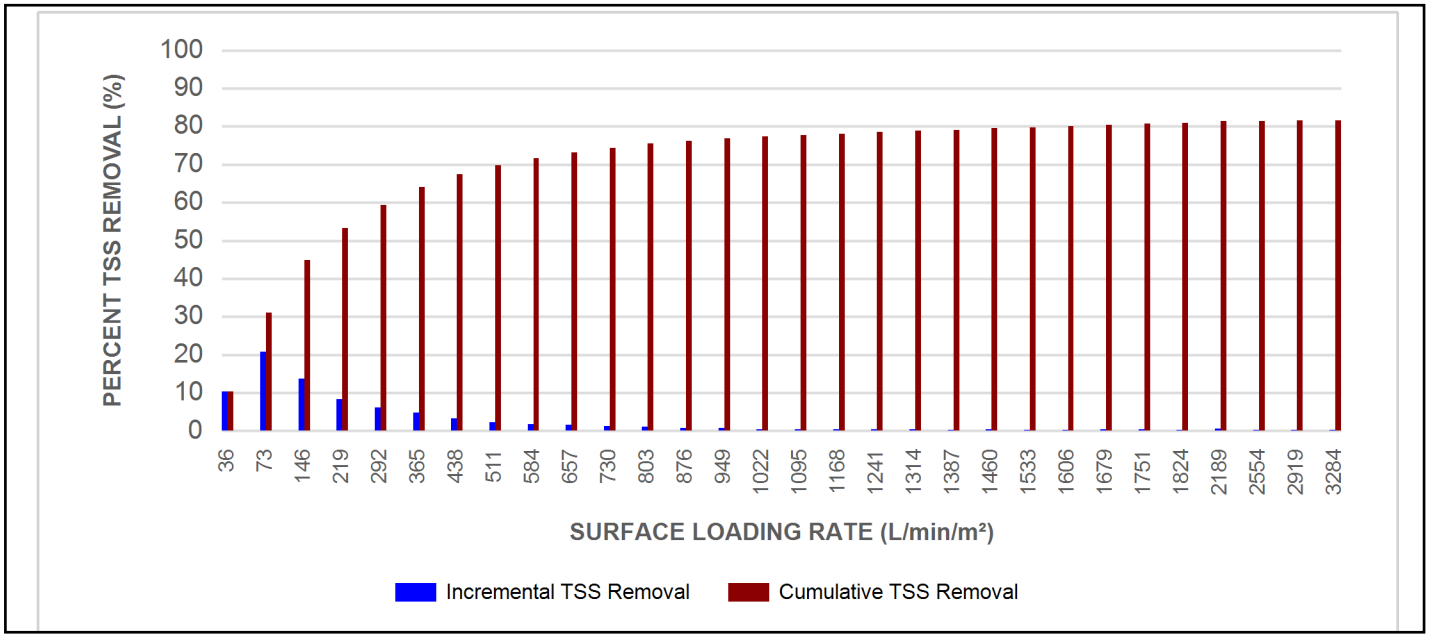
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	10.3	10.3	1.60	96.0	36.0	100	10.3	10.3
1	20.8	31.1	3.20	192.0	73.0	100	20.8	31.1
2	15.1	46.2	6.40	384.0	146.0	91	13.7	44.8
3	10.1	56.3	9.60	576.0	219.0	83	8.3	53.2
4	7.7	64.0	12.80	768.0	292.0	79	6.1	59.3
5	6.4	70.4	15.99	960.0	365.0	76	4.8	64.1
6	4.6	75.1	19.19	1152.0	438.0	72	3.3	67.4
7	3.4	78.4	22.39	1344.0	511.0	69	2.3	69.8
8	2.7	81.1	25.59	1535.0	584.0	66	1.8	71.6
9	2.6	83.7	28.79	1727.0	657.0	64	1.7	73.2
10	1.9	85.6	31.99	1919.0	730.0	64	1.2	74.4
11	1.7	87.3	35.19	2111.0	803.0	63	1.1	75.5
12	1.2	88.5	38.39	2303.0	876.0	63	0.7	76.2
13	1.1	89.6	41.59	2495.0	949.0	62	0.7	76.9
14	0.7	90.3	44.78	2687.0	1022.0	61	0.5	77.3
15	0.6	90.9	47.98	2879.0	1095.0	59	0.4	77.7
16	0.7	91.6	51.18	3071.0	1168.0	58	0.4	78.1
17	0.6	92.3	54.38	3263.0	1241.0	56	0.4	78.5
18	0.8	93.0	57.58	3455.0	1314.0	54	0.4	78.9
19	0.3	93.3	60.78	3647.0	1387.0	53	0.2	79.0
20	0.9	94.2	63.98	3839.0	1460.0	50	0.4	79.5
21	0.7	94.9	67.18	4031.0	1533.0	48	0.3	79.8
22	0.5	95.3	70.38	4223.0	1606.0	46	0.2	80.0
23	1.0	96.3	73.57	4414.0	1679.0	44	0.4	80.4
24	0.9	97.2	76.77	4606.0	1751.0	42	0.4	80.8
25	2.8	100.0	79.97	4798.0	1824.0	40	1.1	81.9
30	0.0	100.0	92.00	5520.0	2099.0	35	0.0	81.9
35	0.0	100.0	92.00	5520.0	2099.0	35	0.0	81.9
40	0.0	100.0	92.00	5520.0	2099.0	35	0.0	81.9
45	0.0	100.0	92.00	5520.0	2099.0	35	0.0	81.9
Estimated Net Annual Sediment (TSS) Load Reduction =								**82 %**

Climate Station ID: 6116132 *Years of Rainfall Data*: 40

RAINFALL DATA FROM OWEN SOUND MOE RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

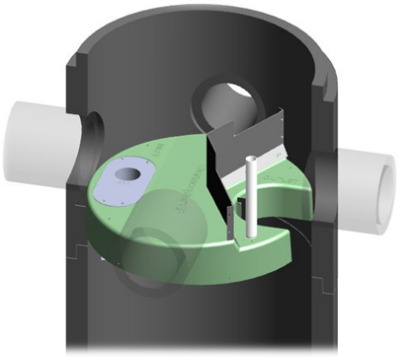
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

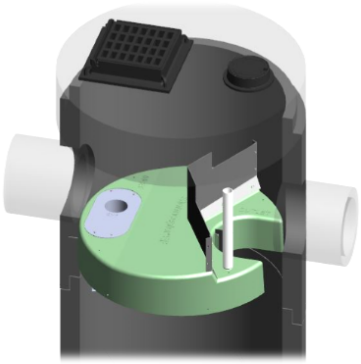
DESIGN FLEXIBILITY

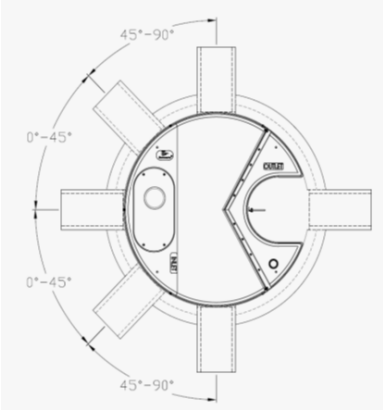
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.

0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.

45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall

remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

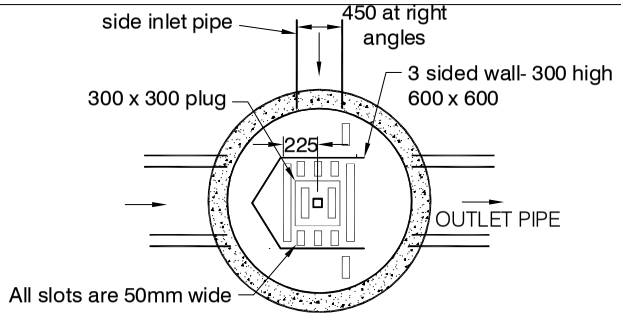
3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

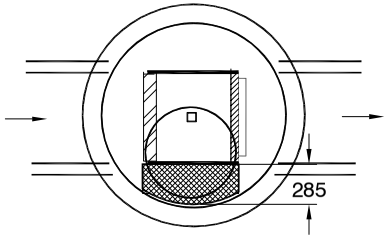
The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to

assess whether light liquids captured after a spill are effectively retained at high flow rates.

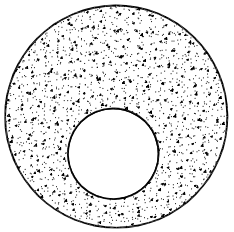
3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.



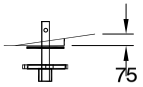
Grate plan view



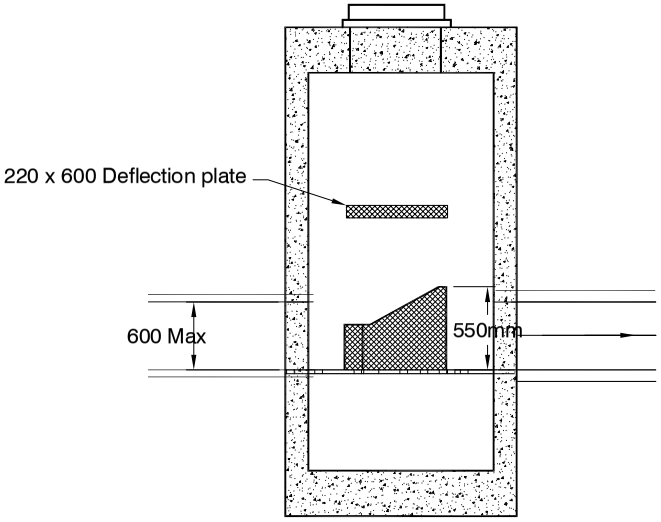
Inlet flow deflection plate attached to wall



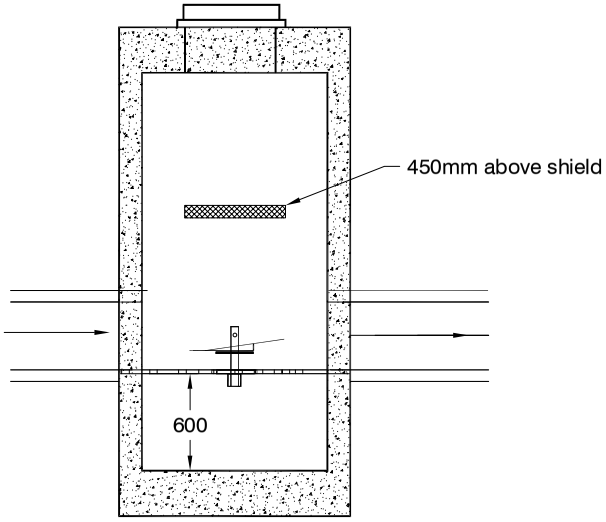
Standard Flat Cap



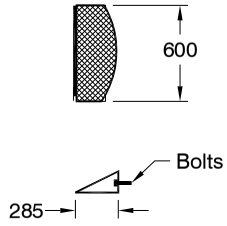
Shallow Sloped plate with flexible skirt.



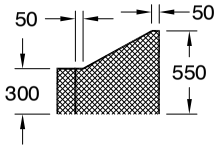
Side view of Deflection wall and Deflection Plate (above)



Side view of Sloped plate and Clean out plug



Deflection plate Detail



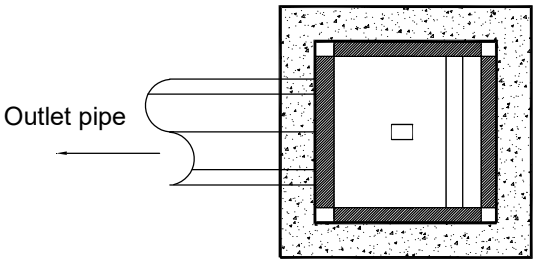
Deflection wall dimensions

CBMH Shield-1200mm -Generic Drawing

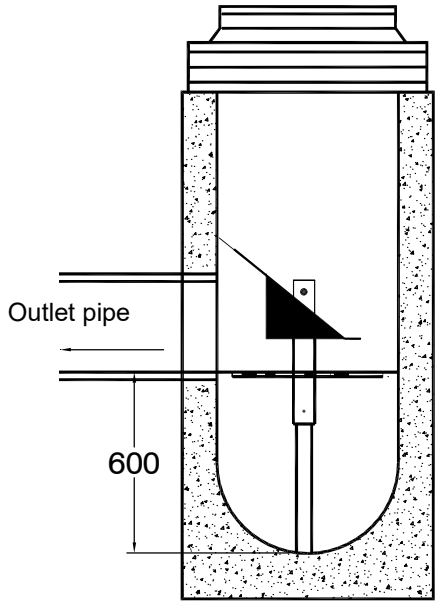
Notes

1 Recommended depth t/g - invert = 1.2m
Maximum depth t/g - invert = 2.4m

1. CB Shield to be installed in non frozen conditions.
2. The frame and cover should be well aligned with the catchbasin.
3. The sump must be clean before installation
4. The grate is at the same elevation as pipe invert.
5. Pipes must be cut flush with inside walls



Top view



Profile view

600 x 600 CB
CB Shield (600mm Sump)

Average Annual Sediment Removal Rates (%) using a CB Shield (based on ETV Sediment - 1 to 1000 micron Particle Size Distribution)

Area to CB (ha)	Imperviousness[1] (%)					
	20%	35%	50%	65%	80%	100%
0.02	57%	57%	57%	57%	56%	56%
0.05	56%	56%	56%	55%	55%	54%
0.10	56%	55%	54%	53%	52%	51%
0.20	54%	53%	51%	49%	48%	46%
0.30	53%	50%	48%	46%	45%	43%
0.40	51%	48%	46%	44%	42%	40%
0.50	50%	47%	44%	42%	40%	38%
0.60	49%	45%	43%	40%	39%	36%

Notes:

1. Runoff Coefficient 'C' is approximately equal to 0.05 + 0.9*Impervious Fraction.
2. Above chart is based on long term continuous hydrologic analysis of Toronto, Ontario (Bloor St) rainfall data.
3. Assumes 0.6 m sump in CB and that maintenance is performed (i.e. CB cleaning) when required by sediment/pollutant build-up or otherwise.
4. See accompanying chart for suggested maintenance scheduling - AND - get CB Shield Inc. to monitor it for you in field.
5. Sediment/Pollutant removal rates based on third party certified laboratory testing using ETV sediment (PSD analysis available on request).
6. See additional discussion regarding scour protection from CB Shield during more infrequent runoff events.

Appendix E:
Storm Sewer Design Sheet

TATHAM ENGINEERING

Storm Sewer Design Sheet

Version Number: 1 **Version Date:** December 14, 2022

Project Information

24 Alfred Street	121108

Drawing Reference

STM01 - Storm Drainage Plan	December 20-22

Prepared By

Amy Mejia	December 13-22

Reviewed By

Kyle Gowanlock	December 14-22

Municipality

Town of The Blue Mountains

Runoff Coefficient Adjustment

Year	A	B
10	0.80	0.20
25	0.70	0.30
50	0.60	0.40
100	0.50	0.50

Manning's Coefficient

Pipe	Value
CSP	0.024
Concrete	0.013
PVC	0.009

Time of Concentration

15 mins

IDF Curve Coefficients

Year	A	B	C
2	807.44	6.75	0.83
5	1135.40	7.50	0.84
10	1387.00	7.97	0.85
25	1676.20	8.30	0.86
50	1973.10	9.00	0.87
100	2193.10	9.04	0.87

Engineer Stamp

Street Name	Area ID / Label	Upstream Maintenance Hole	Downstream Maintenance Hole	Area (ha)	5 Year Runoff Coefficient (C)	Design Storm (Year)	Adjusted Runoff Coefficient (C)	Area x Runoff Coefficient	Cumulative Area (ha)	Cumulative Area x Adjusted Runoff Coefficient	Time of Concentration (min)	Rainfall Intensity (mm/hr)	Peak Flow (m^3/s)	Manning's Roughness Coefficient	Sewer Length (m)	Sewer Slope (%)	Actual Sewer Diameter (mm)	Full Flow Velocity (m/s)	Full Flow Capacity (m^3/s)	Actual Velocity (m/s)	Travel Time (min)	Calculated Sewer Diameter (mm)	Percentage of Full Flow Capacity (%)	Total Time of Travel (min)
Street A	A1	RYCB1	CB8B	0.06	0.53	100	0.77	0.05	0.06	0.05	15.00	137.49	0.018	0.013	51.2	0.5%	300	0.97	0.068	0.75	1.13	180	25.6%	16.13
Street A	A2	CB8B	CBMH8	0.02	0.10	100	0.55	0.01	0.08	0.06	16.13	132.08	0.021	0.013	19.6	0.5%	300	0.97	0.068	0.79	0.41	192	30.5%	16.55
Street A	A3	CBMH8	STM MH6B	0.14	0.46	100	0.73	0.10	0.22	0.16	16.55	130.22	0.058	0.013	26.6	0.5%	300	0.97	0.068	0.97	0.46	281	84.2%	17.01
Street A	-	STM MH6B	CBMH5B	-	-			-	0.22	0.16	17.01	128.22	0.057	0.013	14.9	0.5%	300	0.97	0.068	0.97	0.26	279	82.9%	17.26
Street A	A4	CBMH5B	CBMH4B	0.61	0.32	100	0.66	0.40	0.83	0.56	17.26	127.13	0.198	0.013	79.1	0.5%	450	1.27	0.202	1.27	1.04	447	98.4%	18.30
Street A	A5	CBMH4B	STM MH3B	0.36	0.62	100	0.81	0.29	1.19	0.85	18.30	122.91	0.291	0.013	20.7	0.5%	525	1.40	0.304	1.40	0.25	516	95.8%	18.55
West Rear Yards	A6	RYCB2	STM MH3B	0.12	0.31	100	0.66	0.08	0.12	0.08	15.00	137.49	0.030	0.013	26.0	0.5%	300	0.97	0.068	0.87	0.50	220	43.9%	15.50
East Rear Yards	A7	RYCB4	RYCB3	0.22	0.18	100	0.59	0.13	0.22	0.13	15.00	137.49	0.050	0.013	56.8	0.8%	300	1.22	0.086	1.19	0.80	243	57.3%	15.80
East Rear Yards	A8	RYCB3	CB3C	0.33	0.25	100	0.63	0.21	0.55	0.34	15.80	133.63	0.125	0.013	32.0	2.0%	300	1.93	0.137	1.93	0.28	290	91.2%	16.07
Street A	A9	CB3C	STM MH3B	0.15	0.44	100	0.72	0.11	0.70	0.44	16.07	132.35	0.163	0.013	5.9	0.5%	450	1.27	0.202	1.27	0.08	416	81.0%	16.15
Street A	-	STM MH3B	UGS	-	-			-	2.01	1.38	18.55	121.95	0.466	0.013	3.4	0.5%	675	1.66	0.594	1.66	0.03	616	78.4%	18.58
Street A	A10	DCBMH2B	UGS	0.22	0.41	100	0.71	0.16	0.22	0.16	15.00	137.49	0.059	0.013	1.8	1.0%	**375**	1.59	0.175	1.34	0.02	250	33.8%	15.02
Street A	-	UGS	EFO6	-	-		-	-	-	-	15.00	-	0.091	0.013	1.8	1.1%	**375**	1.66	0.184	1.55	0.02	288	49.5%	15.02
Street A	-	EFO6	STM MH1B	-	-		-	-	-	-	15.00	-	0.091	0.013	5.7	0.4%	375	1.00	0.111	1.00	0.09	348	82.1%	15.09

Notes:
1. Underground Storage Facility Outlet Controlled to 0.091 cms

TATHAM ENGINEERING

PROJECT	24 Alfred Street	FILE	121108
		DATE	Dec. 2022
SUBJECT	Swale Capacity	NAME	KG
		PAGE	1 OF 1

SWALE CAPACITY CALULATIONS

STM01 Catchments - 100 Year Design Storm Peak Flow

	West Swale	East Swale		
Runoff Coefficient, C	0.40	0.31		
Contributing Area, A_c	0.14	0.35	(ha)	
Time of Concentration, t_c	15.0	15.0	(min)	
100yr IDF Contsant, a_{100}	47.7	47.7		
100yr IDF Contsant, b_{100}	-0.738	-0.738		
100yr Rainfall Intensity, i_{100}	132.7	132.7	(mm/hr)	$(i_{100} = a_{100}(t_c/60)^{b100})$
100yr Peak Flow, Q_{100}	0.021	0.040	(m^3/s)	$(Q_{100} = Ci_{100}A_c/360)$

Trapezoidal, Full Flow

Manning's Coeff., n	0.035	0.035	(grass)
Slope, S	0.005	0.015	(m/m)
Depth, H =	0.15	0.15	(m)
Side Slope (horizontal):1	3	3	
Ditch Bottom Width, W	0	0	(m)
Area, A	0.07	0.07	(m^2)
Wetted Perimeter, P	0.95	0.95	(m)
Hydraulic Radius, R	0.07	0.07	(m)

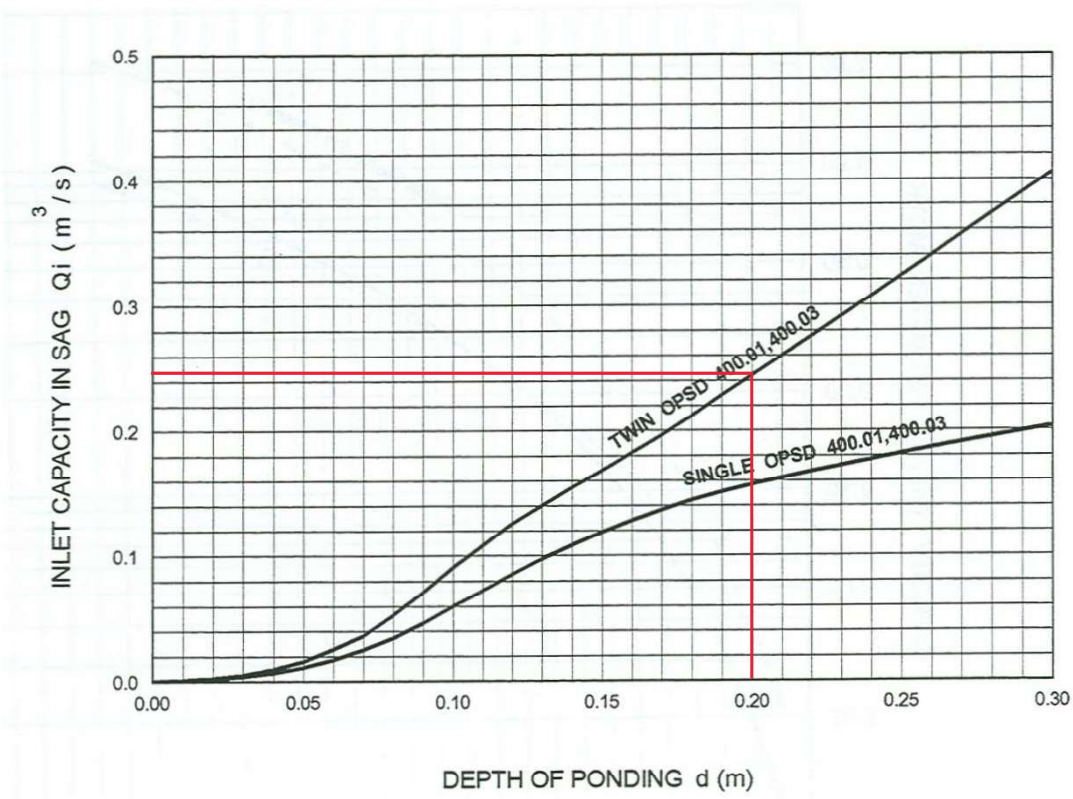
Swale Flow Capacity and Velocity

Swale Flow Capacity, Q_{ditch}	**0.023**	**0.041**	(m^3/s)	$(Q_{ditch} = (A \cdot R^{2/3} \cdot S^{1/2})/n)$

Checks

West Swale:	Q_{swale} =	0.023	m^3/s	>	100-Year Peak Flow, Q_{100} =	0.021	m^3/s	**Acceptable**
East Swale:	Q_{swale} =	0.041	m^3/s	>	100-Year Peak Flow, Q_{100} =	0.040	m^3/s	**Acceptable**

Design Chart 4.19: Inlet Capacity at Road Sag



Appendix F: Thornbury West Reconstruction Project

TATHAM ENGINEERING

Storm Sewer Design Sheet

Project Information

Thornbury West Reconstruction Project	119105

Drawing Reference

119105-STM01	March 1, 2022

Prepared By

MJF	March 1, 2022

Reviewed By

APR	March 1, 2022

Engineer's Stamp

Municipality: Town of the Blue Mountains

Design Storm: 5 year

Time of Concentation: 15 mins

IDF Curve Coefficients

Year	5
A	1135.40
B	7.50
C	0.84

Manning's Coefficient

Pipe	Value
CSP	0.024
Conc.	0.013
PVC	0.009

STREET NAME	AREA LABEL / ID	UPSTREAM MAINTENANCE HOLE	DOWNSTREAM MAINTENANCE HOLE	TRIBUTARY AREA (ha)	RUNOFF COEFFICIENT	AREA × RUNOFF COEFFICIENT	CUMULATIVE AREA (ha)	CUMULATIVE AREA × RUNOFF COEFFICIENT	TIME OF CONCENTRATION (min.)	RAINFALL INTENSITY (mm/hr)	PEAK FLOW (m^3/s)	MANNING'S ROUGHNESS COEFFICIENT	PIPE LENGTH (m)	SLOPE	ACTUAL PIPE DIAMETER (mm)	FULL FLOW VELOCITY (m/s)	FULL FLOW CAPACITY (m^3/s)	ACTUAL VELOCITY (m/s)	TRAVEL TIME (min.)	CALCULATED PIPE DIAMETER (mm)	PERCENT OF FULL FLOW	TOTAL TIME OF TRAVEL (min.)
Elma Street	301	STM MH1	STM MH2	0.47	0.45	0.21	0.47	0.21	15.00	82.79	0.049	0.013	100.4	0.7%	300	1.14	**0.081**	1.12	1.49	248	0.60	16.49
Elma Street	302	STM MH2	STM MH7	1.10	0.30	0.33	1.57	0.54	16.49	78.44	0.118	0.013	69.9	0.5%	375	1.12	**0.124**	1.12	1.04	368	0.95	17.53
Alice Street	303	STM MH3	STM MH4	0.56	0.45	0.25	0.56	0.25	15.00	82.79	0.058	0.013	62.3	0.5%	300	0.97	**0.068**	0.97	1.07	282	0.85	16.07
Alice Street	304	STM MH4	STM MH7	0.49	0.45	0.22	1.05	0.47	16.07	79.61	0.104	0.013	58.8	0.5%	375	1.12	**0.124**	1.12	0.87	352	0.84	16.95
Park Lane	305	CB5A	STM MH5	0.16	0.60	0.10	0.16	0.10	15.00	82.79	0.022	0.013	60.2	0.5%	300	0.97	**0.068**	0.80	1.25	196	0.32	16.25
Alice Street	-	STM MH5	STM MH6	0.00	0.00	0.00	0.16	0.10	16.25	79.10	0.021	0.013	46.4	0.5%	300	0.97	**0.068**	0.79	0.98	193	0.31	17.23
Alice Street	306	STM MH6	STM MH7	2.50	0.30	0.75	2.66	0.85	17.23	76.46	0.180	0.013	93.9	0.6%	450	1.39	**0.221**	1.39	1.13	416	0.81	18.36
Elma Street	307	STM MH7	STM MH8	0.45	0.45	0.20	5.73	2.06	18.36	73.65	0.422	0.013	99.8	0.5%	600	1.54	**0.434**	1.54	1.08	594	0.97	19.44
Elma Street	-	STM MH8	STM MH9	0.00	0.00	0.00	5.73	2.06	19.44	71.15	0.408	0.013	73.9	0.5%	600	1.54	**0.434**	1.54	0.80	586	0.94	20.24
Elma Street	308	STM MH9	STM MH10	0.95	0.30	0.29	6.68	2.35	20.24	69.42	0.453	0.013	24.7	3.6%	600	4.12	**1.165**	3.63	0.11	421	0.39	20.35
Elma Street	309	STM MH10	STM MH12	0.14	0.60	0.08	6.82	2.43	20.35	69.18	0.468	0.013	29.9	7.0%	600	5.75	**1.625**	4.69	0.11	376	0.29	20.46
Louisa Street	310	STM MH17	STM MH11	0.50	0.35	0.18	0.50	0.18	15.00	82.79	0.040	0.013	83.1	1.1%	300	1.43	**0.101**	1.26	1.10	212	0.40	16.10
Louisa Street	311	STM MH11	STM MH12	2.02	0.35	0.71	2.52	0.88	16.10	79.54	0.195	0.013	88.6	1.0%	600	2.17	**0.614**	1.80	0.82	390	0.32	16.92

TATHAM ENGINEERING

Storm Sewer Design Sheet

Project Information

Thornbury West Reconstruction Project	119105

Drawing Reference

119105-STM01	March 1, 2022

Prepared By

MJF	March 1, 2022

Reviewed By

APR	March 1, 2022

Engineer's Stamp

Municipality: Town of the Blue Mountains

Design Storm: 5 year

Time of Concentation: 15 mins

IDF Curve Coefficients

Year	5
A	1135.40
B	7.50
C	0.84

Manning's Coefficient

Pipe	Value
CSP	0.024
Conc.	0.013
PVC	0.009

STREET NAME	AREA LABEL / ID	UPSTREAM MAINTENANCE HOLE	DOWNSTREAM MAINTENANCE HOLE	TRIBUTARY AREA (ha)	RUNOFF COEFFICIENT	AREA × RUNOFF COEFFICIENT	CUMULATIVE AREA (ha)	CUMULATIVE AREA × RUNOFF COEFFICIENT	TIME OF CONCENTRATION (min.)	RAINFALL INTENSITY (mm/hr)	PEAK FLOW (m^3/s)	MANNING'S ROUGHNESS COEFFICIENT	PIPE LENGTH (m)	SLOPE	ACTUAL PIPE DIAMETER (mm)	FULL FLOW VELOCITY (m/s)	FULL FLOW CAPACITY (m^3/s)	ACTUAL VELOCITY (m/s)	TRAVEL TIME (min.)	CALCULATED PIPE DIAMETER (mm)	PERCENT OF FULL FLOW	TOTAL TIME OF TRAVEL (min.)
Elma Street	-	STM MH12	CBMH13	0.00	0.00	0.00	9.34	3.31	20.46	68.96	0.635	0.013	55.7	0.5%	900	2.01	**1.280**	1.88	0.49	692	0.50	20.96
Elma Street	312	CBMH13	DCBMH14	0.38	0.45	0.17	9.72	3.49	20.96	67.95	0.658	0.013	48.6	0.5%	900	2.01	**1.280**	1.90	0.43	701	0.51	21.38
Elma Street	313	DCBMH14	STM MH15	0.74	0.45	0.33	10.46	3.82	21.38	67.10	0.712	0.013	8.4	0.5%	900	2.01	**1.280**	1.94	0.07	722	0.56	21.45
Alice Street	401	STM MH5 (2)	STM MH16	0.58	0.60	0.35	0.58	0.35	15.00	82.79	0.080	0.013	76.4	0.5%	375	1.12	**0.124**	1.12	1.13	318	0.65	16.13
Victoria Street	601	STM MH49	STM MH50	0.89	0.45	0.40	0.89	0.40	15.00	82.79	0.092	0.013	30.2	2.0%	300	1.93	**0.137**	1.93	0.26	259	0.67	15.26
Victoria Street	602	DICB100A	DDICB100B	0.49	0.30	0.15	0.49	0.15	15.00	82.79	0.034	0.013	76.6	0.2%	300	0.61	**0.043**	0.61	2.09	273	0.78	17.09
Victoria Street	603	DDICB100B	STM MH100	1.01	0.90	0.91	1.50	1.06	17.09	76.84	0.225	0.013	22.3	1.1%	750	2.64	**1.168**	1.92	0.19	405	0.19	17.28
Victoria Street	-	STM MH100	STM MH50	0.00	0.00	0.00	1.50	1.06	17.28	76.33	0.224	0.013	21.0	1.1%	750	2.64	**1.168**	1.92	0.18	404	0.19	17.46
Victoria Street	604	STM MH50	STM MH52	1.30	0.45	0.59	3.69	2.04	17.46	75.86	0.430	0.013	102.1	1.1%	750	2.64	**1.168**	2.28	0.74	516	0.37	18.21
Alice Street	605	CBMH52A	STM MH52	1.89	0.35	0.66	1.89	0.66	15.00	82.79	0.152	0.013	8.1	1.0%	450	1.79	**0.285**	1.71	0.08	355	0.53	15.08
Alice Street	606	STM MH51	STM MH52	0.69	0.45	0.31	0.69	0.31	15.00	82.79	0.071	0.013	85.9	1.5%	300	1.68	**0.118**	1.65	0.87	248	0.60	15.87

TATHAM ENGINEERING

Storm Sewer Design Sheet

Project Information

Thornbury West Reconstruction Project	119105

Drawing Reference

119105-STM01	March 1, 2022

Prepared By

MJF	March 1, 2022

Reviewed By

APR	March 1, 2022

Engineer's Stamp

Municipality: Town of the Blue Mountains

Design Storm: 5 year

Time of Concentation: 15 mins

IDF Curve Coefficients

Year	5
A	1135.40
B	7.50
C	0.84

Manning's Coefficient

Pipe	Value
CSP	0.024
Conc.	0.013
PVC	0.009

STREET NAME	AREA LABEL / ID	UPSTREAM MAINTENANCE HOLE	DOWNSTREAM MAINTENANCE HOLE	TRIBUTARY AREA (ha)	RUNOFF COEFFICIENT	AREA × RUNOFF COEFFICIENT	CUMULATIVE AREA (ha)	CUMULATIVE AREA × RUNOFF COEFFICIENT	TIME OF CONCENTRATION (min.)	RAINFALL INTENSITY (mm/hr)	PEAK FLOW (m^3/s)	MANNING'S ROUGHNESS COEFFICIENT	PIPE LENGTH (m)	SLOPE	ACTUAL PIPE DIAMETER (mm)	FULL FLOW VELOCITY (m/s)	FULL FLOW CAPACITY (m^3/s)	ACTUAL VELOCITY (m/s)	TRAVEL TIME (min.)	CALCULATED PIPE DIAMETER (mm)	PERCENT OF FULL FLOW	TOTAL TIME OF TRAVEL (min.)
Victoria Street	607	STM MH52	STM MH53	0.39	0.45	0.18	6.66	3.19	18.21	74.01	0.656	0.013	87.6	1.1%	750	2.64	**1.168**	2.56	0.57	604	0.56	18.78
Victoria Street	608	STM MH53	STM MH54	0.21	0.45	0.09	6.87	3.28	18.78	72.66	0.663	0.013	46.9	2.0%	750	3.56	**1.574**	3.20	0.24	542	0.42	19.02
Victoria Street	609	STM MH54	STM MH57	1.11	0.60	0.67	7.98	3.95	19.02	72.09	0.791	0.013	104.5	2.5%	750	3.98	**1.760**	3.65	0.48	555	0.45	19.50
Louisa Street	610	STM MH55	STM MH56	0.93	0.45	0.42	0.93	0.42	15.00	82.79	0.096	0.013	93.3	1.2%	300	1.50	**0.106**	1.50	1.04	289	0.91	16.04
Louisa Street	611	DICB56A	STM MH56	2.60	0.30	0.78	2.60	0.78	15.00	82.79	0.179	0.013	3.5	2.0%	450	2.54	**0.403**	2.31	0.03	332	0.44	15.03
Louisa Street	612	STM MH56	STM MH57	0.46	0.60	0.28	3.99	1.47	16.04	79.71	0.326	0.013	80.0	0.5%	600	1.54	**0.434**	1.54	0.87	539	0.75	16.91
Beaver Street	613	STM MH59	STM MH60	1.77	0.45	0.80	1.77	0.80	15.00	82.79	0.183	0.013	88.8	4.7%	300	2.97	**0.210**	2.97	0.50	285	0.87	15.50
Beaver Street	-	STM MH60	STM MH61	0.00	0.00	0.00	1.77	0.80	15.50	81.27	0.180	0.013	53.6	0.5%	450	1.27	**0.202**	1.27	0.70	431	0.89	16.20
Louisa Street	615	DCBMH61	STM MH61	0.66	0.60	0.40	0.66	0.40	15.00	82.79	0.091	0.013	7.3	0.6%	375	1.23	**0.136**	1.23	0.10	323	0.67	15.10
Louisa Street	614	STM MH61	STM MH62	0.82	0.45	0.37	3.25	1.56	16.20	79.24	0.344	0.013	15.9	0.7%	525	1.66	**0.360**	1.66	0.16	516	0.96	16.36
Louisa Street	616	DICB62A	STM MH62	0.28	0.60	0.17	0.28	0.17	15.00	82.79	0.039	0.013	17.0	0.5%	300	0.97	**0.068**	0.93	0.30	242	0.57	15.30
Louisa Street	617	STM MH62	STM MH57	0.52	0.60	0.31	4.05	2.04	16.36	78.79	0.447	0.013	53.1	0.3%	675	1.29	**0.460**	1.29	0.69	667	0.97	17.05
Victoria Street	-	STM MH57	DCBMH58	0.00	0.00	0.00	16.02	7.47	19.50	71.02	1.473	0.013	75.3	0.5%	975	2.12	**1.585**	2.12	0.59	948	0.93	20.09

Storm Sewer Design Sheet

Project Information

Thornbury West Reconstruction Project	119105

Drawing Reference

119105-STM01	March 1, 2022

Prepared By

MJF	March 1, 2022

Reviewed By

APR	March 1, 2022

Engineer's Stamp

Municipality: Town of the Blue Mountains

Design Storm: 5 year

Time of Concentation: 15 mins

IDF Curve Coefficients

Year	5
A	1135.40
B	7.50
C	0.84

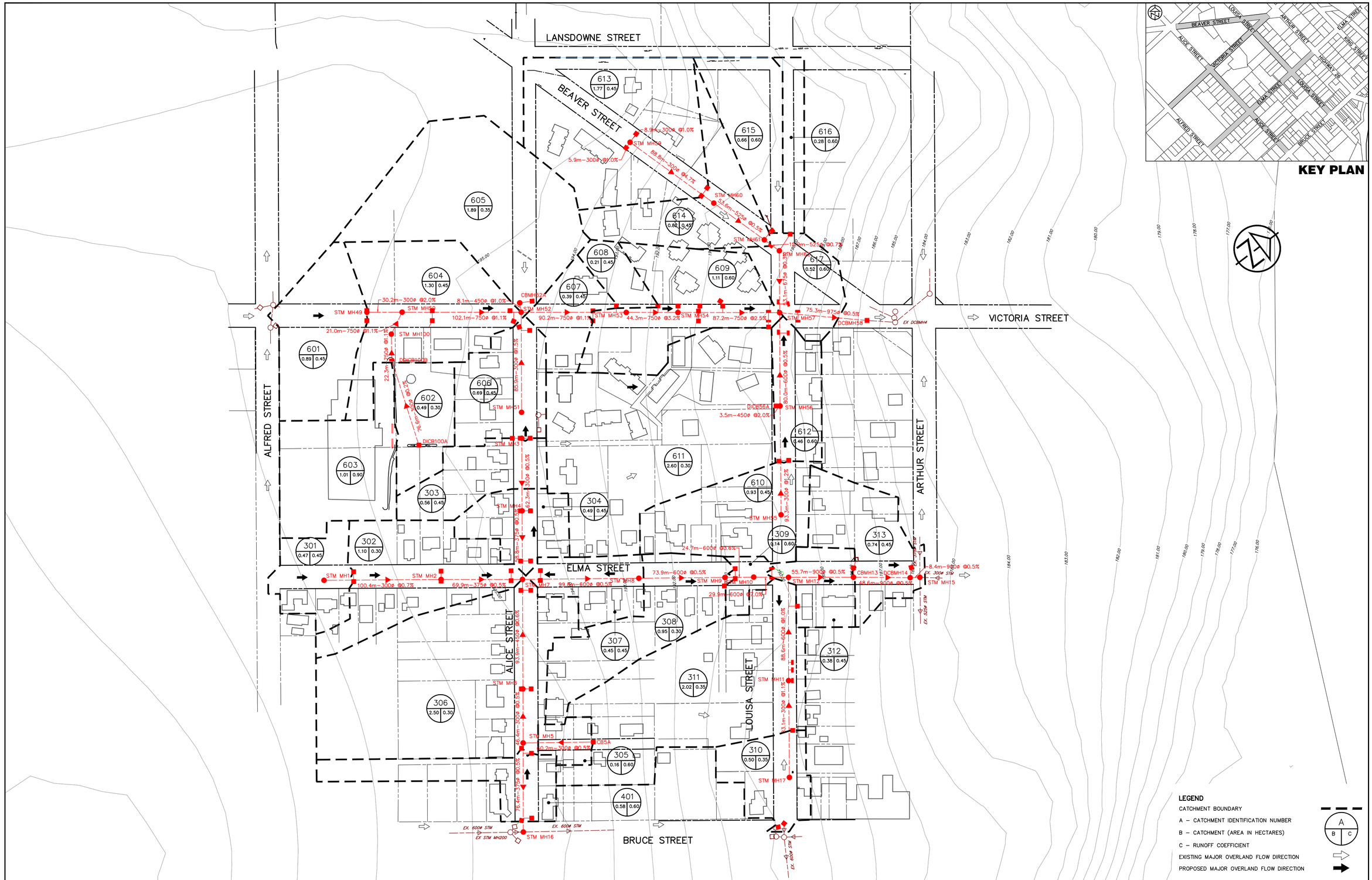
Manning's Coefficient

Pipe	Value
CSP	0.024
Conc.	0.013
PVC	0.009

STREET NAME	AREA LABEL / ID	UPSTREAM MAINTENANCE HOLE	DOWNSTREAM MAINTENANCE HOLE	TRIBUTARY AREA (ha)	RUNOFF COEFFICIENT	AREA × RUNOFF COEFFICIENT	CUMULATIVE AREA (ha)	CUMULATIVE AREA × RUNOFF COEFFICIENT	TIME OF CONCENTRATION (min.)	RAINFALL INTENSITY (mm/hr)	PEAK FLOW (m^3/s)	MANNING'S ROUGHNESS COEFFICIENT	PIPE LENGTH (m)	SLOPE	ACTUAL PIPE DIAMETER (mm)	FULL FLOW VELOCITY (m/s)	FULL FLOW CAPACITY (m^3/s)	ACTUAL VELOCITY (m/s)	TRAVEL TIME (min.)	CALCULATED PIPE DIAMETER (mm)	PERCENT OF FULL FLOW	TOTAL TIME OF TRAVEL (min.)

Notes

1. 100 year storm overland flow from Louisa Street will be captured and conveyed to Arthur Street via Elma Street. Runoff coefficient for catchment 501 modified to produce 100 year resultant flows.
2. Time of concentration for long catchments based on an assumed 2 m/s velocity.
3. Roughness coefficent assumed to be 0.013 for all sewers.
4. Overland flow of 1.14 cms from catchment 603 collected and conveyed through Victoria Street trunk sewer.



KEY PLAN

LEGEND

CATCHMENT BOUNDARY

A – CATCHMENT IDENTIFICATION NUMBER

B – CATCHMENT (AREA IN HECTARES)

C – RUNOFF COEFFICIENT

EXISTING MAJOR OVERLAND FLOW DIRECTION

PROPOSED MAJOR OVERLAND FLOW DIRECTION

DISCLAIMER AND COPYRIGHT

CONTRACTOR MUST VERIFY ALL DIMENSIONS AND BE RESPONSIBLE FOR SAME. ANY DISCREPANCIES MUST BE REPORTED TO THE ENGINEER BEFORE COMMENCING WORK. DRAWINGS ARE NOT TO BE SCALED.

BENCHMARKS

TBM1 – ELEVATION 191.25
NAIL AND WASHERS IN EAST FACE OF HYDRO POLE ON NORTH SIDE OF LOUISA STREET WEST ADJACENT TO 16 ELMA STREET SOUTH.

TBM2 – ELEVATION 193.12
NAIL AND WASHERS IN NORTH FACE OF HYDRO POLE 23X4 ON VICTORIA STREET SOUTH, 26m NORTH OF DRIVEWAY TO RANKIN'S LANDING.

REFER TO DRAWING IN-1 FOR A FULL LISTING OF BENCHMARKS WITHIN THE PROJECT AREA.

NOTES

PIPE SIZES ARE IN MILLIMETRES UNLESS OTHERWISE INDICATED. ELEVATIONS ARE IN METRES UNLESS INDICATED. ALL DIMENSIONS, ELEVATIONS AND SIZES ARE IN METRIC UNITS UNLESS INDICATED.

LEGAL BOUNDARIES SHOWN ON THIS PLAN ARE FROM PLAN 17–08 AND 19–218 PREPARED BY HEWITT AND MILNE LIMITED, DATED OCTOBER 23, 2017 AND MARCH 4, 2020.

TOPOGRAPHIC SURVEY COMPLETED BY WSP CANADA INC. AND TATHAM ENGINEERING LIMITED.

No.	REVISION DESCRIPTION	DATE
2.	60% DESIGN SUBMISSION	AUG 2021
3.	ISSUED FOR PREQUALIFICATION	NOV 2021
4.	90% DESIGN SUBMISSION	NOV 2021
5.	100% DESIGN SUBMISSION	FEB 2022
6.	ISSUED FOR APPROVAL	MAR 2022

ENGINEER STAMP

LICENSED PROFESSIONAL ENGINEER
A. P. ROEPER
100226212
March 1, 2022
PROVINCE OF ONTARIO

THORNBURY WEST RECONSTRUCTION PROJECT

TOWN OF THE BLUE MOUNTAINS

TATHAM ENGINEERING

STORM CATCHMENT PLAN

DESIGN: APR	FILE: 119105	DWG:	
DRAWN: APR/MJF	DATE: JULY 2019	**STM-1**	
CHECK: AEB	SCALE: 1:1500	Sheet No. 4 of 78	

Drawing Name: 119105–STM01.dwg, Plotted: Mar 01, 2022