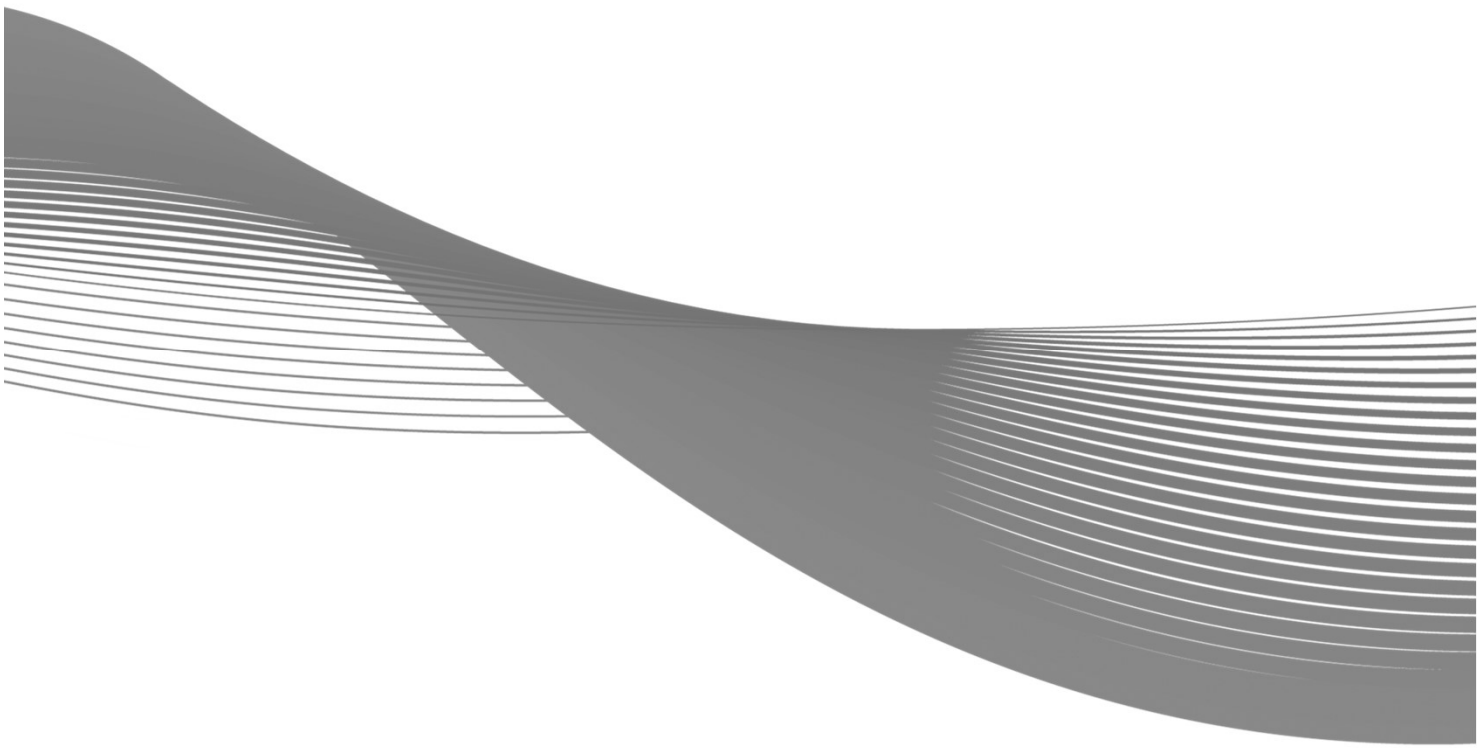
TACCGATE DEVELOPMENTS INC.

Functional Servicing & Stormwater Management Report

Parcel 24 (Whitevale East), Neighbourhood #19, Seaton Community
City of Pickering, Regional Municipality of Durham

Project No.: 24-017



SMD CONSULTANTS INC.

SMD CONSULTANTS INC.

HEAD OFFICE
322 – 954 King Street West
Toronto, ON CANADA M6K 3L9
T. 416-627-7905

December 2024

PREPARED BY:

SMD CONSULTANTS INC.

PETER SLAMA, P. ENG.
Principal Engineer

SMD CONSULTANTS INC.

DANIEL MA
Senior Civil Designer

Issues and Revisions Registry

Identification	Date	Description of issued and/or revision
Draft Plan Application	December 2024	1st DPA Submission under TACCGATE Dev.

Statement of Conditions

This Report / Study (the "Work") has been prepared at the request of, and for the exclusive use of, the Owner / Client, City of Pickering and its affiliates (the "Intended User"). No one other than the Intended User has the right to use and rely on the Work without first obtaining the written authorization of SMD Consultants Inc. and the Owner. SMD Consultants Inc. expressly excludes liability to any party except the Intended User for any use of, and/or reliance upon, the work.

Table of Contents

LIST OF FIGURES

LIST OF TABLES

LIST OF DRAWINGS

APPENDICES

Appendix A – Background Drawings

A1 – Draft Plan of Subdivision

A2 – Original Topographic Survey

A3 – Proposed 17.0m (P-746SE) & 15.35m (P-744SE) ROW Cross Section City Std. Drawings

Appendix B – Stormwater Management

B1 – Forebay Sizing

B2 – Post-Development Imperviousness

B3 – Post-Development Land Use Plan

B4 – Figure IMP-1 Lot Imperviousness Coverage

B5 – Figure IMP-2 ROW Imperviousness Coverage

B6 – Pond 25 Stage Storage Discharge Table

B7 – Extended Detention Drawdown Time

B8 – Pond 25 Outlet - Orifice Control

B9 – Pond 25 Emergency Spillway Sizing

B10 – VO Model Inputs – Time of Lag

B11 – VO Model Inputs – NASHYD

B12 – VO Model Inputs – STANDHYD

B13 – VO Model Output – 2 Year 2012 DCHU AES Storm

B14 – VO Model Output – 5 Year 2012 DCHU AES Storm

B15 – VO Model Output – 10 Year 2012 DCHU AES Storm

B16 – VO Model Output – 25 Year 2012 DCHU AES Storm

B17 – VO Model Output – 50 Year 2012 DCHU AES Storm

B18 – VO Model Output – 100 Year 2012 DCHU AES Storm

B19 – VO Model Output – Regional 2012 DCHU AES Storm

B20 – VO Model Output – 4 Hour, 25mm Chicago Storm

Appendix C – Storm Drainage

C1 – Overland Conveyance Capacities

C2 – Overland Flow Calculations

C3 – Street ‘C’ Culvert Sizing

Appendix D – Preliminary Environmental Impacts Review Memo, R.J. Burnside & Associates Ltd.

Appendix E – Erosion Threshold Analysis Summary Letter, Geo Morphix Ltd.

1.0 Introduction

1.1. Background

SMD Consultants Inc. (SMD) has been retained by TACCGATE Developments Inc. (the "Owner") to prepare a Functional Servicing and Stormwater Management Report (FSSR) for a proposed residential subdivision referred to as Parcel 24 (the "site") within the Community of Seaton, City of Pickering, Regional Municipality of Durham. The site is bordered by Peter Matthews Drive to the west, Alexander Knox Road (formerly Whitevale Road) to the north, and natural heritage system containing a branch of Ganatsekiagon Creek to the east and south. Refer to **Figure-LP Location Plan**.

This FSSR has been prepared in support of a Draft Plan of Subdivision planning application and will address the feasibility associated with providing municipal services, such as roads, sanitary sewers, storm sewers, watermains and stormwater management facilities for the subject site. This report describes the ultimate design for the stormwater management pond (referred to as SWMF #25) receiving drainage from both the subject site and external drainage from Regional Road Peter Matthews Drive. Design of utilities such as natural gas and electricity distribution will be coordinated with local utility companies at the next stage of planning approval, i.e. during the detailed design process.

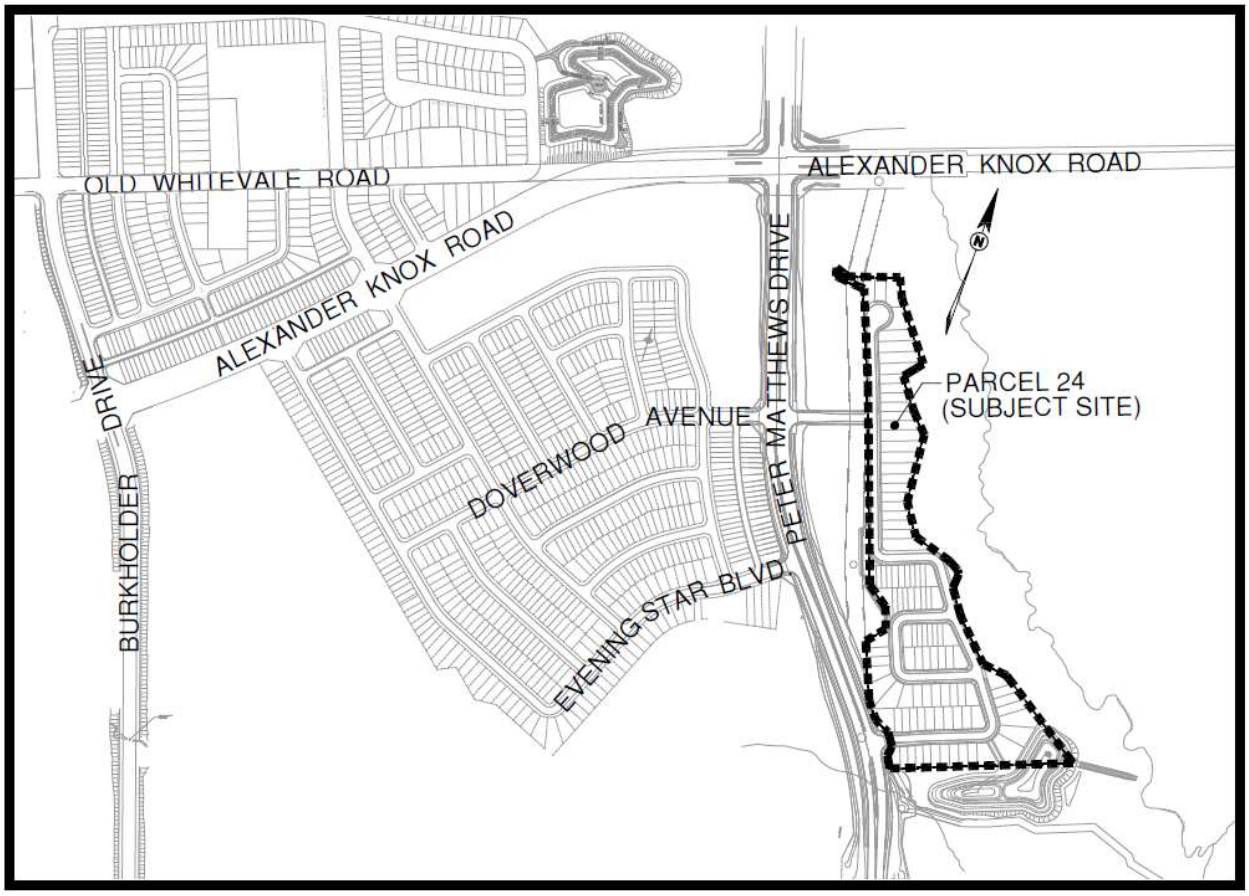


Figure LP-Location Plan

Previous draft plan of subdivision applications along with associated FSSR documents prepared by other consultants have been submitted for the subject site in the past on behalf of: a) Ontario Infrastructure

and Lands Corporation and b) 1133373 Ontario Inc. (Lebovic Enterprises) in years 2015 and 2019, respectively. This current FSSR has considered and addresses the municipal/agency comments issued with respect to the preceding FSSR prepared by Cole Engineering Group Ltd., dated June 2019.

Permits and licenses have been secured through the efforts of previous Owner(s) and Consultant(s) to complete site works to date, including: a) the installation of erosion and sediment control measures, b) construction of an interim stormwater management/sediment control pond, c) removal of trees, d) strip and dispose of topsoil and e) import fill and rough grade the proposed development area.

1.2. Purpose and Scope of Work

The subject site is located within Neighbourhood #19, as defined within the Master Environmental Servicing Plan Amendment for the overall Seaton Community (MESPA, Final July 2013). A Neighbourhood Functional Servicing and Stormwater Report (NFSSR #19) was prepared for Neighbourhood #19 Landowners Group by RJ Burnside, dated August 2013.

This Functional Servicing and Stormwater Management Report builds upon the preliminary design presented within the NFSSR #19 and provides a finer level of technical design detail with respect to proposed servicing alignments and stormwater management strategy relevant to the subject site, Parcel 24. This FSSR has been completed in accordance with the policies of City of Pickering OPA No. 22 as well as relevant technical guidelines including but not limited to:

- City of Pickering's Stormwater Management Design Guidelines (July 2019),
- TRCA Stormwater Management Criteria (August 2012),
- Region of Durham Design and Construction Specifications for Regional Services,
- Ministry of the Environment Stormwater Management Planning and Design Manual (2003), and
- Ministry of Natural Resources and Forestry Guidance for Development Activities in Redside Dace Protected Habitat (March 2016).

There are a number of policies within Pickering's OPA No. 22 that provide guidance and direction to the preparation of FSSR documents as follows:

- City policy regarding development (Section 11.37 (g) through (k)) - Provides direction regarding water management (both ground and surface water; and both quantity and quality control requirements),
- City policy on Sustainable Water Management (Section 11.44 (a) & (b)) - Requires the implementation of Low Impact Development (LID) measures and the incorporation of a treatment train approach to stormwater management,
- City policy on Stormwater Facility Considerations (Section 11.45 (a) through (j)) - Provides guidance for the location and design of stormwater management facilities and LID measures, and,
- City policy on FSSR (Section 11.73 a) through r)) – Requires the preparation of FSSR's in support of development applications and outlines the FSSR's requirements.

Additionally, the Master Environmental Servicing Plan Amendment (MESPA, Final July 2013) provides conclusions and recommendations on the following topics relevant to the preparation of site specific FSSR documents. The chapter notations shown in brackets below are based on the MESPA chapter references:

- Water resources issues including the hydrogeological assessment, groundwater modelling, water balance modelling, surface water hydrology for erosion, quantity control target release rates and volumes, feature based water balance assessments and recommended stormwater management plans including LID measures (Chapter B),
- Existing and planned transportation infrastructure, traffic data, proposed road and transit networks and road crossing design through the Natural Heritage System (Chapter C),
- Municipal servicing requirements including service areas, trunk water and wastewater services (Chapter D),
- Endangered Species (Chapter E), and
- Potential impacts to aquatic systems and presents a fish habitat compensation framework (Chapter F).

Furthermore, the Neighbourhood Functional Servicing and Stormwater Report #19 provides additional detail, building upon the MESPA with respect to neighbourhood specific technical design information. The following is a summary of the recommendations from the NFSSR #19 document dealing with aspects of water resources that are applicable to the subject site:

Stormwater Management Strategy

The proposed stormwater management plan considers the following measures:

One END-OF-PIPE Stormwater Management Facility (SWMF 25), to provide water quality control, erosion control and flood control storage for the proposed residential subdivision and a section of Peter Matthews Drive.

LOW IMPACT DEVELOPMENT (LID) MEASURES are recommended to address water balance augmentation for natural features as well as for maintaining overall groundwater recharge and providing surface water runoff volume reductions in the developed areas.

ROOF DRAIN COLLECTOR (RDC) SEWER system to direct clean roof runoff to specific wetland, woodland or headwater drainage features is not applicable to Parcel 24 as the subject site is not naturally tributary in terms of pre-development drainage area to any of the specific natural heritage features listed in the NFSSR #19. However, an RDC system may be considered for directing the 5mm residential roof runoff to a communal LID system if at-source control is not feasible.

1.3. Study Area

The proposed Parcel 24 residential subdivision development is located within Neighbourhood 19 of the Seaton Community area. The site is bordered by Alexander Knox Road (formerly Whitevale Road) to the north, Peter Matthews Drive and natural heritage system (woodlot) to the west and bordered by natural heritage system containing a branch of Ganatsekiagon Creek to the east and south.

The total site area for Parcel 24 is 5.47 ha and based on a draft plan of subdivision prepared by Korsiak Urban Planning consists of the following proposed land uses:

- 76 Single Detached Residential Lots
- 28 Street Townhouses
- 1 Stormwater Management Pond Block

- 1 Overland Flow/Pond Access Block
- 3 Open Space Blocks
- 15.35m Municipal ROW, 434m Length
- 17.0m Municipal ROW, 493m Length

The proposed subdivision is located within the "Phase 1 Living Area" of the Seaton Community, as per the Development Phasing Plan provided within the MESPA.

Refer to **Appendix A** for the proposed draft plan of subdivision.

2.0 Existing Conditions

The site is currently in a rough graded condition having been cleared of vegetation and topsoil under prior permitting and license completed by others and the site is ringed with temporary sediment control fencing. An interim stormwater management pond is currently situated at the southeast corner of the site which is utilized for both temporary sediment control for site runoff and to control stormwater runoff from a portion of Peter Matthews Drive which is conveyed to the temporary pond via open swale aligned just south of the site.

Based on the original ground topographic survey completed by JD Barnes December 2016, the site topography generally drains from northwest to southeast from a high elevation of 181.0m to a low elevation of 156.0m over a distance of approximately 660m for an average site gradient of 3.8%. Refer to **Appendix A** for the original ground topographic survey. The rough grading completed onsite has maintained the same drainage pattern as original conditions.

A branch of Ganatsekiagon Creek (East Branch) flowing southerly is situated external to the site, located just to the east the property, while the West Branch of Ganatsekiagon Creek flowing southeasterly is located approximately 150m to the south.

Three existing natural heritage features identified near the site for clean water augmentation include: a) Woodlot FC20 located immediately to the west, separating the site from Peter Matthews Drive, b) Wetland G5 located on the west side of Peter Matthews Drive and c) Wetland G8 located on the east side of Ganatsekiagon Creek (East Branch). The subject site is not naturally tributary in terms of pre-development drainage area to any of these three existing natural heritage features.

3.0 Site Layout

The proposed development consists of 76 single-detached and 28 townhouses for a total of 104 residential units. Two proposed municipal right-of-ways (Streets A & B) shall provide access internal to the subdivision along with two proposed intersections with Peter Matthews Drive. A new municipal road, external to the subdivision, shall be aligned through lands owned by Infrastructure Ontario and will intersect with Peter Matthews Drive at the northern portion of the site.

The proposed municipal ROW's shall be 17.0m wide for typical local roads and 15.35m wide for window street condition, where the road abuts the natural heritage system on one side.

A portion of the proposed stormwater management facility (SWMF #25) is located in the south-east corner of the property, while the remaining portion of the SWMF Block is located within adjacent land currently owned by Infrastructure Ontario.

4.0 Background Studies

Relevant technical studies completed in support of the draft plan application for Parcel 24 include the Geotechnical Report, Hydrogeological Report, Preliminary Environmental Impacts Review Memo, Erosion Threshold Analysis Summary Letter, Environmental Noise Assessment Report and Traffic Sensitivity Analysis Report. The reader should refer to the most recent version thereof for such supporting technical documents. A summary of the findings relevant to the functional servicing and stormwater management design are outlined below.

4.1. Geotechnical Study

A report titled "Geotechnical Investigation, Lebovic – Seaton Whitevale East Development", dated December 10, 2020 has been prepared by Golder Associates Ltd. for the subject site in support of a previous draft plan application for the development.

The investigation was completed in May 2020 and advanced a total of 9 boreholes across the site with depths ranging from 3.3m to 8.1m below ground surface. A deposit of glacial till was encountered in all boreholes across the site. Soils within the northern two thirds of the site are classified as Silty Clay to Clayey Silt, while the soils within the southern one-third of the site transitions to layers of predominantly Silty Sand.

Two of the boreholes were located within the footprint of the proposed stormwater management facility #25 which show that existing soil conditions in the range of Pond Normal Water Level Elevation (157.0m) to Pond Bottom Elevation (154.0m) consist of Silty Sand. Additional geotechnical recommendations are required at the detailed design stage to determine whether an impermeable liner is required within SWMF #25.

Since the time of borehole investigation, the site has been rough graded and raised with an average of 3m imported fill material within the proposed road and lot areas, to suit the preliminary grading design intent of the subdivision.

The geotechnical investigation has also analyzed the slope stability of proposed fill slopes along the eastern boundary of the development and found that 2.5 horizontal to 1 vertical sloping is considered acceptable for slope design, if and when required.

4.2. Hydrogeological Study

A report titled "Hydrogeological Investigation, Lebovic – Seaton Whitevale East Development", dated September 29, 2020 has been prepared by Golder Associates Ltd. for the subject site in support of a previous draft plan application for the development.

In conjunction with the geotechnical borehole investigation, six groundwater monitoring wells were installed at select borehole locations in May 2020. Groundwater levels were measured twice in the summer of 2020 and groundwater was found to reside between 1m to 6.3m below ground surface. Since the site shall be raised with an average depth of 3m of imported fill, it appears that depth to groundwater will not pose a constraint for proposed near-surface infiltration galleries installed within the raised development area, if any. Further discussion of groundwater elevation versus underside of proposed infiltration galleries is discussed under the Low Impact Development headings in Chapter 6 of this FSSR. Determining the infiltration rates of existing soils will be the subject of in-situ infiltration testing at select location(s), to be completed in Spring 2025, which is the preferred season for in-situ testing.

A monitoring well was installed within the footprint of SWMF #25 and indicates a static groundwater elevation of 153.82m (July 2020) compared to the proposed SWMF #25 Pond Bottom Elevation of 154.0m. Groundwater elevation will fluctuate seasonally. Additional groundwater monitoring measurements and geotechnical recommendations are required at the detailed design stage to determine whether an impermeable liner is required within SWMF #25.

The report concluded that the site is not expected to represent a significant groundwater recharge or discharge area in the Ganatsekiagon Creek watershed.

4.3. Preliminary Environmental Impacts Review

A preliminary review of the environmental constraints, opportunities and future study requirements associated with the Natural Heritage System surrounding the site has been prepared in memo format by R.J. Burnside & Associates Ltd. Please refer to **Appendix D** for the complete memorandum.

4.4. Erosion Threshold Analysis Summary

A review of the background erosion related assessments previously completed for relevant watercourse reaches downstream of proposed SWMF 25 has been summarized in letter format by the project fluvial geomorphologist, Geo Morphix Ltd. The letter concludes and recommends that an erosion threshold analysis be completed for the immediate receiving section of watercourse, Reach GB2, at the detailed design stage. Additionally, the fluvial geomorphologist shall prepare the design of the proposed stormwater pond outfall channel and connection to the existing watercourse. Please refer to **Appendix E** for the complete letter.

5.0 Grading and Road Network

A preliminary road and lot grading plan has been prepared for the subject site. Roads have been designed to follow the existing topography and drainage patterns to the extent possible, and to provide overland flow paths to convey drainage to the proposed SWMF #25. The proposed grading has been designed to minimize grading encroachments into the Natural Heritage System buffers, to match existing grade at the site boundary where possible, and to minimize cut and fill requirements but it is understood that additional fill may be required to be imported to raise/grade the site to the final design pre-grade elevation. Refer to **Drawing GR-1, Functional Grading Plan** included at the end of this report.

5.1. Grading

The development lands generally slope southeasterly towards SWMF #25. The development is proposed to consist of front draining, split draining and walkout type draining lots. Major storm drainage for the entire area is conveyed to SWMF 25 via the proposed ROW's, with the exception of some rear yards backing onto the natural heritage features.

In areas where grading to meet existing elevations could not be achieved along the property limit, grading is proposed within the NHS buffer, in particular along the eastern edge of the development where minor grading encroaches into the existing Tree Drip Line buffer. Sloping of three (3) horizontal to one (1) vertical are used to minimize the area of disturbance, and in select locations, proposed fill sloping of 2.5:1 will be utilized, if or where required, as supported by slope stability analysis by the geotechnical engineer.

All intrusions to the NHS have been minimized to the extent possible. Restoration to the area of disturbance will be discussed with TRCA and the City on a case-by-case basis during detailed design.

Overland flow converges in an access Block located at the road low point at the southern end of the site, discharging to SWMF #25. The access Block shall be graded to 10.0% maximum.

Lot and swale grades shall range between 2% and 5%. Where greater grade differentials within Lots are required, a maximum slope of three (3) horizontal to one (1) vertical may be utilized. Road grades are proposed between minimum 0.5% to maximum 6.0%, with a desirable maximum of 5%. Grading for lots and roads shall be designed according to the City's Engineering Design Criteria, for Lot Grading and Roads.

5.2. Road Network

Peter Matthews Drive

Peter Matthews Drive is an existing four lane north-south Regional road located just to the west of the site and shall provide vehicular access via two intersections with the subject site local roads. Peter Matthews Drive has been designed by Stantec, constructed as part of Regional Assignment #6 and includes constructed right turn and left turn auxiliary lanes to the two proposed site accesses.

Local Road Cross-Sections

Special road right-of-way cross sections have been developed by the City of Pickering for use within the Seaton Community. Residential local roads within the site shall consist of 17.0m ROW (City Std. P-746SE) and 15.35m ROW (City Std. P-744SE) for window streets adjacent the Natural Heritage System. Pavement width shall be 8.5m and will include 1.5m wide sidewalks on both sides for the 17.0m ROW. Window streets with 15.35m ROW shall include a sidewalk on one side only.

Refer to **Appendix A** for the City of Pickering ROW cross section standard drawings.

6.0 Stormwater Management

6.1. Design Criteria

The development will meet the standards as set out in the Ministry of the Environment Stormwater Management Planning and Design (SWMPD) Manual (March 2003), the City of Pickering Stormwater Management Design Guidelines, the Toronto and Region Conservation Authority's Stormwater Management Criteria (August 2012), and the MNRF Guidance for Development Activities in Redside Dace Protected Habitat (March 2016).

The SWM criteria for this development have been established through the development of the *Seaton Community Master Environmental Servicing Plan Amendment* (MESPA, Final July 2013) and the *2012 Duffins Creek Hydrology Update* prepared by Aquafor Beech Ltd. (Feb. 2013). The criteria to be used in the stormwater management design are listed below:

Stormwater Management Facility #25 Design

- *Quantity Control* – Control post-development release rates for the 2-year through 100-year design storm events to the unitary release rates and unitary storage requirements, as provided in the 2012 Duffins Creek Hydrology Update (Aquafor Beech Ltd., Feb. 2013).
  - Note: As per the 2012 DCHU document, Regional Storm control is not required.
- *Water Quality* – Provide enhanced (Level 1) protection (minimum 80% total suspended solids removal) based on the *MOE Stormwater Management Planning and Design Manual* (2003);
  - A 3.0m deep permanent pool with bottom draw outlet structure is required for the main cell of the pond to satisfy MNRF Redside Dace criteria. As defined in the MESPA, the reach downstream of SWMF #25 is considered contributing Redside Dace habitat.
- *Erosion Control* – Channel morphology and stream bank erosion for the main channels within the Seaton development, including Ganatsekiagon Creek, was studied as part of the Seaton MESPA and the results of this analysis were the following erosion criteria:
  - Provide extended detention of the 25mm rainfall event for a minimum of 120 hours;
  - Unitary storage volume of 250 m^3/Impervious ha (MESPA, Table B11.1),
  - Unitary Discharge Rate for the 25mm event = 0.6 L/s/ha (MESPA, Table B11.1)
- *Redside Dace* – As the outlet for the proposed SWMF #25 has been designated as Contributing Redside Dace Habitat, the stormwater management design must meet the MNR requirements for development activities in Redside Dace protected habitat. These requirements include:
  - Thermal mitigation to below 24°C.
  - TSS levels should not exceed 25mg/L above background levels.

Low Impact Development (LID) Measures are recommended to address water balance augmentation for natural features as well as for maintaining overall groundwater recharge and providing surface water runoff volume reductions in the developed areas. The LID measures should be designed to meet targets for infiltration and water retention as follows:

- Retention of 5mm of rainfall for all residential roof areas (requirement does not apply to driveways). Storage to be provided communally and/or on individual lots.

- Local Roads that extend through the NHS or where they abut (i.e. physically touches) the NHS shall include roadside bioswales to promote evapotranspiration, infiltration, retention or detention or any combination thereof. The roadside bioswales will not be designed with any specific storage or infiltration target, however they will be designed to accept as much of the drainage from that section of local road as possible.

6.2. Existing Drainage Conditions

The site is located within the Ganatsekiagon Creek subwatershed, situated within the larger Duffins Creek watershed. Based on the original ground topographic survey completed by JD Barnes December 2016, the site topography generally drains from northwest to southeast from a high elevation of 181.0m to a low elevation of 156.0m over a distance of approximately 660m for an average site gradient of 3.8%. Recent rough grading activity to raise the site closer to future grade has maintained similar drainage patterns as pre-development conditions. The site currently contains an interim stormwater management facility situated at the southeast corner, at the ultimate location for proposed SWMF #25, providing temporary sediment control from site runoff and accepting road drainage from a portion of Peter Matthews Drive.

The site is bisected by the existing TRCA subwatershed catchment divide line separating subcatchment # 34 (Ganatsekiagon Creek West Branch) from subcatchment # 35 (Ganatsekiagon Creek East Branch), as defined within the *2012 Duffins Creek Hydrogeology Update-Final Report, Figure 2.1 Duffins Creek Hydrologic Model-Subcatchment Boundaries*. Refer to **Drawing DAP-1 Pre-Development Storm Drainage Area Plan** for a depiction of existing drainage conditions, included at the end of this report.

6.2.1. Target Flow Rates

An existing conditions hydrology analysis for the Duffins Creek watershed was completed by Aquafor Beech (February 2013) in the report titled, '*2012 Duffins Creek Hydrology Update-Final Report*'. As part of this update, a post-development conditions scenario was developed in order to establish unit storage and unit outflow rates for the development areas within the Seaton lands.

The targets were provided in two formats to be used as follows:

- Unit flow rates and storage volumes set on a per ha basis (L/s/ha and m^3/ha) are to be used to size SWM facilities where the % impervious of the proposed development is less than or equal to the % impervious value used in the post-development Duffins Creek model;
- Unit flow rates and storage volumes set on a per impervious ha basis (L/s/imp-ha and m^3/imp-ha) are to be used to size SWM facilities where the % impervious of the proposed development is greater than the % impervious value used in the post-development Duffins Creek model; and,
- In the case of drainage diversions within the Seaton Lands, small diversions between adjacent catchments should be controlled using criteria for the receiving catchment.

Within the Duffins Creek hydrology model, an 81% imperviousness was applied to Catchment #34 and an imperviousness of 83% was applied to Catchment #35. Since the planned ultimate development of the proposed Parcel 24 subdivision proposes an overall imperviousness of 66.9% (as noted in the subsequent sections of this report), target flows shall be calculated based on the "per ha" basis since the proposed imperviousness is less than the Duffins Creek model imperviousness.

A small drainage diversion of 3.26 ha area is proposed, which includes both subject site area plus external area, originating from Catchment #34 draining towards Catchment #35. Target flows for SWMF 25 have

been established based on the combination of development area from both Catchments #34 and #35 areas tributary to the SWM facility 25 added together, based on the unit flow rate criteria of the receiving catchment, Catchment #35. The area for Regional Road Peter Matthews Drive has not been utilized for determining any of the target flow rates for the site as major system drainage greater than 10-year storm events originating from Peter Matthews Drive ROW are accounted for in other downstream stormwater management facility outlets and associated target flow rates.

In addition, drainage areas totaling approximately 0.62 ha for proposed pervious rear yards of lots abutting the Natural Heritage System shall drain towards the NHS uncontrolled. Such uncontrolled areas shall not be utilized or counted towards establishing the target release rate. It is noted however that full area of rooftops are directed via downspouts towards the front of the lot and thus would be controlled.

Refer to **Drawing DAP-2 Post-Development Storm Drainage Area Plan** for a depiction of the catchment areas used to establish the target flow rates.

Table 6.1 – Target Flow Rates

Total Drainage Area (ha)	Total Drainage Area Contributing to SWMF 25 within Catchments #34 & #35 (ha)	Storm Event	Ganatsekiagon Creek East Branch (Catchment #35) Unit Flow Release Rate Target* (L/s/ha)	Target Flow Release Rate for SWMF 25 (L/s)
10.57	9.17**	2 Year	2.81	25.8
		5 Year	4.51	41.4
		10 Year	5.71	52.4
		25 Year	7.40	67.9
		50 Year	8.72	80.0
		100 Year	10.12	92.8

**As per 2012 Duffins Creek Hydrology Update-Final Report (Feb. 11, 2013), Table 5.2*
***Value excludes Peter Matthews Road and Uncontrolled Rear Yards for Lots Abutting NHS.*

6.3. Proposed Drainage Conditions

Under post-development conditions, both minor and major system drainage from the subject site shall be directed to the proposed stormwater management facility #25 located in the southeast corner of the site.

Due to the proposed Walkout style grading pattern for lots abutting the Natural Heritage System, several rear yards along the perimeter of the property will release uncontrolled runoff towards the adjacent Natural Heritage System.

External drainage originating from the existing adjacent Woodlot to the west shall be captured into the site storm sewer network for 100-year storm conditions at the Street 'B' road bend where it abuts the Woodlot. The allowance for 100-year capture shall prevent potential debris from the Woodlot from migrating onto the municipal roadway during major storm events.

External drainage for the minor system storm (10-year event as per Regional standards) originating from a portion of Regional Road Peter Matthews Drive shall be directed through the storm sewers of the subject site towards SWMF 25, while major system overland flow shall be directed southerly towards an existing downstream stormwater management pond (SWMF 14). Allowance for such Regional Road minor system drainage has been documented within the Stormwater Management Report for Sideline 22 (Regional Assignment #6, Peter Matthews Drive), prepared by Stantec Consulting Ltd. A post-development drainage area plan has been prepared for the proposed development condition, refer to **Drawing DAP-2 Post-Development Storm Drainage Area Plan** provided at the end of this report.

A hydrologic model for the proposed storm drainage condition was prepared using Visual OttHYMO (VO) version 6.2. The STANDHYD and NASHYD parameters used in the model are summarized in **Table 6.2** and **Table 6.3** below. Detailed VO model input parameters are provided in **Appendix B-1 VO Model Parameters** and detailed VO model output is provided in **Appendix B-2 VO Modeling Output**.

Table 6.2 – SWMF 25 STANDHYD Drainage Parameters

Catchment ID	Drainage Area (ha)	TIMP	XIMP
A-25 (SWMF 25)	1.23	90%	90%
A-26 (Residential)	5.39	66.9%	56.3%
A-3 (Peter Matthews)	0.78	87%*	65%

**Total Imperviousness as per Stormwater Management Report, Sideline 22 (Regional Assignment #6, Peter Matthews Drive), Stantec Consulting Ltd.*

Table 6.3 – SWMF 25 NASHYD Drainage Parameters

Catchment ID	Drainage Area (ha)	CN	TP
EXT-1 (Woodlot)	1.25	70	0.122
EXT-2 (Woodlot)	1.93	70	0.146

6.3.1. Residential Roof LID's

Low Impact Development (LID) measures are recommended to address water balance conditions for natural features as well as for maintaining overall groundwater recharge and providing surface water runoff volume reductions in the developed areas. The measures should be designed to meet targets for infiltration and water retention as discussed below.

Residential areas:

- Retention of 5mm of rainfall for all residential roof areas (requirement does not apply to driveways). Storage to be provided communally and/or on individual lots.
- Best efforts to achieve 5mm retention in all other residential areas.
- LID measures are not required for local roads, except for local roads that extend through the NHS or where they abut (i.e. physically touches) the NHS.

Based on the proposed development plan, a total residential roof area of 14,286m^2 is proposed, therefore requiring that 72.0m^3 (0.005m x 14,286m^2) of volume be retained via LID's to achieve 5mm of retention from residential roofs. Roof areas for various sized Lots have been calculated and depicted within **Figure**

IMP-1, Lot Impervious Coverage found in **Appendix B**. Refer to **Table 6.4** below for a summary of residential roof areas.

Table 6.4 – Residential Roof Areas for 5mm Retention

Unit Type (Frontage)	# of Units	Roof Area per Unit (m^2)*	Total Roof Area (m^2)
Singles (9.15m)	19	122.2	2,322
Singles (11m)	45	152.2	6,849
Singles (13.1m)	12	191.1	2,293
Street Townhouses (6.1m)	28	100.8	2,822
TOTAL:	**104**		**14,286**

**Refer to Figure IMP-1, Lot Impervious Coverage*

Residential roof LID measures are proposed to be incorporated at the outlet of the proposed stormwater management pond #25, where treated water shall discharge via perforated pipe to a centralized, public infiltration gallery. The infiltration gallery shall be sited to achieve the following design parameters:

- Provide a minimum of 72 m^3 of void space within the clear stone infiltration media to satisfy the required volume generated under 5mm rainfall over rooftops.
- Placed a minimum of 5m horizontal separation from the toe of pond slopes.
- Maintain minimum 1m vertical separation from the seasonal high groundwater table
    - Underside of infiltration trench will be placed close to existing grade, with topsoil placed on top for total frost protection to bottom of facility with depth of soil cover as per MOE SWMP Design Manual Figure 4.4-Soil Cover for Trenches.

Based on the Golder Hydrogeological Report (Sept. 2020), the following design parameters have been utilized for the proposed Roofwater LID siting next to the proposed SWM Pond 25:

- In-situ testing (Guelph Permeameter) of existing soils completed on August 5, 2019 at the location of the SWM Pond bottom (Test GP 20-9), the estimated infiltration rate was measured to be 58 mm/hr, Correction Factor of 3.5 and a Corrected Estimated Infiltration Rate of 17 mm/hr.
- Groundwater elevation at monitoring well BH20-8 located within the SWM Pond footprint was measured at elevation 153.82m (July 2020).

Based on MOE SWMP Design Manual (2003) equation 4.3, the Roofwater LID infiltration trench shall achieve the following minimum bottom area:

- Minimum Infiltration Trench Bottom Area (MOE Equation 4.3) = 220 m^2

Where: Bottom Area (m^2) = 1000V / (P x n x t)

- P = design Infiltration Rate of 17 mm/hr
- t = 48-hour maximum drawdown time
- V = 72 m^3 storage volume as required above
- n = 0.4 void ratio for 50mm clear stone

The proposed Roofwater LID infiltration trench is functionally sized with bottom area of 300 m^2, with 0.6m depth of clear stone which provides 72 m^3 of storage volume and provides a drawdown time of 35.3 hours.

Based on the Golder Hydrogeological Report (Sept. 2020) the existing soils at the in-situ test location (Test GP 20-9) are Silt which requires 0.9m soil cover according to MOE SWMP Design Manual Figure 4-4.

Refer to **Drawing SP-1 Functional Servicing Plan** for a depiction of the proposed Roofwater LID siting.

As noted under Section 4.2 above, additional in-situ testing will be completed at the location of the proposed Roofwater LID in the Spring 2025 to confirm prior hydrogeological findings which may result in modifications to the design of the proposed infiltration trench.

6.3.2. Roadside LID's

Local Roads that extend through the NHS or where they abut (i.e. physically touches) the NHS shall include roadside bioswales to promote evapotranspiration, infiltration, retention or detention or any combination thereof. The roadside bioswales will not be designed with any specific storage or infiltration target, however they will be designed to accept as much of the drainage from that section of local road as possible.

There are three locations where roadside bioswales have been considered, consistent with the recommendations of the NFSSR #19:

1. Adjacent to the external proposed local road (both sides) through the Natural Heritage System to Peter Matthews Drive.
2. Adjacent Street 'A' (East Side) along the Natural Heritage System of Ganatsekiagon Creek East Branch.
3. Adjacent Street 'A' (West Side) along the existing Woodlot.

Roadside bioswales are intended to be located immediately adjacent to the road right-of-way and should be generally compatible in terms of grade. All three local road locations noted above for potential roadside bioswale implementation are raised by up to 3m of fill relative to the toe of slope matching to existing ground and an assessment for each of the three locations has been completed as follows:

1. The external road directed through the NHS contains sidewalks on both sides of the right-of-way and it is not recommended to direct road drainage overtop sidewalks towards bioswales.
2. Street 'A' (East Side) is consistently 3m higher in elevation than existing ground for the section of road abutting the NHS of Ganatsekiagon Creek East Branch and it would not be feasible to install a bioswale catchbasin to capture excess runoff and direct bioswale drainage back into the storm sewer system due to the similar grade of the bioswale CB and storm sewer. This would also present a risk of storm flows escaping through the bioswale CB during periods of high intensity storm events and surcharged storm sewer conditions.
3. Street 'A' (West Side) presents a reasonable opportunity to introduce a Roadside Bioswale by directing road runoff along the edge of the Woodlot. A curb cut location has been selected along Street 'A' where the smallest vertical grade separation exists to minimize slope erosion potential.

Two examples of typical roadside bioswale cross sections have been included within the NFSSR #19 to depict the dimensions and media for the proposed bioswales, refer to **Figure BIO** below. The final bioswale cross section will be established at the detailed design stage.

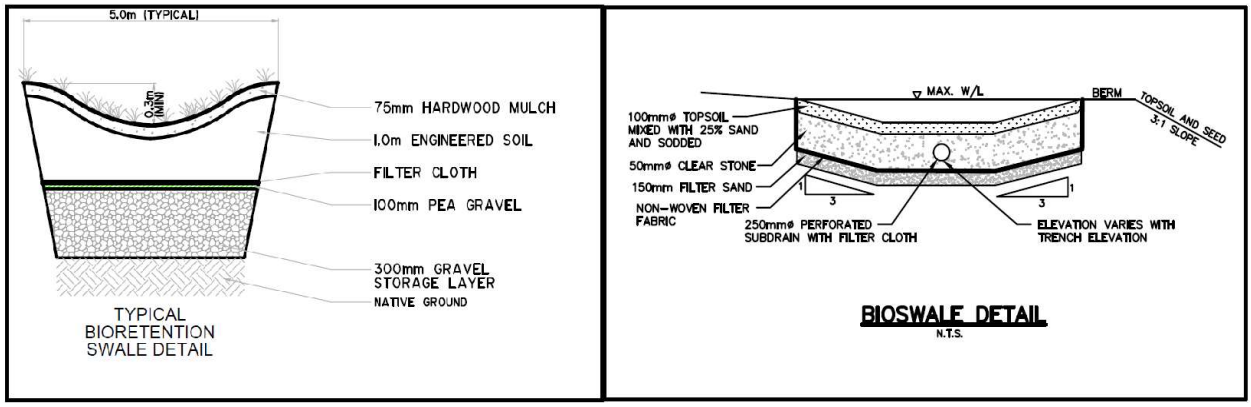


Figure BIO – Typical Roadside Bioswale Cross Section Examples

Refer to **Drawing DAP-2 Post-Development Storm Drainage Plan** and **Drawing GR-1 Functional Grading Plan** for a depiction of the proposed roadside bioswale location.

6.4. Stormwater Management Facility Design

6.4.1. SWM Facility Criteria

The stormwater management facilities within Seaton are required to be designed in accordance with MECP, MNRF, TRCA, and City of Pickering design criteria.

Table 4.6 of the MOE SWM Planning and Design Guidelines summarizes the minimum criteria for a Wet Pond. A summary of these criteria are as follows:

MECP

- Table 4.1 of the MOE SWM Planning and Design Guidelines shows the only physical constraint for a constructed wetland is a minimum drainage area of 5 ha;
- Quality Treatment Volume as per Table 3.2 of the MOE SWM Planning and Design Guidelines;
- Forebay:
    - Minimum depth of 1m;
    - Sized to ensure non-erosive velocities leaving the forebay;
    - Maximum area is 33% of the total permanent pool;
    - Minimum length to width ratio 2:1.
- Overall minimum length to width ratio of 3:1;
- Maximum permanent pool depth should be 3.0m;
- Inlet minimum size 450mm at 1% preferred slope; and,
- In order to avoid clogging / freezing, the outlet pipe should be at minimum a 450mm diameter pipe at 1% slope. Minimum orifice control size is 75mm.

City of Pickering

- Minimum length-to-width ratio of the SWM facility shall be 4:1.

- Side Slopes:
    - 3:1 from the bottom of the permanent pool to 500mm below the Normal Water Level;
    - 6:1 within 3.0m on either side of NWL;
    - 4:1 where the slope backs on to the rear yard lot line or an adjacent valley system;
    - 4:1 where the pond is adjacent to a municipal boundary;
    - 5:1 where the slope backs on to an adjacent road system.
- Water Levels:
    - Permanent Pool 1.0 to 2.0m, 3.0 max for deep pools;
    - Extended Detention Storage 1.5m max;
    - Quantity Control Storage 2.0m max;
    - Overall max depth 4.5m for up to the 100-year event.
- Forebay Berm:
    - Forebay spillway invert at the NWL with appropriate erosion protection;
    - The minimum top width of the berm shall be 1.0m.
- Facility Berm:
    - Max berm height of 2m;
    - Where berm >2m it must be designed by a geotechnical engineer (max 3m).
- Maintenance access roadway (min. width of 4m) to all inlets, outlets, spillways and outfall channels:
    - Dead end access may be designed with a hammerhead width of 17m and 12m centerline radius.
- Emergency spillway
- Perimeter security fencing at 1.8m height to be anti-climb.

MNRF (Redside Dace Guidelines)

The SWM design must meet the MNRF requirements for development activities in Redside Dace protected habitat, including providing 3m deep permanent pool. SWMF 25 will discharge to Redside Dace Contributing habitat.

These requirements also include:

- Providing thermal mitigation to discharge below 24°C;
- The TSS levels of discharged water should not exceed 25mg/L above background levels.

6.4.2. Quality Controls

6.4.2.1 Permanent Pool

Stormwater treatment must meet Enhanced Level 1 Protection criteria as defined by the MOE SWM Planning & Design Manual (2003) to achieve 80% removal of total suspended solids (TSS). For areas contributing to SWM Facility 25, it is proposed that the required 80% TSS removal be achieved by permanent pool storage within the subject wet pond facility. Given that the MNRF requires a minimum

3.0m deep permanent pool in consideration of guidelines for releasing to Redside Dace (contributing) habitat, SWMF 25 will inherently provide a large permanent pool volume by meeting this MNRF criteria.

The MOE 2003 SWMP Manual (Table 3.2), provides the following range of required water quality storage volume rates to satisfy Enhanced Level 1 (80%) TSS removal within a wet pond. Volumetric storage rates include 40m^3/ha for extended detention, while the remainder represents the permanent pool. As a result, for permanent pool volume calculations, 40m^3/ha may be subtracted from the MOE 2003 SWMP Manual volumetric storage rates.

- 140 m^3/ha for Imperviousness Level: 35%
- 190 m^3/ha for Imperviousness Level: 55%
- 225 m^3/ha for Imperviousness Level: 70%
- 250 m^3/ha for Imperviousness Level: 85%

Permanent pool volume calculations are summarized in **Table 6.5** below which demonstrates that SWM facility 25 provides sufficient permanent pool storage volume below the Normal Water Level (NWL) to achieve Enhanced Level 1 protection. For conservatism at this draft plan application stage, the Drainage Area for Quality Control currently includes the entire development site area, including uncontrolled rear yard areas that discharge directly to the adjacent NHS. The final Quality Control drainage area can be refined at the detailed design stage.

Table 6.5 – SWMF 25 Permanent Pool Volume Summary

Drainage Area for Quality Control (ha)	Percent Imperviousness (%)	Volumetric Storage Rate (m^3/ha)	Required Permanent Pool (m^3)	Provided Permanent Pool (m^3)	SWMF 25 Contour Elevation (m)
10.57	54%	150 (190-40)	1,586	4,619	BOT 154.00 NWL 157.00

6.4.2.2 Forebay Sizing

Forebay sizing calculations were undertaken for SWMF 25 to confirm the proposed pond dimensions conform to the MECP quality control criteria requirements. A minimum required length to width ratio of 2:1 is required to comply with the MECP design criteria for constructed wet ponds.

Table 6.6 below outlines the required and proposed forebay lengths and widths for SWMF 25 to ensure proper sediment settling and dispersion criteria.

Table 6.6 – SWMF 25 Forebay Design Summary

Proposed Forebay Length (m)	Proposed Forebay Width (m)	Proposed Length to Width Ratio	Minimum Required Settling Length (m)	Minimum Required Dispersion Length (m)	Minimum Required Bottom Width (m)	Proposed Forebay Bottom Width (m)
60	20	3:1	8.25	6.12	7.5	8.5

As noted above, SWM facility 25 provides adequate forebay length and width, therefore achieving the required minimum settling length, dispersion length, and 2:1 length to width ratio. The SWMF 25 forebay bottom width also satisfies the minimum forebay bottom width requirement. Forebay sizing calculations are provided in **Appendix B-3 SWM Facility 25 Calculations**.

6.4.2.3 Thermal Mitigation

The MNRF requires thermal mitigation for effluent from SWM facilities directed to Redside Dace habitat to reduce the temperature to 24°C. Thermal mitigation for runoff from the proposed residential subdivision and Regional Road Peter Matthews Drive will be provided by SWMF 25 to include the following MNRF Guidelines:

- Average permanent pool depth is to be minimum 3.0m.
- Bottom draw outlet is to be located a minimum of 2.5m below the permanent pool elevation.
- The perimeter of the pond at the permanent pool elevation is to include a minimum 3m wide flat shelf (to be 6:1 as per City Standards) as a wetland planting area.
- Side slopes below the normal water level of the permanent pool are minimum 4:1.
- The volume of water in the permanent pool between 1.5m to 3.0m depth is at least equivalent to the volume of runoff generated by a 10mm storm event within the catchment of the pond. The calculated volume below 1.5m depth is to be discharged over a minimum 24-hour period.

6.4.3. Quantity Control

SWMF 25 will be designed to provide extended detention and quantity control up to the 100-year storm event for the tributary drainage areas and pond block. Controlled flows from SWMF 25 are proposed to outlet to the Ganatsekiagon Creek East Branch.

6.4.3.1 Outlet Structures

SWM Facility 25 will have a single bottom draw/reverse slope pipe structure discharging to a control manhole in order to control flows to the established targets. Within the control manhole, an orifice plate will be set at the normal water level to provide extended detention control, with a larger flow structure (weir or plate) provided at higher elevations to provide control up to the 100-year event. Specifics regarding the outlet controls for SWMF 25 are summarized in **Table 6.7** below.

Table 6.7 – SWMF 25 Outlet Control Summary

Control Structure	Invert Elevation (m)	Diameter / Width x Height (mm)
Circular Orifice #1	157.00	75
Circular Orifice #2	157.45	110
Circular Orifice #3	157.70	110
Rectangular Orifice #4	158.02	250W x 100H

For SWMF 25, controlled pond outflows will be piped to the top end of an outfall channel, from which point flows will drain overland within the channel to the existing watercourse. A conceptual outlet channel and connection to existing valley has been shown on the drawings within this report. Refer to **Drawing SWM-1 Stormwater Management Pond 25**. The final outfall channel shall be designed using 'natural

channel' principles by the project fluvial geomorphologist at the detailed design stage and will be sized to convey the uncontrolled Regional Storm event, utilizing the same flow rate as sizing the emergency spillway in **Section 6.4.3.4** below.

Refer to **Section 6.4.3.3** below for a summary of SWMF 25's flood control operating characteristics, including the storage volumes required in order to achieve the target unitary flow release rates.

6.4.3.2 Extended Detention

SWMF 25 will be designed with an extended detention orifice control in order to achieve erosion targets as established within the Seaton MESPA. The MESPA requires erosion controls to provide extended detention volumetric storage of a minimum 250 m^3/imp.ha to be released over a minimum duration of 120 hours, at a maximum unitary release rate of 0.6 L/s/ha. Refer to **Table 6.8** below for a summary of the erosion controls for SWMF 25.

Table 6.8 – SWMF 25 Erosion Control Summary

Contrib. 25mm Event Area (ha)	% Imp.	Imp. ha	Required Extended Detention Volume (m^3)	Provided Extended Detention Volume (m^3)	Target Erosion Release Rate (L/s)	Provided Erosion Release Rate (L/s)	Det. Time (hr)	SWMF 25 Contour Elevation (m)
10.57	54%	5.71	1,423	1,487	6.3	6.8	103	157.36

As shown above, adequate extended detention volume is provided in SWMF 25 to meet the erosion control requirement. It is noted that despite proposing the smallest orifice size (75mm dia.), the extended detention release rate slightly exceeds the target extended detention release rate. In addition, the minimum detention time of 120 hours cannot be met with the minimum 75mm diameter orifice.

6.4.3.3 Flood Control

The drainage characteristics for the proposed development areas were coded into the post-development VO6.2 model to calculate the peak flow rates and associated storage volumes required to meet the target release rates for the range of storm events from 2-year to 100-year return periods. The detailed VO6.2 model output is provided in **Appendix B-2** and the detailed stage-storage-discharge tables for SWMF 25 are provided in **Appendix B-3**. A summary of the flood control design parameters for SWMF 25 are shown in **Table 6.9** below.

Table 6.9 – Post Development Peak Flow & Flood Control Storage Volume Summary

Return Period Storm Event	Target Release Rate (L/s)	Controlled Release Rate (L/s)	Required Storage Volume Above Extended Detention (m^3)	Provided Storage Volume Above Extended Detention (m^3)	SWMF 25 Contour Elevation (m)
2-Year	25.8	25.8	2,235	2,263	157.81
5-Year	41.4	37.3	2,963	2,980	157.94
10-Year	52.4	43.6	3,459	3,493	158.03
25-Year	67.9	66.2	4,054	4,139	158.14
50-Year	80.0	77.4	4,489	4,560	158.21
100-Year	92.8	88.7	4,961	5,114	158.30

Based on the summary table above, the maximum required storage volume occurs during the 100-year storm event, where a total of 4,961m^3 storage volume is required during the 100-year event. The proposed SWMF 25 provides a total of 5,114m^3 of available flood control storage volume up to a water elevation of 158.30m which is sufficient flood control storage to achieve the target release rates.

6.4.3.4 Emergency Spillway

An emergency spillway will be provided for SWMF 25 in order to safely convey overland flow to the valley in the event of a blockage in the outlet control structure. The emergency spillway is designed to convey the uncontrolled Regional Storm peak flow (which is the greater of the 100-Year Storm or the Regional Storm) with appropriate minimum freeboard of 0.3m from the top of pond.

Table 6.10 provides the emergency spillway details for SWMF 25. Refer to Appendix B-3 SWM Facility 25 Calculations for detailed calculations. The outfall channel for SWMF 25 shall be designed to convey this uncontrolled Regional Storm peak flow to the receiving watercourse.

Table 6.10 – Emergency Spillway Details Summary

Drainage Area to SWMF 25 (ha)	Emergency Spillway Invert (m)	Top of Pond (m)	Spillway Width (m)	Depth of Flow over Spillway (m)	Uncontrolled Regional Storm Peak Flow (m^3/s)	Spillway Conveyance Capacity (m^3/s)
10.57	158.30	159.00	10	0.20	1.357	1.565

7.0 Municipal Servicing

7.1. Storm Drainage

7.1.1. Storm Drainage – Minor System

Storm sewers shall be designed and initially sized to convey the 5-year storm event, as per the design criteria and procedures for minor system drainage described within the City of Pickering's Engineering Design Criteria and Stormwater Management Design Guidelines. At the detailed design stage, once the catchbasin layout and roof drain capture areas are finalized, the storm sewer sizing may require increasing to accommodate 100-year hydraulic grade line conditions to maintain required clearances from proposed house basement elevations.

External storm drainage from a portion of Peter Matthews Drive along the site frontage currently drains through the site via open channel towards the interim constructed SWM Pond and such external drainage shall be connected to the site storm sewers in the ultimate condition. The proposed storm sewers within the site shall be designed to convey the 10-year storm event from the defined drainage area of external Peter Matthews Drive, as established within the Regional road design prepared by Stantec for Regional Assignment #6.

In addition, external storm drainage from the existing woodlot will be captured at the low spot elevation adjacent to the Street 'B' northerly elbow. To avoid major system runoff from the woodlot entering the local roads, 100-year storm capture will be utilized at the Street 'B' north elbow location, with grate sizing based on a theoretical 50% blockage scenario.

The proposed preliminary storm sewer alignments, sizing and obvert elevations are shown on **Drawing SP-1 Functional Servicing Plan**, at the end of this report.

Storm sewer design flows are calculated using the Rational formula, shown below, where 'A' is the contributing area in hectares, 'I' is the rainfall intensity (mm/hr) and 'C' is the run-off coefficient.

Q (L/s) = 2.778 x A x I x C,

Rainfall intensities are based on the City's Intensity-Duration-Frequency (IDF) parameters, refer to **Table 7.1** below), and are expressed as follows, where 'I' is the intensity in mm/hr and tc is the time of concentration in minutes.

$$I = \frac{A}{(t_c + B)^C}$$

Table 7.1 – City of Pickering IDF Parameters

Parameter	Return Period					
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
A	715.076	1082.901	1313.979	1581.718	1828.009	2096.425
B	5.262	6.007	6.026	6.007	6.193	6.485
C	0.815	0.837	0.845	0.848	0.856	0.863

Source: City of Pickering Stormwater Management Design Guidelines Manual, July 2019 (Table 12)

Run-off coefficients are shown in **Table 7.2** and are in accordance with City of Pickering criteria for various land uses.

Table 7.2 – City of Pickering Standard Runoff Coefficients by Land Use

Land Use	Run-off Coefficient
Parks over 4 hectares	0.20
Unimproved	0.20
Parks 4 hectares and under	0.25
Railroad Yard	0.35
Single Family Residential	0.65
Single Family Residential (Frontage less than 12.2 m)	0.70
Semi-detached Residential	0.70
Street Townhouses	0.75
Laneway Townhouses	0.85
Back-to-Back Townhouses	0.90
Apartments	0.85
Schools and Churches	0.85
Industrial	0.90
Commercial	0.90
Heavily Developed Areas	0.95
Paved Areas	0.95

Source: City of Pickering Stormwater Management Design Guidelines Manual, July 2019 (Table 9)

7.1.2. House Foundation Drainage

All residential units within the subject site are expected to contain a single level, standard depth basements sited approximately 1.8m below finished grade. Foundation drainage collected around the building subdrains shall be connected to the proposed storm sewer via typical 150mm diameter storm laterals extended to each individual lot.

At the detailed design stage, calculations will be completed for the proposed storm sewer to determine the 100-year Hydraulic Grade Line along the entire storm sewer alignment, starting from the high water level of the proposed stormwater management pond. The storm sewer network shall be designed such that the 100-Year HGL is not closer than 0.5m vertically from the proposed building basement elevation for all units. If required, in locations where the 0.5m vertical separation cannot be achieved, several options can be explored, including: a) introducing inlet control devices within road catchbasins, b) establishing minimum (raised) basement elevations, c) increasing the storm sewer size, or d) introducing sump pumps to hydraulically separate the foundation drains from the storm sewer.

7.1.3. Roof Water Drainage

Several natural heritage features within Seaton Community have been identified within Seaton MESPA and NFSSR #19 background reports to be replenished with clean water via a dedicated roof water collector sewer. The subject site is not tributary to any previously identified natural heritage feature and the site has not been identified within the MESPA or NFSSR #19 as requiring to contribute clean water to any natural feature. Therefore, a dedicated roof water collector sewer system is not required within the site.

However, according to City standards, direct connection of roof leaders (front and rear leaders) to municipal storm sewers are required for all lots with a frontage less than 12.0m width. For lots greater than 12.0m width, all roof leaders may discharge to grade. For lots that are greater than 12.0m width and back onto natural heritage systems, all roof leaders (front and rear) shall discharge to surface at the front of the lot to avoid uncontrolled roof runoff and ensure roof drainage is directed to the stormwater management pond for appropriate controls.

Refer to **Drawing SP-1 Functional Servicing Plan** for a depiction of the various roof leader drainage and discharge criteria identified for each individual lot.

7.1.4. NHS Road Culvert Sizing

The proposed external municipal road crossing through the Natural Heritage System (Woodlot) will bisect existing drainage originating from within the woodlot. Based on City standards, the design capacity for the new culvert crossing under the local road shall be sized for the 50-Year storm event.

The 50-Year runoff rate from the area (EXT-1) draining towards the proposed culvert is 66 L/s and requires a 450mm diameter culvert, which has capacity of 161 L/s, at 1.0% grade and Mannings 'n' of 0.023 for corrugated steel pipe.

7.1.5. Storm Drainage – Major System

Local road ROW's and conveyance blocks have been designed as major system flow paths to convey overland storm drainage to an appropriate outlet and/or SWMF #25. The capacity of major system overland flow routes are checked for conveyance of the flows generated by the 100-year minus the 5-year storm event, calculated using the rational method.

The conveyance capacity at two critical locations within the subdivision were determined to ensure overland flow depths during the 100-year storm event are acceptable and can be maintained within public right-of-ways in accordance with City standards.

At 17.0m Wide ROW Street 'A' Road Low Point to SWM Pond Access:
Overland Flow (100-Yr minus 5-Yr Flow) = 0.655 m^3/s
ROW Conveyance Capacity = 1.807 m^3/s

At 7.6m Wide SWM Pond Access/Overland Flow Block:
Overland Flow (100-Yr minus 5-Yr Flow) = 0.785 m^3/s
Block Conveyance Capacity = 1.326 m^3/s

Since the conveyance capacities exceed the expected major system flow rates at both critical locations, the major system design is acceptable. Refer to **Appendix C** for overland flow and conveyance capacity calculations.

7.2. Sanitary Drainage

Sanitary sewers fall under the jurisdiction of the Region of Durham. The preliminary sanitary sewer alignments, size and obverts have been designed and shown on **Drawing SP-1, Functional Servicing Plan,** included at the end of this report. Appropriate depth on local sewers has been provided to allow gravity connections to basements of all residential dwellings. During detailed design, local sanitary sewers within

the subdivision will be sized based on the design flow (detailed below) and in accordance with Regional design standards.

The site shall be serviced by an existing 1067mm diameter Regional trunk sewer located along the west side of the site, within an easement, generally adjacent Peter Matthews Drive. The existing trunk sewer has been designed and constructed to service the Seaton Community and includes an existing local sanitary sewer connection extended into the site at the intersection of Peter Matthews Drive and Street 'A', for ease of local connection.

In accordance with Region design guidelines, residential sewage flows shall be calculated on the basis of the following for residential areas:

- Residential Average Flow – 364 litres/person/day; and,
- Infiltration – 0.26 litres/second/hectare

All sanitary sewers shall be sized to handle the theoretical daily peak flow, where the peaking factor for sanitary drainage is calculated as follows:

$$\text{Peaking Factor, KH} = \frac{1 + \frac{14}{4 + P^{0.5}}}{}$$

Where, P is population in thousands
KH is the Harmon peaking factor, maximum of 3.8 and minimum of 1.5

In accordance with Region design guidelines, the calculation of population and peak sanitary design flow for the proposed development are shown in **Table 7.3**.

Table 7.3 – Calculated Proposed Sanitary Peak Flow

Land Use	Unit	PPU	Pop. (persons)	Average Flows (L/s)	Peaking Factor	Infiltration Area (ha)	Infiltration Flows (L/s)	Design Flows (L/s)
Single Detached	76	3.5	266	1.47	3.8	5.47	1.42	7.0
Townhouses	28	3.0	84					
TOTAL	104		350					

7.3. Municipal Water Supply

The subject site is located within the Region of Durham Zone 4 water pressure district and will be serviced by an existing 400mm diameter PVC watermain located along Peter Matthews Drive. Two local watermain extensions have been constructed and connected to the existing 400mm watermain at the two proposed road access locations to service the subject site.

Proposed 150mm and 200mm diameter PVC watermains shall be extended from the provided connections at Peter Matthews Drive into the subdivision to satisfy internal looping requirements. At the detailed design stage, hydrants are to be spaced along local water mains to provide adequate fire protection coverage in accordance with Region standards.

Adequacy of appropriate water flow and pressure within the municipal water distribution network to satisfy fire flow requirements falls within the jurisdiction of Durham Region. If required, at the detailed design stage, a hydrant flow test can be completed near the site to confirm available flow and pressure.

Refer to **Drawing SP-1, Functional Servicing Plan** for a depiction of the proposed water distribution network.

7.4. Construction Practices Recommendations

As outlined in the MESPA, there are a number of factors and conditions that should be taken into consideration when installing buried services throughout the Seaton Community. Each is discussed below.

7.4.1. Construction Below the Water Table

The construction of buried services below the water table has the potential to capture and redirect groundwater flow through more permeable fill materials typically placed in the base of excavated trenches. Over the long term, these impacts can lower the local groundwater table. Permeable trenches also have the potential to provide conduits for migration of contaminants through the subsurface.

In the Seaton area, particularly in the vicinity of local wetlands and woodlots, it is important to maintain groundwater levels within their natural elevation ranges. As such, Low Impact Development (LID) measures have been recommended to improve the infiltration of water within the developed area. It is important that any services constructed below the water table be constructed using best management practices to reduce or prevent the collection and/or redirection of groundwater flow and the overall lowering of the local water table. This will involve the use of anti-seepage collars or clay plugs surrounding the pipes to provide barriers to prevent groundwater flow along the granular bedding and erosion of the backfill materials.

7.4.2. Dewatering Requirements

Temporary dewatering for construction may be required where sewer excavations must extend below the local groundwater table. In areas of surficial till overburden, the hydraulic conductivity of the soils is relatively low, and as such, significant dewatering is not anticipated for residential construction excavations. In these cases, groundwater and drainage can often be managed by occasional pumping of accumulated water from sumps. Construction of deeper infrastructure could also encounter local water bearing zones that may require dewatering and/or depressurization for construction.

Permitting requirements for temporary construction dewatering will be completed in accordance with the recommendation of the Hydrogeological Study.

7.4.3. Well Decommissioning

Prior to construction, it will be necessary to ensure that all inactive water supply wells within the construction area have been located and properly decommissioned by a licensed water well contractor in accordance with Ontario Regulation 903. In addition, all groundwater monitoring wells installed for this study must be decommissioned in accordance with Regulation 903 prior to or during the site development, unless they are maintained throughout the construction period for long-term monitoring purposes.

7.5. Requirements for Erosion and Sediment Control

7.5.1. Construction Practice Recommendations

Sediment and erosion control practices during construction are paramount to protection of the endangered species Redside Dace and habitat with which it resides along Ganatsekiagon Creek. Particular attention will be paid to the provision of enhanced sediment and erosion control practices during construction. All sediment and erosion control practices will be in accordance with the Greater Golden Horseshoe Conservation Authorities Erosion and Sediment Control Guideline for Urban Construction and following MNR's Redside Dace Guidance document (March 2016) document.

The following provides a general outline of the standard mitigation measures to be implemented for construction, in particular for the proposed outfall for SWMF #25:

In-water works – will occur during the cold-water fisheries window (July 1 – September 15) or as otherwise directed by the MNR.

Pre-Construction Meeting – A start-up meeting will be held with all project team members to ensure that the contractor and site personnel are aware and familiar with the approved activities, monitoring requirements, and their rationale. All participating approval agencies will be notified of the meeting, anticipated start-up construction date and schedule.

Permits – Prior to construction, all applicable permits will be provided to the project team members and contractor. The permits will be reviewed to ensure that all pertinent timelines and conditions are understood by the responsible parties. Valid copies of the permits will be kept onsite and by key personnel responsible for carrying out conditions of the permits. The Contract Administrator must be notified if there is any deviation from the permit conditions that may impact implementation of the approved activities.

Construction Supervision – A team comprised of engineers, ecologists, and fluvial geomorphologists will be present during construction to ensure proper installation of the design. This will enable quick and appropriate response to construction issues and ensure implementation of important design details and construction techniques.

Erosion and Sediment Control (ESC) – Redside Dace are particularly sensitive to sediment inputs and turbidity. As such, the installation, maintenance and monitoring of all sediment and erosion control measures is key to the successful implementation of the project. An erosion and sediment control plan must demonstrate that BMP's following pertinent guideline documents were employed during all phases of construction in accordance with site conditions. The plan will ensure that the approved activities are implemented in compliance with the permit requirements.

Dewatering of Works Area – Flow dissipaters and/or filter bags, or equivalent shall be placed at water discharge points to prevent erosion and sediment release. Silt or debris that has accumulated around temporary sediment control areas shall be removed prior to withdrawal. Sediment laden unwatering discharge shall be pumped to a stilling basin or filtering system well away from the watercourse and allowed to settle and/or filter through the riparian vegetation before re-entering the watercourse downstream of the construction area.

Site Maintenance, Materials and Equipment – Any stockpiled materials will be stored and stabilized away from the regulated areas including the meander belt width and 30m Redside Dace riparian area. All materials and equipment used in the channel works should be properly maintained to prevent deleterious substances from entering the water. All vehicle and equipment refuelling and/or maintenance should be conducted in the staging / storage area. All vehicles and equipment entering the water should be free of fluid leaks and externally cleaned / degreased to prevent deleterious substances from entering the water.

7.5.2. Erosion, Sediment and Topsoil Control Strategy

Erosion and sediment control will be implemented for all construction activities, including topsoil stripping, earth moving operations, foundation excavation and stockpiling of materials. Detailed erosion and sediment control plans have been prepared in support of prior site alteration permit(s) to allow rough grading of the site. Modification of the previously approved Erosion and sediment control plans will be completed, as required, if development grading objectives changes compared to previously approved limits of disturbance, as established by the silt fence installation.

The erosion and sediment control strategies may include the following:

- Immediately following construction for all permanent works, all disturbed areas to be treated with appropriate seed mix.
- Temporary sediment control fence at construction limits, and/or downstream of any disturbed areas prior to grading.
- Gravel mud mats at construction vehicle access points to minimize off-site tracking of sediments.
- Vehicle and equipment re-fuelling and/or maintenance conducted a reasonable distance from watercourses.
- Temporary sediment ponds as required, utilizing the permanent SWMF footprint.
- Check dams for erosion / velocity control.
- Sediment traps in catch-basins.
- Routine inspection, monitoring, and repair as necessary of all temporary erosion and sediment control measures during construction.
- Removal of temporary controls once the areas they serve are restored and stable.

7.6. Utility Requirements

The subject site will require electrical servicing, telecommunications and natural gas supply. Within the City, the service utility companies are Elexicon Energy, Bell Canada, Rogers Communications and Enbridge Gas Distribution. These utility companies will be advised of the scope and timing of the proposed development during the draft plan application stage.

At the detailed design stage, street illumination for local roadways will be required and be municipally owned and maintained. The proponent shall retain an electrical consultant for the design of streetlights and to coordinate the electrical distribution design for the subdivision.

8.0 Conclusion

This FSSR was completed in support of a Draft Plan of Subdivision application. Based on review of municipal services considered in this FSSR, it is concluded that it is feasible to provide municipal servicing to the development lands.

The detailed design for water, storm and sanitary servicing shall conform to the City's and Region's design criteria. We conclude and recommend the following:

Grading and Road Network

A preliminary road and lot grading design has been completed to follow existing topography and drainage patterns to the extent possible. Roads have been designed to provide overland flow paths to convey drainage to proposed SWM facility #25. The subdivision grading is contained within the subdivision boundary, except for the walkout lots along Street A where 3:1 sloping within the NHS buffer is required to match into existing grade. Site access shall be accomplished via two new local road intersections with Peter Matthews Drive.

Stormwater Management

Quantity, quality, and erosion control and thermal mitigation will be provided within a proposed stormwater management pond facility (SWMF #25). The stormwater management pond will meet the requirements of the City of Pickering, TRCA, MECP and MNRF for the site conditions.

Runoff from residential rooftop areas shall be retained within an infiltration gallery located near the proposed SWMF #25 and sized for 5mm of rainfall to satisfy low impact development requirements.

Storm Drainage

The minor system has been designed for a 5-year storm event as per City criteria. Roads are designed as major system flow paths to convey overland storm drainage to an appropriate outlet, capture point, and/or SWM facility.

Sanitary Servicing

Sanitary sewers have been designed with appropriate depth of cover to allow gravity connections to basements of residential dwellings. During detailed design, local sanitary sewers within the subdivision will be sized based on the design flow and in accordance to Regional design standards.

The site shall be serviced by an existing 1067mm diameter Regional trunk sewer located along the west side of the site, within an easement, generally adjacent Peter Matthews Drive.

Water Supply and Distribution

The site is located within Durham Region Zone 4 water pressure district and will be serviced by an existing 400mm diameter PVC watermain located on Peter Matthews Drive. Two extensions of local watermains shall connect to the existing 400mm diameter watermain at the two local road intersections with Peter Matthews Drive to provide water supply for the site and satisfy looping requirements.

Appendix A

A1 – Draft Plan of Subdivision
A2 – Original Ground Topographic Survey
A3 – Typical ROW Cross Sections (17.0m & 15.35m widths)


KEY MAP
N.T.S.
SUBJECT LANDS
ADDITIONAL LANDS OWNED BY APPLICANT
WHITEVALE ROAD
TAUNTON ROAD
SITE
WHITEVALE ROAD
PETER MATTHEWS DRIVE
NATURAL HERITAGE SYSTEM
Block 13
Open Space
0.03 ha
STREET A
Block 6
Single Detached
26 Units
Block 12
Open Space
0.03 ha
Block 7
Street Townhouse
11 Units
Block 8
Street Townhouse
9 Units
Block 11
Open Space
0.01 ha
STREET B
Block 9
Street TH
8 Units
Block 5
Single Detached
7 Units
Block 4
Single Detached
14 Units
Block 3
Single Detached
11 Units
Block 2
Single Detached
7 Units
Block 1
Single Detached
11 Units
Block 14
Overland Flow
Block
0.03 ha
Block 10
Stormwater Management
Pond
0.18 ha
FLOODLINE
LIMIT OF MEANDER BELT
SECONDARY TRAIL SYSTEM
R17.25
R7.5
15.35
17
N 73° 00' 30" E 61.810
N 70° 29' 45" E
237.460
130.840
R=7.500 A=9.764 C=9.089 N71°38'00"W
R=7.500 A=13.065 C=11.475 N21°09'55"E
R=435.696 A=33.718 C=33.709 N36°33'15"W

DRAFT PLAN OF SUBDIVISION
Whitevale Parcel 24

PART OF LOT 22
CONCESSION 4
(GEOGRAPHIC TOWNSHIP OF PICKERING)
CITY OF PICKERING
REGIONAL MUNICIPALITY OF DURHAM

OWNER'S AUTHORIZATION

I HEREBY AUTHORIZE KORSIAK URBAN PLANNING TO PREPARE THIS DRAFT PLAN OF SUBDIVISION FOR APPROVAL BY THE CITY OF PICKERING.

SIGNED ______________________ DATE ____________
Silvio De Gasperis
Taccgate Developments INC.

SURVEYOR'S CERTIFICATE

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

SIGNED ______________________ DATE ____________
Ontario Land Surveyor

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

A) SHOWN ON PLAN
B) SHOWN ON PLAN
C) SHOWN ON PLAN
D) LAND TO BE USED IN ACCORDANCE WITH LAND USE SCHEDULE
E) SHOWN ON PLAN
F) SHOWN ON PLAN
G) SHOWN ON PLAN
H) MUNICIPAL WATER TO BE PROVIDED
I) LOAM AND SANDY LOAM
J) SHOWN ON PLAN
K) FULL MUNICIPAL SERVICES
L) SHOWN ON PLAN

LAND USE SCHEDULE:

Land Use	Blocks	Block Total	Area (ha)	Units
Single Detached	1 - 6	6	3.05	76
Street Townhouse	7 - 9	3	0.58	28
Stormwater Management Pond	10	1	0.18	
Open Space	11 - 13	3	0.07	
Overland Flow Block	14	1	0.03	
15.35m ROW (434 m)			0.68	
17m ROW (493 m)			0.88	
Total		**14**	**5.47**	**104**

NOTES:

- Local ROW to arterial ROW triangle = 15m
- All other daylight roundings = 5.0m
- Pavement illustration is diagrammatic

DATE [D.M.Y]	REVISION	DWG	BY
11/11/24	MOVE OVERLAND FLOW BLOCK	C	KC
16/10/24	REVISE CORNER ROUNDINGS	B	KC
28/06/24	FIRST SUBMISSION	A	WS

TACC DEVELOPMENTS

SCALE 1:1000	November 11, 2024
DRAWN BY: WS	CHECKED BY: KC

C

KORSIAK Urban Planning
206-277 Lakeshore Road East
Oakville, Ontario L6J 1H9
T: 905-257-0227
info@korsiak.com

S:\Korsiak & Company\TACC\Whitevale East\Parcel 24 Teardrop\Draft Plan\2024-11\Parcel 24 - Draft Plan - Nov 11 24_kc.dwg

PART 1, PLAN 40R-14164

PART 1, PLAN 40R-29143

PART 1, PLAN 40R-14164

PART 2, PLAN 40R-29143

CONCESSION 4

CONCESSION 4

LOT 23, CONCESSION 4 (NOT TRAVELLED)

SIDELINE 22

AND

SIDELINE 22

ROAD ALLOWANCE BETWEEN LOTS 22 AND 23

LOT 22

PART 1, PLAN 40R-14164

TREES AND BUSH

CULTIVATED FIELD

PROPOSED OUTFALL AREA

TOPOGRAPHIC PLAN ILLUSTRATING

PART OF LOTS 22 AND 23 AND PART OF THE ROAD ALLOWANCE BETWEEN LOTS 22 AND 23 CONCESSION 4

(GEOGRAPHIC TOWNSHIP OF PICKERING)
NOW IN THE
CITY OF PICKERING
REGIONAL MUNICIPALITY OF DURHAM

SCALE 1 : 1000

10 0 10 20 30 metres

J. D. BARNES LIMITED

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

BENCHMARK

ELEVATIONS HEREON ARE GEODETIC AND ARE REFERRED TO CITY OF PICKERING BENCHMARK No. 2-045, HAVING A PUBLISHED ELEVATION OF 125.055m (COVID-1928/9/78) AND MINISTRY OF TRANSPORTATION OF ONTARIO BENCHMARK No. 00819668322, HAVING A PUBLISHED ELEVATION OF 227.633m (COVD-1928/1978).

NOTES AND LEGEND

BEARINGS HEREON ARE GRID AND ARE REFERRED UTM ZONE 17, NAD83 (ORG.).

DISTANCES ON THIS PLAN ARE GROUND AND CAN BE CONVERTED TO GRID USING A SCALE FACTOR OF 0.9996197.

THE LOCATION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND ANY OTHER UNDERGROUND AND ABOVEGROUND UTILITIES AND STRUCTURES, ARE NOT NECESSARILY SHOWN ON THIS PLAN, AND WHERE SHOWN THE ACCURACY AND COMPLETENESS OF THE UTILITIES AND STRUCTURES ARE NOT GUARANTEED. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION AND INVERT MEASUREMENTS OF ALL SUCH UTILITIES AND STRUCTURES PRIOR TO CONSTRUCTION AND SHALL ASSUME LIABILITY FOR ANY DAMAGE TO THEM.

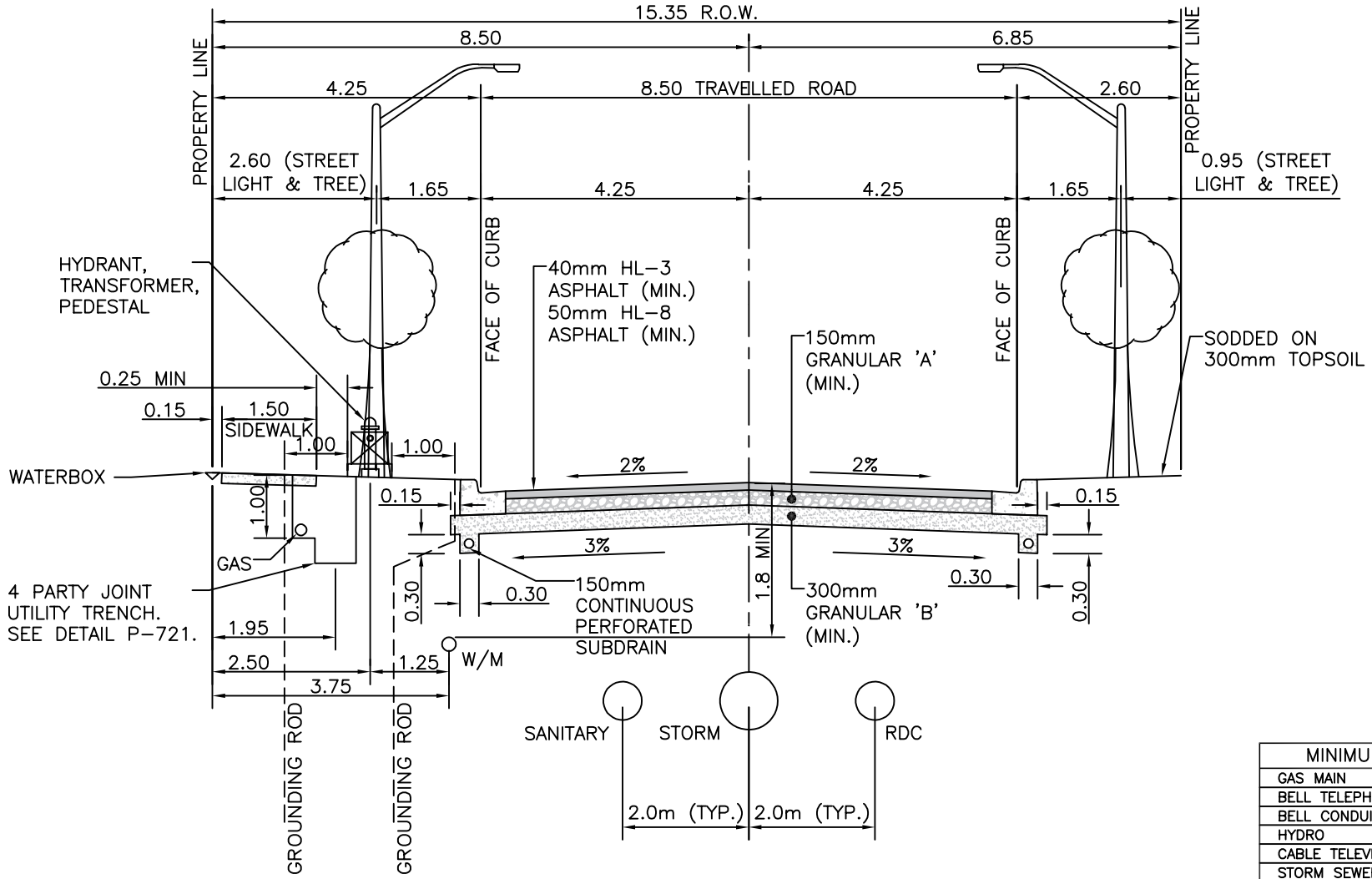
BOUNDARY INFORMATION IS COMPILED FROM REGISTRY OFFICE DOCUMENTS AND HAS NOT BEEN CONFIRMED BY FIELD MEASUREMENTS.

- ⊙ DENOTES DECIDUOUS TREE
- MW DENOTES MONITORING WELL
- BH DENOTES BORE HOLE
- ■ STK DENOTES WOODEN STAKE

THE FIELDWORK REPRESENTED BY THIS PLAN WAS COMPLETED ON DECEMBER 22, 2016.

J.D.BARNES LIMITED
SURVEYING MAPPING GIS
LAND INFORMATION SPECIALISTS
110 SCOTIA COURT, #40, WHITBY, ON L1N 8Y7
T: (905) 723-1212 F: (905) 723-4234 www.jdbarnes.com

DRAWN BY:	CHECKED BY:	REFERENCE NO.:
S.J.P.	G.C.L.	16-25-300-00
FILE: G:/16-25-300/00/16-25-300-00.dgn		DATED: JANUARY 5, 2017
		PLOTTED: 1/5/2017



MINIMUM COVER	
GAS MAIN	0.9m
BELL TELEPHONE	0.6m
BELL CONDUIT	0.6m
HYDRO	0.6m
CABLE TELEVISION	0.6m
STORM SEWER	1.8m
RDC	1.8m
SANITARY SEWER	2.5m
WATERMAIN	1.8m

All dimensions are in metres unless otherwise noted.

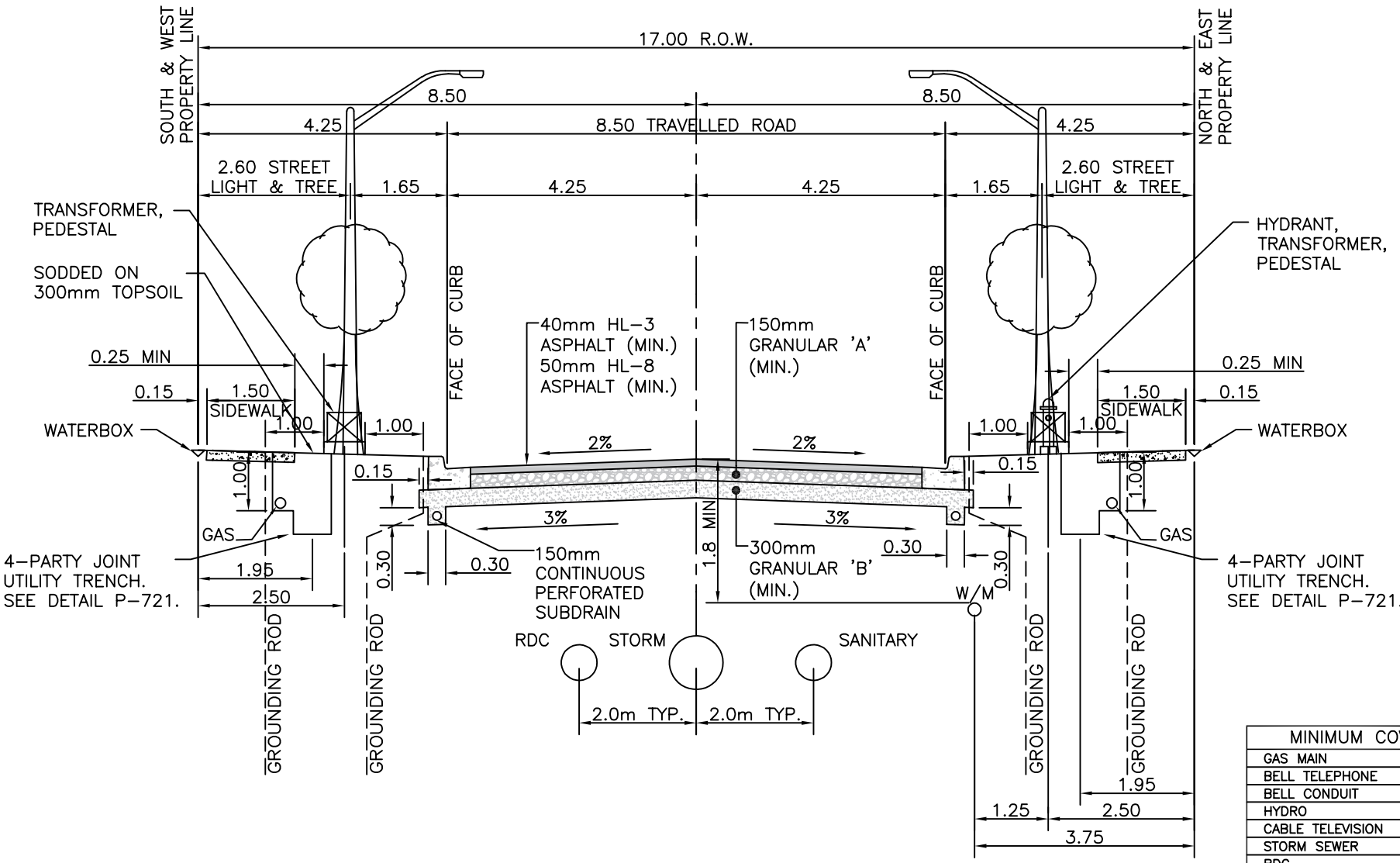
City of Pickering — Engineering Services Department

DRAWN	D. POLAK
APPROVED	P. HELGESEN
DATE	AUGUST 2019

TYPICAL CROSS-SECTION
15.35m ROAD ALLOWANCE 8.5m PAVEMENT

REVISION NO.	
DATE	

P-744SE



MINIMUM COVER	
GAS MAIN	0.9m
BELL TELEPHONE	0.6m
BELL CONDUIT	0.6m
HYDRO	0.6m
CABLE TELEVISION	0.6m
STORM SEWER	1.8m
RDC	1.8m
SANITARY SEWER	2.5m
WATERMAIN	1.8m

All dimensions are in metres unless otherwise noted.

City of Pickering — Engineering Services Department

DRAWN	D. POLAK
APPROVED	P. HELGESEN
DATE	AUGUST 2019

TYPICAL CROSS-SECTION
17.0m ROAD ALLOWANCE 8.5m PAVEMENT

REVISION NO.	
DATE	

P-746SE

Appendix B

SMD CONSULTANTS INC.

Forebay Sizing
Pond 25
Parcel 24
File No.: 24-017
Prepared by: Daniel Ma
December 2024

Forebay Sizing

Settling Calculations

Eq. 4.5, MOE SWM Planning and Design Manual, 2003

$$Min.\ Settlement\ Length = \sqrt{\frac{rQ_p}{V_s}}$$

Water Quality Design Flow Rate from Pond (Q_p) =	0.0068	m^3/s
Length to Width Ratio of Forebay (r) =	3.0	:1
Settling Velocity (V_s) =	0.0003	m/s
Minimum Forebay Length for Settling	**8.2**	**m**

Eq. 4.6, MOE SWM Planning and Design Manual, 2003

$$Min.\ Dispersion\ Length = \frac{8Q}{dV_f}$$

Inlet Flowrate (Q) (25mm 4 hr Chicago)	0.517	m^3/s
Permanent Pool Depth in Forebay (d)	1.5	m
Desired velocity in forebay (V_f)	0.5	m/s
Minimum Dispersion Length	**5.5**	**m**
Minimum Length of Forebay =	**8.2**	**m**

Eq. 4.7, MOE SWM Planning and Design Manual, 2003

$$Min.Width = \frac{Forebay\ Length}{8}$$

Minimum Bottom Width	**7.5**	**m**

Proposed Forebay Dimensions:

Length:	60.0	m
Width:	20.0	m
Bottom Width:	8.5	m

Therefore, the proposed forebay meets all minimum size requirements.

SMD CONSULTANTS INC.

Post-Development Imperviousness
Pond 25
Parcel 24
File No.: 24-017
Prepared by: Daniel Ma
December 2024

Drainage Area A-26				
Land Use Type	**Area (ha)**	**TIMP (%)**	**XIMP (%)**	**Comments**
9.15m Frontage Single Lots	0.3782	59.5%	48.6%	See Figures IMP-1 & IMP-2 for imperviousness percentage calculations.
11.00 Frontage Single Lots	1.9047	62.2%	50.3%	
13.10m Frontage Single Lots	0.7644	63.0%	53.0%	
6.10m Frontage Townhomes	0.5816	72.1%	61.2%	See Figure PDLUP-1 for Post-Development Land Use Areas
Open Space	0.0865	10.0%	10.0%	
15.35m Right-Of-Way	0.6979	73.2%	66.7%	
17.00m Right-Of-Way	0.9743	79.5%	67.4%	
TOTAL	**5.3876**			
WEIGHTED AVERAGE		**66.9%**	**56.3%**	

Drainage A-25				
Land Use Type	**Area (ha)**	**TIMP (%)**	**XIMP (%)**	**Comments**
SWM Pond	1.2256	90%	90%	
TOTAL	**1.2256**	**90%**	**90%**	

External Drainage				
Land Use Type	**Area (ha)**	**TIMP (%)**	**XIMP (%)**	**Comments**
EXT-1 (Woodlot)	1.25	10%	10%	
EXT-2 (Woodlot)	1.93	10%	10%	
TOTAL	**3.18**	**10%**	**10%**	

A-3 Peter Matthews (Minor Only)				
Land Use Type	Area (ha)	TIMP (%)	XIMP (%)	**Comments**
36.00m Regional Right-Of-Way	0.78	87%	87%	Impervious percentage retrieved from Table 2 in *Stormwater Management Report - Side Line 22 Detailed Design, Seaton Community Phase 1* , prepared by Stantec, dated May 3, 2017
TOTAL	**0.78**	**87%**	**87%**	

Total Area to Pond	Area (ha)	TIMP (%)	XIMP(%)
Minor	**10.57**	**54%**	**49%**
Major	**9.79**	**51%**	**45%**

LAND USE TYPE	AREA (m^2)
9.15m FRONTAGE LOT	3,781.5
11.00m FRONTAGE LOT	19,047.2
13.10m FRONTAGE LOT	7,643.8
6.10m FRONTAGE TOWNHOME	5,816.2
STORMWATER MANAGEMENT POND	12,256.3
OPEN SPACE	865.0
15.35m RIGHT-OF-WAY	6,979.4
17.00m RIGHT-OF-WAY	9,743.1

LEGEND

- 9.15m FRONTAGE LOT
- 11.00m FRONTAGE LOT
- 13.10m FRONTAGE LOT
- 6.10m FRONTAGE TOWNHOME
- STORMWATER MANAGEMENT POND
- OPEN SPACE
- 15.35m RIGHT-OF-WAY
- 17.00m RIGHT-OF-WAY

SMD CONSULTANTS INC.

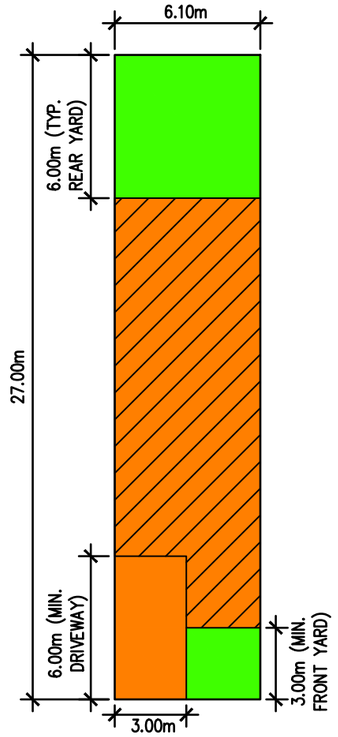
POST-DEVELOPMENT LAND USE PLAN

PARCEL 24 - TACCGATE DEVELOPMENTS INC.
CITY OF PICKERING
REGION OF DURHAM

DATE:	OCTOBER 2024	PROJECT No.:	24-017
SCALE:	1:2000	FIGURE No.:	PDLUP-1

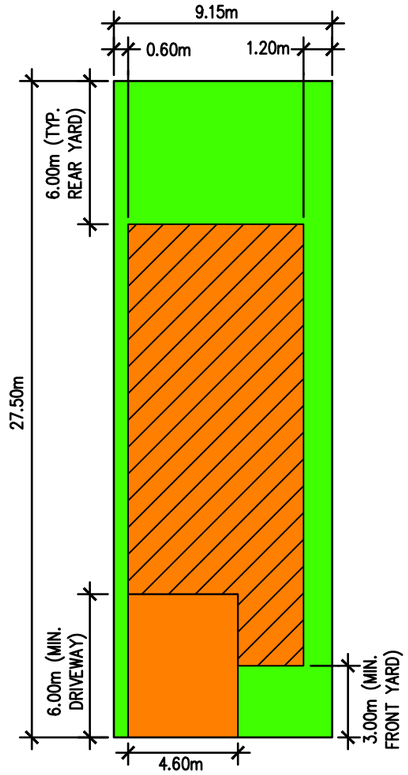
File : P:\Projects\2024\24-017 TACCGATE - Parcel 24\400 - CAD\402 - Detailed Design\Figures\SWM\24-017 LOT BREAKDOWN.dwg, Date : Dec 16, 2024 - 1:20pm, Edit By : donie

TYPICAL 6.10m STREET TOWN



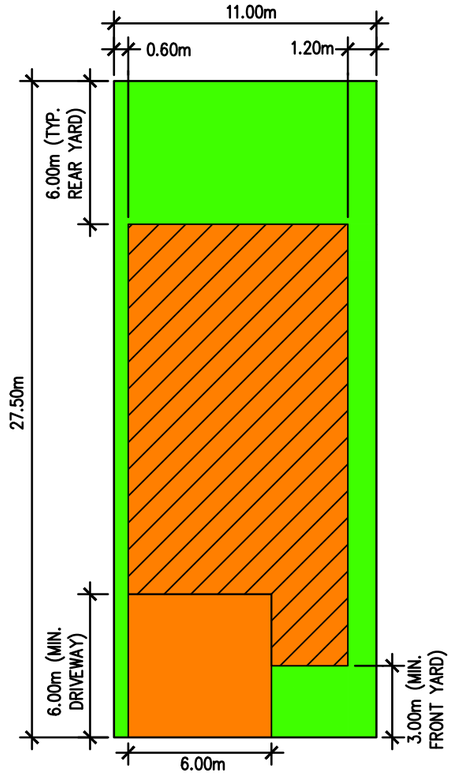
LOT AREA	= 164.7m^2
IMPERVIOUS AREA	= 118.8m^2
PERVIOUS AREA	= 45.9m^2
NET IMPERVIOUS % (TIMP)	**= 72.1%**
ROOF AREA	= 100.8m^2
ROOF IMPERVIOUS % (XIMP)	**= 61.2%**

TYPICAL 9.15m SINGLE LOT



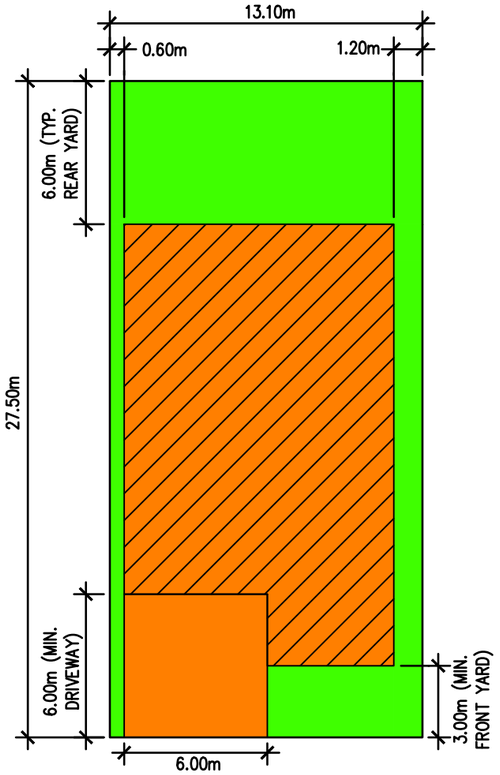
LOT AREA	= 251.6m^2
IMPERVIOUS AREA	= 149.8m^2
PERVIOUS AREA	= 101.8m^2
NET IMPERVIOUS % (TIMP)	**= 59.5%**
ROOF AREA	= 122.2m^2
ROOF IMPERVIOUS % (XIMP)	**= 48.6%**

TYPICAL 11.00m SINGLE LOT



LOT AREA	= 302.5m^2
IMPERVIOUS AREA	= 188.2m^2
PERVIOUS AREA	= 114.3m^2
NET IMPERVIOUS % (TIMP)	**= 62.2%**
ROOF AREA	= 152.2m^2
ROOF IMPERVIOUS % (XIMP)	**= 50.3%**

TYPICAL 13.10m SINGLE LOT



LOT AREA	= 360.3m^2
IMPERVIOUS AREA	= 227.1m^2
PERVIOUS AREA	= 133.2m^2
NET IMPERVIOUS % (TIMP)	**= 63.0%**
ROOF AREA	= 191.1m^2
ROOF IMPERVIOUS % (XIMP)	**= 53.0%**

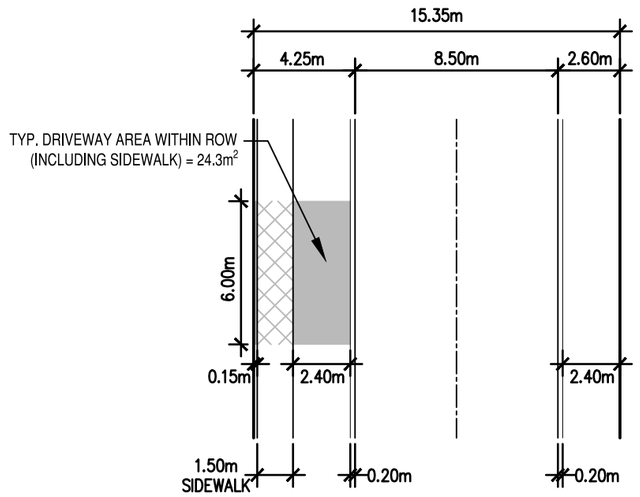
SMD CONSULTANTS INC.

TYPICAL LOT IMPERVIOUS COVERAGE

PARCEL 24 - TACCGATE DEVELOPMENTS INC.
CITY OF PICKERING
REGION OF DURHAM

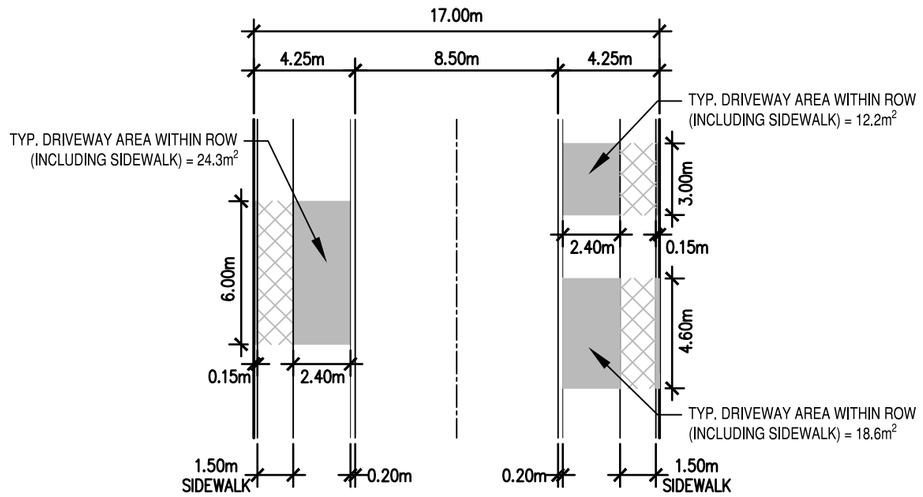
DATE:	DECEMBER 2024	PROJECT No.:	24-017
SCALE:	1:250	FIGURE No.:	IMP-1

TYPICAL 15.35m RIGHT-OF-WAY



ROW WIDTH	= 15.35m
TOTAL LENGTH OF ROW	= 454.7m
TOTAL ROADWAY AREA	= 454.7 x 8.9m = 4,046.8m²
6m DRIVEWAYS WITHIN ROW	= 25
TOTAL DRIVEWAY AREA WITHIN ROW	= 25 x 24.3 = 607.5m²
TOTAL SIDEWALK AREA (EXCLUDING DRIVEWAYS)	= 1.5 x 454.7 - 1.5 x 25 x 6 = 457.1m²
TOTAL 15.35m ROW AREA	= 6,979.4m²
TOTAL IMPERVIOUS AREA	= 4,046.8 + 607.5 + 457.1 = 5,110.6m²
NET IMPERVIOUS % (TIMP)	**= 73.2%**
TOTAL ROADWAY AND DRIVEWAY AREAS	= 4,046.8 + 607.5 = 4,654.3m²
DIRECTLY CONNECTED IMPERVIOUS % (XIMP)	**= 66.7%**

TYPICAL 17.00m RIGHT-OF-WAY



ROW WIDTH	= 17.00m
TOTAL LENGTH OF ROW	= 573.1m
TOTAL ROADWAY AREA	= 573.1 x 8.9m = 5,100.6m²
6m DRIVEWAYS WITHIN ROW	= 35
4.6m DRIVEWAYS WITHIN ROW	= 15
3.0m DRIVEWAYS WITHIN ROW	= 28
TOTAL DRIVEWAY AREA WITHIN ROW	= 35 x 24.3 + 15 x 18.6 + 28 x 12.2 = 1,471.1m²
TOTAL SIDEWALK AREA (EXCLUDING DRIVEWAYS)	= 1.5 x 573.1 x 2 - 1.5 x 35 x 6 -1.5 x 15 x 4.6 -1.5 x 28 x 3.0 = 1,174.8m²
TOTAL 17.00m ROW AREA	= 9,743.1m²
TOTAL IMPERVIOUS AREA	= 5,100.6 + 1,471.1 + 1,174.8 = 7,746.5m²
NET IMPERVIOUS % (TIMP)	**= 79.5%**
TOTAL ROADWAY AND DRIVEWAY AREAS	= 5,100.6 + 1,471.1 = 6,571.7m²
DIRECTLY CONNECTED IMPERVIOUS % (XIMP)	**= 67.4%**

SMD CONSULTANTS INC.

TYPICAL ROW IMPERVIOUS COVERAGE

PARCEL 24 - TACCGATE DEVELOPMENTS INC.
CITY OF PICKERING
REGION OF DURHAM

DATE:	DECEMBER 2024	PROJECT No.:	24-017
SCALE:	1:250	FIGURE No.:	IMP-2

SMD CONSULTANTS INC.

Stage - Storage - Discharge Curve
SWM Pond 25

Parcel 24
File No.: 24-017
Prepared by: Daniel Ma
Date: December 2024

	"c"	Height / Dia.	Length	Invert Elevation	Centroid Elevation	
Orifice No. 1	0.61	0.075		157.00	157.038	
Orifice No. 2	0.61	0.110		157.40	157.455	
Orifice No. 3	0.61	0.120		157.81	157.870	
Orifice No. 4	0.61	0.100	0.250	158.03	158.080	
Emergency Spillway	1.75		10.0	158.30	158.300	10.0m broad crested weir

Description	Depth above NWL (m)	Elevation (m)	Volume Above NWL (ha-m)	Extended Detention Volume (ha-m)	Active Storage Volume (ha-m)	Orifice No. 1 (m^3/s)	Orifice No. 2 (m^3/s)	Orifice No. 3 (m^3/s)	Orifice No. 4 (m^3/s)	Emergency Spillway (m^3/s)	Total Outflow (m^3/s)	Total Outflow (L/s)	VO Model Inputs (All Other Storm Events)
NWL	0.00	157.00	0.0000	0.0000		0.000					0.000	0.000	1
	0.05	157.05	0.0189	0.0189		0.001					0.001	1.335	
	0.10	157.10	0.0383	0.0383		0.003					0.003	2.984	
	0.15	157.15	0.0583	0.0583		0.004					0.004	4.004	
	0.20	157.20	0.0789	0.0789		0.005					0.005	4.812	
	0.25	157.25	0.1001	0.1001		0.006					0.006	5.503	
	0.30	157.30	0.1218	0.1218		0.006					0.006	6.116	
	0.35	157.35	0.1442	0.1442		0.007					0.007	6.673	
Ext. Detention WL = 157.36	0.36	157.36	0.1487	0.1487		0.007					0.007	**6.779**	2
	0.40	157.40	0.1672		0.0184	0.007	0.000				0.007	7.187	
	0.45	157.45	0.1908		0.0420	0.008	0.003				0.011	10.646	
	0.50	157.50	0.2150		0.0663	0.008	0.005				0.014	13.565	
	0.55	157.55	0.2398		0.0910	0.009	0.008				0.016	16.460	
	0.60	157.60	0.2649		0.1162	0.009	0.010				0.019	18.730	
	0.65	157.65	0.2905		0.1417	0.009	0.011				0.021	20.681	
	0.70	157.70	0.3164		0.1677	0.010	0.013				0.022	22.426	
	0.75	157.75	0.3428		0.1941	0.010	0.014				0.024	24.022	
	0.80	157.80	0.3696		0.2208	0.010	0.015				0.026	25.506	
2-Year WL = 157.81	0.81	157.81	0.3750		0.2263	0.010	0.015	0.000			0.026	**25.791**	3
	0.85	157.85	0.3968		0.2480	0.011	0.016	0.002			0.029	28.701	
	0.90	157.90	0.4244		0.2756	0.011	0.017	0.005			0.034	33.508	
5-Year WL = 157.94	0.94	157.94	0.4467		0.2980	0.011	0.018	0.008			0.037	**37.307**	4
	0.95	157.95	0.4524		0.3036	0.011	0.018	0.009			0.038	38.112	
	1.00	158.00	0.4808		0.3321	0.012	0.019	0.011			0.042	41.685	
10-Year WL = 158.03	1.03	158.03	0.4980		0.3493	0.012	0.019	0.012	0.000		0.044	**43.586**	5
	1.05	158.05	0.5096		0.3609	0.012	0.020	0.013	0.001		0.046	45.594	
	1.10	158.10	0.5389		0.3902	0.012	0.021	0.015	0.010		0.057	57.135	
25-Year WL = 158.14	1.14	158.14	0.5626		0.4139	0.013	0.021	0.016	0.017		0.066	**66.210**	6
	1.15	158.15	0.5686		0.4199	0.013	0.021	0.016	0.018		0.068	68.039	
	1.20	158.20	0.5987		0.4500	0.013	0.022	0.018	0.023		0.076	75.988	
50-Year WL = 158.21	1.21	158.21	0.6048		0.4560	0.013	0.022	0.018	0.024		0.077	**77.411**	7
	1.25	158.25	0.6292		0.4805	0.013	0.023	0.019	0.028		0.083	82.728	
100-Year WL = 158.30	1.30	158.30	0.6602		0.5115	0.013	0.024	0.020	0.032	0.000	0.089	**88.738**	8
	1.35	158.35	0.6916		0.5429	0.014	0.024	0.021	0.035	0.196	0.290	289.895	
	1.40	158.40	0.7234		0.5747	0.014	0.025	0.022	0.038	0.553	0.653	652.752	
	1.45	158.45	0.7557		0.6069	0.014	0.026	0.023	0.041	1.017	1.121	1120.819	
Top of Spillway = 158.50	1.50	158.50	0.7884		0.6396	0.014	0.026	0.024	0.044	**1.565**	1.674	1673.964	9
	1.55	158.55	0.8215		0.6728	0.015	0.027	0.025	0.046	2.188	2.301	2300.559	
	1.60	158.60	0.8551		0.7063	0.015	0.027	0.026	0.049	2.876	2.993	2992.760	
	1.65	158.65	0.8891		0.7403	0.015	0.028	0.027	0.051	3.624	3.745	3744.814	
	1.70	158.70	0.9235		0.7748	0.015	0.029	0.028	0.053	4.427	4.552	4552.259	
	1.75	158.75	0.9584		0.8097	0.016	0.029	0.029	0.055	5.283	5.412	5411.510	
	1.80	158.80	0.9938		0.8451	0.016	0.030	0.029	0.057	6.187	6.320	6319.598	
	1.85	158.85	1.0296		0.8809	0.016	0.030	0.030	0.059	7.138	7.274	7274.015	
Top of Pond	1.90	158.90	1.0659		0.9171	0.016	0.031	0.031	0.061	8.133	8.273	8272.604	

SMD CONSULTANTS INC.

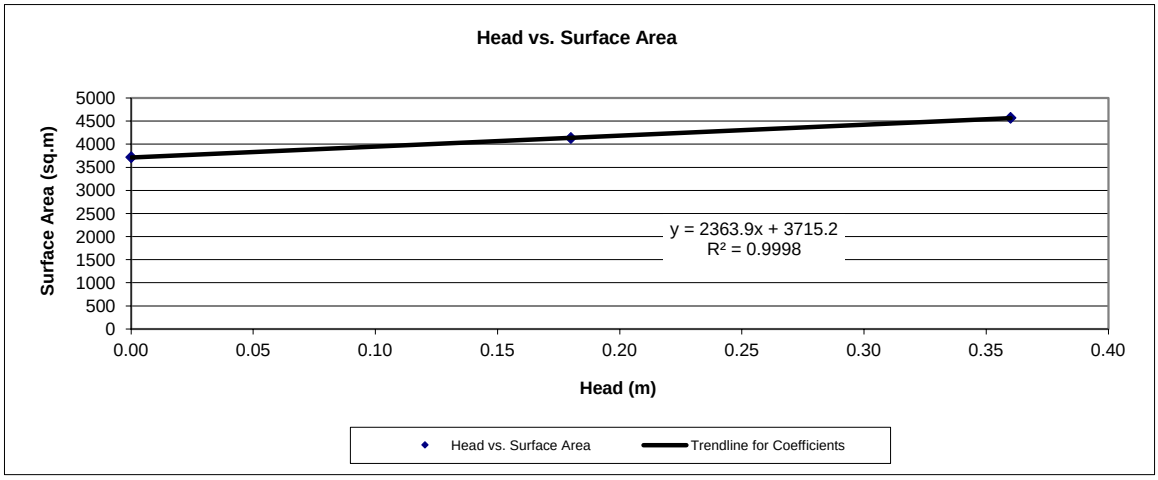
Extended Detention Drawdown Time
Pond 25

Parcel 24
File No. 24-017
Prepared by: Daniel Ma
Date: December 2024

MOE Detention Time Calculation:

Active Storage:

	Elevation (m)	Head (m)	Surface Area (m^2)
NWL	157.00	0.00	3719
	157.18	0.18	4133
	157.36	0.36	4570



$$t = \frac{0.66\,C_2 h^{1.5} + 2\,C_3 h^{0.5}}{2.75\,A_o}$$

where
- t = drawdown time in seconds
- A_p = surface area of the pond (m^2)
- C = discharge coefficient (typically 0.63)
- A_o = cross-sectional area of the orifice (m^2)
- g = gravitational acceleration constant (9.81 m/s^2)
- h_1 = starting water elevation above the orifice (m)
- h_2 = ending water elevation above the orifice (m)
- h = maximum water elevation above the orifice (m)
- C_2 = slope coefficient from the area-depth linear regression
- C_3 = intercept from the area-depth linear regression

Reference: MOE Stormwater Management Guidelines Equation 4.11

D_o=	75	mm
A_o=	0.0044	m^2
$C_{2=}$	2363.9	
$C_{3=}$	3715.2	
h=	0.32	m
t=	370840.9	s
Ext. Det. =	**103.0**	**hr**

SMD CONSULTANTS INC.

Pond 25 Outlet - Orifice Control

Parcel 24
Project No. 24-017
Prepared by: Daniel Ma
December 2024

Description	Unit	Orifice No. 1	Orifice No. 2	Orifice No. 3	Orifice No. 4
Invert	m	157.00	157.40	157.81	158.03
Diameter	mm	75	110	120	
Width	mm				250
Height	mm				100
Area	m^2	0.004	0.010	0.011	0.025
Centroid Elevation	m	157.038	157.455	157.870	158.080
Obvert	m	157.075	157.510	157.930	158.130

Orifice Equation

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

Orifice Coefficient 0.61

Storm Event	Headwater Elevation	Orifice No. 1		Orifice No. 2		Orifice No. 3		Orifice No. 4		Actual Release Rate	Target Release Rate
		Head Acting On Orifice No. 1	Orifice No. 1 Release Rate	Head Acting On Orifice No. 2	Orifice No. 2 Release Rate	Head Acting On Orifice No. 3	Orifice No. 3 Release Rate	Head Acting On Orifice No. 4	Orifice No. 4 Release Rate		
	(m)	(m)	(L/s)	(m)	(L/s)	(m)	(L/s)	(m)	(L/s)	(L/s)	(L/s)
Extended Detention	157.36	0.32	6.8							6.8	
2-Year	157.81	0.77	10.5	0.35	15.3					25.8	25.8
5-Year	157.94	0.90	11.3	0.48	17.9	0.07	8.1			37.3	41.4
10-Year	158.03	0.99	11.9	0.57	19.5	0.16	12.2			43.6	52.4
25-Year	158.14	1.10	12.5	0.68	21.3	0.27	15.9	0.06	16.5	66.2	67.9
50-Year	158.21	1.17	12.9	0.75	22.3	0.34	17.8	0.13	24.4	77.4	80.0
100-Year	158.30	1.26	13.4	0.84	23.6	0.43	20.0	0.22	31.7	88.7	92.8

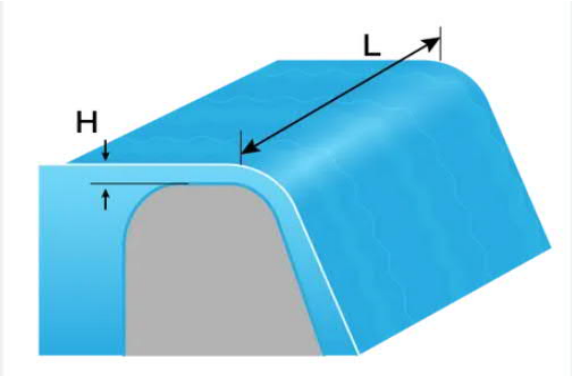
SMD CONSULTANTS INC.

Emergency Spillway Conveyance
Pond 25

Parcel 24
Prepared by: Daniel Ma
File No. 24-017
Date: December 2024

Emergency Spillway Conveyance (Broadcrested Weir)

$$Q = C \; x \; L \; x \; H^{1.5}$$



C	1.75	
Length (L)	10	m
Depth of Flow (H)	0.20	m
Spillway Conveyance	**1.565**	**m^3**
Peak flow from pond during Hurricane Hazel (from VO Model)	1.357	m^3

Therefore, the spillway has adequate conveyance capacity for emergency relief during the Regional Event

SMD CONSULTANTS INC.

Time of Lag Calculation
Pond 25

Parcel 24
File No. 24-017
Prepared by: Daniel Ma
Date: December 2024

Time of Lag Calculation							
Area ID	Area	CN	L	Elevation Change	Sw	T_L (Watt-Chow)	$2*T_L$
	(ha)		(m)	(m)	(m/m)	(hr)	(hr)
EXT-1	1.25	70	184.0	9	0.049	0.066	0.132
EXT-2	1.93	70	248.0	17	0.069	0.073	0.146

Watt and Chow T_L Calculation

$T_L = T_P =$ $$0.000326\left(\frac{L}{\sqrt{S}}\right)^{0.79}$$

Where T_L = time of lag (hr)

$T_L = T_P$ = Time to Peak

L = Stream length (m)

S = slope (dimensionless)

SMD CONSULTANTS INC.

Post-Development Visual Otthymo Model Input Parameters (NASHYD)

Parcel 24
File No.: 24-017
Date: December 2024

Parameter	Description	EXT-1	EXT-2
AREA	(ha)	1.25	1.93
N	Number of Linear Reservoirs	3	3
SLPI	Average Slope (Impervious)	2%	2%
DT	Time Step Increment	5	5
TP	Unit Hydrograph time to peak (hr)	0.132	0.146
CN	Curve Number	70	70
IA	Initial Abstraction (mm)	10	10

SMD CONSULTANTS INC.

Post-Development Visual Otthymo Model Input Parameters (STANDHYD)

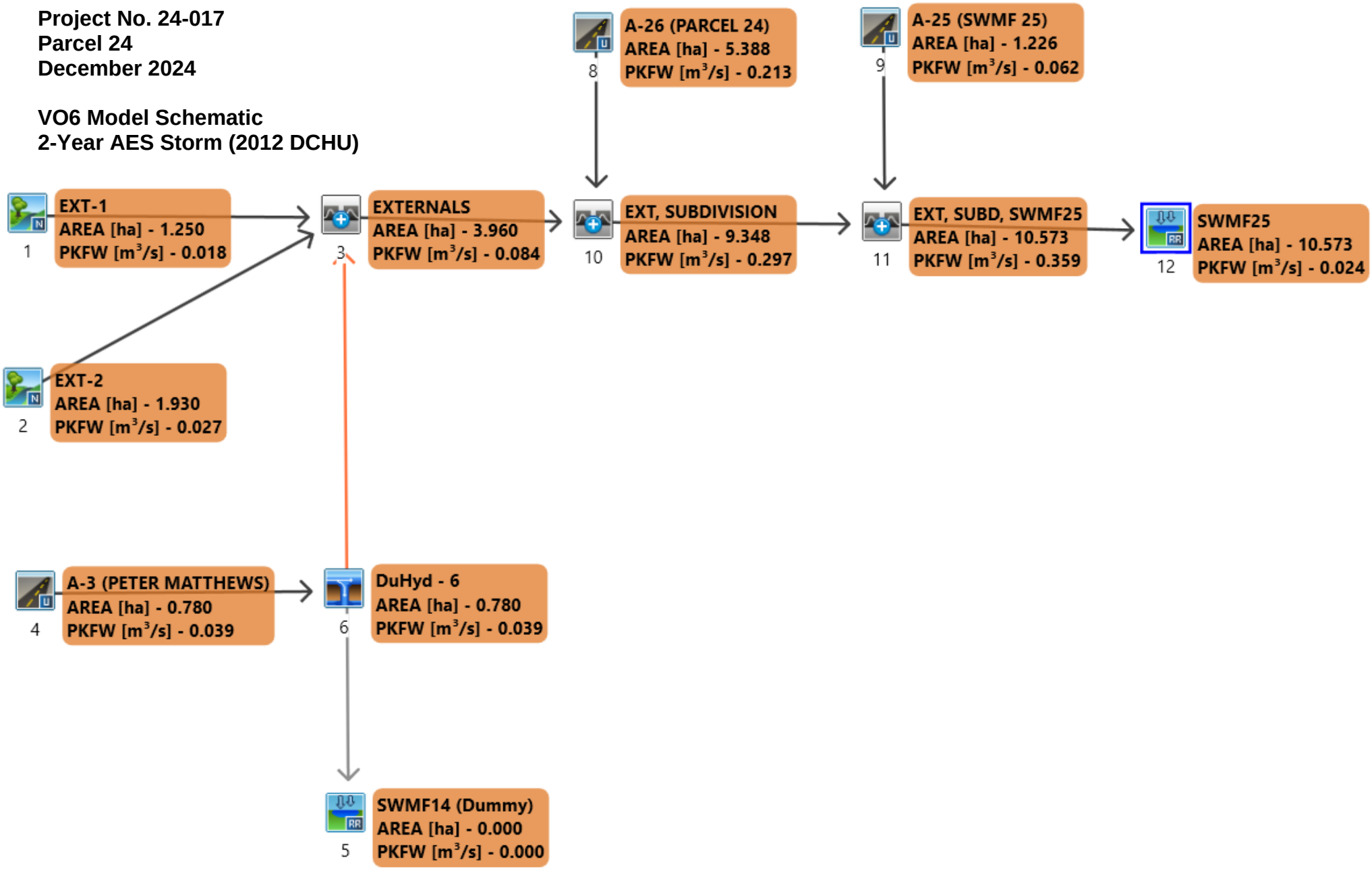
Parcel 24
File No.: 24-017
Date: December 2024

Parameter	Description	A-3	A-25	A-26
AREA	(ha)	0.78	1.23	5.39
XIMP	Impervious Area (Direct Connection)	87%	90%	56.3%
TIMP	Total Impervious Area	87%	90%	66.9%
LGI	Overland Flow Length (Impervious)	72.11	90.43	189.52
SLPI	Average Slope (Impervious)	2%	2%	2%
DT	Time Step Increment	5	5	5
DWF	Dry Weather Flow (Base Flow)	0	0	0
LOSS	Rainfall Loss Method (SCS Curve Method)	CN = 71		
		IA= 1.5mm		
SLPP	Average Slope (Pervious)	2%	2%	2%
LGP	Overland Flow Length (Pervious)	40	70	27.5
MNP	Manning's Roughness Coefficient (Pervious)	0.25	0.25	0.25
DPSI	Depression Storage (Impervious)	1 mm	1 mm	1 mm
MNI	Manning's Roughness Coefficient (Impervious)	0.013	0.013	0.013

SMD
CONSULTANTS INC.

Project No. 24-017
Parcel 24
December 2024

VO6 Model Schematic
2-Year AES Storm (2012 DCHU)



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

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2017)
       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
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.
```

***** D E T A I L E D O U T P U T *****

Input filename: M:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

Output filename:
C:\Users\danie\AppData\Local\Civica\VH5\939bc6dd-92de-4fe3-9512-437733e37904\a766ed15-c128-4b20-8dba-94e2e3d04d4b\scenar
Summary filename:
C:\Users\danie\AppData\Local\Civica\VH5\939bc6dd-92de-4fe3-9512-437733e37904\a766ed15-c128-4b20-8dba-94e2e3d04d4b\scenar

DATE: 12-03-2024 TIME: 11:47:07

USER:

COMMENTS: _____

```
--------------------------------------------------------------------------------
------------------------
  ***********************************************
  ** SIMULATION : A - 2 Year AES Storm         **
  ***********************************************


--------------------
|    READ STORM    |    Filename: C:\Users\danie\AppD
|                  |              ata\Local\Temp\
|                  |              42e1b15d-69e0-49b9-ba0f-8ea5ccefdb00\54ad9343
| Ptotal= 43.20 mm |    Comments: 2 Year AES Storm (2012 DCHU)
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.40	3.00	7.40	6.00	3.00	9.00	0.40
0.25	0.40	3.25	7.40	6.25	3.00	9.25	0.40
0.50	0.40	3.50	7.40	6.50	3.00	9.50	0.40
0.75	0.40	3.75	7.40	6.75	3.00	9.75	0.40
1.00	0.40	4.00	20.00	7.00	1.70	10.00	0.40
1.25	0.40	4.25	20.00	7.25	1.70	10.25	0.40
1.50	0.40	4.50	20.00	7.50	1.70	10.50	0.40
1.75	0.40	4.75	20.00	7.75	1.70	10.75	0.40
2.00	2.60	5.00	5.60	8.00	0.90	11.00	0.40
2.25	2.60	5.25	5.60	8.25	0.90	11.25	0.40
2.50	2.60	5.50	5.60	8.50	0.90	11.50	0.40
2.75	2.60	5.75	5.60	8.75	0.90	11.75	0.40

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

--------------------
| CALIB            |
| STANDHYD (  0004)|   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  87.00   Dir. Conn.(%)=  87.00
--------------------
```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.68	0.10
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	72.11	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.40	3.083	7.40	6.083	3.00	9.08	0.40
0.167	0.40	3.167	7.40	6.167	3.00	9.17	0.40
0.250	0.40	3.250	7.40	6.250	3.00	9.25	0.40
0.333	0.40	3.333	7.40	6.333	3.00	9.33	0.40
0.417	0.40	3.417	7.40	6.417	3.00	9.42	0.40
0.500	0.40	3.500	7.40	6.500	3.00	9.50	0.40
0.583	0.40	3.583	7.40	6.583	3.00	9.58	0.40
0.667	0.40	3.667	7.40	6.667	3.00	9.67	0.40
0.750	0.40	3.750	7.40	6.750	3.00	9.75	0.40
0.833	0.40	3.833	7.40	6.833	3.00	9.83	0.40
0.917	0.40	3.917	7.40	6.917	3.00	9.92	0.40
1.000	0.40	4.000	7.40	7.000	3.00	10.00	0.40
1.083	0.40	4.083	20.00	7.083	1.70	10.08	0.40
1.167	0.40	4.167	20.00	7.167	1.70	10.17	0.40
1.250	0.40	4.250	20.00	7.250	1.70	10.25	0.40
1.333	0.40	4.333	20.00	7.333	1.70	10.33	0.40

1.417	0.40	4.417	20.00	7.417	1.70	10.42	0.40
1.500	0.40	4.500	20.00	7.500	1.70	10.50	0.40
1.583	0.40	4.583	20.00	7.583	1.70	10.58	0.40
1.667	0.40	4.667	20.00	7.667	1.70	10.67	0.40
1.750	0.40	4.750	20.00	7.750	1.70	10.75	0.40
1.833	0.40	4.833	20.00	7.833	1.70	10.83	0.40
1.917	0.40	4.917	20.00	7.917	1.70	10.92	0.40
2.000	0.40	5.000	20.00	8.000	1.70	11.00	0.40
2.083	2.60	5.083	5.60	8.083	0.90	11.08	0.40
2.167	2.60	5.167	5.60	8.167	0.90	11.17	0.40
2.250	2.60	5.250	5.60	8.250	0.90	11.25	0.40
2.333	2.60	5.333	5.60	8.333	0.90	11.33	0.40
2.417	2.60	5.417	5.60	8.417	0.90	11.42	0.40
2.500	2.60	5.500	5.60	8.500	0.90	11.50	0.40
2.583	2.60	5.583	5.60	8.583	0.90	11.58	0.40
2.667	2.60	5.667	5.60	8.667	0.90	11.67	0.40
2.750	2.60	5.750	5.60	8.750	0.90	11.75	0.40
2.833	2.60	5.833	5.60	8.833	0.90	11.83	0.40
2.917	2.60	5.917	5.60	8.917	0.90	11.92	0.40
3.000	2.60	6.000	5.60	9.000	0.90	12.00	0.40

Max.Eff.Inten.(mm/hr)=	20.00	6.33	
over (min)	5.00	30.00	
Storage Coeff. (min)=	4.00 (ii)	25.28 (ii)	
Unit Hyd. Tpeak (min)=	5.00	30.00	
Unit Hyd. peak (cms)=	0.24	0.04	
			TOTALS
PEAK FLOW (cms)=	0.04	0.00	0.039 (iii)
TIME TO PEAK (hrs)=	4.83	5.25	5.00
RUNOFF VOLUME (mm)=	42.20	10.79	38.10
TOTAL RAINFALL (mm)=	43.20	43.20	43.20
RUNOFF COEFFICIENT =	0.98	0.25	0.88

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

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

DUHYD (0006)					
Inlet Cap.= 0.180					
#of Inlets= 1					
Total(cms)= 0.2	AREA	QPEAK	TPEAK	R.V.	
	(ha)	(cms)	(hrs)	(mm)	
TOTAL HYD.(ID= 1):	0.78	0.04	5.00	38.10	
MAJOR SYS.(ID= 2):	0.00	0.00	0.00	0.00	
MINOR SYS.(ID= 3):	0.78	0.04	5.00	38.10	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0005)		OVERFLOW IS OFF			
IN= 2---> OUT= 1					
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)	
	0.0000	0.0000	1.5300	0.0100	
	0.5000	0.0050	1.5400	3.0000	

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0006)	0.000	0.000	0.00	0.00
OUTFLOW: ID= 1 (0005)	0.000	0.000	0.00	NaN

PEAK FLOW REDUCTION [Qout/Qin](%)= NaN
TIME SHIFT OF PEAK FLOW (min)= 0.00
MAXIMUM STORAGE USED (ha.m.)= 0.0000
MAXIMUM STORAGE USED (cu.m.)= 0.000000

**** WARNING : HYDROGRAPH PEAK WAS NOT REDUCED.
CHECK OUTFLOW/STORAGE TABLE OR REDUCE DT.

CALIB			
NASHYD (0001)|	Area (ha)= 1.25	Curve Number (CN)= 70.0	
ID= 1 DT= 5.0 min |	Ia (mm)= 10.00	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= 0.13		

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.40	3.083	7.40	6.083	3.00	9.08	0.40
0.167	0.40	3.167	7.40	6.167	3.00	9.17	0.40
0.250	0.40	3.250	7.40	6.250	3.00	9.25	0.40
0.333	0.40	3.333	7.40	6.333	3.00	9.33	0.40
0.417	0.40	3.417	7.40	6.417	3.00	9.42	0.40
0.500	0.40	3.500	7.40	6.500	3.00	9.50	0.40
0.583	0.40	3.583	7.40	6.583	3.00	9.58	0.40
0.667	0.40	3.667	7.40	6.667	3.00	9.67	0.40
0.750	0.40	3.750	7.40	6.750	3.00	9.75	0.40
0.833	0.40	3.833	7.40	6.833	3.00	9.83	0.40
0.917	0.40	3.917	7.40	6.917	3.00	9.92	0.40
1.000	0.40	4.000	7.40	7.000	3.00	10.00	0.40
1.083	0.40	4.083	20.00	7.083	1.70	10.08	0.40
1.167	0.40	4.167	20.00	7.167	1.70	10.17	0.40
1.250	0.40	4.250	20.00	7.250	1.70	10.25	0.40

1.333	0.40	4.333	20.00	7.333	1.70	10.33	0.40
1.417	0.40	4.417	20.00	7.417	1.70	10.42	0.40
1.500	0.40	4.500	20.00	7.500	1.70	10.50	0.40
1.583	0.40	4.583	20.00	7.583	1.70	10.58	0.40
1.667	0.40	4.667	20.00	7.667	1.70	10.67	0.40
1.750	0.40	4.750	20.00	7.750	1.70	10.75	0.40
1.833	0.40	4.833	20.00	7.833	1.70	10.83	0.40
1.917	0.40	4.917	20.00	7.917	1.70	10.92	0.40
2.000	0.40	5.000	20.00	8.000	1.70	11.00	0.40
2.083	2.60	5.083	5.60	8.083	0.90	11.08	0.40
2.167	2.60	5.167	5.60	8.167	0.90	11.17	0.40
2.250	2.60	5.250	5.60	8.250	0.90	11.25	0.40
2.333	2.60	5.333	5.60	8.333	0.90	11.33	0.40
2.417	2.60	5.417	5.60	8.417	0.90	11.42	0.40
2.500	2.60	5.500	5.60	8.500	0.90	11.50	0.40
2.583	2.60	5.583	5.60	8.583	0.90	11.58	0.40
2.667	2.60	5.667	5.60	8.667	0.90	11.67	0.40
2.750	2.60	5.750	5.60	8.750	0.90	11.75	0.40
2.833	2.60	5.833	5.60	8.833	0.90	11.83	0.40
2.917	2.60	5.917	5.60	8.917	0.90	11.92	0.40
3.000	2.60	6.000	5.60	9.000	0.90	12.00	0.40

Unit Hyd Qpeak (cms)= 0.362

PEAK FLOW (cms)= 0.018 (i)
TIME TO PEAK (hrs)= 5.000
RUNOFF VOLUME (mm)= 7.686
TOTAL RAINFALL (mm)= 43.200
RUNOFF COEFFICIENT = 0.178

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

CALIB					
NASHYD (0002)	Area (ha)=	1.93	Curve Number (CN)=	70.0	
ID= 1 DT= 5.0 min	Ia (mm)=	10.00	# of Linear Res.(N)=	3.00	
	U.H. Tp(hrs)=	0.15			

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.40	3.083	7.40	6.083	3.00	9.08	0.40
0.167	0.40	3.167	7.40	6.167	3.00	9.17	0.40
0.250	0.40	3.250	7.40	6.250	3.00	9.25	0.40
0.333	0.40	3.333	7.40	6.333	3.00	9.33	0.40
0.417	0.40	3.417	7.40	6.417	3.00	9.42	0.40
0.500	0.40	3.500	7.40	6.500	3.00	9.50	0.40
0.583	0.40	3.583	7.40	6.583	3.00	9.58	0.40
0.667	0.40	3.667	7.40	6.667	3.00	9.67	0.40
0.750	0.40	3.750	7.40	6.750	3.00	9.75	0.40
0.833	0.40	3.833	7.40	6.833	3.00	9.83	0.40
0.917	0.40	3.917	7.40	6.917	3.00	9.92	0.40
1.000	0.40	4.000	7.40	7.000	3.00	10.00	0.40
1.083	0.40	4.083	20.00	7.083	1.70	10.08	0.40
1.167	0.40	4.167	20.00	7.167	1.70	10.17	0.40
1.250	0.40	4.250	20.00	7.250	1.70	10.25	0.40
1.333	0.40	4.333	20.00	7.333	1.70	10.33	0.40
1.417	0.40	4.417	20.00	7.417	1.70	10.42	0.40
1.500	0.40	4.500	20.00	7.500	1.70	10.50	0.40
1.583	0.40	4.583	20.00	7.583	1.70	10.58	0.40
1.667	0.40	4.667	20.00	7.667	1.70	10.67	0.40
1.750	0.40	4.750	20.00	7.750	1.70	10.75	0.40
1.833	0.40	4.833	20.00	7.833	1.70	10.83	0.40
1.917	0.40	4.917	20.00	7.917	1.70	10.92	0.40
2.000	0.40	5.000	20.00	8.000	1.70	11.00	0.40
2.083	2.60	5.083	5.60	8.083	0.90	11.08	0.40
2.167	2.60	5.167	5.60	8.167	0.90	11.17	0.40
2.250	2.60	5.250	5.60	8.250	0.90	11.25	0.40
2.333	2.60	5.333	5.60	8.333	0.90	11.33	0.40
2.417	2.60	5.417	5.60	8.417	0.90	11.42	0.40
2.500	2.60	5.500	5.60	8.500	0.90	11.50	0.40
2.583	2.60	5.583	5.60	8.583	0.90	11.58	0.40
2.667	2.60	5.667	5.60	8.667	0.90	11.67	0.40
2.750	2.60	5.750	5.60	8.750	0.90	11.75	0.40
2.833	2.60	5.833	5.60	8.833	0.90	11.83	0.40
2.917	2.60	5.917	5.60	8.917	0.90	11.92	0.40
3.000	2.60	6.000	5.60	9.000	0.90	12.00	0.40

Unit Hyd Qpeak (cms)= 0.505

PEAK FLOW (cms)= 0.027 (i)
TIME TO PEAK (hrs)= 5.000
RUNOFF VOLUME (mm)= 7.709
TOTAL RAINFALL (mm)= 43.200
RUNOFF COEFFICIENT = 0.178

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

ADD HYD (0003)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0001):	1.25	0.018	5.00	7.69
	+ ID2= 2 (0002):	1.93	0.027	5.00	7.71
	ID = 3 (0003):	3.18	0.045	5.00	7.70

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD  (  0003)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0003):     3.18   0.045     5.00     7.70
     + ID2= 2 (  0006):     0.78   0.039     5.00    38.10
       ================================================
       ID = 1 (  0003):     3.96   0.084     5.00    13.69

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0008)|   Area    (ha)=   5.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.90   Dir. Conn.(%)=  56.30
--------------------
                           IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       3.60         1.78
    Dep. Storage     (mm)=       1.00         1.50
    Average Slope     (%)=       1.00         2.00
    Length            (m)=     189.52        27.50
    Mannings n           =      0.013        0.250

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.40	3.083	7.40	6.083	3.00	9.08	0.40
0.167	0.40	3.167	7.40	6.167	3.00	9.17	0.40
0.250	0.40	3.250	7.40	6.250	3.00	9.25	0.40
0.333	0.40	3.333	7.40	6.333	3.00	9.33	0.40
0.417	0.40	3.417	7.40	6.417	3.00	9.42	0.40
0.500	0.40	3.500	7.40	6.500	3.00	9.50	0.40
0.583	0.40	3.583	7.40	6.583	3.00	9.58	0.40
0.667	0.40	3.667	7.40	6.667	3.00	9.67	0.40
0.750	0.40	3.750	7.40	6.750	3.00	9.75	0.40
0.833	0.40	3.833	7.40	6.833	3.00	9.83	0.40
0.917	0.40	3.917	7.40	6.917	3.00	9.92	0.40
1.000	0.40	4.000	7.40	7.000	3.00	10.00	0.40
1.083	0.40	4.083	20.00	7.083	1.70	10.08	0.40
1.167	0.40	4.167	20.00	7.167	1.70	10.17	0.40
1.250	0.40	4.250	20.00	7.250	1.70	10.25	0.40
1.333	0.40	4.333	20.00	7.333	1.70	10.33	0.40
1.417	0.40	4.417	20.00	7.417	1.70	10.42	0.40
1.500	0.40	4.500	20.00	7.500	1.70	10.50	0.40
1.583	0.40	4.583	20.00	7.583	1.70	10.58	0.40
1.667	0.40	4.667	20.00	7.667	1.70	10.67	0.40
1.750	0.40	4.750	20.00	7.750	1.70	10.75	0.40
1.833	0.40	4.833	20.00	7.833	1.70	10.83	0.40
1.917	0.40	4.917	20.00	7.917	1.70	10.92	0.40
2.000	0.40	5.000	20.00	8.000	1.70	11.00	0.40
2.083	2.60	5.083	5.60	8.083	0.90	11.08	0.40
2.167	2.60	5.167	5.60	8.167	0.90	11.17	0.40
2.250	2.60	5.250	5.60	8.250	0.90	11.25	0.40
2.333	2.60	5.333	5.60	8.333	0.90	11.33	0.40
2.417	2.60	5.417	5.60	8.417	0.90	11.42	0.40
2.500	2.60	5.500	5.60	8.500	0.90	11.50	0.40
2.583	2.60	5.583	5.60	8.583	0.90	11.58	0.40
2.667	2.60	5.667	5.60	8.667	0.90	11.67	0.40
2.750	2.60	5.750	5.60	8.750	0.90	11.75	0.40
2.833	2.60	5.833	5.60	8.833	0.90	11.83	0.40
2.917	2.60	5.917	5.60	8.917	0.90	11.92	0.40
3.000	2.60	6.000	5.60	9.000	0.90	12.00	0.40

```
    Max.Eff.Inten.(mm/hr)=      20.00        11.82
                over (min)        5.00        25.00
    Storage Coeff.  (min)=       7.14 (ii)   20.38 (ii)
    Unit Hyd. Tpeak (min)=       5.00        25.00
    Unit Hyd. peak  (cms)=       0.17         0.05
                                                          *TOTALS*
    PEAK FLOW       (cms)=       0.17         0.05          0.213 (iii)
    TIME TO PEAK    (hrs)=       5.00         5.08          5.00
    RUNOFF VOLUME    (mm)=      42.20        14.67         30.17
    TOTAL RAINFALL   (mm)=      43.20        43.20         43.20
    RUNOFF COEFFICIENT   =       0.98         0.34          0.70

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN*  =  71.0    Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD  (  0010)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0003):     3.96   0.084     5.00    13.69
     + ID2= 2 (  0008):     5.39   0.213     5.00    30.17
       ================================================
       ID = 3 (  0010):     9.35   0.297     5.00    23.19

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0009)|   Area    (ha)=   1.23
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
```

```
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.10         0.12
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      90.39        70.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

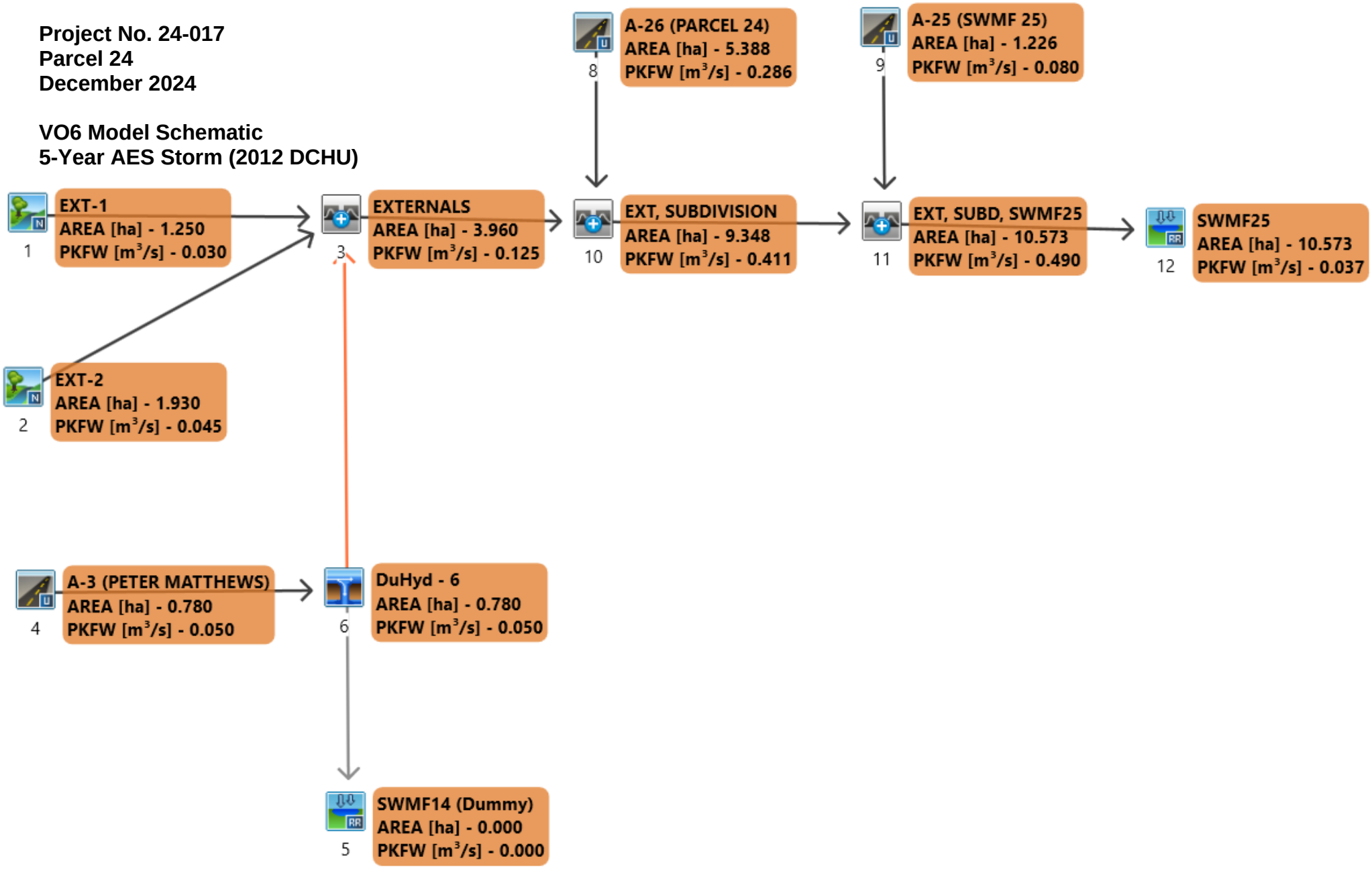
TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.40	3.083	7.40	6.083	3.00	9.08	0.40
0.167	0.40	3.167	7.40	6.167	3.00	9.17	0.40
0.250	0.40	3.250	7.40	6.250	3.00	9.25	0.40
0.333	0.40	3.333	7.40	6.333	3.00	9.33	0.40
0.417	0.40	3.417	7.40	6.417	3.00	9.42	0.40
0.500	0.40	3.500	7.40	6.500	3.00	9.50	0.40
0.583	0.40	3.583	7.40	6.583	3.00	9.58	0.40
0.667	0.40	3.667	7.40	6.667	3.00	9.67	0.40
0.750	0.40	3.750	7.40	6.750	3.00	9.75	0.40
0.833	0.40	3.833	7.40	6.833	3.00	9.83	0.40
0.917	0.40	3.917	7.40	6.917	3.00	9.92	0.40
1.000	0.40	4.000	7.40	7.000	3.00	10.00	0.40
1.083	0.40	4.083	20.00	7.083	1.70	10.08	0.40
1.167	0.40	4.167	20.00	7.167	1.70	10.17	0.40
1.250	0.40	4.250	20.00	7.250	1.70	10.25	0.40
1.333	0.40	4.333	20.00	7.333	1.70	10.33	0.40
1.417	0.40	4.417	20.00	7.417	1.70	10.42	0.40
1.500	0.40	4.500	20.00	7.500	1.70	10.50	0.40
1.583	0.40	4.583	20.00	7.583	1.70	10.58	0.40
1.667	0.40	4.667	20.00	7.667	1.70	10.67	0.40
1.750	0.40	4.750	20.00	7.750	1.70	10.75	0.40
1.833	0.40	4.833	20.00	7.833	1.70	10.83	0.40
1.917	0.40	4.917	20.00	7.917	1.70	10.92	0.40
2.000	0.40	5.000	20.00	8.000	1.70	11.00	0.40
2.083	2.60	5.083	5.60	8.083	0.90	11.08	0.40
2.167	2.60	5.167	5.60	8.167	0.90	11.17	0.40
2.250	2.60	5.250	5.60	8.250	0.90	11.25	0.40
2.333	2.60	5.333	5.60	8.333	0.90	11.33	0.40
2.417	2.60	5.417	5.60	8.417	0.90	11.42	0.40
2.500	2.60	5.500	5.60	8.500	0.90	11.50	0.40
2.583	2.60	5.583	5.60	8.583	0.90	11.58	0.40
2.667	2.60	5.667	5.60	8.667	0.90	11.67	0.40
2.750	2.60	5.750	5.60	8.750	0.90	11.75	0.40
2.833	2.60	5.833	5.60	8.833	0.90	11.83	0.40
2.917	2.60	5.917	5.60	8.917	0.90	11.92	0.40
3.000	2.60	6.000	5.60	9.000	0.90	12.00	0.40

```
     Max.Eff.Inten.(mm/hr)=      20.00         6.10
                   over (min)        5.00        55.00
     Storage Coeff.  (min)=       4.58 (ii)   50.40 (ii)
     Unit Hyd. Tpeak (min)=        5.00        55.00
     Unit Hyd. peak  (cms)=        0.23         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=        0.06         0.00          0.062 (iii)
     TIME TO PEAK    (hrs)=        5.00         5.67           5.00
     RUNOFF VOLUME    (mm)=       42.20        11.96          39.15
     TOTAL RAINFALL   (mm)=       43.20        43.20          43.20
     RUNOFF COEFFICIENT   =        0.98         0.28           0.91

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0010):      9.35   0.297     5.00    23.19
     + ID2= 2 (  0009):      1.23   0.062     5.00    39.15
       ==================================================
       ID = 3 (  0011):     10.57   0.359     5.00    25.04

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0012)|     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   |    0.0660      0.4138
                          0.0068      0.1487   |    0.0771      0.4560
                          0.0250      0.2263   |    0.0877      0.5115
                          0.0370      0.2980   |    1.5650      0.6396
                          0.0430      0.3493   |    0.0000      0.0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0011)     10.573      0.359      5.00      25.04
   OUTFLOW: ID= 1 (  0012)     10.573      0.024      8.17      23.66

                PEAK   FLOW   REDUCTION [Qout/Qin](%)=  6.79
                TIME SHIFT OF PEAK FLOW         (min)=190.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  0.2235
```

SMD
CONSULTANTS INC.

Project No. 24-017
Parcel 24
December 2024

VO6 Model Schematic
5-Year AES Storm (2012 DCHU)



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

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2017)
       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
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.

                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: M:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\danie\AppData\Local\Civica\VH5\939bc6dd-92de-4fe3-9512-437733e37904\9d02da
32-0a14-4f1e-8e86-0afcee8985e7\scenar
  Summary filename:
C:\Users\danie\AppData\Local\Civica\VH5\939bc6dd-92de-4fe3-9512-437733e37904\9d02da
32-0a14-4f1e-8e86-0afcee8985e7\scenar


DATE: 12-03-2024                          TIME: 11:47:08

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------
  ***********************************************
  ** SIMULATION : B - 5 Year AES Storm         **
  ***********************************************


--------------------
|    READ STORM    |    Filename: C:\Users\danie\AppD
|                  |              ata\Local\Temp\
|                  |              42e1b15d-69e0-49b9-ba0f-8ea5ccefdb00\61a1b6f6
| Ptotal= 55.50 mm |    Comments: 5 Year AES Storm
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.60	3.00	9.40	6.00	3.90	9.00	0.60
0.25	0.60	3.25	9.40	6.25	3.90	9.25	0.60
0.50	0.60	3.50	9.40	6.50	3.90	9.50	0.60
0.75	0.60	3.75	9.40	6.75	3.90	9.75	0.60
1.00	0.60	4.00	25.40	7.00	2.20	10.00	0.60
1.25	0.60	4.25	25.40	7.25	2.20	10.25	0.60
1.50	0.60	4.50	25.40	7.50	2.20	10.50	0.60
1.75	0.60	4.75	25.40	7.75	2.20	10.75	0.60
2.00	3.30	5.00	7.20	8.00	1.10	11.00	0.60
2.25	3.30	5.25	7.20	8.25	1.10	11.25	0.60
2.50	3.30	5.50	7.20	8.50	1.10	11.50	0.60
2.75	3.30	5.75	7.20	8.75	1.10	11.75	0.60

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

--------------------
| CALIB            |
| STANDHYD (  0004)|   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  87.00   Dir. Conn.(%)=  87.00
--------------------
```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.68	0.10
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	72.11	40.00
Mannings n	=	0.013	0.250

```
    NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.60	3.083	9.40	6.083	3.90	9.08	0.60
0.167	0.60	3.167	9.40	6.167	3.90	9.17	0.60
0.250	0.60	3.250	9.40	6.250	3.90	9.25	0.60
0.333	0.60	3.333	9.40	6.333	3.90	9.33	0.60
0.417	0.60	3.417	9.40	6.417	3.90	9.42	0.60
0.500	0.60	3.500	9.40	6.500	3.90	9.50	0.60
0.583	0.60	3.583	9.40	6.583	3.90	9.58	0.60
0.667	0.60	3.667	9.40	6.667	3.90	9.67	0.60
0.750	0.60	3.750	9.40	6.750	3.90	9.75	0.60
0.833	0.60	3.833	9.40	6.833	3.90	9.83	0.60
0.917	0.60	3.917	9.40	6.917	3.90	9.92	0.60
1.000	0.60	4.000	9.40	7.000	3.90	10.00	0.60
1.083	0.60	4.083	25.40	7.083	2.20	10.08	0.60
1.167	0.60	4.167	25.40	7.167	2.20	10.17	0.60
1.250	0.60	4.250	25.40	7.250	2.20	10.25	0.60
1.333	0.60	4.333	25.40	7.333	2.20	10.33	0.60

1.417	0.60	4.417	25.40	7.417	2.20	10.42	0.60
1.500	0.60	4.500	25.40	7.500	2.20	10.50	0.60
1.583	0.60	4.583	25.40	7.583	2.20	10.58	0.60
1.667	0.60	4.667	25.40	7.667	2.20	10.67	0.60
1.750	0.60	4.750	25.40	7.750	2.20	10.75	0.60
1.833	0.60	4.833	25.40	7.833	2.20	10.83	0.60
1.917	0.60	4.917	25.40	7.917	2.20	10.92	0.60
2.000	0.60	5.000	25.40	8.000	2.20	11.00	0.60
2.083	3.30	5.083	7.20	8.083	1.10	11.08	0.60
2.167	3.30	5.167	7.20	8.167	1.10	11.17	0.60
2.250	3.30	5.250	7.20	8.250	1.10	11.25	0.60
2.333	3.30	5.333	7.20	8.333	1.10	11.33	0.60
2.417	3.30	5.417	7.20	8.417	1.10	11.42	0.60
2.500	3.30	5.500	7.20	8.500	1.10	11.50	0.60
2.583	3.30	5.583	7.20	8.583	1.10	11.58	0.60
2.667	3.30	5.667	7.20	8.667	1.10	11.67	0.60
2.750	3.30	5.750	7.20	8.750	1.10	11.75	0.60
2.833	3.30	5.833	7.20	8.833	1.10	11.83	0.60
2.917	3.30	5.917	7.20	8.917	1.10	11.92	0.60
3.000	3.30	6.000	7.20	9.000	1.10	12.00	0.60

Max.Eff.Inten.(mm/hr)=	25.40	9.91	
over (min)	5.00	25.00	
Storage Coeff. (min)=	3.63 (ii)	21.43 (ii)	
Unit Hyd. Tpeak (min)=	5.00	25.00	
Unit Hyd. peak (cms)=	0.25	0.05	
			TOTALS
PEAK FLOW (cms)=	0.05	0.00	0.050 (iii)
TIME TO PEAK (hrs)=	4.83	5.17	5.00
RUNOFF VOLUME (mm)=	54.50	16.80	49.58
TOTAL RAINFALL (mm)=	55.50	55.50	55.50
RUNOFF COEFFICIENT =	0.98	0.30	0.89

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

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

DUHYD (0006)	
Inlet Cap.= 0.180	
#of Inlets= 1	
Total(cms)= 0.2	

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
TOTAL HYD.(ID= 1):	0.78	0.05	5.00	49.58
MAJOR SYS.(ID= 2):	0.00	0.00	0.00	0.00
MINOR SYS.(ID= 3):	0.78	0.05	5.00	49.58

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0005)		OVERFLOW IS OFF			
IN= 2---> OUT= 1					
DT= 5.0 min		OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
		0.0000	0.0000	1.5300	0.0100
		0.5000	0.0050	1.5400	3.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0006)	0.000	0.000	0.00	0.00
OUTFLOW: ID= 1 (0005)	0.000	0.000	0.00	NaN

PEAK FLOW REDUCTION [Qout/Qin](%)= NaN
TIME SHIFT OF PEAK FLOW (min)= 0.00
MAXIMUM STORAGE USED (ha.m.)= 0.0000
MAXIMUM STORAGE USED (cu.m.)= 0.000000

**** WARNING : HYDROGRAPH PEAK WAS NOT REDUCED.
CHECK OUTFLOW/STORAGE TABLE OR REDUCE DT.

CALIB					
NASHYD (0001)	Area (ha)= 1.25	Curve Number (CN)= 70.0			
ID= 1 DT= 5.0 min	Ia (mm)= 10.00	# of Linear Res.(N)= 3.00			
	U.H. Tp(hrs)= 0.13				

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.60	3.083	9.40	6.083	3.90	9.08	0.60
0.167	0.60	3.167	9.40	6.167	3.90	9.17	0.60
0.250	0.60	3.250	9.40	6.250	3.90	9.25	0.60
0.333	0.60	3.333	9.40	6.333	3.90	9.33	0.60
0.417	0.60	3.417	9.40	6.417	3.90	9.42	0.60
0.500	0.60	3.500	9.40	6.500	3.90	9.50	0.60
0.583	0.60	3.583	9.40	6.583	3.90	9.58	0.60
0.667	0.60	3.667	9.40	6.667	3.90	9.67	0.60
0.750	0.60	3.750	9.40	6.750	3.90	9.75	0.60
0.833	0.60	3.833	9.40	6.833	3.90	9.83	0.60
0.917	0.60	3.917	9.40	6.917	3.90	9.92	0.60
1.000	0.60	4.000	9.40	7.000	3.90	10.00	0.60
1.083	0.60	4.083	25.40	7.083	2.20	10.08	0.60
1.167	0.60	4.167	25.40	7.167	2.20	10.17	0.60
1.250	0.60	4.250	25.40	7.250	2.20	10.25	0.60

1.333	0.60	4.333	25.40	7.333	2.20	10.33	0.60
1.417	0.60	4.417	25.40	7.417	2.20	10.42	0.60
1.500	0.60	4.500	25.40	7.500	2.20	10.50	0.60
1.583	0.60	4.583	25.40	7.583	2.20	10.58	0.60
1.667	0.60	4.667	25.40	7.667	2.20	10.67	0.60
1.750	0.60	4.750	25.40	7.750	2.20	10.75	0.60
1.833	0.60	4.833	25.40	7.833	2.20	10.83	0.60
1.917	0.60	4.917	25.40	7.917	2.20	10.92	0.60
2.000	0.60	5.000	25.40	8.000	2.20	11.00	0.60
2.083	3.30	5.083	7.20	8.083	1.10	11.08	0.60
2.167	3.30	5.167	7.20	8.167	1.10	11.17	0.60
2.250	3.30	5.250	7.20	8.250	1.10	11.25	0.60
2.333	3.30	5.333	7.20	8.333	1.10	11.33	0.60
2.417	3.30	5.417	7.20	8.417	1.10	11.42	0.60
2.500	3.30	5.500	7.20	8.500	1.10	11.50	0.60
2.583	3.30	5.583	7.20	8.583	1.10	11.58	0.60
2.667	3.30	5.667	7.20	8.667	1.10	11.67	0.60
2.750	3.30	5.750	7.20	8.750	1.10	11.75	0.60
2.833	3.30	5.833	7.20	8.833	1.10	11.83	0.60
2.917	3.30	5.917	7.20	8.917	1.10	11.92	0.60
3.000	3.30	6.000	7.20	9.000	1.10	12.00	0.60

Unit Hyd Qpeak (cms)= 0.362

PEAK FLOW (cms)= 0.030 (i)
TIME TO PEAK (hrs)= 5.000
RUNOFF VOLUME (mm)= 13.286
TOTAL RAINFALL (mm)= 55.500
RUNOFF COEFFICIENT = 0.239

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

CALIB			
NASHYD (0002)	Area (ha)= 1.93	Curve Number (CN)= 70.0	
ID= 1 DT= 5.0 min	Ia (mm)= 10.00	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= 0.15		

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.60	3.083	9.40	6.083	3.90	9.08	0.60
0.167	0.60	3.167	9.40	6.167	3.90	9.17	0.60
0.250	0.60	3.250	9.40	6.250	3.90	9.25	0.60
0.333	0.60	3.333	9.40	6.333	3.90	9.33	0.60
0.417	0.60	3.417	9.40	6.417	3.90	9.42	0.60
0.500	0.60	3.500	9.40	6.500	3.90	9.50	0.60
0.583	0.60	3.583	9.40	6.583	3.90	9.58	0.60
0.667	0.60	3.667	9.40	6.667	3.90	9.67	0.60
0.750	0.60	3.750	9.40	6.750	3.90	9.75	0.60
0.833	0.60	3.833	9.40	6.833	3.90	9.83	0.60
0.917	0.60	3.917	9.40	6.917	3.90	9.92	0.60
1.000	0.60	4.000	9.40	7.000	3.90	10.00	0.60
1.083	0.60	4.083	25.40	7.083	2.20	10.08	0.60
1.167	0.60	4.167	25.40	7.167	2.20	10.17	0.60
1.250	0.60	4.250	25.40	7.250	2.20	10.25	0.60
1.333	0.60	4.333	25.40	7.333	2.20	10.33	0.60
1.417	0.60	4.417	25.40	7.417	2.20	10.42	0.60
1.500	0.60	4.500	25.40	7.500	2.20	10.50	0.60
1.583	0.60	4.583	25.40	7.583	2.20	10.58	0.60
1.667	0.60	4.667	25.40	7.667	2.20	10.67	0.60
1.750	0.60	4.750	25.40	7.750	2.20	10.75	0.60
1.833	0.60	4.833	25.40	7.833	2.20	10.83	0.60
1.917	0.60	4.917	25.40	7.917	2.20	10.92	0.60
2.000	0.60	5.000	25.40	8.000	2.20	11.00	0.60
2.083	3.30	5.083	7.20	8.083	1.10	11.08	0.60
2.167	3.30	5.167	7.20	8.167	1.10	11.17	0.60
2.250	3.30	5.250	7.20	8.250	1.10	11.25	0.60
2.333	3.30	5.333	7.20	8.333	1.10	11.33	0.60
2.417	3.30	5.417	7.20	8.417	1.10	11.42	0.60
2.500	3.30	5.500	7.20	8.500	1.10	11.50	0.60
2.583	3.30	5.583	7.20	8.583	1.10	11.58	0.60
2.667	3.30	5.667	7.20	8.667	1.10	11.67	0.60
2.750	3.30	5.750	7.20	8.750	1.10	11.75	0.60
2.833	3.30	5.833	7.20	8.833	1.10	11.83	0.60
2.917	3.30	5.917	7.20	8.917	1.10	11.92	0.60
3.000	3.30	6.000	7.20	9.000	1.10	12.00	0.60

Unit Hyd Qpeak (cms)= 0.505

PEAK FLOW (cms)= 0.045 (i)
TIME TO PEAK (hrs)= 5.000
RUNOFF VOLUME (mm)= 13.326
TOTAL RAINFALL (mm)= 55.500
RUNOFF COEFFICIENT = 0.240

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

ADD HYD (0003)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0001):	1.25	0.030	5.00	13.29
+ ID2= 2 (0002):	1.93	0.045	5.00	13.33
ID = 3 (0003):	3.18	0.075	5.00	13.31

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD  (  0003)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0003):     3.18   0.075     5.00    13.31
     + ID2= 2 (  0006):     0.78   0.050     5.00    49.58
       ================================================
       ID = 1 (  0003):     3.96   0.125     5.00    20.46

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0008)|   Area    (ha)=   5.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.90   Dir. Conn.(%)=  56.30
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.60         1.78
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     189.52        27.50
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.60	3.083	9.40	6.083	3.90	9.08	0.60
0.167	0.60	3.167	9.40	6.167	3.90	9.17	0.60
0.250	0.60	3.250	9.40	6.250	3.90	9.25	0.60
0.333	0.60	3.333	9.40	6.333	3.90	9.33	0.60
0.417	0.60	3.417	9.40	6.417	3.90	9.42	0.60
0.500	0.60	3.500	9.40	6.500	3.90	9.50	0.60
0.583	0.60	3.583	9.40	6.583	3.90	9.58	0.60
0.667	0.60	3.667	9.40	6.667	3.90	9.67	0.60
0.750	0.60	3.750	9.40	6.750	3.90	9.75	0.60
0.833	0.60	3.833	9.40	6.833	3.90	9.83	0.60
0.917	0.60	3.917	9.40	6.917	3.90	9.92	0.60
1.000	0.60	4.000	9.40	7.000	3.90	10.00	0.60
1.083	0.60	4.083	25.40	7.083	2.20	10.08	0.60
1.167	0.60	4.167	25.40	7.167	2.20	10.17	0.60
1.250	0.60	4.250	25.40	7.250	2.20	10.25	0.60
1.333	0.60	4.333	25.40	7.333	2.20	10.33	0.60
1.417	0.60	4.417	25.40	7.417	2.20	10.42	0.60
1.500	0.60	4.500	25.40	7.500	2.20	10.50	0.60
1.583	0.60	4.583	25.40	7.583	2.20	10.58	0.60
1.667	0.60	4.667	25.40	7.667	2.20	10.67	0.60
1.750	0.60	4.750	25.40	7.750	2.20	10.75	0.60
1.833	0.60	4.833	25.40	7.833	2.20	10.83	0.60
1.917	0.60	4.917	25.40	7.917	2.20	10.92	0.60
2.000	0.60	5.000	25.40	8.000	2.20	11.00	0.60
2.083	3.30	5.083	7.20	8.083	1.10	11.08	0.60
2.167	3.30	5.167	7.20	8.167	1.10	11.17	0.60
2.250	3.30	5.250	7.20	8.250	1.10	11.25	0.60
2.333	3.30	5.333	7.20	8.333	1.10	11.33	0.60
2.417	3.30	5.417	7.20	8.417	1.10	11.42	0.60
2.500	3.30	5.500	7.20	8.500	1.10	11.50	0.60
2.583	3.30	5.583	7.20	8.583	1.10	11.58	0.60
2.667	3.30	5.667	7.20	8.667	1.10	11.67	0.60
2.750	3.30	5.750	7.20	8.750	1.10	11.75	0.60
2.833	3.30	5.833	7.20	8.833	1.10	11.83	0.60
2.917	3.30	5.917	7.20	8.917	1.10	11.92	0.60
3.000	3.30	6.000	7.20	9.000	1.10	12.00	0.60

```
     Max.Eff.Inten.(mm/hr)=      25.40        17.47
               over (min)        5.00        20.00
     Storage Coeff.  (min)=       6.49 (ii)   17.81 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.18         0.06
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.21         0.07          0.286 (iii)
     TIME TO PEAK    (hrs)=       5.00         5.08          5.00
     RUNOFF VOLUME    (mm)=      54.50        22.23         40.40
     TOTAL RAINFALL   (mm)=      55.50        55.50         55.50
     RUNOFF COEFFICIENT   =       0.98         0.40          0.73

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD  (  0010)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0003):     3.96   0.125     5.00    20.46
     + ID2= 2 (  0008):     5.39   0.286     5.00    40.40
       ================================================
       ID = 3 (  0010):     9.35   0.411     5.00    31.95

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0009)|   Area    (ha)=   1.23
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
```

```
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.10         0.12
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      90.39        70.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

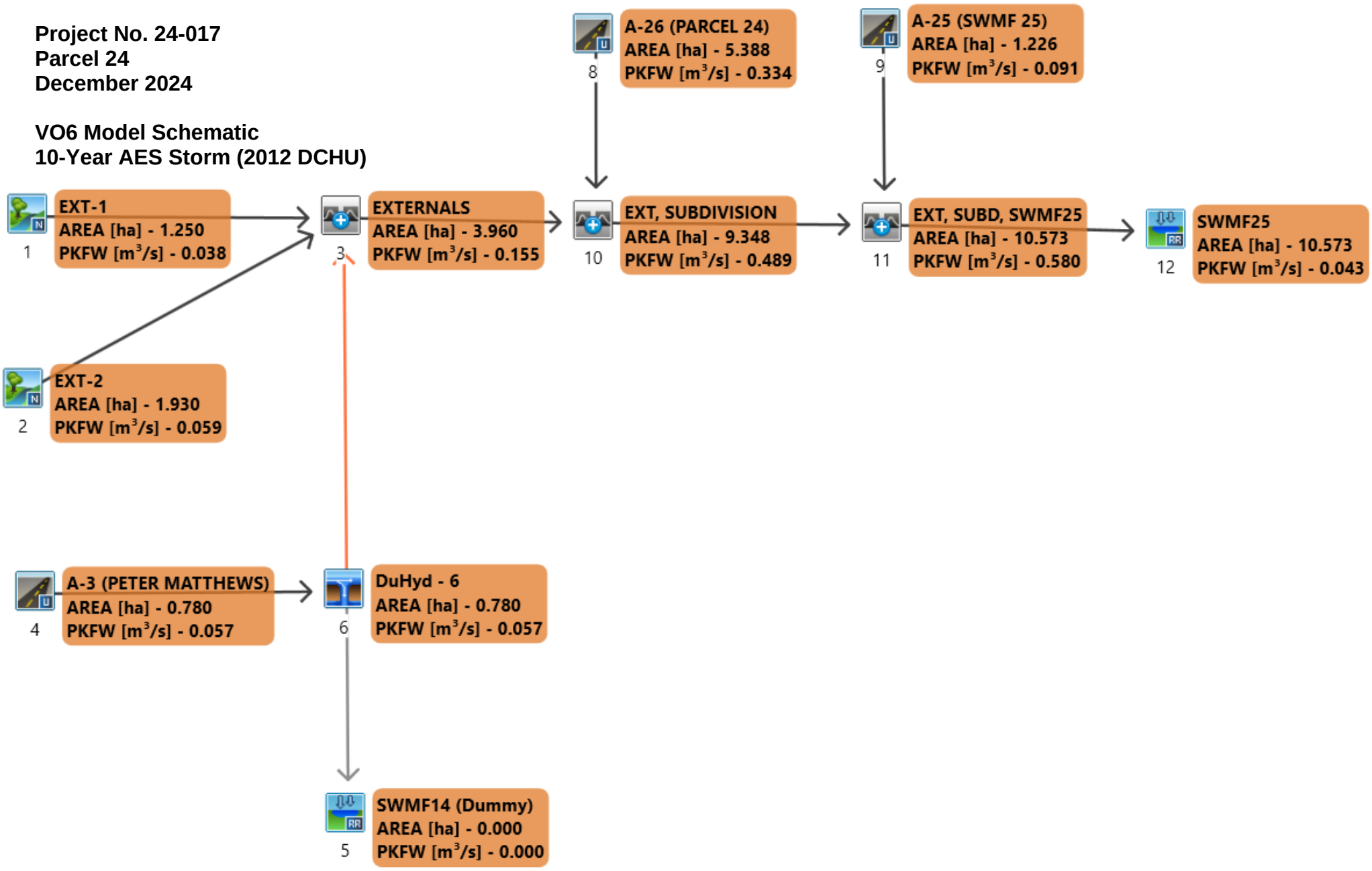
TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.60	3.083	9.40	6.083	3.90	9.08	0.60
0.167	0.60	3.167	9.40	6.167	3.90	9.17	0.60
0.250	0.60	3.250	9.40	6.250	3.90	9.25	0.60
0.333	0.60	3.333	9.40	6.333	3.90	9.33	0.60
0.417	0.60	3.417	9.40	6.417	3.90	9.42	0.60
0.500	0.60	3.500	9.40	6.500	3.90	9.50	0.60
0.583	0.60	3.583	9.40	6.583	3.90	9.58	0.60
0.667	0.60	3.667	9.40	6.667	3.90	9.67	0.60
0.750	0.60	3.750	9.40	6.750	3.90	9.75	0.60
0.833	0.60	3.833	9.40	6.833	3.90	9.83	0.60
0.917	0.60	3.917	9.40	6.917	3.90	9.92	0.60
1.000	0.60	4.000	9.40	7.000	3.90	10.00	0.60
1.083	0.60	4.083	25.40	7.083	2.20	10.08	0.60
1.167	0.60	4.167	25.40	7.167	2.20	10.17	0.60
1.250	0.60	4.250	25.40	7.250	2.20	10.25	0.60
1.333	0.60	4.333	25.40	7.333	2.20	10.33	0.60
1.417	0.60	4.417	25.40	7.417	2.20	10.42	0.60
1.500	0.60	4.500	25.40	7.500	2.20	10.50	0.60
1.583	0.60	4.583	25.40	7.583	2.20	10.58	0.60
1.667	0.60	4.667	25.40	7.667	2.20	10.67	0.60
1.750	0.60	4.750	25.40	7.750	2.20	10.75	0.60
1.833	0.60	4.833	25.40	7.833	2.20	10.83	0.60
1.917	0.60	4.917	25.40	7.917	2.20	10.92	0.60
2.000	0.60	5.000	25.40	8.000	2.20	11.00	0.60
2.083	3.30	5.083	7.20	8.083	1.10	11.08	0.60
2.167	3.30	5.167	7.20	8.167	1.10	11.17	0.60
2.250	3.30	5.250	7.20	8.250	1.10	11.25	0.60
2.333	3.30	5.333	7.20	8.333	1.10	11.33	0.60
2.417	3.30	5.417	7.20	8.417	1.10	11.42	0.60
2.500	3.30	5.500	7.20	8.500	1.10	11.50	0.60
2.583	3.30	5.583	7.20	8.583	1.10	11.58	0.60
2.667	3.30	5.667	7.20	8.667	1.10	11.67	0.60
2.750	3.30	5.750	7.20	8.750	1.10	11.75	0.60
2.833	3.30	5.833	7.20	8.833	1.10	11.83	0.60
2.917	3.30	5.917	7.20	8.917	1.10	11.92	0.60
3.000	3.30	6.000	7.20	9.000	1.10	12.00	0.60

```
     Max.Eff.Inten.(mm/hr)=      25.40         9.90
                  over (min)        5.00        45.00
     Storage Coeff.  (min)=       4.16 (ii)   41.90 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=       0.24         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.08         0.00          0.080 (iii)
     TIME TO PEAK    (hrs)=       4.92         5.50           5.00
     RUNOFF VOLUME    (mm)=      54.50        18.49          50.88
     TOTAL RAINFALL   (mm)=      55.50        55.50          55.50
     RUNOFF COEFFICIENT   =       0.98         0.33           0.92

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0010):     9.35   0.411     5.00    31.95
     + ID2= 2 (  0009):     1.23   0.080     5.00    50.88
       ================================================
       ID = 3 (  0011):    10.57   0.490     5.00    34.14

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0012)|     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   |    0.0660      0.4138
                          0.0068      0.1487   |    0.0771      0.4560
                          0.0250      0.2263   |    0.0877      0.5115
                          0.0370      0.2980   |    1.5650      0.6396
                          0.0430      0.3493   |    0.0000      0.0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0011)     10.573      0.490      5.00      34.14
   OUTFLOW: ID= 1 (  0012)     10.573      0.037      8.08      32.61

                PEAK   FLOW   REDUCTION [Qout/Qin](%)=  7.49
                TIME SHIFT OF PEAK FLOW         (min)=185.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  0.2963
```

SMD
CONSULTANTS INC.

Project No. 24-017
Parcel 24
December 2024

VO6 Model Schematic
10-Year AES Storm (2012 DCHU)



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

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2017)
       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
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.

                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: M:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\danie\AppData\Local\Civica\VH5\939bc6dd-92de-4fe3-9512-437733e37904\4db6cb
2c-b427-4109-abec-5224bf93f2e5\scenar
  Summary filename:
C:\Users\danie\AppData\Local\Civica\VH5\939bc6dd-92de-4fe3-9512-437733e37904\4db6cb
2c-b427-4109-abec-5224bf93f2e5\scenar


DATE: 12-03-2024                          TIME: 11:47:08

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------
  ***********************************************
  ** SIMULATION : C - 10 Year AES Storm         **
  ***********************************************


--------------------
|    READ STORM    |    Filename: C:\Users\danie\AppD
|                  |              ata\Local\Temp\
|                  |              42e1b15d-69e0-49b9-ba0f-8ea5ccefdb00\6941df4a
| Ptotal= 62.90 mm |    Comments: 10 Year AES Storm
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.00    0.60 |  3.00   10.70 |  6.00    4.40 |  9.00    0.60
                0.25    0.60 |  3.25   10.70 |  6.25    4.40 |  9.25    0.60
                0.50    0.60 |  3.50   10.70 |  6.50    4.40 |  9.50    0.60
                0.75    0.60 |  3.75   10.70 |  6.75    4.40 |  9.75    0.60
                1.00    0.60 |  4.00   29.00 |  7.00    2.50 | 10.00    0.60
                1.25    0.60 |  4.25   29.00 |  7.25    2.50 | 10.25    0.60
                1.50    0.60 |  4.50   29.00 |  7.50    2.50 | 10.50    0.60
                1.75    0.60 |  4.75   29.00 |  7.75    2.50 | 10.75    0.60
                2.00    3.80 |  5.00    8.20 |  8.00    1.30 | 11.00    0.60
                2.25    3.80 |  5.25    8.20 |  8.25    1.30 | 11.25    0.60
                2.50    3.80 |  5.50    8.20 |  8.50    1.30 | 11.50    0.60
                2.75    3.80 |  5.75    8.20 |  8.75    1.30 | 11.75    0.60
--------------------------------------------------------------------------------

--------------------
| CALIB            |
| STANDHYD (  0004)|   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  87.00   Dir. Conn.(%)=  87.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.68         0.10
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      72.11        40.00
     Mannings n           =      0.013        0.250

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    0.60 | 3.083   10.70 | 6.083    4.40 |  9.08    0.60
               0.167    0.60 | 3.167   10.70 | 6.167    4.40 |  9.17    0.60
               0.250    0.60 | 3.250   10.70 | 6.250    4.40 |  9.25    0.60
               0.333    0.60 | 3.333   10.70 | 6.333    4.40 |  9.33    0.60
               0.417    0.60 | 3.417   10.70 | 6.417    4.40 |  9.42    0.60
               0.500    0.60 | 3.500   10.70 | 6.500    4.40 |  9.50    0.60
               0.583    0.60 | 3.583   10.70 | 6.583    4.40 |  9.58    0.60
               0.667    0.60 | 3.667   10.70 | 6.667    4.40 |  9.67    0.60
               0.750    0.60 | 3.750   10.70 | 6.750    4.40 |  9.75    0.60
               0.833    0.60 | 3.833   10.70 | 6.833    4.40 |  9.83    0.60
               0.917    0.60 | 3.917   10.70 | 6.917    4.40 |  9.92    0.60
               1.000    0.60 | 4.000   10.70 | 7.000    4.40 | 10.00    0.60
               1.083    0.60 | 4.083   29.00 | 7.083    2.50 | 10.08    0.60
               1.167    0.60 | 4.167   29.00 | 7.167    2.50 | 10.17    0.60
               1.250    0.60 | 4.250   29.00 | 7.250    2.50 | 10.25    0.60
               1.333    0.60 | 4.333   29.00 | 7.333    2.50 | 10.33    0.60
```

1.417	0.60	4.417	29.00	7.417	2.50	10.42	0.60
1.500	0.60	4.500	29.00	7.500	2.50	10.50	0.60
1.583	0.60	4.583	29.00	7.583	2.50	10.58	0.60
1.667	0.60	4.667	29.00	7.667	2.50	10.67	0.60
1.750	0.60	4.750	29.00	7.750	2.50	10.75	0.60
1.833	0.60	4.833	29.00	7.833	2.50	10.83	0.60
1.917	0.60	4.917	29.00	7.917	2.50	10.92	0.60
2.000	0.60	5.000	29.00	8.000	2.50	11.00	0.60
2.083	3.80	5.083	8.20	8.083	1.30	11.08	0.60
2.167	3.80	5.167	8.20	8.167	1.30	11.17	0.60
2.250	3.80	5.250	8.20	8.250	1.30	11.25	0.60
2.333	3.80	5.333	8.20	8.333	1.30	11.33	0.60
2.417	3.80	5.417	8.20	8.417	1.30	11.42	0.60
2.500	3.80	5.500	8.20	8.500	1.30	11.50	0.60
2.583	3.80	5.583	8.20	8.583	1.30	11.58	0.60
2.667	3.80	5.667	8.20	8.667	1.30	11.67	0.60
2.750	3.80	5.750	8.20	8.750	1.30	11.75	0.60
2.833	3.80	5.833	8.20	8.833	1.30	11.83	0.60
2.917	3.80	5.917	8.20	8.917	1.30	11.92	0.60
3.000	3.80	6.000	8.20	9.000	1.30	12.00	0.60

Max.Eff.Inten.(mm/hr)=	29.00	12.37	
over (min)	5.00	20.00	
Storage Coeff. (min)=	3.44 (ii)	19.73 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	0.26	0.06	
			TOTALS
PEAK FLOW (cms)=	0.05	0.00	0.057 (iii)
TIME TO PEAK (hrs)=	4.83	5.08	5.00
RUNOFF VOLUME (mm)=	61.90	20.84	56.55
TOTAL RAINFALL (mm)=	62.90	62.90	62.90
RUNOFF COEFFICIENT =	0.98	0.33	0.90

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

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

DUHYD (0006)				
Inlet Cap.= 0.180				
#of Inlets= 1				
Total(cms)= 0.2	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
TOTAL HYD.(ID= 1):	0.78	0.06	5.00	56.55
MAJOR SYS.(ID= 2):	0.00	0.00	0.00	0.00
MINOR SYS.(ID= 3):	0.78	0.06	5.00	56.55

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0005)	OVERFLOW IS OFF			
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	1.5300	0.0100
	0.5000	0.0050	1.5400	3.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0006)	0.000	0.000	0.00	0.00
OUTFLOW: ID= 1 (0005)	0.000	0.000	0.00	NaN

PEAK FLOW REDUCTION [Qout/Qin](%)= NaN
TIME SHIFT OF PEAK FLOW (min)= 0.00
MAXIMUM STORAGE USED (ha.m.)= 0.0000
MAXIMUM STORAGE USED (cu.m.)= 0.000000

**** WARNING : HYDROGRAPH PEAK WAS NOT REDUCED.
CHECK OUTFLOW/STORAGE TABLE OR REDUCE DT.

CALIB					
NASHYD (0001)	Area (ha)=	1.25	Curve Number (CN)=	70.0	
ID= 1 DT= 5.0 min	Ia (mm)=	10.00	# of Linear Res.(N)=	3.00	
	U.H. Tp(hrs)=	0.13			

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.60	3.083	10.70	6.083	4.40	9.08	0.60
0.167	0.60	3.167	10.70	6.167	4.40	9.17	0.60
0.250	0.60	3.250	10.70	6.250	4.40	9.25	0.60
0.333	0.60	3.333	10.70	6.333	4.40	9.33	0.60
0.417	0.60	3.417	10.70	6.417	4.40	9.42	0.60
0.500	0.60	3.500	10.70	6.500	4.40	9.50	0.60
0.583	0.60	3.583	10.70	6.583	4.40	9.58	0.60
0.667	0.60	3.667	10.70	6.667	4.40	9.67	0.60
0.750	0.60	3.750	10.70	6.750	4.40	9.75	0.60
0.833	0.60	3.833	10.70	6.833	4.40	9.83	0.60
0.917	0.60	3.917	10.70	6.917	4.40	9.92	0.60
1.000	0.60	4.000	10.70	7.000	4.40	10.00	0.60
1.083	0.60	4.083	29.00	7.083	2.50	10.08	0.60
1.167	0.60	4.167	29.00	7.167	2.50	10.17	0.60
1.250	0.60	4.250	29.00	7.250	2.50	10.25	0.60

1.333	0.60	4.333	29.00	7.333	2.50	10.33	0.60
1.417	0.60	4.417	29.00	7.417	2.50	10.42	0.60
1.500	0.60	4.500	29.00	7.500	2.50	10.50	0.60
1.583	0.60	4.583	29.00	7.583	2.50	10.58	0.60
1.667	0.60	4.667	29.00	7.667	2.50	10.67	0.60
1.750	0.60	4.750	29.00	7.750	2.50	10.75	0.60
1.833	0.60	4.833	29.00	7.833	2.50	10.83	0.60
1.917	0.60	4.917	29.00	7.917	2.50	10.92	0.60
2.000	0.60	5.000	29.00	8.000	2.50	11.00	0.60
2.083	3.80	5.083	8.20	8.083	1.30	11.08	0.60
2.167	3.80	5.167	8.20	8.167	1.30	11.17	0.60
2.250	3.80	5.250	8.20	8.250	1.30	11.25	0.60
2.333	3.80	5.333	8.20	8.333	1.30	11.33	0.60
2.417	3.80	5.417	8.20	8.417	1.30	11.42	0.60
2.500	3.80	5.500	8.20	8.500	1.30	11.50	0.60
2.583	3.80	5.583	8.20	8.583	1.30	11.58	0.60
2.667	3.80	5.667	8.20	8.667	1.30	11.67	0.60
2.750	3.80	5.750	8.20	8.750	1.30	11.75	0.60
2.833	3.80	5.833	8.20	8.833	1.30	11.83	0.60
2.917	3.80	5.917	8.20	8.917	1.30	11.92	0.60
3.000	3.80	6.000	8.20	9.000	1.30	12.00	0.60

Unit Hyd Qpeak (cms)= 0.362

PEAK FLOW (cms)= 0.038 (i)
TIME TO PEAK (hrs)= 5.000
RUNOFF VOLUME (mm)= 17.138
TOTAL RAINFALL (mm)= 62.900
RUNOFF COEFFICIENT = 0.272

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

CALIB					
NASHYD (0002)	Area (ha)=	1.93	Curve Number (CN)=	70.0	
ID= 1 DT= 5.0 min	Ia (mm)=	10.00	# of Linear Res.(N)=	3.00	
	U.H. Tp(hrs)=	0.15			

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.60	3.083	10.70	6.083	4.40	9.08	0.60
0.167	0.60	3.167	10.70	6.167	4.40	9.17	0.60
0.250	0.60	3.250	10.70	6.250	4.40	9.25	0.60
0.333	0.60	3.333	10.70	6.333	4.40	9.33	0.60
0.417	0.60	3.417	10.70	6.417	4.40	9.42	0.60
0.500	0.60	3.500	10.70	6.500	4.40	9.50	0.60
0.583	0.60	3.583	10.70	6.583	4.40	9.58	0.60
0.667	0.60	3.667	10.70	6.667	4.40	9.67	0.60
0.750	0.60	3.750	10.70	6.750	4.40	9.75	0.60
0.833	0.60	3.833	10.70	6.833	4.40	9.83	0.60
0.917	0.60	3.917	10.70	6.917	4.40	9.92	0.60
1.000	0.60	4.000	10.70	7.000	4.40	10.00	0.60
1.083	0.60	4.083	29.00	7.083	2.50	10.08	0.60
1.167	0.60	4.167	29.00	7.167	2.50	10.17	0.60
1.250	0.60	4.250	29.00	7.250	2.50	10.25	0.60
1.333	0.60	4.333	29.00	7.333	2.50	10.33	0.60
1.417	0.60	4.417	29.00	7.417	2.50	10.42	0.60
1.500	0.60	4.500	29.00	7.500	2.50	10.50	0.60
1.583	0.60	4.583	29.00	7.583	2.50	10.58	0.60
1.667	0.60	4.667	29.00	7.667	2.50	10.67	0.60
1.750	0.60	4.750	29.00	7.750	2.50	10.75	0.60
1.833	0.60	4.833	29.00	7.833	2.50	10.83	0.60
1.917	0.60	4.917	29.00	7.917	2.50	10.92	0.60
2.000	0.60	5.000	29.00	8.000	2.50	11.00	0.60
2.083	3.80	5.083	8.20	8.083	1.30	11.08	0.60
2.167	3.80	5.167	8.20	8.167	1.30	11.17	0.60
2.250	3.80	5.250	8.20	8.250	1.30	11.25	0.60
2.333	3.80	5.333	8.20	8.333	1.30	11.33	0.60
2.417	3.80	5.417	8.20	8.417	1.30	11.42	0.60
2.500	3.80	5.500	8.20	8.500	1.30	11.50	0.60
2.583	3.80	5.583	8.20	8.583	1.30	11.58	0.60
2.667	3.80	5.667	8.20	8.667	1.30	11.67	0.60
2.750	3.80	5.750	8.20	8.750	1.30	11.75	0.60
2.833	3.80	5.833	8.20	8.833	1.30	11.83	0.60
2.917	3.80	5.917	8.20	8.917	1.30	11.92	0.60
3.000	3.80	6.000	8.20	9.000	1.30	12.00	0.60

Unit Hyd Qpeak (cms)= 0.505

PEAK FLOW (cms)= 0.059 (i)
TIME TO PEAK (hrs)= 5.000
RUNOFF VOLUME (mm)= 17.189
TOTAL RAINFALL (mm)= 62.900
RUNOFF COEFFICIENT = 0.273

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

ADD HYD (0003)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0001):	1.25	0.038	5.00	17.14
+ ID2= 2 (0002):	1.93	0.059	5.00	17.19
ID = 3 (0003):	3.18	0.097	5.00	17.17

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD  (  0003)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0003):     3.18   0.097     5.00    17.17
     + ID2= 2 (  0006):     0.78   0.057     5.00    56.55
       ================================================
       ID = 1 (  0003):     3.96   0.155     5.00    24.93

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0008)|   Area    (ha)=   5.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.90   Dir. Conn.(%)=  56.30
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.60         1.78
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     189.52        27.50
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.

                      ---- TRANSFORMED HYETOGRAPH ----
  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
 0.083    0.60 | 3.083   10.70 | 6.083    4.40 |  9.08    0.60
 0.167    0.60 | 3.167   10.70 | 6.167    4.40 |  9.17    0.60
 0.250    0.60 | 3.250   10.70 | 6.250    4.40 |  9.25    0.60
 0.333    0.60 | 3.333   10.70 | 6.333    4.40 |  9.33    0.60
 0.417    0.60 | 3.417   10.70 | 6.417    4.40 |  9.42    0.60
 0.500    0.60 | 3.500   10.70 | 6.500    4.40 |  9.50    0.60
 0.583    0.60 | 3.583   10.70 | 6.583    4.40 |  9.58    0.60
 0.667    0.60 | 3.667   10.70 | 6.667    4.40 |  9.67    0.60
 0.750    0.60 | 3.750   10.70 | 6.750    4.40 |  9.75    0.60
 0.833    0.60 | 3.833   10.70 | 6.833    4.40 |  9.83    0.60
 0.917    0.60 | 3.917   10.70 | 6.917    4.40 |  9.92    0.60
 1.000    0.60 | 4.000   10.70 | 7.000    4.40 | 10.00    0.60
 1.083    0.60 | 4.083   29.00 | 7.083    2.50 | 10.08    0.60
 1.167    0.60 | 4.167   29.00 | 7.167    2.50 | 10.17    0.60
 1.250    0.60 | 4.250   29.00 | 7.250    2.50 | 10.25    0.60
 1.333    0.60 | 4.333   29.00 | 7.333    2.50 | 10.33    0.60
 1.417    0.60 | 4.417   29.00 | 7.417    2.50 | 10.42    0.60
 1.500    0.60 | 4.500   29.00 | 7.500    2.50 | 10.50    0.60
 1.583    0.60 | 4.583   29.00 | 7.583    2.50 | 10.58    0.60
 1.667    0.60 | 4.667   29.00 | 7.667    2.50 | 10.67    0.60
 1.750    0.60 | 4.750   29.00 | 7.750    2.50 | 10.75    0.60
 1.833    0.60 | 4.833   29.00 | 7.833    2.50 | 10.83    0.60
 1.917    0.60 | 4.917   29.00 | 7.917    2.50 | 10.92    0.60
 2.000    0.60 | 5.000   29.00 | 8.000    2.50 | 11.00    0.60
 2.083    3.80 | 5.083    8.20 | 8.083    1.30 | 11.08    0.60
 2.167    3.80 | 5.167    8.20 | 8.167    1.30 | 11.17    0.60
 2.250    3.80 | 5.250    8.20 | 8.250    1.30 | 11.25    0.60
 2.333    3.80 | 5.333    8.20 | 8.333    1.30 | 11.33    0.60
 2.417    3.80 | 5.417    8.20 | 8.417    1.30 | 11.42    0.60
 2.500    3.80 | 5.500    8.20 | 8.500    1.30 | 11.50    0.60
 2.583    3.80 | 5.583    8.20 | 8.583    1.30 | 11.58    0.60
 2.667    3.80 | 5.667    8.20 | 8.667    1.30 | 11.67    0.60
 2.750    3.80 | 5.750    8.20 | 8.750    1.30 | 11.75    0.60
 2.833    3.80 | 5.833    8.20 | 8.833    1.30 | 11.83    0.60
 2.917    3.80 | 5.917    8.20 | 8.917    1.30 | 11.92    0.60
 3.000    3.80 | 6.000    8.20 | 9.000    1.30 | 12.00    0.60

     Max.Eff.Inten.(mm/hr)=      29.00        21.44
                over (min)        5.00        20.00
     Storage Coeff.  (min)=       6.15 (ii)   16.59 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.19         0.06
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.24         0.09          0.334 (iii)
     TIME TO PEAK    (hrs)=       5.00         5.08          5.00
     RUNOFF VOLUME    (mm)=      61.90        27.18         46.73
     TOTAL RAINFALL   (mm)=      62.90        62.90         62.90
     RUNOFF COEFFICIENT   =       0.98         0.43          0.74

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD  (  0010)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0003):     3.96   0.155     5.00    24.93
     + ID2= 2 (  0008):     5.39   0.334     5.00    46.73
       ================================================
       ID = 3 (  0010):     9.35   0.489     5.00    37.49

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0009)|   Area    (ha)=   1.23
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
```

```
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.10         0.12
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      90.39        70.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

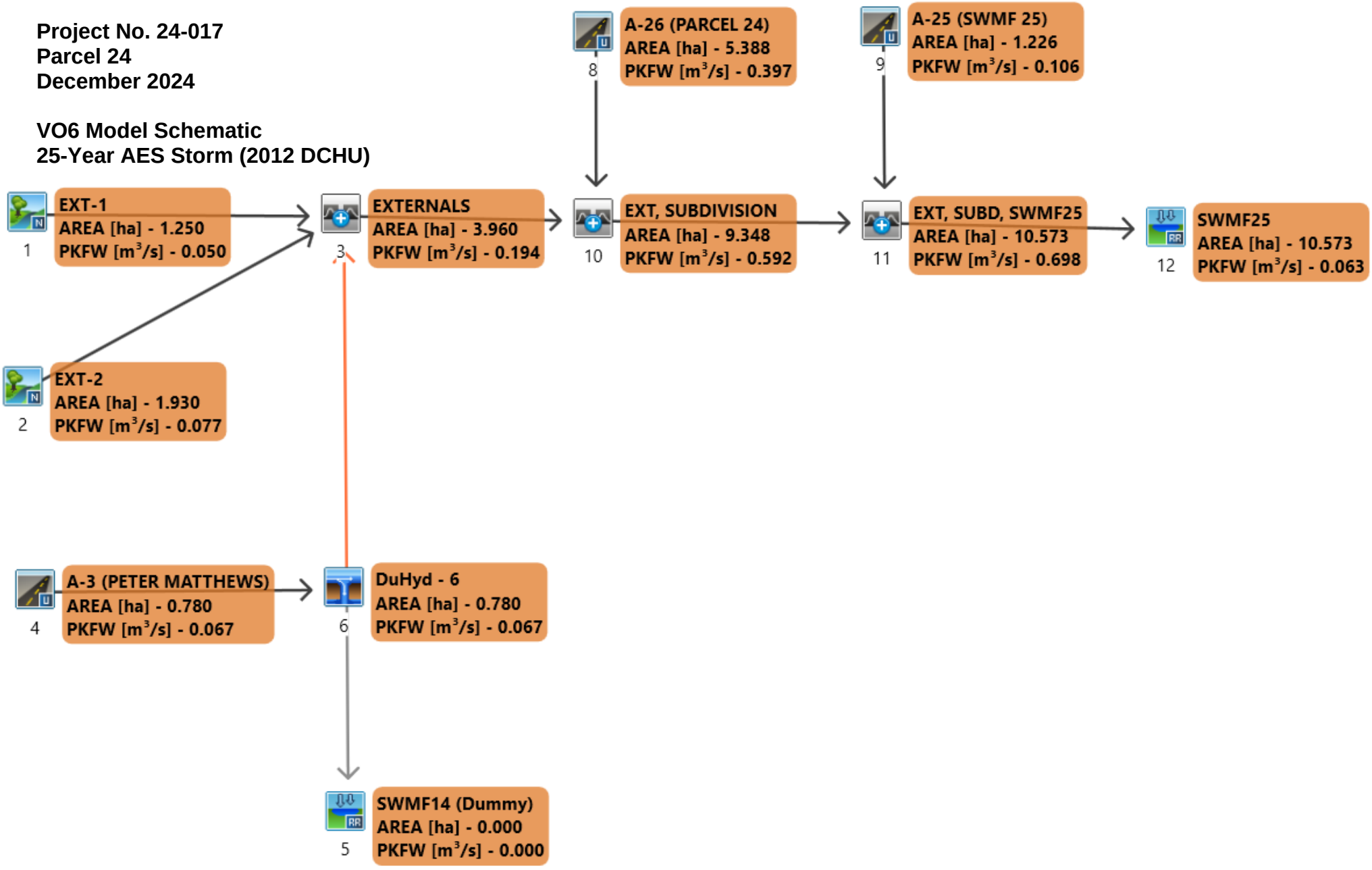
TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.60	3.083	10.70	6.083	4.40	9.08	0.60
0.167	0.60	3.167	10.70	6.167	4.40	9.17	0.60
0.250	0.60	3.250	10.70	6.250	4.40	9.25	0.60
0.333	0.60	3.333	10.70	6.333	4.40	9.33	0.60
0.417	0.60	3.417	10.70	6.417	4.40	9.42	0.60
0.500	0.60	3.500	10.70	6.500	4.40	9.50	0.60
0.583	0.60	3.583	10.70	6.583	4.40	9.58	0.60
0.667	0.60	3.667	10.70	6.667	4.40	9.67	0.60
0.750	0.60	3.750	10.70	6.750	4.40	9.75	0.60
0.833	0.60	3.833	10.70	6.833	4.40	9.83	0.60
0.917	0.60	3.917	10.70	6.917	4.40	9.92	0.60
1.000	0.60	4.000	10.70	7.000	4.40	10.00	0.60
1.083	0.60	4.083	29.00	7.083	2.50	10.08	0.60
1.167	0.60	4.167	29.00	7.167	2.50	10.17	0.60
1.250	0.60	4.250	29.00	7.250	2.50	10.25	0.60
1.333	0.60	4.333	29.00	7.333	2.50	10.33	0.60
1.417	0.60	4.417	29.00	7.417	2.50	10.42	0.60
1.500	0.60	4.500	29.00	7.500	2.50	10.50	0.60
1.583	0.60	4.583	29.00	7.583	2.50	10.58	0.60
1.667	0.60	4.667	29.00	7.667	2.50	10.67	0.60
1.750	0.60	4.750	29.00	7.750	2.50	10.75	0.60
1.833	0.60	4.833	29.00	7.833	2.50	10.83	0.60
1.917	0.60	4.917	29.00	7.917	2.50	10.92	0.60
2.000	0.60	5.000	29.00	8.000	2.50	11.00	0.60
2.083	3.80	5.083	8.20	8.083	1.30	11.08	0.60
2.167	3.80	5.167	8.20	8.167	1.30	11.17	0.60
2.250	3.80	5.250	8.20	8.250	1.30	11.25	0.60
2.333	3.80	5.333	8.20	8.333	1.30	11.33	0.60
2.417	3.80	5.417	8.20	8.417	1.30	11.42	0.60
2.500	3.80	5.500	8.20	8.500	1.30	11.50	0.60
2.583	3.80	5.583	8.20	8.583	1.30	11.58	0.60
2.667	3.80	5.667	8.20	8.667	1.30	11.67	0.60
2.750	3.80	5.750	8.20	8.750	1.30	11.75	0.60
2.833	3.80	5.833	8.20	8.833	1.30	11.83	0.60
2.917	3.80	5.917	8.20	8.917	1.30	11.92	0.60
3.000	3.80	6.000	8.20	9.000	1.30	12.00	0.60

```
     Max.Eff.Inten.(mm/hr)=      29.00        12.66
                   over (min)        5.00        40.00
     Storage Coeff.  (min)=       3.95 (ii)   38.15 (ii)
     Unit Hyd. Tpeak (min)=        5.00        40.00
     Unit Hyd. peak  (cms)=        0.24         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=        0.09         0.00          0.091 (iii)
     TIME TO PEAK    (hrs)=        4.92         5.33          5.00
     RUNOFF VOLUME    (mm)=       61.90        22.83         57.97
     TOTAL RAINFALL   (mm)=       62.90        62.90         62.90
     RUNOFF COEFFICIENT   =        0.98         0.36          0.92

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0010):     9.35   0.489     5.00    37.49
     + ID2= 2 (  0009):     1.23   0.091     5.00    57.97
       ================================================
       ID = 3 (  0011):    10.57   0.580     5.00    39.86

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0012)|     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  |    0.0660      0.4138
                           0.0068      0.1487  |    0.0771      0.4560
                           0.0250      0.2263  |    0.0877      0.5115
                           0.0370      0.2980  |    1.5650      0.6396
                           0.0430      0.3493  |    0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0011)     10.573      0.580      5.00      39.86
   OUTFLOW: ID= 1 (  0012)     10.573      0.043      8.17      38.25

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  7.34
                  TIME SHIFT OF PEAK FLOW         (min)=190.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.3459
```

SMD
CONSULTANTS INC.

Project No. 24-017
Parcel 24
December 2024

VO6 Model Schematic
25-Year AES Storm (2012 DCHU)



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

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2017)
       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
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.

                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: M:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\danie\AppData\Local\Civica\VH5\939bc6dd-92de-4fe3-9512-437733e37904\03bcc9
61-b6b7-4ca9-acf9-6e2fa7533acb\scenar
  Summary filename:
C:\Users\danie\AppData\Local\Civica\VH5\939bc6dd-92de-4fe3-9512-437733e37904\03bcc9
61-b6b7-4ca9-acf9-6e2fa7533acb\scenar


DATE: 12-03-2024                          TIME: 11:47:08

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------
  ***********************************************
  ** SIMULATION : D - 25 Year AES Storm         **
  ***********************************************


--------------------
|    READ STORM    |    Filename: C:\Users\danie\AppD
|                  |              ata\Local\Temp\
|                  |              42e1b15d-69e0-49b9-ba0f-8ea5ccefdb00\4605aa16
| Ptotal= 72.80 mm |    Comments: 25 Year AES Storm
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.70	3.00	12.40	6.00	5.10	9.00	0.70
0.25	0.70	3.25	12.40	6.25	5.10	9.25	0.70
0.50	0.70	3.50	12.40	6.50	5.10	9.50	0.70
0.75	0.70	3.75	12.40	6.75	5.10	9.75	0.70
1.00	0.70	4.00	33.50	7.00	2.90	10.00	0.70
1.25	0.70	4.25	33.50	7.25	2.90	10.25	0.70
1.50	0.70	4.50	33.50	7.50	2.90	10.50	0.70
1.75	0.70	4.75	33.50	7.75	2.90	10.75	0.70
2.00	4.40	5.00	9.50	8.00	1.50	11.00	0.70
2.25	4.40	5.25	9.50	8.25	1.50	11.25	0.70
2.50	4.40	5.50	9.50	8.50	1.50	11.50	0.70
2.75	4.40	5.75	9.50	8.75	1.50	11.75	0.70

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

--------------------
| CALIB            |
| STANDHYD (  0004)|   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  87.00   Dir. Conn.(%)=  87.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.68         0.10
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      72.11        40.00
     Mannings n           =      0.013        0.250

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.70	3.083	12.40	6.083	5.10	9.08	0.70
0.167	0.70	3.167	12.40	6.167	5.10	9.17	0.70
0.250	0.70	3.250	12.40	6.250	5.10	9.25	0.70
0.333	0.70	3.333	12.40	6.333	5.10	9.33	0.70
0.417	0.70	3.417	12.40	6.417	5.10	9.42	0.70
0.500	0.70	3.500	12.40	6.500	5.10	9.50	0.70
0.583	0.70	3.583	12.40	6.583	5.10	9.58	0.70
0.667	0.70	3.667	12.40	6.667	5.10	9.67	0.70
0.750	0.70	3.750	12.40	6.750	5.10	9.75	0.70
0.833	0.70	3.833	12.40	6.833	5.10	9.83	0.70
0.917	0.70	3.917	12.40	6.917	5.10	9.92	0.70
1.000	0.70	4.000	12.40	7.000	5.10	10.00	0.70
1.083	0.70	4.083	33.50	7.083	2.90	10.08	0.70
1.167	0.70	4.167	33.50	7.167	2.90	10.17	0.70
1.250	0.70	4.250	33.50	7.250	2.90	10.25	0.70
1.333	0.70	4.333	33.50	7.333	2.90	10.33	0.70

1.417	0.70	4.417	33.50	7.417	2.90	10.42	0.70
1.500	0.70	4.500	33.50	7.500	2.90	10.50	0.70
1.583	0.70	4.583	33.50	7.583	2.90	10.58	0.70
1.667	0.70	4.667	33.50	7.667	2.90	10.67	0.70
1.750	0.70	4.750	33.50	7.750	2.90	10.75	0.70
1.833	0.70	4.833	33.50	7.833	2.90	10.83	0.70
1.917	0.70	4.917	33.50	7.917	2.90	10.92	0.70
2.000	0.70	5.000	33.50	8.000	2.90	11.00	0.70
2.083	4.40	5.083	9.50	8.083	1.50	11.08	0.70
2.167	4.40	5.167	9.50	8.167	1.50	11.17	0.70
2.250	4.40	5.250	9.50	8.250	1.50	11.25	0.70
2.333	4.40	5.333	9.50	8.333	1.50	11.33	0.70
2.417	4.40	5.417	9.50	8.417	1.50	11.42	0.70
2.500	4.40	5.500	9.50	8.500	1.50	11.50	0.70
2.583	4.40	5.583	9.50	8.583	1.50	11.58	0.70
2.667	4.40	5.667	9.50	8.667	1.50	11.67	0.70
2.750	4.40	5.750	9.50	8.750	1.50	11.75	0.70
2.833	4.40	5.833	9.50	8.833	1.50	11.83	0.70
2.917	4.40	5.917	9.50	8.917	1.50	11.92	0.70
3.000	4.40	6.000	9.50	9.000	1.50	12.00	0.70

Max.Eff.Inten.(mm/hr)=	33.50	16.02		
over (min)	5.00	20.00		
Storage Coeff. (min)=	3.25 (ii)	17.93 (ii)		
Unit Hyd. Tpeak (min)=	5.00	20.00		
Unit Hyd. peak (cms)=	0.27	0.06		
			TOTALS	
PEAK FLOW (cms)=	0.06	0.00	0.067 (iii)	
TIME TO PEAK (hrs)=	4.83	5.08	5.00	
RUNOFF VOLUME (mm)=	71.80	26.64	65.92	
TOTAL RAINFALL (mm)=	72.80	72.80	72.80	
RUNOFF COEFFICIENT =	0.99	0.37	0.91	

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

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

DUHYD (0006)					
Inlet Cap.= 0.180					
#of Inlets= 1					
Total(cms)= 0.2	AREA	QPEAK	TPEAK	R.V.	
	(ha)	(cms)	(hrs)	(mm)	
TOTAL HYD.(ID= 1):	0.78	0.07	5.00	65.92	
MAJOR SYS.(ID= 2):	0.00	0.00	0.00	0.00	
MINOR SYS.(ID= 3):	0.78	0.07	5.00	65.92	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0005)		OVERFLOW IS OFF			
IN= 2---> OUT= 1					
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)	
	0.0000	0.0000	1.5300	0.0100	
	0.5000	0.0050	1.5400	3.0000	

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0006)	0.000	0.000	0.00	0.00
OUTFLOW: ID= 1 (0005)	0.000	0.000	0.00	NaN

PEAK FLOW REDUCTION [Qout/Qin](%)= NaN
TIME SHIFT OF PEAK FLOW (min)= 0.00
MAXIMUM STORAGE USED (ha.m.)= 0.0000
MAXIMUM STORAGE USED (cu.m.)= 0.000000

**** WARNING : HYDROGRAPH PEAK WAS NOT REDUCED.
CHECK OUTFLOW/STORAGE TABLE OR REDUCE DT.

CALIB				
NASHYD (0001)|	Area (ha)= 1.25	Curve Number (CN)= 70.0		
ID= 1 DT= 5.0 min |	Ia (mm)= 10.00	# of Linear Res.(N)= 3.00		
	U.H. Tp(hrs)= 0.13			

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.70	3.083	12.40	6.083	5.10	9.08	0.70
0.167	0.70	3.167	12.40	6.167	5.10	9.17	0.70
0.250	0.70	3.250	12.40	6.250	5.10	9.25	0.70
0.333	0.70	3.333	12.40	6.333	5.10	9.33	0.70
0.417	0.70	3.417	12.40	6.417	5.10	9.42	0.70
0.500	0.70	3.500	12.40	6.500	5.10	9.50	0.70
0.583	0.70	3.583	12.40	6.583	5.10	9.58	0.70
0.667	0.70	3.667	12.40	6.667	5.10	9.67	0.70
0.750	0.70	3.750	12.40	6.750	5.10	9.75	0.70
0.833	0.70	3.833	12.40	6.833	5.10	9.83	0.70
0.917	0.70	3.917	12.40	6.917	5.10	9.92	0.70
1.000	0.70	4.000	12.40	7.000	5.10	10.00	0.70
1.083	0.70	4.083	33.50	7.083	2.90	10.08	0.70
1.167	0.70	4.167	33.50	7.167	2.90	10.17	0.70
1.250	0.70	4.250	33.50	7.250	2.90	10.25	0.70

1.333	0.70	4.333	33.50	7.333	2.90	10.33	0.70
1.417	0.70	4.417	33.50	7.417	2.90	10.42	0.70
1.500	0.70	4.500	33.50	7.500	2.90	10.50	0.70
1.583	0.70	4.583	33.50	7.583	2.90	10.58	0.70
1.667	0.70	4.667	33.50	7.667	2.90	10.67	0.70
1.750	0.70	4.750	33.50	7.750	2.90	10.75	0.70
1.833	0.70	4.833	33.50	7.833	2.90	10.83	0.70
1.917	0.70	4.917	33.50	7.917	2.90	10.92	0.70
2.000	0.70	5.000	33.50	8.000	2.90	11.00	0.70
2.083	4.40	5.083	9.50	8.083	1.50	11.08	0.70
2.167	4.40	5.167	9.50	8.167	1.50	11.17	0.70
2.250	4.40	5.250	9.50	8.250	1.50	11.25	0.70
2.333	4.40	5.333	9.50	8.333	1.50	11.33	0.70
2.417	4.40	5.417	9.50	8.417	1.50	11.42	0.70
2.500	4.40	5.500	9.50	8.500	1.50	11.50	0.70
2.583	4.40	5.583	9.50	8.583	1.50	11.58	0.70
2.667	4.40	5.667	9.50	8.667	1.50	11.67	0.70
2.750	4.40	5.750	9.50	8.750	1.50	11.75	0.70
2.833	4.40	5.833	9.50	8.833	1.50	11.83	0.70
2.917	4.40	5.917	9.50	8.917	1.50	11.92	0.70
3.000	4.40	6.000	9.50	9.000	1.50	12.00	0.70

Unit Hyd Qpeak (cms)= 0.362

PEAK FLOW (cms)= 0.050 (i)
TIME TO PEAK (hrs)= 5.000
RUNOFF VOLUME (mm)= 22.760
TOTAL RAINFALL (mm)= 72.800
RUNOFF COEFFICIENT = 0.313

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

CALIB					
NASHYD (0002)	Area (ha)=	1.93	Curve Number (CN)=	70.0	
ID= 1 DT= 5.0 min	Ia (mm)=	10.00	# of Linear Res.(N)=	3.00	
	U.H. Tp(hrs)=	0.15			

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.70	3.083	12.40	6.083	5.10	9.08	0.70
0.167	0.70	3.167	12.40	6.167	5.10	9.17	0.70
0.250	0.70	3.250	12.40	6.250	5.10	9.25	0.70
0.333	0.70	3.333	12.40	6.333	5.10	9.33	0.70
0.417	0.70	3.417	12.40	6.417	5.10	9.42	0.70
0.500	0.70	3.500	12.40	6.500	5.10	9.50	0.70
0.583	0.70	3.583	12.40	6.583	5.10	9.58	0.70
0.667	0.70	3.667	12.40	6.667	5.10	9.67	0.70
0.750	0.70	3.750	12.40	6.750	5.10	9.75	0.70
0.833	0.70	3.833	12.40	6.833	5.10	9.83	0.70
0.917	0.70	3.917	12.40	6.917	5.10	9.92	0.70
1.000	0.70	4.000	12.40	7.000	5.10	10.00	0.70
1.083	0.70	4.083	33.50	7.083	2.90	10.08	0.70
1.167	0.70	4.167	33.50	7.167	2.90	10.17	0.70
1.250	0.70	4.250	33.50	7.250	2.90	10.25	0.70
1.333	0.70	4.333	33.50	7.333	2.90	10.33	0.70
1.417	0.70	4.417	33.50	7.417	2.90	10.42	0.70
1.500	0.70	4.500	33.50	7.500	2.90	10.50	0.70
1.583	0.70	4.583	33.50	7.583	2.90	10.58	0.70
1.667	0.70	4.667	33.50	7.667	2.90	10.67	0.70
1.750	0.70	4.750	33.50	7.750	2.90	10.75	0.70
1.833	0.70	4.833	33.50	7.833	2.90	10.83	0.70
1.917	0.70	4.917	33.50	7.917	2.90	10.92	0.70
2.000	0.70	5.000	33.50	8.000	2.90	11.00	0.70
2.083	4.40	5.083	9.50	8.083	1.50	11.08	0.70
2.167	4.40	5.167	9.50	8.167	1.50	11.17	0.70
2.250	4.40	5.250	9.50	8.250	1.50	11.25	0.70
2.333	4.40	5.333	9.50	8.333	1.50	11.33	0.70
2.417	4.40	5.417	9.50	8.417	1.50	11.42	0.70
2.500	4.40	5.500	9.50	8.500	1.50	11.50	0.70
2.583	4.40	5.583	9.50	8.583	1.50	11.58	0.70
2.667	4.40	5.667	9.50	8.667	1.50	11.67	0.70
2.750	4.40	5.750	9.50	8.750	1.50	11.75	0.70
2.833	4.40	5.833	9.50	8.833	1.50	11.83	0.70
2.917	4.40	5.917	9.50	8.917	1.50	11.92	0.70
3.000	4.40	6.000	9.50	9.000	1.50	12.00	0.70

Unit Hyd Qpeak (cms)= 0.505

PEAK FLOW (cms)= 0.077 (i)
TIME TO PEAK (hrs)= 5.000
RUNOFF VOLUME (mm)= 22.828
TOTAL RAINFALL (mm)= 72.800
RUNOFF COEFFICIENT = 0.314

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

ADD HYD (0003)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0001):	1.25	0.050	5.00	22.76
+ ID2= 2 (0002):	1.93	0.077	5.00	22.83
ID = 3 (0003):	3.18	0.127	5.00	22.80

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD  (  0003)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0003):     3.18   0.127     5.00    22.80
     + ID2= 2 (  0006):     0.78   0.067     5.00    65.92
       ================================================
       ID = 1 (  0003):     3.96   0.194     5.00    31.29

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0008)|   Area    (ha)=   5.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.90   Dir. Conn.(%)=  56.30
--------------------
                           IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       3.60         1.78
    Dep. Storage     (mm)=       1.00         1.50
    Average Slope     (%)=       1.00         2.00
    Length            (m)=     189.52        27.50
    Mannings n           =      0.013        0.250

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.70	3.083	12.40	6.083	5.10	9.08	0.70
0.167	0.70	3.167	12.40	6.167	5.10	9.17	0.70
0.250	0.70	3.250	12.40	6.250	5.10	9.25	0.70
0.333	0.70	3.333	12.40	6.333	5.10	9.33	0.70
0.417	0.70	3.417	12.40	6.417	5.10	9.42	0.70
0.500	0.70	3.500	12.40	6.500	5.10	9.50	0.70
0.583	0.70	3.583	12.40	6.583	5.10	9.58	0.70
0.667	0.70	3.667	12.40	6.667	5.10	9.67	0.70
0.750	0.70	3.750	12.40	6.750	5.10	9.75	0.70
0.833	0.70	3.833	12.40	6.833	5.10	9.83	0.70
0.917	0.70	3.917	12.40	6.917	5.10	9.92	0.70
1.000	0.70	4.000	12.40	7.000	5.10	10.00	0.70
1.083	0.70	4.083	33.50	7.083	2.90	10.08	0.70
1.167	0.70	4.167	33.50	7.167	2.90	10.17	0.70
1.250	0.70	4.250	33.50	7.250	2.90	10.25	0.70
1.333	0.70	4.333	33.50	7.333	2.90	10.33	0.70
1.417	0.70	4.417	33.50	7.417	2.90	10.42	0.70
1.500	0.70	4.500	33.50	7.500	2.90	10.50	0.70
1.583	0.70	4.583	33.50	7.583	2.90	10.58	0.70
1.667	0.70	4.667	33.50	7.667	2.90	10.67	0.70
1.750	0.70	4.750	33.50	7.750	2.90	10.75	0.70
1.833	0.70	4.833	33.50	7.833	2.90	10.83	0.70
1.917	0.70	4.917	33.50	7.917	2.90	10.92	0.70
2.000	0.70	5.000	33.50	8.000	2.90	11.00	0.70
2.083	4.40	5.083	9.50	8.083	1.50	11.08	0.70
2.167	4.40	5.167	9.50	8.167	1.50	11.17	0.70
2.250	4.40	5.250	9.50	8.250	1.50	11.25	0.70
2.333	4.40	5.333	9.50	8.333	1.50	11.33	0.70
2.417	4.40	5.417	9.50	8.417	1.50	11.42	0.70
2.500	4.40	5.500	9.50	8.500	1.50	11.50	0.70
2.583	4.40	5.583	9.50	8.583	1.50	11.58	0.70
2.667	4.40	5.667	9.50	8.667	1.50	11.67	0.70
2.750	4.40	5.750	9.50	8.750	1.50	11.75	0.70
2.833	4.40	5.833	9.50	8.833	1.50	11.83	0.70
2.917	4.40	5.917	9.50	8.917	1.50	11.92	0.70
3.000	4.40	6.000	9.50	9.000	1.50	12.00	0.70

```
    Max.Eff.Inten.(mm/hr)=      33.50        27.11
                over (min)        5.00        20.00
    Storage Coeff.  (min)=       5.81 (ii)   15.31 (ii)
    Unit Hyd. Tpeak (min)=       5.00        20.00
    Unit Hyd. peak  (cms)=       0.20         0.07
                                                          *TOTALS*
    PEAK FLOW       (cms)=       0.28         0.12          0.397 (iii)
    TIME TO PEAK    (hrs)=       5.00         5.08          5.00
    RUNOFF VOLUME    (mm)=      71.80        34.18         55.36
    TOTAL RAINFALL   (mm)=      72.80        72.80         72.80
    RUNOFF COEFFICIENT   =       0.99         0.47          0.76

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN*  =  71.0    Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD  (  0010)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0003):     3.96   0.194     5.00    31.29
     + ID2= 2 (  0008):     5.39   0.397     5.00    55.36
       ================================================
       ID = 3 (  0010):     9.35   0.592     5.00    45.16

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0009)|   Area    (ha)=   1.23
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.10	0.12
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	0.50
Length	(m)=	90.39	70.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.70	3.083	12.40	6.083	5.10	9.08	0.70
0.167	0.70	3.167	12.40	6.167	5.10	9.17	0.70
0.250	0.70	3.250	12.40	6.250	5.10	9.25	0.70
0.333	0.70	3.333	12.40	6.333	5.10	9.33	0.70
0.417	0.70	3.417	12.40	6.417	5.10	9.42	0.70
0.500	0.70	3.500	12.40	6.500	5.10	9.50	0.70
0.583	0.70	3.583	12.40	6.583	5.10	9.58	0.70
0.667	0.70	3.667	12.40	6.667	5.10	9.67	0.70
0.750	0.70	3.750	12.40	6.750	5.10	9.75	0.70
0.833	0.70	3.833	12.40	6.833	5.10	9.83	0.70
0.917	0.70	3.917	12.40	6.917	5.10	9.92	0.70
1.000	0.70	4.000	12.40	7.000	5.10	10.00	0.70
1.083	0.70	4.083	33.50	7.083	2.90	10.08	0.70
1.167	0.70	4.167	33.50	7.167	2.90	10.17	0.70
1.250	0.70	4.250	33.50	7.250	2.90	10.25	0.70
1.333	0.70	4.333	33.50	7.333	2.90	10.33	0.70
1.417	0.70	4.417	33.50	7.417	2.90	10.42	0.70
1.500	0.70	4.500	33.50	7.500	2.90	10.50	0.70
1.583	0.70	4.583	33.50	7.583	2.90	10.58	0.70
1.667	0.70	4.667	33.50	7.667	2.90	10.67	0.70
1.750	0.70	4.750	33.50	7.750	2.90	10.75	0.70
1.833	0.70	4.833	33.50	7.833	2.90	10.83	0.70
1.917	0.70	4.917	33.50	7.917	2.90	10.92	0.70
2.000	0.70	5.000	33.50	8.000	2.90	11.00	0.70
2.083	4.40	5.083	9.50	8.083	1.50	11.08	0.70
2.167	4.40	5.167	9.50	8.167	1.50	11.17	0.70
2.250	4.40	5.250	9.50	8.250	1.50	11.25	0.70
2.333	4.40	5.333	9.50	8.333	1.50	11.33	0.70
2.417	4.40	5.417	9.50	8.417	1.50	11.42	0.70
2.500	4.40	5.500	9.50	8.500	1.50	11.50	0.70
2.583	4.40	5.583	9.50	8.583	1.50	11.58	0.70
2.667	4.40	5.667	9.50	8.667	1.50	11.67	0.70
2.750	4.40	5.750	9.50	8.750	1.50	11.75	0.70
2.833	4.40	5.833	9.50	8.833	1.50	11.83	0.70
2.917	4.40	5.917	9.50	8.917	1.50	11.92	0.70
3.000	4.40	6.000	9.50	9.000	1.50	12.00	0.70

Max.Eff.Inten.(mm/hr)=	33.50	16.07	
over (min)	5.00	35.00	
Storage Coeff. (min)=	3.72 (ii)	34.82 (ii)	
Unit Hyd. Tpeak (min)=	5.00	35.00	
Unit Hyd. peak (cms)=	0.25	0.03	
			TOTALS
PEAK FLOW (cms)=	0.10	0.00	0.106 (iii)
TIME TO PEAK (hrs)=	4.83	5.25	5.00
RUNOFF VOLUME (mm)=	71.80	29.04	67.51
TOTAL RAINFALL (mm)=	72.80	72.80	72.80
RUNOFF COEFFICIENT =	0.99	0.40	0.93

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0011) / 1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0010):	9.35	0.592	5.00	45.16
+ ID2= 2 (0009):	1.23	0.106	5.00	67.51
ID = 3 (0011):	10.57	0.698	5.00	47.75

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0012) / IN= 2---> OUT= 1 / DT= 5.0 min	OVERFLOW IS OFF			
	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0660	0.4138
	0.0068	0.1487	0.0771	0.4560
	0.0250	0.2263	0.0877	0.5115
	0.0370	0.2980	1.5650	0.6396
	0.0430	0.3493	0.0000	0.0000

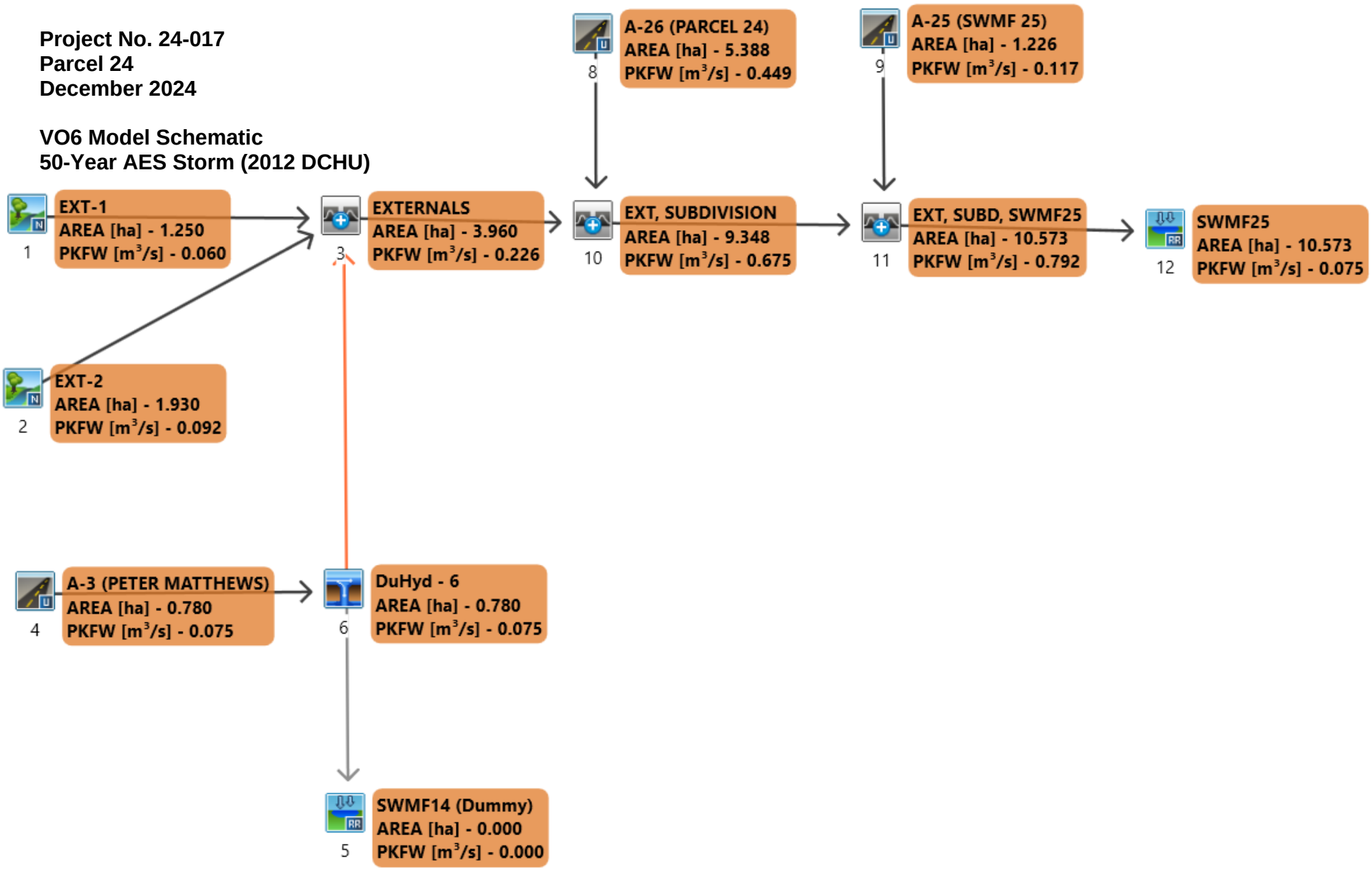
	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0011)	10.573	0.698	5.00	47.75
OUTFLOW: ID= 1 (0012)	10.573	0.063	8.00	46.06

PEAK FLOW REDUCTION [Qout/Qin](%)= 9.03
TIME SHIFT OF PEAK FLOW (min)=180.00
MAXIMUM STORAGE USED (ha.m.)= 0.4054

SMD
CONSULTANTS INC.

Project No. 24-017
Parcel 24
December 2024

VO6 Model Schematic
50-Year AES Storm (2012 DCHU)



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

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2017)
       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
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.

                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: M:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\danie\AppData\Local\Civica\VH5\939bc6dd-92de-4fe3-9512-437733e37904\3f9853
13-7bd0-491c-9634-0cc7e2bebc51\scenar
  Summary filename:
C:\Users\danie\AppData\Local\Civica\VH5\939bc6dd-92de-4fe3-9512-437733e37904\3f9853
13-7bd0-491c-9634-0cc7e2bebc51\scenar


DATE: 12-03-2024                          TIME: 11:47:08

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------
  ***********************************************
  ** SIMULATION : E - 50 Year AES Storm         **
  ***********************************************


--------------------
|    READ STORM    |    Filename: C:\Users\danie\AppD
|                  |              ata\Local\Temp\
|                  |              42e1b15d-69e0-49b9-ba0f-8ea5ccefdb00\caee032c
| Ptotal= 80.10 mm |    Comments: 50 Year AES Storm
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.80	3.00	13.60	6.00	5.60	9.00	0.80
0.25	0.80	3.25	13.60	6.25	5.60	9.25	0.80
0.50	0.80	3.50	13.60	6.50	5.60	9.50	0.80
0.75	0.80	3.75	13.60	6.75	5.60	9.75	0.80
1.00	0.80	4.00	36.90	7.00	3.20	10.00	0.80
1.25	0.80	4.25	36.90	7.25	3.20	10.25	0.80
1.50	0.80	4.50	36.90	7.50	3.20	10.50	0.80
1.75	0.80	4.75	36.90	7.75	3.20	10.75	0.80
2.00	4.80	5.00	10.40	8.00	1.60	11.00	0.80
2.25	4.80	5.25	10.40	8.25	1.60	11.25	0.80
2.50	4.80	5.50	10.40	8.50	1.60	11.50	0.80
2.75	4.80	5.75	10.40	8.75	1.60	11.75	0.80

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

--------------------
| CALIB            |
| STANDHYD (  0004)|   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  87.00   Dir. Conn.(%)=  87.00
--------------------
```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.68	0.10
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	72.11	40.00
Mannings n	=	0.013	0.250

```
    NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.80	3.083	13.60	6.083	5.60	9.08	0.80
0.167	0.80	3.167	13.60	6.167	5.60	9.17	0.80
0.250	0.80	3.250	13.60	6.250	5.60	9.25	0.80
0.333	0.80	3.333	13.60	6.333	5.60	9.33	0.80
0.417	0.80	3.417	13.60	6.417	5.60	9.42	0.80
0.500	0.80	3.500	13.60	6.500	5.60	9.50	0.80
0.583	0.80	3.583	13.60	6.583	5.60	9.58	0.80
0.667	0.80	3.667	13.60	6.667	5.60	9.67	0.80
0.750	0.80	3.750	13.60	6.750	5.60	9.75	0.80
0.833	0.80	3.833	13.60	6.833	5.60	9.83	0.80
0.917	0.80	3.917	13.60	6.917	5.60	9.92	0.80
1.000	0.80	4.000	13.60	7.000	5.60	10.00	0.80
1.083	0.80	4.083	36.90	7.083	3.20	10.08	0.80
1.167	0.80	4.167	36.90	7.167	3.20	10.17	0.80
1.250	0.80	4.250	36.90	7.250	3.20	10.25	0.80
1.333	0.80	4.333	36.90	7.333	3.20	10.33	0.80

1.417	0.80	4.417	36.90	7.417	3.20	10.42	0.80
1.500	0.80	4.500	36.90	7.500	3.20	10.50	0.80
1.583	0.80	4.583	36.90	7.583	3.20	10.58	0.80
1.667	0.80	4.667	36.90	7.667	3.20	10.67	0.80
1.750	0.80	4.750	36.90	7.750	3.20	10.75	0.80
1.833	0.80	4.833	36.90	7.833	3.20	10.83	0.80
1.917	0.80	4.917	36.90	7.917	3.20	10.92	0.80
2.000	0.80	5.000	36.90	8.000	3.20	11.00	0.80
2.083	4.80	5.083	10.40	8.083	1.60	11.08	0.80
2.167	4.80	5.167	10.40	8.167	1.60	11.17	0.80
2.250	4.80	5.250	10.40	8.250	1.60	11.25	0.80
2.333	4.80	5.333	10.40	8.333	1.60	11.33	0.80
2.417	4.80	5.417	10.40	8.417	1.60	11.42	0.80
2.500	4.80	5.500	10.40	8.500	1.60	11.50	0.80
2.583	4.80	5.583	10.40	8.583	1.60	11.58	0.80
2.667	4.80	5.667	10.40	8.667	1.60	11.67	0.80
2.750	4.80	5.750	10.40	8.750	1.60	11.75	0.80
2.833	4.80	5.833	10.40	8.833	1.60	11.83	0.80
2.917	4.80	5.917	10.40	8.917	1.60	11.92	0.80
3.000	4.80	6.000	10.40	9.000	1.60	12.00	0.80

Max.Eff.Inten.(mm/hr)=	36.90	19.04	
over (min)	5.00	10.00	
Storage Coeff. (min)=	3.13 (ii)	8.04 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.27	0.13	
			TOTALS
PEAK FLOW (cms)=	0.07	0.01	0.075 (iii)
TIME TO PEAK (hrs)=	4.83	5.00	5.00
RUNOFF VOLUME (mm)=	79.10	31.18	72.87
TOTAL RAINFALL (mm)=	80.10	80.10	80.10
RUNOFF COEFFICIENT =	0.99	0.39	0.91

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

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

DUHYD (0006)				
Inlet Cap.= 0.180				
#of Inlets= 1				
Total(cms)= 0.2	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
TOTAL HYD.(ID= 1):	0.78	0.07	5.00	72.87
MAJOR SYS.(ID= 2):	0.00	0.00	0.00	0.00
MINOR SYS.(ID= 3):	0.78	0.07	5.00	72.87

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0005)	OVERFLOW IS OFF			
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	1.5300	0.0100
	0.5000	0.0050	1.5400	3.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0006)	0.000	0.000	0.00	0.00
OUTFLOW: ID= 1 (0005)	0.000	0.000	0.00	NaN

PEAK FLOW REDUCTION [Qout/Qin](%)= NaN
TIME SHIFT OF PEAK FLOW (min)= 0.00
MAXIMUM STORAGE USED (ha.m.)= 0.0000
MAXIMUM STORAGE USED (cu.m.)= 0.000000

**** WARNING : HYDROGRAPH PEAK WAS NOT REDUCED.
CHECK OUTFLOW/STORAGE TABLE OR REDUCE DT.

CALIB					
NASHYD (0001)	Area (ha)=	1.25	Curve Number (CN)=	70.0	
ID= 1 DT= 5.0 min	Ia (mm)=	10.00	# of Linear Res.(N)=	3.00	
	U.H. Tp(hrs)=	0.13			

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.80	3.083	13.60	6.083	5.60	9.08	0.80
0.167	0.80	3.167	13.60	6.167	5.60	9.17	0.80
0.250	0.80	3.250	13.60	6.250	5.60	9.25	0.80
0.333	0.80	3.333	13.60	6.333	5.60	9.33	0.80
0.417	0.80	3.417	13.60	6.417	5.60	9.42	0.80
0.500	0.80	3.500	13.60	6.500	5.60	9.50	0.80
0.583	0.80	3.583	13.60	6.583	5.60	9.58	0.80
0.667	0.80	3.667	13.60	6.667	5.60	9.67	0.80
0.750	0.80	3.750	13.60	6.750	5.60	9.75	0.80
0.833	0.80	3.833	13.60	6.833	5.60	9.83	0.80
0.917	0.80	3.917	13.60	6.917	5.60	9.92	0.80
1.000	0.80	4.000	13.60	7.000	5.60	10.00	0.80
1.083	0.80	4.083	36.90	7.083	3.20	10.08	0.80
1.167	0.80	4.167	36.90	7.167	3.20	10.17	0.80
1.250	0.80	4.250	36.90	7.250	3.20	10.25	0.80

1.333	0.80	4.333	36.90	7.333	3.20	10.33	0.80
1.417	0.80	4.417	36.90	7.417	3.20	10.42	0.80
1.500	0.80	4.500	36.90	7.500	3.20	10.50	0.80
1.583	0.80	4.583	36.90	7.583	3.20	10.58	0.80
1.667	0.80	4.667	36.90	7.667	3.20	10.67	0.80
1.750	0.80	4.750	36.90	7.750	3.20	10.75	0.80
1.833	0.80	4.833	36.90	7.833	3.20	10.83	0.80
1.917	0.80	4.917	36.90	7.917	3.20	10.92	0.80
2.000	0.80	5.000	36.90	8.000	3.20	11.00	0.80
2.083	4.80	5.083	10.40	8.083	1.60	11.08	0.80
2.167	4.80	5.167	10.40	8.167	1.60	11.17	0.80
2.250	4.80	5.250	10.40	8.250	1.60	11.25	0.80
2.333	4.80	5.333	10.40	8.333	1.60	11.33	0.80
2.417	4.80	5.417	10.40	8.417	1.60	11.42	0.80
2.500	4.80	5.500	10.40	8.500	1.60	11.50	0.80
2.583	4.80	5.583	10.40	8.583	1.60	11.58	0.80
2.667	4.80	5.667	10.40	8.667	1.60	11.67	0.80
2.750	4.80	5.750	10.40	8.750	1.60	11.75	0.80
2.833	4.80	5.833	10.40	8.833	1.60	11.83	0.80
2.917	4.80	5.917	10.40	8.917	1.60	11.92	0.80
3.000	4.80	6.000	10.40	9.000	1.60	12.00	0.80

Unit Hyd Qpeak (cms)= 0.362

PEAK FLOW (cms)= 0.060 (i)
TIME TO PEAK (hrs)= 5.000
RUNOFF VOLUME (mm)= 27.202
TOTAL RAINFALL (mm)= 80.100
RUNOFF COEFFICIENT = 0.340

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

CALIB			
NASHYD (0002)	Area (ha)= 1.93	Curve Number (CN)= 70.0	
ID= 1 DT= 5.0 min	Ia (mm)= 10.00	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= 0.15		

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.80	3.083	13.60	6.083	5.60	9.08	0.80
0.167	0.80	3.167	13.60	6.167	5.60	9.17	0.80
0.250	0.80	3.250	13.60	6.250	5.60	9.25	0.80
0.333	0.80	3.333	13.60	6.333	5.60	9.33	0.80
0.417	0.80	3.417	13.60	6.417	5.60	9.42	0.80
0.500	0.80	3.500	13.60	6.500	5.60	9.50	0.80
0.583	0.80	3.583	13.60	6.583	5.60	9.58	0.80
0.667	0.80	3.667	13.60	6.667	5.60	9.67	0.80
0.750	0.80	3.750	13.60	6.750	5.60	9.75	0.80
0.833	0.80	3.833	13.60	6.833	5.60	9.83	0.80
0.917	0.80	3.917	13.60	6.917	5.60	9.92	0.80
1.000	0.80	4.000	13.60	7.000	5.60	10.00	0.80
1.083	0.80	4.083	36.90	7.083	3.20	10.08	0.80
1.167	0.80	4.167	36.90	7.167	3.20	10.17	0.80
1.250	0.80	4.250	36.90	7.250	3.20	10.25	0.80
1.333	0.80	4.333	36.90	7.333	3.20	10.33	0.80
1.417	0.80	4.417	36.90	7.417	3.20	10.42	0.80
1.500	0.80	4.500	36.90	7.500	3.20	10.50	0.80
1.583	0.80	4.583	36.90	7.583	3.20	10.58	0.80
1.667	0.80	4.667	36.90	7.667	3.20	10.67	0.80
1.750	0.80	4.750	36.90	7.750	3.20	10.75	0.80
1.833	0.80	4.833	36.90	7.833	3.20	10.83	0.80
1.917	0.80	4.917	36.90	7.917	3.20	10.92	0.80
2.000	0.80	5.000	36.90	8.000	3.20	11.00	0.80
2.083	4.80	5.083	10.40	8.083	1.60	11.08	0.80
2.167	4.80	5.167	10.40	8.167	1.60	11.17	0.80
2.250	4.80	5.250	10.40	8.250	1.60	11.25	0.80
2.333	4.80	5.333	10.40	8.333	1.60	11.33	0.80
2.417	4.80	5.417	10.40	8.417	1.60	11.42	0.80
2.500	4.80	5.500	10.40	8.500	1.60	11.50	0.80
2.583	4.80	5.583	10.40	8.583	1.60	11.58	0.80
2.667	4.80	5.667	10.40	8.667	1.60	11.67	0.80
2.750	4.80	5.750	10.40	8.750	1.60	11.75	0.80
2.833	4.80	5.833	10.40	8.833	1.60	11.83	0.80
2.917	4.80	5.917	10.40	8.917	1.60	11.92	0.80
3.000	4.80	6.000	10.40	9.000	1.60	12.00	0.80

Unit Hyd Qpeak (cms)= 0.505

PEAK FLOW (cms)= 0.092 (i)
TIME TO PEAK (hrs)= 5.000
RUNOFF VOLUME (mm)= 27.283
TOTAL RAINFALL (mm)= 80.100
RUNOFF COEFFICIENT = 0.341

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

ADD HYD (0003)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0001):	1.25	0.060	5.00	27.20
+ ID2= 2 (0002):	1.93	0.092	5.00	27.28
ID = 3 (0003):	3.18	0.151	5.00	27.25

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD  (  0003)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0003):     3.18   0.151     5.00    27.25
     + ID2= 2 (  0006):     0.78   0.075     5.00    72.87
       ================================================
       ID = 1 (  0003):     3.96   0.226     5.00    36.24

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0008)|   Area    (ha)=   5.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.90   Dir. Conn.(%)=  56.30
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.60         1.78
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     189.52        27.50
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.80	3.083	13.60	6.083	5.60	9.08	0.80
0.167	0.80	3.167	13.60	6.167	5.60	9.17	0.80
0.250	0.80	3.250	13.60	6.250	5.60	9.25	0.80
0.333	0.80	3.333	13.60	6.333	5.60	9.33	0.80
0.417	0.80	3.417	13.60	6.417	5.60	9.42	0.80
0.500	0.80	3.500	13.60	6.500	5.60	9.50	0.80
0.583	0.80	3.583	13.60	6.583	5.60	9.58	0.80
0.667	0.80	3.667	13.60	6.667	5.60	9.67	0.80
0.750	0.80	3.750	13.60	6.750	5.60	9.75	0.80
0.833	0.80	3.833	13.60	6.833	5.60	9.83	0.80
0.917	0.80	3.917	13.60	6.917	5.60	9.92	0.80
1.000	0.80	4.000	13.60	7.000	5.60	10.00	0.80
1.083	0.80	4.083	36.90	7.083	3.20	10.08	0.80
1.167	0.80	4.167	36.90	7.167	3.20	10.17	0.80
1.250	0.80	4.250	36.90	7.250	3.20	10.25	0.80
1.333	0.80	4.333	36.90	7.333	3.20	10.33	0.80
1.417	0.80	4.417	36.90	7.417	3.20	10.42	0.80
1.500	0.80	4.500	36.90	7.500	3.20	10.50	0.80
1.583	0.80	4.583	36.90	7.583	3.20	10.58	0.80
1.667	0.80	4.667	36.90	7.667	3.20	10.67	0.80
1.750	0.80	4.750	36.90	7.750	3.20	10.75	0.80
1.833	0.80	4.833	36.90	7.833	3.20	10.83	0.80
1.917	0.80	4.917	36.90	7.917	3.20	10.92	0.80
2.000	0.80	5.000	36.90	8.000	3.20	11.00	0.80
2.083	4.80	5.083	10.40	8.083	1.60	11.08	0.80
2.167	4.80	5.167	10.40	8.167	1.60	11.17	0.80
2.250	4.80	5.250	10.40	8.250	1.60	11.25	0.80
2.333	4.80	5.333	10.40	8.333	1.60	11.33	0.80
2.417	4.80	5.417	10.40	8.417	1.60	11.42	0.80
2.500	4.80	5.500	10.40	8.500	1.60	11.50	0.80
2.583	4.80	5.583	10.40	8.583	1.60	11.58	0.80
2.667	4.80	5.667	10.40	8.667	1.60	11.67	0.80
2.750	4.80	5.750	10.40	8.750	1.60	11.75	0.80
2.833	4.80	5.833	10.40	8.833	1.60	11.83	0.80
2.917	4.80	5.917	10.40	8.917	1.60	11.92	0.80
3.000	4.80	6.000	10.40	9.000	1.60	12.00	0.80

```
     Max.Eff.Inten.(mm/hr)=      36.90        31.25
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       5.59 (ii)   14.56 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.20         0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.31         0.14          0.449 (iii)
     TIME TO PEAK    (hrs)=       5.00         5.00           5.00
     RUNOFF VOLUME    (mm)=      79.10        39.58          61.83
     TOTAL RAINFALL   (mm)=      80.10        80.10          80.10
     RUNOFF COEFFICIENT   =       0.99         0.49           0.77

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD  (  0010)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0003):     3.96   0.226     5.00    36.24
     + ID2= 2 (  0008):     5.39   0.449     5.00    61.83
       ================================================
       ID = 3 (  0010):     9.35   0.675     5.00    50.99

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0009)|   Area    (ha)=   1.23
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
```

```
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.10         0.12
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      90.39        70.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

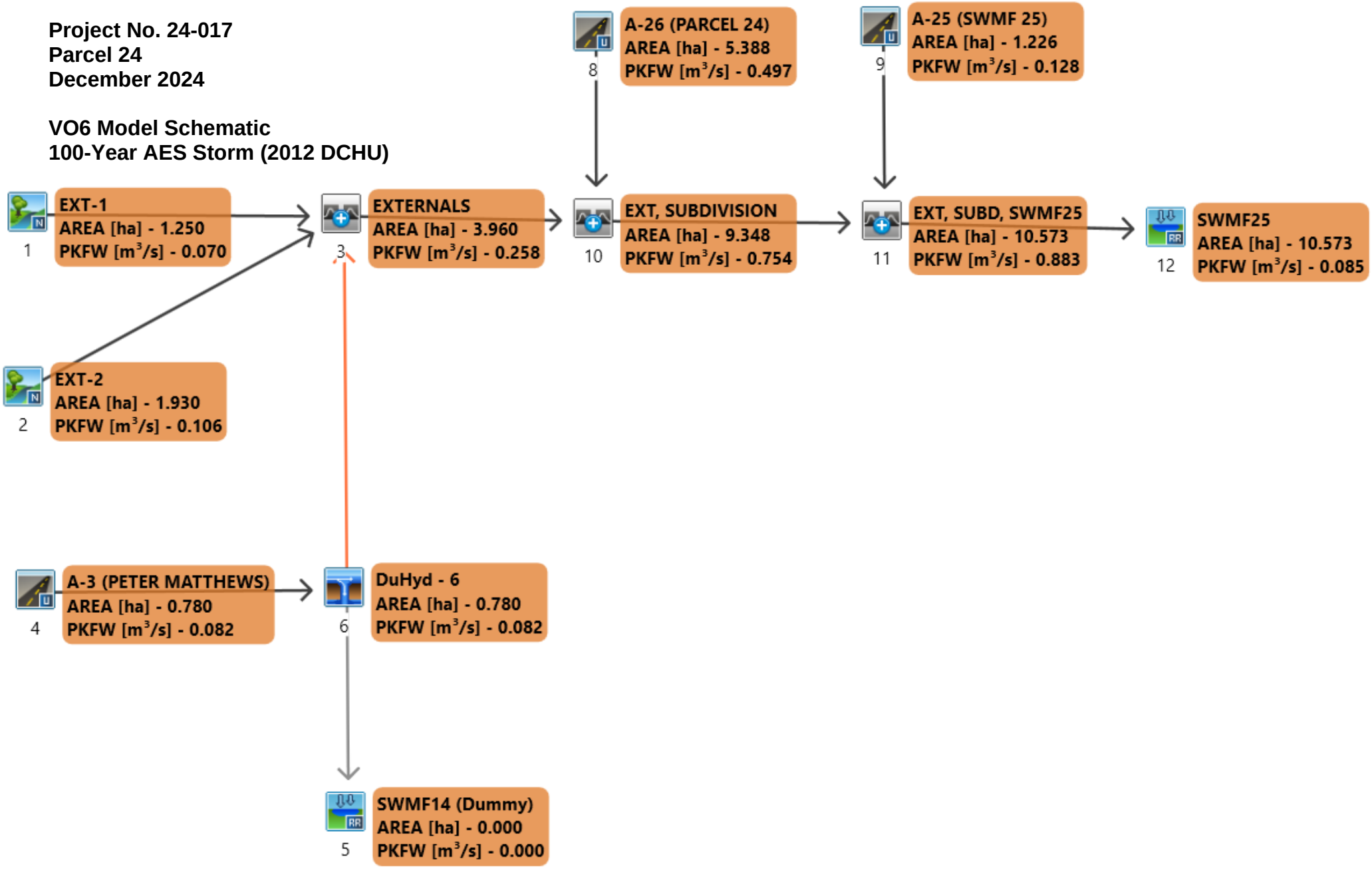
TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.80	3.083	13.60	6.083	5.60	9.08	0.80
0.167	0.80	3.167	13.60	6.167	5.60	9.17	0.80
0.250	0.80	3.250	13.60	6.250	5.60	9.25	0.80
0.333	0.80	3.333	13.60	6.333	5.60	9.33	0.80
0.417	0.80	3.417	13.60	6.417	5.60	9.42	0.80
0.500	0.80	3.500	13.60	6.500	5.60	9.50	0.80
0.583	0.80	3.583	13.60	6.583	5.60	9.58	0.80
0.667	0.80	3.667	13.60	6.667	5.60	9.67	0.80
0.750	0.80	3.750	13.60	6.750	5.60	9.75	0.80
0.833	0.80	3.833	13.60	6.833	5.60	9.83	0.80
0.917	0.80	3.917	13.60	6.917	5.60	9.92	0.80
1.000	0.80	4.000	13.60	7.000	5.60	10.00	0.80
1.083	0.80	4.083	36.90	7.083	3.20	10.08	0.80
1.167	0.80	4.167	36.90	7.167	3.20	10.17	0.80
1.250	0.80	4.250	36.90	7.250	3.20	10.25	0.80
1.333	0.80	4.333	36.90	7.333	3.20	10.33	0.80
1.417	0.80	4.417	36.90	7.417	3.20	10.42	0.80
1.500	0.80	4.500	36.90	7.500	3.20	10.50	0.80
1.583	0.80	4.583	36.90	7.583	3.20	10.58	0.80
1.667	0.80	4.667	36.90	7.667	3.20	10.67	0.80
1.750	0.80	4.750	36.90	7.750	3.20	10.75	0.80
1.833	0.80	4.833	36.90	7.833	3.20	10.83	0.80
1.917	0.80	4.917	36.90	7.917	3.20	10.92	0.80
2.000	0.80	5.000	36.90	8.000	3.20	11.00	0.80
2.083	4.80	5.083	10.40	8.083	1.60	11.08	0.80
2.167	4.80	5.167	10.40	8.167	1.60	11.17	0.80
2.250	4.80	5.250	10.40	8.250	1.60	11.25	0.80
2.333	4.80	5.333	10.40	8.333	1.60	11.33	0.80
2.417	4.80	5.417	10.40	8.417	1.60	11.42	0.80
2.500	4.80	5.500	10.40	8.500	1.60	11.50	0.80
2.583	4.80	5.583	10.40	8.583	1.60	11.58	0.80
2.667	4.80	5.667	10.40	8.667	1.60	11.67	0.80
2.750	4.80	5.750	10.40	8.750	1.60	11.75	0.80
2.833	4.80	5.833	10.40	8.833	1.60	11.83	0.80
2.917	4.80	5.917	10.40	8.917	1.60	11.92	0.80
3.000	4.80	6.000	10.40	9.000	1.60	12.00	0.80

```
     Max.Eff.Inten.(mm/hr)=      36.90        19.16
                     over (min)        5.00        35.00
          Storage Coeff.  (min)=       3.58 (ii)   32.56 (ii)
          Unit Hyd. Tpeak (min)=       5.00        35.00
          Unit Hyd. peak  (cms)=       0.26         0.03
                                                          *TOTALS*
          PEAK FLOW       (cms)=       0.11         0.00          0.117 (iii)
          TIME TO PEAK    (hrs)=       4.83         5.25          5.00
          RUNOFF VOLUME    (mm)=      79.10        33.88         74.56
          TOTAL RAINFALL   (mm)=      80.10        80.10         80.10
          RUNOFF COEFFICIENT   =       0.99         0.42          0.93

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

           (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
                CN*  =  71.0    Ia = Dep. Storage  (Above)
          (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
               THAN THE STORAGE COEFFICIENT.
         (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

     --------------------
     | ADD HYD  (  0011)|
     |   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
     --------------------          (ha)    (cms)    (hrs)     (mm)
            ID1= 1 (  0010):     9.35   0.675     5.00    50.99
          + ID2= 2 (  0009):     1.23   0.117     5.00    74.56
            ================================================
            ID = 3 (  0011):    10.57   0.792     5.00    53.72

         NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
     --------------------------------------------------------------------------------
     --------------------
     | RESERVOIR(  0012)|     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   |    0.0660      0.4138
                               0.0068      0.1487   |    0.0771      0.4560
                               0.0250      0.2263   |    0.0877      0.5115
                               0.0370      0.2980   |    1.5650      0.6396
                               0.0430      0.3493   |    0.0000      0.0000

                                    AREA     QPEAK     TPEAK       R.V.
                                    (ha)     (cms)     (hrs)       (mm)
        INFLOW : ID= 2 (  0011)     10.573      0.792      5.00      53.72
        OUTFLOW: ID= 1 (  0012)     10.573      0.075      8.00      51.98

                       PEAK   FLOW   REDUCTION [Qout/Qin](%)=  9.49
                       TIME SHIFT OF PEAK FLOW         (min)=180.00
                       MAXIMUM  STORAGE   USED       (ha.m.)=  0.4489
```

SMD
CONSULTANTS INC.

Project No. 24-017
Parcel 24
December 2024

VO6 Model Schematic
100-Year AES Storm (2012 DCHU)



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

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2017)
       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
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.

                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: M:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\danie\AppData\Local\Civica\VH5\939bc6dd-92de-4fe3-9512-437733e37904\d5e9c0
b3-49e6-41bb-8060-24b0cccf937c\scenar
  Summary filename:
C:\Users\danie\AppData\Local\Civica\VH5\939bc6dd-92de-4fe3-9512-437733e37904\d5e9c0
b3-49e6-41bb-8060-24b0cccf937c\scenar


DATE: 12-03-2024                          TIME: 11:47:09

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------
  ***********************************************
  ** SIMULATION : F - 100 Year AES Storm        **
  ***********************************************


--------------------
|    READ STORM    |    Filename: C:\Users\danie\AppD
|                  |              ata\Local\Temp\
|                  |              42e1b15d-69e0-49b9-ba0f-8ea5ccefdb00\f00d8033
| Ptotal= 87.50 mm |    Comments: 100 Year AES Storm
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.00    0.90 |  3.00   14.90 |  6.00    6.10 |  9.00    0.90
                0.25    0.90 |  3.25   14.90 |  6.25    6.10 |  9.25    0.90
                0.50    0.90 |  3.50   14.90 |  6.50    6.10 |  9.50    0.90
                0.75    0.90 |  3.75   14.90 |  6.75    6.10 |  9.75    0.90
                1.00    0.90 |  4.00   40.20 |  7.00    3.50 | 10.00    0.90
                1.25    0.90 |  4.25   40.20 |  7.25    3.50 | 10.25    0.90
                1.50    0.90 |  4.50   40.20 |  7.50    3.50 | 10.50    0.90
                1.75    0.90 |  4.75   40.20 |  7.75    3.50 | 10.75    0.90
                2.00    5.20 |  5.00   11.40 |  8.00    1.70 | 11.00    0.90
                2.25    5.20 |  5.25   11.40 |  8.25    1.70 | 11.25    0.90
                2.50    5.20 |  5.50   11.40 |  8.50    1.70 | 11.50    0.90
                2.75    5.20 |  5.75   11.40 |  8.75    1.70 | 11.75    0.90

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

--------------------
| CALIB            |
| STANDHYD (  0004)|   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  87.00   Dir. Conn.(%)=  87.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.68         0.10
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      72.11        40.00
     Mannings n           =      0.013        0.250

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    0.90 | 3.083   14.90 | 6.083    6.10 |  9.08    0.90
               0.167    0.90 | 3.167   14.90 | 6.167    6.10 |  9.17    0.90
               0.250    0.90 | 3.250   14.90 | 6.250    6.10 |  9.25    0.90
               0.333    0.90 | 3.333   14.90 | 6.333    6.10 |  9.33    0.90
               0.417    0.90 | 3.417   14.90 | 6.417    6.10 |  9.42    0.90
               0.500    0.90 | 3.500   14.90 | 6.500    6.10 |  9.50    0.90
               0.583    0.90 | 3.583   14.90 | 6.583    6.10 |  9.58    0.90
               0.667    0.90 | 3.667   14.90 | 6.667    6.10 |  9.67    0.90
               0.750    0.90 | 3.750   14.90 | 6.750    6.10 |  9.75    0.90
               0.833    0.90 | 3.833   14.90 | 6.833    6.10 |  9.83    0.90
               0.917    0.90 | 3.917   14.90 | 6.917    6.10 |  9.92    0.90
               1.000    0.90 | 4.000   14.90 | 7.000    6.10 | 10.00    0.90
               1.083    0.90 | 4.083   40.20 | 7.083    3.50 | 10.08    0.90
               1.167    0.90 | 4.167   40.20 | 7.167    3.50 | 10.17    0.90
               1.250    0.90 | 4.250   40.20 | 7.250    3.50 | 10.25    0.90
               1.333    0.90 | 4.333   40.20 | 7.333    3.50 | 10.33    0.90
```

1.417	0.90	4.417	40.20	7.417	3.50	10.42	0.90
1.500	0.90	4.500	40.20	7.500	3.50	10.50	0.90
1.583	0.90	4.583	40.20	7.583	3.50	10.58	0.90
1.667	0.90	4.667	40.20	7.667	3.50	10.67	0.90
1.750	0.90	4.750	40.20	7.750	3.50	10.75	0.90
1.833	0.90	4.833	40.20	7.833	3.50	10.83	0.90
1.917	0.90	4.917	40.20	7.917	3.50	10.92	0.90
2.000	0.90	5.000	40.20	8.000	3.50	11.00	0.90
2.083	5.20	5.083	11.40	8.083	1.70	11.08	0.90
2.167	5.20	5.167	11.40	8.167	1.70	11.17	0.90
2.250	5.20	5.250	11.40	8.250	1.70	11.25	0.90
2.333	5.20	5.333	11.40	8.333	1.70	11.33	0.90
2.417	5.20	5.417	11.40	8.417	1.70	11.42	0.90
2.500	5.20	5.500	11.40	8.500	1.70	11.50	0.90
2.583	5.20	5.583	11.40	8.583	1.70	11.58	0.90
2.667	5.20	5.667	11.40	8.667	1.70	11.67	0.90
2.750	5.20	5.750	11.40	8.750	1.70	11.75	0.90
2.833	5.20	5.833	11.40	8.833	1.70	11.83	0.90
2.917	5.20	5.917	11.40	8.917	1.70	11.92	0.90
3.000	5.20	6.000	11.40	9.000	1.70	12.00	0.90

Max.Eff.Inten.(mm/hr)=	40.20	21.81	
over (min)	5.00	10.00	
Storage Coeff. (min)=	3.02 (ii)	7.77 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.27	0.13	
			TOTALS
PEAK FLOW (cms)=	0.08	0.01	0.082 (iii)
TIME TO PEAK (hrs)=	4.83	5.00	5.00
RUNOFF VOLUME (mm)=	86.50	35.99	79.93
TOTAL RAINFALL (mm)=	87.50	87.50	87.50
RUNOFF COEFFICIENT =	0.99	0.41	0.91

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

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

DUHYD (0006)				
Inlet Cap.= 0.180				
#of Inlets= 1				
Total(cms)= 0.2	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
TOTAL HYD.(ID= 1):	0.78	0.08	5.00	79.93
MAJOR SYS.(ID= 2):	0.00	0.00	0.00	0.00
MINOR SYS.(ID= 3):	0.78	0.08	5.00	79.93

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0005)	OVERFLOW IS OFF			
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	1.5300	0.0100
	0.5000	0.0050	1.5400	3.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0006)	0.000	0.000	0.00	0.00
OUTFLOW: ID= 1 (0005)	0.000	0.000	0.00	NaN

PEAK FLOW REDUCTION [Qout/Qin](%)= NaN
TIME SHIFT OF PEAK FLOW (min)= 0.00
MAXIMUM STORAGE USED (ha.m.)= 0.0000
MAXIMUM STORAGE USED (cu.m.)= 0.000000

**** WARNING : HYDROGRAPH PEAK WAS NOT REDUCED.
CHECK OUTFLOW/STORAGE TABLE OR REDUCE DT.

CALIB					
NASHYD (0001)	Area (ha)=	1.25	Curve Number (CN)=	70.0	
ID= 1 DT= 5.0 min	Ia (mm)=	10.00	# of Linear Res.(N)=	3.00	
	U.H. Tp(hrs)=	0.13			

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.90	3.083	14.90	6.083	6.10	9.08	0.90
0.167	0.90	3.167	14.90	6.167	6.10	9.17	0.90
0.250	0.90	3.250	14.90	6.250	6.10	9.25	0.90
0.333	0.90	3.333	14.90	6.333	6.10	9.33	0.90
0.417	0.90	3.417	14.90	6.417	6.10	9.42	0.90
0.500	0.90	3.500	14.90	6.500	6.10	9.50	0.90
0.583	0.90	3.583	14.90	6.583	6.10	9.58	0.90
0.667	0.90	3.667	14.90	6.667	6.10	9.67	0.90
0.750	0.90	3.750	14.90	6.750	6.10	9.75	0.90
0.833	0.90	3.833	14.90	6.833	6.10	9.83	0.90
0.917	0.90	3.917	14.90	6.917	6.10	9.92	0.90
1.000	0.90	4.000	14.90	7.000	6.10	10.00	0.90
1.083	0.90	4.083	40.20	7.083	3.50	10.08	0.90
1.167	0.90	4.167	40.20	7.167	3.50	10.17	0.90
1.250	0.90	4.250	40.20	7.250	3.50	10.25	0.90

1.333	0.90	4.333	40.20	7.333	3.50	10.33	0.90
1.417	0.90	4.417	40.20	7.417	3.50	10.42	0.90
1.500	0.90	4.500	40.20	7.500	3.50	10.50	0.90
1.583	0.90	4.583	40.20	7.583	3.50	10.58	0.90
1.667	0.90	4.667	40.20	7.667	3.50	10.67	0.90
1.750	0.90	4.750	40.20	7.750	3.50	10.75	0.90
1.833	0.90	4.833	40.20	7.833	3.50	10.83	0.90
1.917	0.90	4.917	40.20	7.917	3.50	10.92	0.90
2.000	0.90	5.000	40.20	8.000	3.50	11.00	0.90
2.083	5.20	5.083	11.40	8.083	1.70	11.08	0.90
2.167	5.20	5.167	11.40	8.167	1.70	11.17	0.90
2.250	5.20	5.250	11.40	8.250	1.70	11.25	0.90
2.333	5.20	5.333	11.40	8.333	1.70	11.33	0.90
2.417	5.20	5.417	11.40	8.417	1.70	11.42	0.90
2.500	5.20	5.500	11.40	8.500	1.70	11.50	0.90
2.583	5.20	5.583	11.40	8.583	1.70	11.58	0.90
2.667	5.20	5.667	11.40	8.667	1.70	11.67	0.90
2.750	5.20	5.750	11.40	8.750	1.70	11.75	0.90
2.833	5.20	5.833	11.40	8.833	1.70	11.83	0.90
2.917	5.20	5.917	11.40	8.917	1.70	11.92	0.90
3.000	5.20	6.000	11.40	9.000	1.70	12.00	0.90

Unit Hyd Qpeak (cms)= 0.362

PEAK FLOW (cms)= 0.070 (i)
TIME TO PEAK (hrs)= 5.000
RUNOFF VOLUME (mm)= 31.928
TOTAL RAINFALL (mm)= 87.500
RUNOFF COEFFICIENT = 0.365

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

CALIB			
NASHYD (0002)	Area (ha)= 1.93	Curve Number (CN)= 70.0	
ID= 1 DT= 5.0 min	Ia (mm)= 10.00	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= 0.15		

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.90	3.083	14.90	6.083	6.10	9.08	0.90
0.167	0.90	3.167	14.90	6.167	6.10	9.17	0.90
0.250	0.90	3.250	14.90	6.250	6.10	9.25	0.90
0.333	0.90	3.333	14.90	6.333	6.10	9.33	0.90
0.417	0.90	3.417	14.90	6.417	6.10	9.42	0.90
0.500	0.90	3.500	14.90	6.500	6.10	9.50	0.90
0.583	0.90	3.583	14.90	6.583	6.10	9.58	0.90
0.667	0.90	3.667	14.90	6.667	6.10	9.67	0.90
0.750	0.90	3.750	14.90	6.750	6.10	9.75	0.90
0.833	0.90	3.833	14.90	6.833	6.10	9.83	0.90
0.917	0.90	3.917	14.90	6.917	6.10	9.92	0.90
1.000	0.90	4.000	14.90	7.000	6.10	10.00	0.90
1.083	0.90	4.083	40.20	7.083	3.50	10.08	0.90
1.167	0.90	4.167	40.20	7.167	3.50	10.17	0.90
1.250	0.90	4.250	40.20	7.250	3.50	10.25	0.90
1.333	0.90	4.333	40.20	7.333	3.50	10.33	0.90
1.417	0.90	4.417	40.20	7.417	3.50	10.42	0.90
1.500	0.90	4.500	40.20	7.500	3.50	10.50	0.90
1.583	0.90	4.583	40.20	7.583	3.50	10.58	0.90
1.667	0.90	4.667	40.20	7.667	3.50	10.67	0.90
1.750	0.90	4.750	40.20	7.750	3.50	10.75	0.90
1.833	0.90	4.833	40.20	7.833	3.50	10.83	0.90
1.917	0.90	4.917	40.20	7.917	3.50	10.92	0.90
2.000	0.90	5.000	40.20	8.000	3.50	11.00	0.90
2.083	5.20	5.083	11.40	8.083	1.70	11.08	0.90
2.167	5.20	5.167	11.40	8.167	1.70	11.17	0.90
2.250	5.20	5.250	11.40	8.250	1.70	11.25	0.90
2.333	5.20	5.333	11.40	8.333	1.70	11.33	0.90
2.417	5.20	5.417	11.40	8.417	1.70	11.42	0.90
2.500	5.20	5.500	11.40	8.500	1.70	11.50	0.90
2.583	5.20	5.583	11.40	8.583	1.70	11.58	0.90
2.667	5.20	5.667	11.40	8.667	1.70	11.67	0.90
2.750	5.20	5.750	11.40	8.750	1.70	11.75	0.90
2.833	5.20	5.833	11.40	8.833	1.70	11.83	0.90
2.917	5.20	5.917	11.40	8.917	1.70	11.92	0.90
3.000	5.20	6.000	11.40	9.000	1.70	12.00	0.90

Unit Hyd Qpeak (cms)= 0.505

PEAK FLOW (cms)= 0.106 (i)
TIME TO PEAK (hrs)= 5.000
RUNOFF VOLUME (mm)= 32.024
TOTAL RAINFALL (mm)= 87.500
RUNOFF COEFFICIENT = 0.366

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

ADD HYD (0003)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0001):	1.25	0.070	5.00	31.93
+ ID2= 2 (0002):	1.93	0.106	5.00	32.02
ID = 3 (0003):	3.18	0.176	5.00	31.99

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD  (  0003)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0003):     3.18   0.176     5.00    31.99
     + ID2= 2 (  0006):     0.78   0.082     5.00    79.93
       ================================================
       ID = 1 (  0003):     3.96   0.258     5.00    41.43

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0008)|   Area    (ha)=   5.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.90   Dir. Conn.(%)=  56.30
--------------------
                           IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       3.60         1.78
    Dep. Storage     (mm)=       1.00         1.50
    Average Slope     (%)=       1.00         2.00
    Length            (m)=     189.52        27.50
    Mannings n           =      0.013        0.250

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.90	3.083	14.90	6.083	6.10	9.08	0.90
0.167	0.90	3.167	14.90	6.167	6.10	9.17	0.90
0.250	0.90	3.250	14.90	6.250	6.10	9.25	0.90
0.333	0.90	3.333	14.90	6.333	6.10	9.33	0.90
0.417	0.90	3.417	14.90	6.417	6.10	9.42	0.90
0.500	0.90	3.500	14.90	6.500	6.10	9.50	0.90
0.583	0.90	3.583	14.90	6.583	6.10	9.58	0.90
0.667	0.90	3.667	14.90	6.667	6.10	9.67	0.90
0.750	0.90	3.750	14.90	6.750	6.10	9.75	0.90
0.833	0.90	3.833	14.90	6.833	6.10	9.83	0.90
0.917	0.90	3.917	14.90	6.917	6.10	9.92	0.90
1.000	0.90	4.000	14.90	7.000	6.10	10.00	0.90
1.083	0.90	4.083	40.20	7.083	3.50	10.08	0.90
1.167	0.90	4.167	40.20	7.167	3.50	10.17	0.90
1.250	0.90	4.250	40.20	7.250	3.50	10.25	0.90
1.333	0.90	4.333	40.20	7.333	3.50	10.33	0.90
1.417	0.90	4.417	40.20	7.417	3.50	10.42	0.90
1.500	0.90	4.500	40.20	7.500	3.50	10.50	0.90
1.583	0.90	4.583	40.20	7.583	3.50	10.58	0.90
1.667	0.90	4.667	40.20	7.667	3.50	10.67	0.90
1.750	0.90	4.750	40.20	7.750	3.50	10.75	0.90
1.833	0.90	4.833	40.20	7.833	3.50	10.83	0.90
1.917	0.90	4.917	40.20	7.917	3.50	10.92	0.90
2.000	0.90	5.000	40.20	8.000	3.50	11.00	0.90
2.083	5.20	5.083	11.40	8.083	1.70	11.08	0.90
2.167	5.20	5.167	11.40	8.167	1.70	11.17	0.90
2.250	5.20	5.250	11.40	8.250	1.70	11.25	0.90
2.333	5.20	5.333	11.40	8.333	1.70	11.33	0.90
2.417	5.20	5.417	11.40	8.417	1.70	11.42	0.90
2.500	5.20	5.500	11.40	8.500	1.70	11.50	0.90
2.583	5.20	5.583	11.40	8.583	1.70	11.58	0.90
2.667	5.20	5.667	11.40	8.667	1.70	11.67	0.90
2.750	5.20	5.750	11.40	8.750	1.70	11.75	0.90
2.833	5.20	5.833	11.40	8.833	1.70	11.83	0.90
2.917	5.20	5.917	11.40	8.917	1.70	11.92	0.90
3.000	5.20	6.000	11.40	9.000	1.70	12.00	0.90

```
    Max.Eff.Inten.(mm/hr)=      40.20        35.39
              over (min)        5.00        15.00
    Storage Coeff.  (min)=      5.40 (ii)   13.94 (ii)
    Unit Hyd. Tpeak (min)=      5.00        15.00
    Unit Hyd. peak  (cms)=      0.21         0.08
                                                        *TOTALS*
    PEAK FLOW       (cms)=      0.34         0.16         0.497 (iii)
    TIME TO PEAK    (hrs)=      5.00         5.00          5.00
    RUNOFF VOLUME    (mm)=     86.50        45.22         68.46
    TOTAL RAINFALL   (mm)=     87.50        87.50         87.50
    RUNOFF COEFFICIENT   =      0.99         0.52          0.78

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN*  =  71.0    Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD  (  0010)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0003):     3.96   0.258     5.00    41.43
     + ID2= 2 (  0008):     5.39   0.497     5.00    68.46
       ================================================
       ID = 3 (  0010):     9.35   0.754     5.00    57.01

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0009)|   Area    (ha)=   1.23
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
```

```
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.10         0.12
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         0.50
     Length            (m)=      90.39        70.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

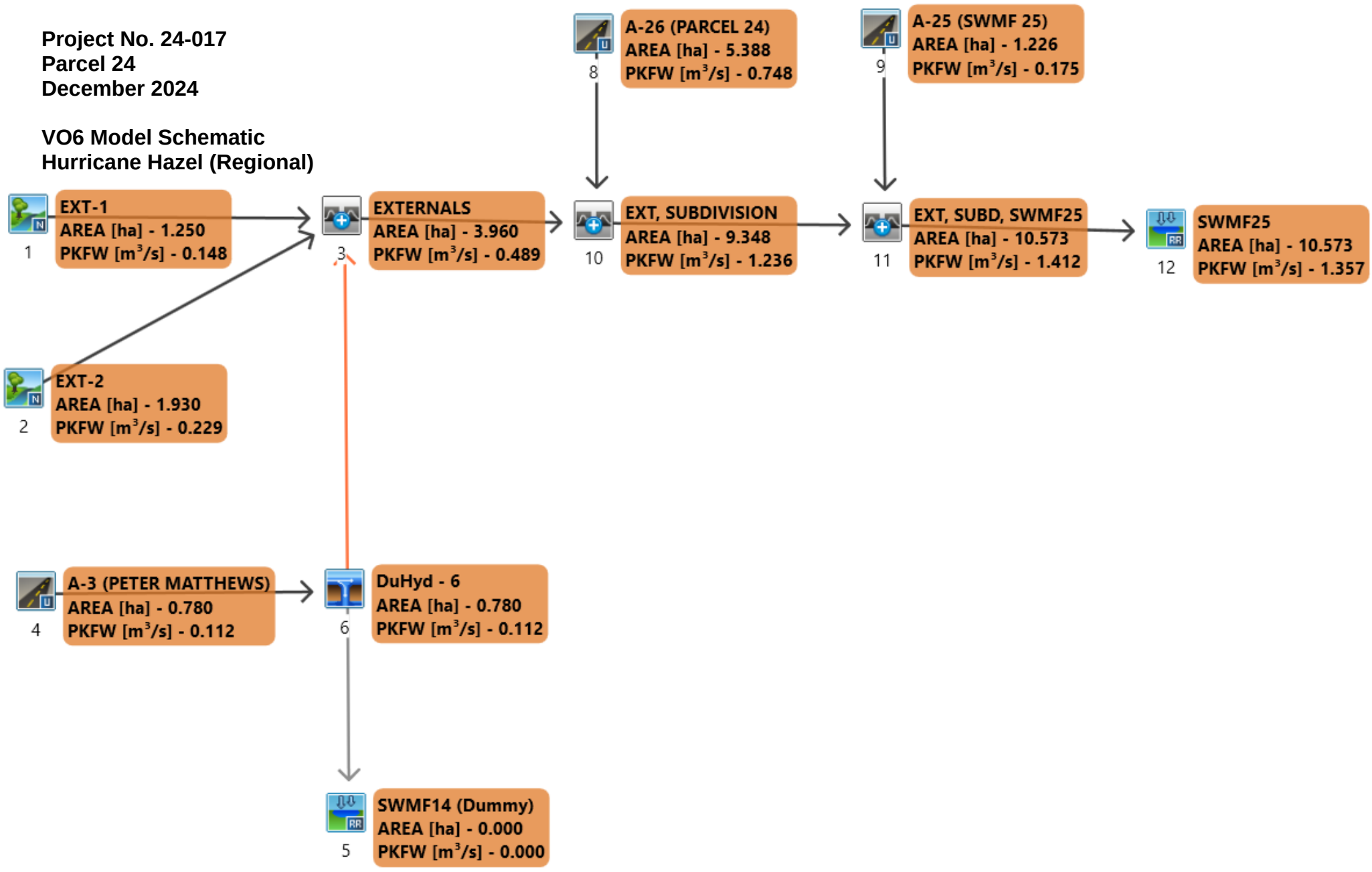
TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.90	3.083	14.90	6.083	6.10	9.08	0.90
0.167	0.90	3.167	14.90	6.167	6.10	9.17	0.90
0.250	0.90	3.250	14.90	6.250	6.10	9.25	0.90
0.333	0.90	3.333	14.90	6.333	6.10	9.33	0.90
0.417	0.90	3.417	14.90	6.417	6.10	9.42	0.90
0.500	0.90	3.500	14.90	6.500	6.10	9.50	0.90
0.583	0.90	3.583	14.90	6.583	6.10	9.58	0.90
0.667	0.90	3.667	14.90	6.667	6.10	9.67	0.90
0.750	0.90	3.750	14.90	6.750	6.10	9.75	0.90
0.833	0.90	3.833	14.90	6.833	6.10	9.83	0.90
0.917	0.90	3.917	14.90	6.917	6.10	9.92	0.90
1.000	0.90	4.000	14.90	7.000	6.10	10.00	0.90
1.083	0.90	4.083	40.20	7.083	3.50	10.08	0.90
1.167	0.90	4.167	40.20	7.167	3.50	10.17	0.90
1.250	0.90	4.250	40.20	7.250	3.50	10.25	0.90
1.333	0.90	4.333	40.20	7.333	3.50	10.33	0.90
1.417	0.90	4.417	40.20	7.417	3.50	10.42	0.90
1.500	0.90	4.500	40.20	7.500	3.50	10.50	0.90
1.583	0.90	4.583	40.20	7.583	3.50	10.58	0.90
1.667	0.90	4.667	40.20	7.667	3.50	10.67	0.90
1.750	0.90	4.750	40.20	7.750	3.50	10.75	0.90
1.833	0.90	4.833	40.20	7.833	3.50	10.83	0.90
1.917	0.90	4.917	40.20	7.917	3.50	10.92	0.90
2.000	0.90	5.000	40.20	8.000	3.50	11.00	0.90
2.083	5.20	5.083	11.40	8.083	1.70	11.08	0.90
2.167	5.20	5.167	11.40	8.167	1.70	11.17	0.90
2.250	5.20	5.250	11.40	8.250	1.70	11.25	0.90
2.333	5.20	5.333	11.40	8.333	1.70	11.33	0.90
2.417	5.20	5.417	11.40	8.417	1.70	11.42	0.90
2.500	5.20	5.500	11.40	8.500	1.70	11.50	0.90
2.583	5.20	5.583	11.40	8.583	1.70	11.58	0.90
2.667	5.20	5.667	11.40	8.667	1.70	11.67	0.90
2.750	5.20	5.750	11.40	8.750	1.70	11.75	0.90
2.833	5.20	5.833	11.40	8.833	1.70	11.83	0.90
2.917	5.20	5.917	11.40	8.917	1.70	11.92	0.90
3.000	5.20	6.000	11.40	9.000	1.70	12.00	0.90

```
     Max.Eff.Inten.(mm/hr)=      40.20        21.95
                   over (min)        5.00        35.00
     Storage Coeff.  (min)=       3.46 (ii)   30.91 (ii)
     Unit Hyd. Tpeak (min)=       5.00        35.00
     Unit Hyd. peak  (cms)=       0.26         0.04
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.12         0.01          0.128 (iii)
     TIME TO PEAK    (hrs)=       4.83         5.25          5.00
     RUNOFF VOLUME    (mm)=      86.50        38.98         81.73
     TOTAL RAINFALL   (mm)=      87.50        87.50         87.50
     RUNOFF COEFFICIENT   =       0.99         0.45          0.93

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0010):      9.35   0.754     5.00    57.01
     + ID2= 2 (  0009):      1.23   0.128     5.00    81.73
       ==========================================================
       ID = 3 (  0011):     10.57   0.883     5.00    59.87

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0012)|     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   |    0.0660      0.4138
                          0.0068      0.1487   |    0.0771      0.4560
                          0.0250      0.2263   |    0.0877      0.5115
                          0.0370      0.2980   |    1.5650      0.6396
                          0.0430      0.3493   |    0.0000      0.0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0011)     10.573      0.883      5.00      59.87
   OUTFLOW: ID= 1 (  0012)     10.573      0.085      8.00      58.08

                 PEAK   FLOW   REDUCTION [Qout/Qin](%)=  9.60
                 TIME SHIFT OF PEAK FLOW         (min)=180.00
                 MAXIMUM  STORAGE   USED       (ha.m.)=  0.4961
```

SMD
CONSULTANTS INC.

Project No. 24-017
Parcel 24
December 2024

VO6 Model Schematic
Hurricane Hazel (Regional)



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

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2017)
       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
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.


                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: M:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\danie\AppData\Local\Civica\VH5\939bc6dd-92de-4fe3-9512-437733e37904\b77472
be-5f4d-4c17-997a-4daacd2c7766\scenar
  Summary filename:
C:\Users\danie\AppData\Local\Civica\VH5\939bc6dd-92de-4fe3-9512-437733e37904\b77472
be-5f4d-4c17-997a-4daacd2c7766\scenar


DATE: 12-03-2024                          TIME: 11:47:09

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------
  ***********************************************
  ** SIMULATION : G - Hurricane Hazel           **
  ***********************************************


--------------------
|    READ STORM    |    Filename: C:\Users\danie\AppD
|                  |              ata\Local\Temp\
|                  |              42e1b15d-69e0-49b9-ba0f-8ea5ccefdb00\9fabf7cf
| Ptotal=212.00 mm |    Comments: Hurricane Hazel
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	6.00	3.00	13.00	6.00	23.00	9.00	53.00
0.25	6.00	3.25	13.00	6.25	23.00	9.25	53.00
0.50	6.00	3.50	13.00	6.50	23.00	9.50	53.00
0.75	6.00	3.75	13.00	6.75	23.00	9.75	53.00
1.00	4.00	4.00	17.00	7.00	13.00	10.00	38.00
1.25	4.00	4.25	17.00	7.25	13.00	10.25	38.00
1.50	4.00	4.50	17.00	7.50	13.00	10.50	38.00
1.75	4.00	4.75	17.00	7.75	13.00	10.75	38.00
2.00	6.00	5.00	13.00	8.00	13.00	11.00	13.00
2.25	6.00	5.25	13.00	8.25	13.00	11.25	13.00
2.50	6.00	5.50	13.00	8.50	13.00	11.50	13.00
2.75	6.00	5.75	13.00	8.75	13.00	11.75	13.00

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

--------------------
| CALIB            |
| STANDHYD (  0004)|   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  87.00   Dir. Conn.(%)=  87.00
--------------------
```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.68	0.10
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	72.11	40.00
Mannings n	=	0.013	0.250

```
    NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.00	3.083	13.00	6.083	23.00	9.08	53.00
0.167	6.00	3.167	13.00	6.167	23.00	9.17	53.00
0.250	6.00	3.250	13.00	6.250	23.00	9.25	53.00
0.333	6.00	3.333	13.00	6.333	23.00	9.33	53.00
0.417	6.00	3.417	13.00	6.417	23.00	9.42	53.00
0.500	6.00	3.500	13.00	6.500	23.00	9.50	53.00
0.583	6.00	3.583	13.00	6.583	23.00	9.58	53.00
0.667	6.00	3.667	13.00	6.667	23.00	9.67	53.00
0.750	6.00	3.750	13.00	6.750	23.00	9.75	53.00
0.833	6.00	3.833	13.00	6.833	23.00	9.83	53.00
0.917	6.00	3.917	13.00	6.917	23.00	9.92	53.00
1.000	6.00	4.000	13.00	7.000	23.00	10.00	53.00
1.083	4.00	4.083	17.00	7.083	13.00	10.08	38.00
1.167	4.00	4.167	17.00	7.167	13.00	10.17	38.00
1.250	4.00	4.250	17.00	7.250	13.00	10.25	38.00
1.333	4.00	4.333	17.00	7.333	13.00	10.33	38.00

1.417	4.00	4.417	17.00	7.417	13.00	10.42	38.00
1.500	4.00	4.500	17.00	7.500	13.00	10.50	38.00
1.583	4.00	4.583	17.00	7.583	13.00	10.58	38.00
1.667	4.00	4.667	17.00	7.667	13.00	10.67	38.00
1.750	4.00	4.750	17.00	7.750	13.00	10.75	38.00
1.833	4.00	4.833	17.00	7.833	13.00	10.83	38.00
1.917	4.00	4.917	17.00	7.917	13.00	10.92	38.00
2.000	4.00	5.000	17.00	8.000	13.00	11.00	38.00
2.083	6.00	5.083	13.00	8.083	13.00	11.08	13.00
2.167	6.00	5.167	13.00	8.167	13.00	11.17	13.00
2.250	6.00	5.250	13.00	8.250	13.00	11.25	13.00
2.333	6.00	5.333	13.00	8.333	13.00	11.33	13.00
2.417	6.00	5.417	13.00	8.417	13.00	11.42	13.00
2.500	6.00	5.500	13.00	8.500	13.00	11.50	13.00
2.583	6.00	5.583	13.00	8.583	13.00	11.58	13.00
2.667	6.00	5.667	13.00	8.667	13.00	11.67	13.00
2.750	6.00	5.750	13.00	8.750	13.00	11.75	13.00
2.833	6.00	5.833	13.00	8.833	13.00	11.83	13.00
2.917	6.00	5.917	13.00	8.917	13.00	11.92	13.00
3.000	6.00	6.000	13.00	9.000	13.00	12.00	13.00

Max.Eff.Inten.(mm/hr)=	53.00	42.96	
over (min)	5.00	10.00	
Storage Coeff. (min)=	2.71 (ii)	6.96 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.29	0.14	
			TOTALS
PEAK FLOW (cms)=	0.10	0.01	0.112 (iii)
TIME TO PEAK (hrs)=	9.75	10.00	10.00
RUNOFF VOLUME (mm)=	211.00	134.26	201.02
TOTAL RAINFALL (mm)=	212.00	212.00	212.00
RUNOFF COEFFICIENT =	1.00	0.63	0.95

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

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

DUHYD (0006)					
Inlet Cap.= 0.180					
#of Inlets= 1					
Total(cms)= 0.2		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
TOTAL HYD.(ID= 1):		0.78	0.11	10.00	201.02
MAJOR SYS.(ID= 2):		0.00	0.00	0.00	0.00
MINOR SYS.(ID= 3):		0.78	0.11	10.00	201.02

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0005)|	OVERFLOW IS OFF			
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	1.5300	0.0100
	0.5000	0.0050	1.5400	3.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0006)	0.000	0.000	0.00	0.00
OUTFLOW: ID= 1 (0005)	0.000	0.000	0.00	NaN

PEAK FLOW REDUCTION [Qout/Qin](%)= NaN
TIME SHIFT OF PEAK FLOW (min)= 0.00
MAXIMUM STORAGE USED (ha.m.)= 0.0000
MAXIMUM STORAGE USED (cu.m.)= 0.000000

**** WARNING : HYDROGRAPH PEAK WAS NOT REDUCED.
CHECK OUTFLOW/STORAGE TABLE OR REDUCE DT.

CALIB |				
NASHYD (0001)|	Area (ha)=	1.25	Curve Number (CN)=	70.0
ID= 1 DT= 5.0 min |	Ia (mm)=	10.00	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	0.13		

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.00	3.083	13.00	6.083	23.00	9.08	53.00
0.167	6.00	3.167	13.00	6.167	23.00	9.17	53.00
0.250	6.00	3.250	13.00	6.250	23.00	9.25	53.00
0.333	6.00	3.333	13.00	6.333	23.00	9.33	53.00
0.417	6.00	3.417	13.00	6.417	23.00	9.42	53.00
0.500	6.00	3.500	13.00	6.500	23.00	9.50	53.00
0.583	6.00	3.583	13.00	6.583	23.00	9.58	53.00
0.667	6.00	3.667	13.00	6.667	23.00	9.67	53.00
0.750	6.00	3.750	13.00	6.750	23.00	9.75	53.00
0.833	6.00	3.833	13.00	6.833	23.00	9.83	53.00
0.917	6.00	3.917	13.00	6.917	23.00	9.92	53.00
1.000	6.00	4.000	13.00	7.000	23.00	10.00	53.00
1.083	4.00	4.083	17.00	7.083	13.00	10.08	38.00
1.167	4.00	4.167	17.00	7.167	13.00	10.17	38.00
1.250	4.00	4.250	17.00	7.250	13.00	10.25	38.00

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

Unit Hyd Qpeak (cms)= 0.362

PEAK FLOW (cms)= 0.148 (i)
TIME TO PEAK (hrs)= 10.000
RUNOFF VOLUME (mm)= 130.035
TOTAL RAINFALL (mm)= 212.000
RUNOFF COEFFICIENT = 0.613

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

CALIB			
NASHYD (0002)	Area (ha)= 1.93	Curve Number (CN)= 70.0	
ID= 1 DT= 5.0 min	Ia (mm)= 10.00	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= 0.15		

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

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

Unit Hyd Qpeak (cms)= 0.505

PEAK FLOW (cms)= 0.229 (i)
TIME TO PEAK (hrs)= 10.000
RUNOFF VOLUME (mm)= 130.424
TOTAL RAINFALL (mm)= 212.000
RUNOFF COEFFICIENT = 0.615

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

ADD HYD (0003)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0001):	1.25	0.148	10.00	130.03
+ ID2= 2 (0002):	1.93	0.229	10.00	130.42
ID = 3 (0003):	3.18	0.377	10.00	130.27

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD  (  0003)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0003):     3.18   0.377    10.00   130.27
     + ID2= 2 (  0006):     0.78   0.112    10.00   201.02
       ================================================
       ID = 1 (  0003):     3.96   0.489    10.00   144.21

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0008)|   Area    (ha)=   5.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.90   Dir. Conn.(%)=  56.30
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.60         1.78
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     189.52        27.50
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.

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

     Max.Eff.Inten.(mm/hr)=      53.00        62.08
                  over (min)        5.00        15.00
     Storage Coeff.  (min)=       4.83 (ii)   11.65 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.22         0.09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.45         0.30         0.748 (iii)
     TIME TO PEAK    (hrs)=      10.00        10.00        10.00
     RUNOFF VOLUME    (mm)=     211.00       153.62       185.92
     TOTAL RAINFALL   (mm)=     212.00       212.00       212.00
     RUNOFF COEFFICIENT   =       1.00         0.72         0.88

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD  (  0010)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0003):     3.96   0.489    10.00   144.21
     + ID2= 2 (  0008):     5.39   0.748    10.00   185.92
       ================================================
       ID = 3 (  0010):     9.35   1.236    10.00   168.25

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0009)|   Area    (ha)=   1.23
```

|ID= 1 DT= 5.0 min | Total Imp(%)= 90.00 Dir. Conn.(%)= 90.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.10	0.12
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	0.50
Length	(m)=	90.39	70.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

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

Max.Eff.Inten.(mm/hr)=	53.00	44.01		
over (min)	5.00	25.00		
Storage Coeff. (min)=	3.10 (ii)	23.88 (ii)		
Unit Hyd. Tpeak (min)=	5.00	25.00		
Unit Hyd. peak (cms)=	0.27	0.05		
				TOTALS
PEAK FLOW (cms)=	0.16	0.01		0.175 (iii)
TIME TO PEAK (hrs)=	10.00	10.17		10.00
RUNOFF VOLUME (mm)=	211.00	141.00		203.99
TOTAL RAINFALL (mm)=	212.00	212.00		212.00
RUNOFF COEFFICIENT =	1.00	0.67		0.96

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0011) | 1 + 2 = 3 |	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0010):	9.35	1.236	10.00	168.25
+ ID2= 2 (0009):	1.23	0.175	10.00	203.99
ID = 3 (0011):	10.57	1.412	10.00	172.39

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0012) IN= 2---> OUT= 1 DT= 5.0 min	OVERFLOW IS OFF OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0660	0.4138
	0.0068	0.1487	0.0771	0.4560
	0.0250	0.2263	0.0877	0.5115
	0.0370	0.2980	1.5650	0.6396
	0.0430	0.3493	0.0000	0.0000

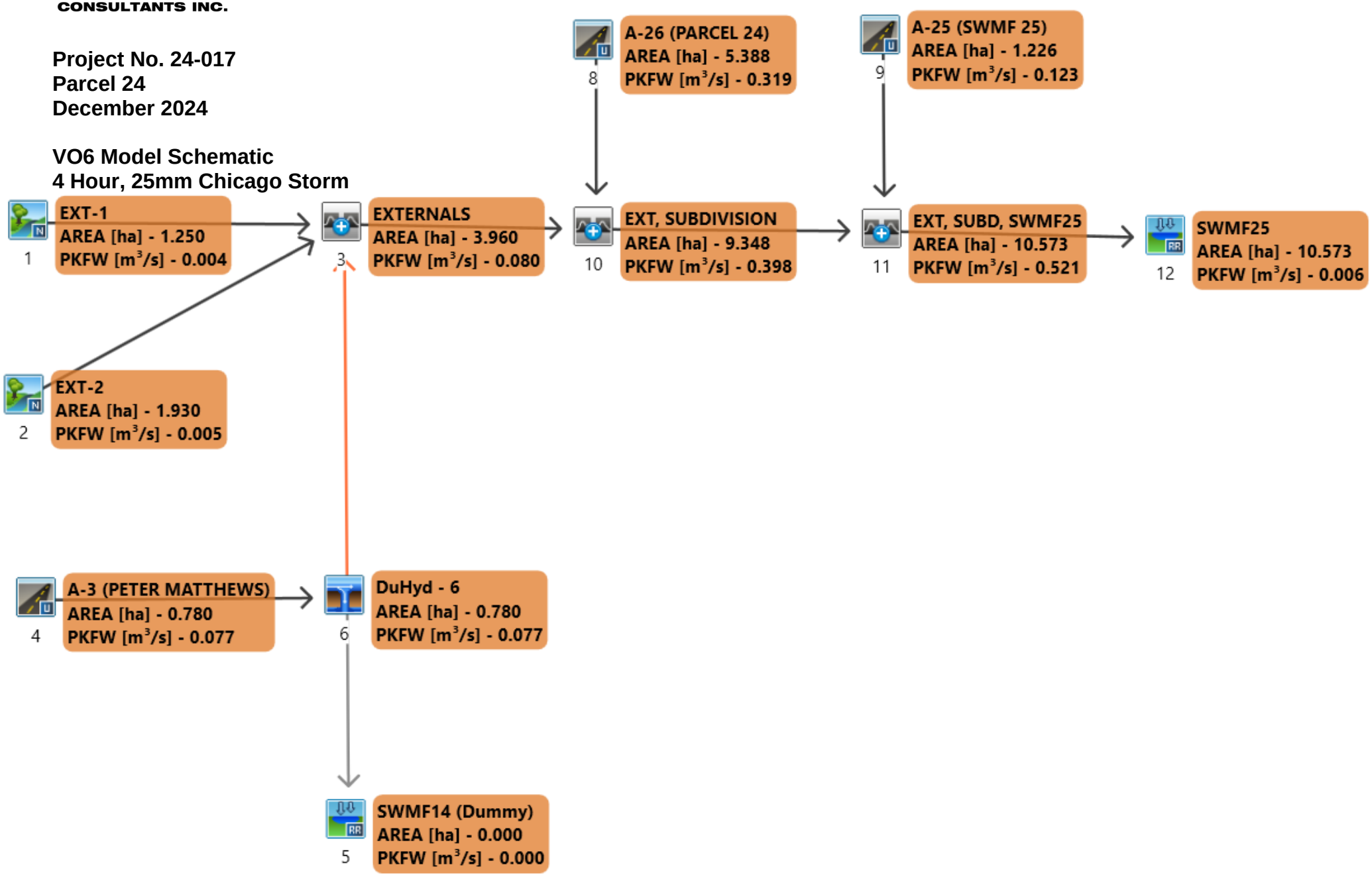
	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0011)	10.573	1.412	10.00	172.39
OUTFLOW: ID= 1 (0012)	10.573	1.357	10.00	170.50

PEAK FLOW REDUCTION [Qout/Qin](%)= 96.11
TIME SHIFT OF PEAK FLOW (min)= 0.00
MAXIMUM STORAGE USED (ha.m.)= 0.6224

SMD CONSULTANTS INC.

Project No. 24-017
Parcel 24
December 2024

VO6 Model Schematic
4 Hour, 25mm Chicago Storm



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

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2017)
       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
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.


                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: M:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\danie\AppData\Local\Civica\VH5\939bc6dd-92de-4fe3-9512-437733e37904\9f870d
23-4668-4244-8068-2dddd5d59320\scenar
  Summary filename:
C:\Users\danie\AppData\Local\Civica\VH5\939bc6dd-92de-4fe3-9512-437733e37904\9f870d
23-4668-4244-8068-2dddd5d59320\scenar


DATE: 12-03-2024                          TIME: 11:47:09

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------
  ***********************************************
  ** SIMULATION : H - 25mm 4-hr Chicago Storm   **
  ***********************************************


--------------------
|    READ STORM    |    Filename: C:\Users\danie\AppD
|                  |              ata\Local\Temp\
|                  |              42e1b15d-69e0-49b9-ba0f-8ea5ccefdb00\44156b80
| Ptotal= 25.02 mm |    Comments: 25mm 4-hr Chicago Storm
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.00	1.17	6.20	2.33	4.80	3.50	2.62
0.17	2.17	1.33	12.18	2.50	4.21	3.67	2.47
0.33	2.38	1.50	41.67	2.67	3.78	3.83	2.35
0.50	2.66	1.67	15.28	2.83	3.45	4.00	2.23
0.67	3.03	1.83	9.22	3.00	3.18		
0.83	3.58	2.00	6.88	3.17	2.95		
1.00	4.47	2.17	5.62	3.33	2.76		

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

--------------------
| CALIB            |
| STANDHYD (  0004)|   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  87.00   Dir. Conn.(%)=  87.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.68         0.10
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      72.11        40.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                              ---- TRANSFORMED HYETOGRAPH ----
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.167	4.47	2.250	5.62	3.33	2.95
0.167	0.00	1.250	6.20	2.333	5.62	3.42	2.76
0.250	2.17	1.333	6.20	2.417	4.80	3.50	2.76
0.333	2.17	1.417	12.18	2.500	4.80	3.58	2.62
0.417	2.38	1.500	12.18	2.583	4.21	3.67	2.62
0.500	2.38	1.583	41.67	2.667	4.21	3.75	2.47
0.583	2.66	1.667	41.67	2.750	3.78	3.83	2.47
0.667	2.66	1.750	15.28	2.833	3.78	3.92	2.35
0.750	3.03	1.833	15.28	2.917	3.45	4.00	2.35
0.833	3.03	1.917	9.22	3.000	3.45	4.08	2.23
0.917	3.58	2.000	9.22	3.083	3.18	4.17	2.23
1.000	3.58	2.083	6.88	3.167	3.18		
1.083	4.47	2.167	6.88	3.250	2.95		

```
     Max.Eff.Inten.(mm/hr)=      41.67         5.09
               over (min)        5.00        10.00
     Storage Coeff.  (min)=      2.98 (ii)    7.66 (ii)
     Unit Hyd. Tpeak (min)=      5.00        10.00
     Unit Hyd. peak  (cms)=      0.28         0.13
                                                        *TOTALS*
     PEAK FLOW       (cms)=      0.08         0.00          0.077 (iii)
```

```
     TIME TO PEAK    (hrs)=       1.67         1.75          1.67
     RUNOFF VOLUME    (mm)=      24.02         3.87         21.40
     TOTAL RAINFALL   (mm)=      25.02        25.02         25.02
     RUNOFF COEFFICIENT   =       0.96         0.15          0.86

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

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

--------------------------------------------------------------------------------
-------------------
| DUHYD    (  0006)|
| Inlet Cap.= 0.180|
| #of Inlets=     1|
| Total(cms)=   0.2|      AREA     QPEAK     TPEAK    R.V.
-------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   0.78      0.08      1.67   21.40
     ==================================================
     MAJOR SYS.(ID= 2):   0.00      0.00      0.00    0.00
     MINOR SYS.(ID= 3):   0.78      0.08      1.67   21.40

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
-------------------
| RESERVOIR(  0005)|     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   |    1.5300      0.0100
                          0.5000      0.0050   |    1.5400      3.0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0006)      0.000      0.000      0.00       0.00
   OUTFLOW: ID= 1 (  0005)      0.000      0.000      0.00        NaN

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=   NaN
                  TIME SHIFT OF PEAK FLOW         (min)=  0.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0000
                  MAXIMUM  STORAGE   USED       (cu.m.)=  0.000000

     **** WARNING : HYDROGRAPH PEAK WAS NOT REDUCED.
                    CHECK OUTFLOW/STORAGE TABLE  OR REDUCE DT.
--------------------------------------------------------------------------------
-------------------
| CALIB            |
| NASHYD   (  0001)|   Area    (ha)=   1.25   Curve Number   (CN)= 70.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=   0.13

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.

                              ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    0.00 | 1.167    4.47 | 2.250    5.62 |  3.33    2.95
               0.167    0.00 | 1.250    6.20 | 2.333    5.62 |  3.42    2.76
               0.250    2.17 | 1.333    6.20 | 2.417    4.80 |  3.50    2.76
               0.333    2.17 | 1.417   12.18 | 2.500    4.80 |  3.58    2.62
               0.417    2.38 | 1.500   12.18 | 2.583    4.21 |  3.67    2.62
               0.500    2.38 | 1.583   41.67 | 2.667    4.21 |  3.75    2.47
               0.583    2.66 | 1.667   41.67 | 2.750    3.78 |  3.83    2.47
               0.667    2.66 | 1.750   15.28 | 2.833    3.78 |  3.92    2.35
               0.750    3.03 | 1.833   15.28 | 2.917    3.45 |  4.00    2.35
               0.833    3.03 | 1.917    9.22 | 3.000    3.45 |  4.08    2.23
               0.917    3.58 | 2.000    9.22 | 3.083    3.18 |  4.17    2.23
               1.000    3.58 | 2.083    6.88 | 3.167    3.18 |
               1.083    4.47 | 2.167    6.88 | 3.250    2.95 |

    Unit Hyd Qpeak  (cms)=   0.362

    PEAK FLOW       (cms)=   0.004 (i)
    TIME TO PEAK    (hrs)=   2.000
    RUNOFF VOLUME    (mm)=   1.805
    TOTAL RAINFALL   (mm)=  25.023
    RUNOFF COEFFICIENT   =   0.072

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

--------------------------------------------------------------------------------
-------------------
| CALIB            |
| NASHYD   (  0002)|   Area    (ha)=   1.93   Curve Number   (CN)= 70.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=   0.15

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.

                              ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    0.00 | 1.167    4.47 | 2.250    5.62 |  3.33    2.95
               0.167    0.00 | 1.250    6.20 | 2.333    5.62 |  3.42    2.76
               0.250    2.17 | 1.333    6.20 | 2.417    4.80 |  3.50    2.76
               0.333    2.17 | 1.417   12.18 | 2.500    4.80 |  3.58    2.62
               0.417    2.38 | 1.500   12.18 | 2.583    4.21 |  3.67    2.62
               0.500    2.38 | 1.583   41.67 | 2.667    4.21 |  3.75    2.47
```

0.583	2.66	1.667	41.67	2.750	3.78	3.83	2.47
0.667	2.66	1.750	15.28	2.833	3.78	3.92	2.35
0.750	3.03	1.833	15.28	2.917	3.45	4.00	2.35
0.833	3.03	1.917	9.22	3.000	3.45	4.08	2.23
0.917	3.58	2.000	9.22	3.083	3.18	4.17	2.23
1.000	3.58	2.083	6.88	3.167	3.18		
1.083	4.47	2.167	6.88	3.250	2.95		

Unit Hyd Qpeak (cms)= 0.505

PEAK FLOW (cms)= 0.005 (i)
TIME TO PEAK (hrs)= 2.000
RUNOFF VOLUME (mm)= 1.810
TOTAL RAINFALL (mm)= 25.023
RUNOFF COEFFICIENT = 0.072

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

ADD HYD (0003)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0001):	1.25	0.004	2.00	1.80
	+ ID2= 2 (0002):	1.93	0.005	2.00	1.81
	ID = 3 (0003):	3.18	0.009	2.00	1.81

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0003)		AREA	QPEAK	TPEAK	R.V.
3 + 2 = 1		(ha)	(cms)	(hrs)	(mm)
	ID1= 3 (0003):	3.18	0.009	2.00	1.81
	+ ID2= 2 (0006):	0.78	0.077	1.67	21.40
	ID = 1 (0003):	3.96	0.080	1.67	5.67

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB			
STANDHYD (0008)	Area (ha)=	5.39	
ID= 1 DT= 5.0 min	Total Imp(%)=	66.90	Dir. Conn.(%)= 56.30

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	3.60	1.78
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	189.52	27.50
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.167	4.47	2.250	5.62	3.33	2.95
0.167	0.00	1.250	6.20	2.333	5.62	3.42	2.76
0.250	2.17	1.333	6.20	2.417	4.80	3.50	2.76
0.333	2.17	1.417	12.18	2.500	4.80	3.58	2.62
0.417	2.38	1.500	12.18	2.583	4.21	3.67	2.62
0.500	2.38	1.583	41.67	2.667	4.21	3.75	2.47
0.583	2.66	1.667	41.67	2.750	3.78	3.83	2.47
0.667	2.66	1.750	15.28	2.833	3.78	3.92	2.35
0.750	3.03	1.833	15.28	2.917	3.45	4.00	2.35
0.833	3.03	1.917	9.22	3.000	3.45	4.08	2.23
0.917	3.58	2.000	9.22	3.083	3.18	4.17	2.23
1.000	3.58	2.083	6.88	3.167	3.18		
1.083	4.47	2.167	6.88	3.250	2.95		

Max.Eff.Inten.(mm/hr)=	41.67	7.74		
over (min)	5.00	25.00		
Storage Coeff. (min)=	5.32 (ii)	21.01 (ii)		
Unit Hyd. Tpeak (min)=	5.00	25.00		
Unit Hyd. peak (cms)=	0.21	0.05		
				TOTALS
PEAK FLOW (cms)=	0.31	0.02		0.319 (iii)
TIME TO PEAK (hrs)=	1.67	2.00		1.67
RUNOFF VOLUME (mm)=	24.02	5.57		15.96
TOTAL RAINFALL (mm)=	25.02	25.02		25.02
RUNOFF COEFFICIENT =	0.96	0.22		0.64

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0010)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0003):	3.96	0.080	1.67	5.67
	+ ID2= 2 (0008):	5.39	0.319	1.67	15.96
	ID = 3 (0010):	9.35	0.398	1.67	11.60

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB	
STANDHYD (0009)	Area (ha)= 1.23
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 90.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.10	0.12
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	0.50
Length	(m)=	90.39	70.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.167	4.47	2.250	5.62	3.33	2.95
0.167	0.00	1.250	6.20	2.333	5.62	3.42	2.76
0.250	2.17	1.333	6.20	2.417	4.80	3.50	2.76
0.333	2.17	1.417	12.18	2.500	4.80	3.58	2.62
0.417	2.38	1.500	12.18	2.583	4.21	3.67	2.62
0.500	2.38	1.583	41.67	2.667	4.21	3.75	2.47
0.583	2.66	1.667	41.67	2.750	3.78	3.83	2.47
0.667	2.66	1.750	15.28	2.833	3.78	3.92	2.35
0.750	3.03	1.833	15.28	2.917	3.45	4.00	2.35
0.833	3.03	1.917	9.22	3.000	3.45	4.08	2.23
0.917	3.58	2.000	9.22	3.083	3.18	4.17	2.23
1.000	3.58	2.083	6.88	3.167	3.18		
1.083	4.47	2.167	6.88	3.250	2.95		

				TOTALS
Max.Eff.Inten.(mm/hr)=		41.67	2.61	
over (min)		5.00	70.00	
Storage Coeff. (min)=		3.41 (ii)	67.75 (ii)	
Unit Hyd. Tpeak (min)=		5.00	70.00	
Unit Hyd. peak (cms)=		0.26	0.02	
PEAK FLOW	(cms)=	0.12	0.00	0.123 (iii)
TIME TO PEAK	(hrs)=	1.67	3.08	1.67
RUNOFF VOLUME	(mm)=	24.02	4.35	22.02
TOTAL RAINFALL	(mm)=	25.02	25.02	25.02
RUNOFF COEFFICIENT	=	0.96	0.17	0.88

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0011)					
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0010):	9.35	0.398	1.67	11.60
+ ID2= 2 (0009):	1.23	0.123	1.67	22.02
ID = 3 (0011):	10.57	0.521	1.67	12.81

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0012)	OVERFLOW IS OFF			
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0660	0.4138
	0.0068	0.1487	0.0771	0.4560
	0.0250	0.2263	0.0877	0.5115
	0.0370	0.2980	1.5650	0.6396
	0.0430	0.3493	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0011)	10.573	0.521	1.67	12.81
OUTFLOW: ID= 1 (0012)	10.573	0.006	4.50	11.95

PEAK FLOW REDUCTION [Qout/Qin](%)= 1.14
TIME SHIFT OF PEAK FLOW (min)=170.00
MAXIMUM STORAGE USED (ha.m.)= 0.1296

Appendix C

C1 – Overland Conveyance Capacities
C2 – Overland Flow Calculations
C3 – Street ‘C’ Culvert Sizing

SMD CONSULTANTS INC.

Overland Conveyance Capacities
Pond 25
Parcel 24
File No.: 24-017
Prepared by: Daniel Ma
December 2024

Overland Conveyance Capacity

Manning's "n"

Conveyance Section	Hardscape Distance (m)	Manning's "n" for Hardscape	Boulevard Distance (m)	Manning's "n" for Boulevard	Weighted Manning's "n" Value
17m ROW	9.12	0.011	9.10	0.024	0.017
7.6m SWM Access (Block 83)	4.00	0.011	3.60	0.024	0.017

Note: Manning's "n" values retrieved from Table 13 in the City of Pickering's Stormwater Management Design Guidelines

Conveyance Capacity

Conveyance Section	Cross-sectional Area (m^2) [A]	Wetted Perimeter (m)	Hydraulic Radius [R]	Slope [S]	Weighted Manning's "n" Value	Conveyance Capacity (m^3/s)
17m ROW	1.970	18.22	0.108	0.005	0.017	1.807
7.6m SWM Access (Block 83)	0.464	7.60	0.061	0.10	0.017	1.326

Manning's Equation

$$Q = \frac{AR^{\frac{2}{3}}S^{\frac{1}{2}}}{n}$$

SMD CONSULTANTS INC.

Overland Flow Calculations
Pond 25
Parcel 24
File No.: 24-017
December 2024

Weighted Runoff Coefficient

Lot Type	Lot Areas (m^2)	Runoff Coefficient	Lot Count x Runoff Coefficient	Weighted Runoff Coefficient
9.15m Frontage Single Lots	3781.5	0.70	2647.05	
11.00 Frontage Single Lots	19047.2	0.65	12380.68	
13.10m Frontage Single Lots	7643.8	0.65	4968.47	
6.10m Frontage Townhomes	5816.2	0.75	4362.15	
Totals	36288.7		24358.35	
Weighted Runoff Coefficient				**0.671**

Time of Concentration

k (intercept coefficient) 0.619 *Retrieved from Table 14, City of Pickering Stormwater Management Design Guidelines*

Elevation at high point of cul-de-sac 184.05 m
Elevation at low Street A low point 163.24 m
Distance from high point to low point 596 m

Average Slope 3.49%

Shallow Concentrated Flow Equation

Velocity **1.16 m/s**

$$V = kS_p^{0.5}$$

Time to reach low point 515 s
8.59 min

Time of Concentration

$$T_c = Initial\ Time\ of\ Concentration\ (T_i) + Time\ to\ reach\ low\ point$$

T_i 10 min
T_c **18.59** min

$$Rainfall\ Intensity\ (i) = \frac{A}{(T_c + B)^C}$$

City of Pickering IDF Values			
	A	B	C
5-Year	1082.901	6.007	0.837
100-Year	2096.425	6.485	0.863

			5-Year Flow			100-Year Flow				
Drainage Area ID	Major Drainage Area without Uncontrolled (ha)	Time of Concentration (min)	Runoff Coefficient (5-Year)	5-Year Rainfall Intensity (mm/hr)	5-Year Flow (m^3/s)	Runoff Coefficient (100-Year) [5-Year x 1.25]	100-Year Rainfall Intensity (mm/hr)	100-Year Flow	Overland Flow (m^3/s) [100-Year - 5-Year]	Overland Flow Route Capacity (m^3/s)
A-26 (East of Low Point Only)	3.98	18.59	0.671	74.21	0.551	0.839	130.01	1.206	0.655	1.807
A-26 (West and East of Low Point)	4.77	18.59	0.671	74.21	0.660	0.839	130.01	1.445	0.785	1.326

Therefore, the overland flow is less than the overland flow route's conveyance capacity in both scenarios.

SMD CONSULTANTS INC.

Street C Culvert Sizing

Parcel 24
File No.: 24-017
Prepared by: Daniel Ma
December 2024

Flow to Culvert

Time of Concentration for Area EXT-1

Airport Equation

$$T_c = \frac{3.26 * (1.1 - C) * L^{0.5}}{S_w^{0.33}}$$

C (Runoff Coefficient) =	0.2	
L (Catchment Length) =	146.80	m
S_w (Catchment Slope) =	2.77	%
T_c =	**25.40**	**min**

Runoff from Area EXT-1

Rational Method

$$Q = \frac{CIA}{360}$$

$$Rainfall\ Intensity\ (I) = \frac{A}{(T_c + B)^C}$$

C (Runoff Coefficient) =	0.2	
A (Area) =	1.25	ha
Intensity (I) =	95.13	mm/hr
Q (Flow) =	66.1	L/s

City of Pickering IDF Values			
	A	**B**	**C**
50-Year	1828.009	6.193	0.856

Proposed Culvert Conveyance Capacity

Manning's Equation

$$Q = \frac{AR^{\frac{2}{3}}S^{\frac{1}{2}}}{n}$$

Conveyance Section	Cross-sectional Area (m^2) [A]	Wetted Perimeter (m)	Hydraulic Radius [R]	Slope [S]	Weighted Manning's "n" Value	Conveyance Capacity (L/s)
450mm Dia. CSP Culvert	0.159	1.41	0.113	0.01	0.023	161.1

Therefore, the proposed 450mm Dia. CSP Culvert has sufficient conveyance capacity for Area EXT-1.

Appendix D

Preliminary Environmental Impacts Review Memo, by R.J. Burnside & Associates Ltd.

R.J. Burnside & Associates Limited 1465 Pickering Parkway Suite 200 Pickering ON L1V 7G7 CANADA
telephone (905) 420-5777 **fax** (226) 526-9660 **web** www.rjburnside.com

BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]

Memorandum

Date: December 13, 2024 **Project No.:** 300055189.0000

Project Name: Whitevale East Subdivision (Parcel 24)

Client Name: TACCGATE Developments Inc.

To: Vince Figliomeni

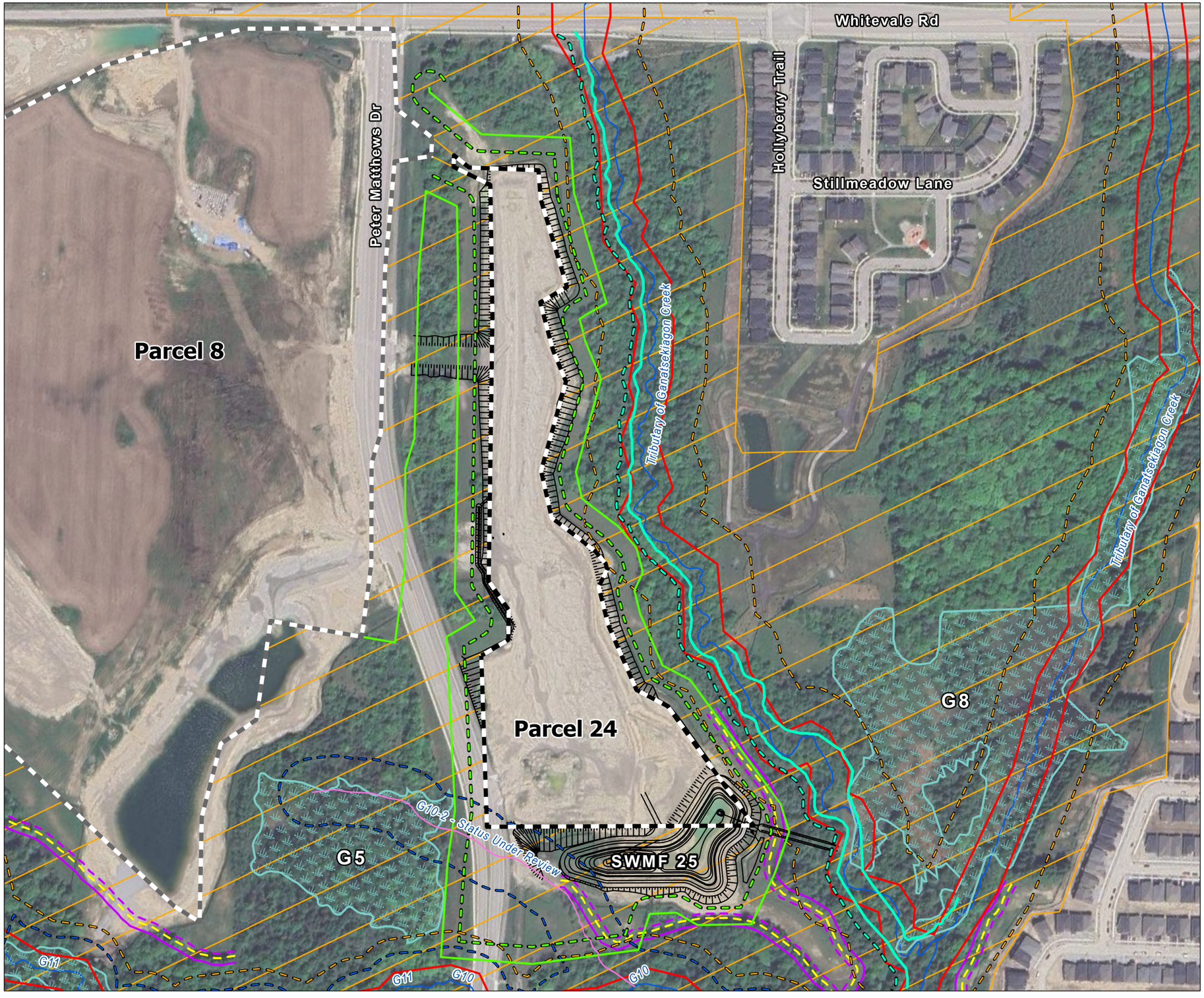
From: Ariana Burgener and Matthew Moote

1.0 Introduction

R.J. Burnside & Associates Limited (Burnside) has been retained by TACCGATE Developments Inc. (Client) to provide ecological services in support of the Whitevale East Subdivision, referred to as Parcel 24. The parcel (herein referred to as the 'subject property') is located in the south-central portion of the Seaton Community outside the Natural Heritage System (NHS) except for a portion of Stormwater Management Facility (SWMF) 25. Access to the subject property is via Peter Matthews Drive to the west. The subject property is in the Ganatsekiagon Creek subwatershed. Regulated Redside Dace (*Clinostomus elongatus*) (Occupied) habitat is present in the tributary of Ganatsekiagon Creek east and south of the subject property (see Figure 1).

The subject property is in Seaton Neighbourhood #19 (NH19) Phase 2 lands, meaning the proposed development was not Draft Plan Approved (DPA) as part of the Master Environmental Servicing Plan (MESP) (The Sernas Group, 2008) and Master Environmental Servicing Plan Addendum (MESPA) (The Sernas Group, 2013).

This preliminary review represents a summary of background information pertaining to the subject property, as well as studies that have been completed to date, impacts that have occurred under previous ownership, anticipated future impacts and permitting as the development progresses, and additional studies required in support of an Environmental Impact Study (EIS) (future submission).



- Grading and SWM Design (SMD Consultants, Nov 2024)
- Erosion Hazard Limit
- Top of Bank
- Top of Bank 10m Setback
- Dripline
- Dripline 15m Setback
- Regional Floodline
- Floodline 10m Setback
- G10-2 Tributary - Status Under Review
- Watercourse
- Watercourse 30m Setback
- Natural Heritage System
- Wetland (MNRF)
- Meander Belt - TRCA (To be Refined with Geomorphologist)
- Redside Dace Occupied Habitat (Meander Belt +30m, TRCA)
- Parcel 8
- Parcel 24

Sources:

1. Ministry of Natural Resources, © Queen's Printer for Ontario
2. Natural Resources Canada © Her Majesty the Queen in Right of Canada.

Disclaimer:

R.J. Burnside & Associates Limited and the above mentioned sources and agencies are not responsible for the accuracy of the spatial, temporal, or other aspects of the data represented on this map. It is recommended that users confirm the accuracy of the information represented.

This map is the product of a Geographic Information System (GIS). As such, the data represented on this map may be subject to updates and future reproductions may not be identical.

Datum: North American 1983 CSRS	
Coord. System: NAD 1983 CSRS UTM Zone 17N	
Projection: Transverse Mercator	
Central Meridian: 81°0'0.00"W	
False Easting: 500,000m	False Northing: 0m
Page Orientation: -19.23°	Scale Factor: 0.99960

N
True North

0 50 100 150 200
Metres

BURNSIDE

Client

TACCGATE DEVELOPMENTS INC.

Figure Title

WHITEVALE EAST
PRELIMINARY CONSTRAINTS

Drawn	Checked	Date	Figure No.
HN	HM	2024/12/13	1
Scale		Project No.	
H 1:3,500		300055189	

File Path: \\Elmo\gis\Project\300\055189 TACC Parcel 24 Print Date: 2024/12/13 Time:

File Path: C:\GIS\Projects\TACC Parcel 24\055189 Parcel 24\055189 Parcel 24.aprx Print Date: 2024/12/13 Time: 09:21 AM

2.0 Background

2.1 Records Review

A substantial amount of baseline data was collected during Phase 1 and 2 MESPs and the MESPA. Numerous studies were also completed in NH19 in support of various approvals, including but not limited to:

- Central Pickering Development Plan (CPDP) (May 2006)
- Seaton Natural Heritage System Management Plan and Master Trails Plan (NHSMP+MTP) (Schollen & Co., January 2009)
- Phase 1 MESP (The Sernas Group, 2008)
- Phase 2 MESP (The Sernas Group, 2010)
- Master Environmental Servicing Plan (MESP) (The Sernas Group, 2008)
- Master Environmental Servicing Plan Amendment (MESPA) (The Sernas Group, July 2013)
- Neighbourhood Functional Servicing and Stormwater Report (NFSSR) for Neighbourhood #19, prepared for the NH19 Landowners Group (August 2013)
- Process for Endangered Species Act (2007) Authorizations, Seaton Community, City of Pickering (Seaton Environmental Consulting Team, 2018)
- Comprehensive Aquatic Framework (CAF) (Seaton Environmental Consulting Team, April 2017)

Natural heritage studies may have been completed by other consultants for the subject property, but these studies were not accessible while compiling this memorandum except for Beacon's Environmental authored Woody Vegetation Assessment and Tree Preservation Report: Teardrop Property (November 2019).

As noted in SMD's FSSR (2024), draft plan of subdivision applications along with associated FSSR documents by other consultants have been submitted for the subject property in the past on behalf of: a) Ontario Infrastructure and Lands Corporation (IO) and b) 1133373 Ontario Inc. (Lebovic Enterprises) in 2015 and 2019, respectively.

Permits and licenses have been secured through the efforts of previous owner(s) and consultants to complete site works to date, including a) the installation of erosion and sediment control measures, b) construction of an interim stormwater management / sediment control pond, c) removal of trees, d) strip and dispose of topsoil, and e) import fill and rough grade the proposed development area.

2.2 Species at Risk

A comprehensive desktop assessment was completed to review existing natural heritage information available for the subject lands. All areas within 120 m of the subject lands were reviewed as part of the high-level assessment to identify significant natural heritage features located within, or directly adjacent to the subject lands, that may be impacted by future development. Based on the background review the following Species at Risk (SAR) (Endangered or Threatened) and Species of Conservation Concern (SCC) were identified as potentially being present on, or adjacent to the subject lands prior to field investigations:

- Acadian Flycatcher (*Empidonax virescens*) - END
- Bobolink (*Dolichonyx oryzivorus*) - THR
- Eastern Meadowlark (*Sturnella magna*) - THR
- Eastern Wood-pewee (*Contopus virens*) - SC
- Wood Thrush (*Hylocichla mustelina*) - SC
- Butternut (*Juglans cinerea*) - END
- Black Ash (*Fraxinus nigra*) - END
- American Brook Lamprey (*Lethenteron appendix*) - SC
- Redside Dace - END (Occupied Habitat)
- SAR Bats: Northern Myotis (*Myotis septentrionalis*), Little Brown Myotis (*Myotis lucifugus*), Tri-colored Bat (*Perimyotis subflavus*) - END

2.3 Aquatic

The watercourses surrounding the subject property are tributaries of Ganatsekiagon Creek. The reaches adjacent to the east boundary of the subject property (i.e., GB-5, GB-4, GB-3 and GB-2) generally flow from north to south, while the reaches to the south of the subject property (i.e., GB-10, GB-9 and GB-8) flow from west to east.

The Ministry of Natural Resources (MNR) Aquatic Resources Area (ARA) mapping states that the Ganatsekiagon tributaries have a coldwater thermal regime. The CAF (2017) states that the watercourse provides both cold and warmwater fish habitat, while the State of the Seaton Lands report (TRCA, 2007) shows that the watercourse remains largely cool – coldwater. As per the CAF (2017), the watercourse reaches surrounding the subject property are classified as Regulated Redside Dace Occupied habitat. Reach GB-1 is classified as critical, coldwater habitat, accessible to trout and Redside Dace.

The proposed SWMF 25 is adjacent to reaches GB-2, GB-3 and GB-9, which are confined channels. The outfall from the SWMF will be designed to dissipate flow velocity before discharge to reach GB-2. As per the MESPA, the shallow groundwater regime within the SWMF is not expected to contribute to the hydrological processes of reach GB-3. The SWMF design is to provide specific attention to Redside Dace habitat sensitivities within the receiving watercourse. The SWMF is located completely within the NHS, there are no implications to corridor function NHS formerly consisted of hedgerows and agricultural fields.

2.4 Agency Consultation

Prior to the purchase of the subject property from 1133373 Ontario Inc. (Lebovic Enterprises) in 2022, Lebovic had retained Beacon Environmental as ecological consultants to conduct preliminary surveys. As part of this, a site walk was conducted with the City of Pickering (City) and Toronto and Region Conservation Authority (TRCA) on June 25, 2020, to review the location of the future SWMF outfall. During the site walk, different options were discussed, including moving the outfall to the open intrusion to the NHS just south of the proposed outfall. It was determined that the currently proposed outfall location would be the better option (See Appendix A).

Natural heritage features within the development limits were cleared under previous ownership, and the site has since been graded. A sediment basin has been constructed in the NHS and will be redesigned and formalized at the SWM pond.

A preliminary environmental constraints map was compiled by Burnside, based on background records and areal imagery (see Figure 1). On November 24, 2024, Burnside conducted a site walk with TRCA to review existing features on the subject property, specifically, tributary G10-2, as mapped in the MESPA. This feature has sometimes been mapped as a tributary reaching the Wetland G5, and sometimes as an HDF (HDFC27) starting east of Peter Matthews Drive in the MESPA. Following the construction of Peter Matthews Drive, waterflow from the Wetland G5 was cut off to the feature, as no culverts were installed that would facilitate drainage from one side to the other. During the site walk, TRCA agreed that there is no longer a tributary of HDF present (See Appendix A for correspondence). The feature has been retained on the constraints mapping as shown in Figure 1 and in SMD's FSSR (2024) until formal notice of its removal has been received from TRCA. The tributary is listed as "status under review" on the figure.

2.5 Preliminary Constraints

Preliminary constraints and setbacks are summarized below in Table 1.

Table 1: Preliminary Constraints

Feature	Setback	Source
Erosion Hazard Limit	n/a	TRCA
Natural Heritage System	n/a	TRCA
Top of Bank	10 m	TRCA
Dripline	15 m	TRCA and aerial imagery
Regional Floodline	10 m	TRCA
Watercourse (Redside Dace Occupied)	Meanderbelt +30 m	The DFO SAR mapping states that the reaches of Ganatsekiagon Creek are occupied habitat for Redside Dace. The CAF document also states this. As such the setback for development is set outside of the meander belt for the watercourse plus 30 m. Minor intrusions into the setback for the SWMF outfall will be addressed during detailed design and will be circulated to TRCA, MECP and DFO for various agency approvals.

2.6 Proposed Development

The total site area for Parcel 24 is 5.47 ha and based on a draft plan of subdivision prepared by Korsiak Urban Planning (see Figure 2). As discussed in SMD's FSSR (2024), the plan consists of the following proposed land uses:

- 76 Single Detached Residential Lots
- 28 Street Townhouses
- One Stormwater Management Pond Block
- One Overland Flow/Pond Access Block
- Three Open Space Blocks

Two proposed municipal rights-of-way (Streets A & B) will provide access internally to the subdivision along with two proposed intersections with Peter Matthews Drive. A new municipal road, external to the subdivision, will be aligned through lands owned by IO and will intersect with Peter Matthews Drive at the northern portion of the site.

A portion of SWMF 25 is located in the south-east corner of the property, while the remaining portion of the SWMF Block is located within adjacent land currently owned by IO.

Grading and SWM Design (SMD Consultants, Nov 2024)

Parcel 8

Parcel 24

Sources:

1. Ministry of Natural Resources, © Queen's Printer for Ontario
2. Natural Resources Canada © Her Majesty the Queen in Right of Canada.

Disclaimer:

R.J. Burnside & Associates Limited and the above mentioned sources and agencies are not responsible for the accuracy of the spatial, temporal, or other aspects of the data represented on this map. It is recommended that users confirm the accuracy of the information represented.

This map is the product of a Geographic Information System (GIS). As such, the data represented on this map may be subject to updates and future reproductions may not be identical.

Datum: North American 1983 CSRS	
Coord. System: NAD 1983 CSRS UTM Zone 17N	
Projection: Transverse Mercator	
Central Meridian: 81°0'0.00"W	
False Easting: 500,000m	False Northing: 0m
Page Orientation: -19.23°	Scale Factor: 0.99960

N

True North

0 50 100 150 200

Metres

BURNSIDE

Client

TACCGATE DEVELOPMENTS INC.

Figure Title

WHITEVALE EAST

PROPOSED DEVELOPMENT

Drawn	Checked	Date	Figure No.
HN	HM	2024/12/13	2
Scale		Project No.	
H 1:3,500		300055189	

File Path: \\Elmo\gis\Project\300\055189 TACC Parcel 24 Print Date: 2024/12/13 Time:

File Path: C:\GIS\Projects\TACC Parcel 24\055189 Parcel 24\055189 Parcel 24.aprx Print Date: 2024/12/13 Time: 09:15 AM

3.0 Preliminary Existing Conditions

3.1 Tree Inventory

Two targeted tree inventories were completed in 2022 and 2024. The 2022 tree inventory was conducted for the NHS road crossing on the west side of the subject property. A Tree Removal Plan was submitted to the City to obtain a tree clearing permit. The NHS crossing has not yet been constructed.

The 2024 tree inventory was conducted to assist with the positioning of the proposed SWMF outfall. Tree locations and details was shared with GEO Morphix to help inform their design of the SWMF outfall. As stated in Section 2.4, a site walk was conducted with the City and TRCA in 2020 to review the location of the future outfall. During the site walk, GEO Morphix discussed refining the outfall alignment to preserve some trees, if possible, by meandering the alignment around trees. Some minor tree removal is anticipated and will be finalized during future refinement of the outfall during detailed design. Additional studies will be completed, if required.

3.2 Outfall Baseline Amphibian Surveys

Burnside staff conducted amphibian breeding call surveys, following the Marsh Monitoring Program Participant's Handbook for Surveying Amphibians (BSC, 2009), during the 2024 season. Surveys were conducted between April and June by qualified ecologists, to detect potential early, mid, and late-season amphibian breeding activity in Central Ontario. One survey station (AMP-001) was established in the NHS where the SWMF outfall will drain to Wetland G8 (see Figure 3).

The Marsh Monitoring Program guidelines state that three call surveys should be completed a minimum of 15 days apart when nighttime air temperatures are greater than 5°C, 10°C and 17°C, respectively and when wind strength is less than 19 km/h (<3 on the Beaufort Scale). Weather conditions during the surveys are outlined in Table 2.

Amphibian calls are used to identify species presence and are quantified by assigning a Call Level Code and an Abundance Count. The purpose of the breeding amphibian surveys was to identify wildlife habitat, as well as any potential Significant Wildlife Habitat (SWH) on, or adjacent to, the subject property. The results from this survey provide baseline data for the location of the SWMF outfall.

Table 2: Amphibian Breeding Call Survey Weather Conditions

Survey Date	Time of Day (Start/End) (24 hours)	Weather Conditions (Air Temp °C / Beaufort Sky Code[1] / Wind Scale[2])
April 18, 2024	21:21 – 21:24	Start: 10°C; End: 6°C Sky: 2 Wind: 0
May 23, 2024	22:04 – 22:07	Start: 22°C; End: 22°C Sky: 0 Wind: 1
June 18, 2024	22:37 – 22:40	Start: 25°C; End: 23°C Sky: 1 Wind: 2

[1]NAAMP/ Beaufort Sky Codes
0 = clear (no cloud cover)
1 = partly cloudy (scattered or broken) or variable
2 = cloudy or overcast
3 = sandstorm, dust storm or blowing snow
4 = fog, smoke, thick dust, or haze
5 = drizzle or light rain
6 = rain
7 = snow or snow/rain mix
8 = showers
9 = thunderstorms

[2]Beaufort Wind Scale
0 = calm, smoke rises vertically (0-2km/hr)
1 = Light air movement, smoke drifts (3-5)
2 = Slight breeze, wind felt on face; leaves rustle (6-11)
3= Gentle breeze, leaves & twigs in constant motion (12-19)
4= Moderate breeze, small branches moving, raises dust & loose paper (20-30);
5= Fresh breeze, small trees begin to sway (31-39)
6= Strong breeze, large branches in motion (40-50)

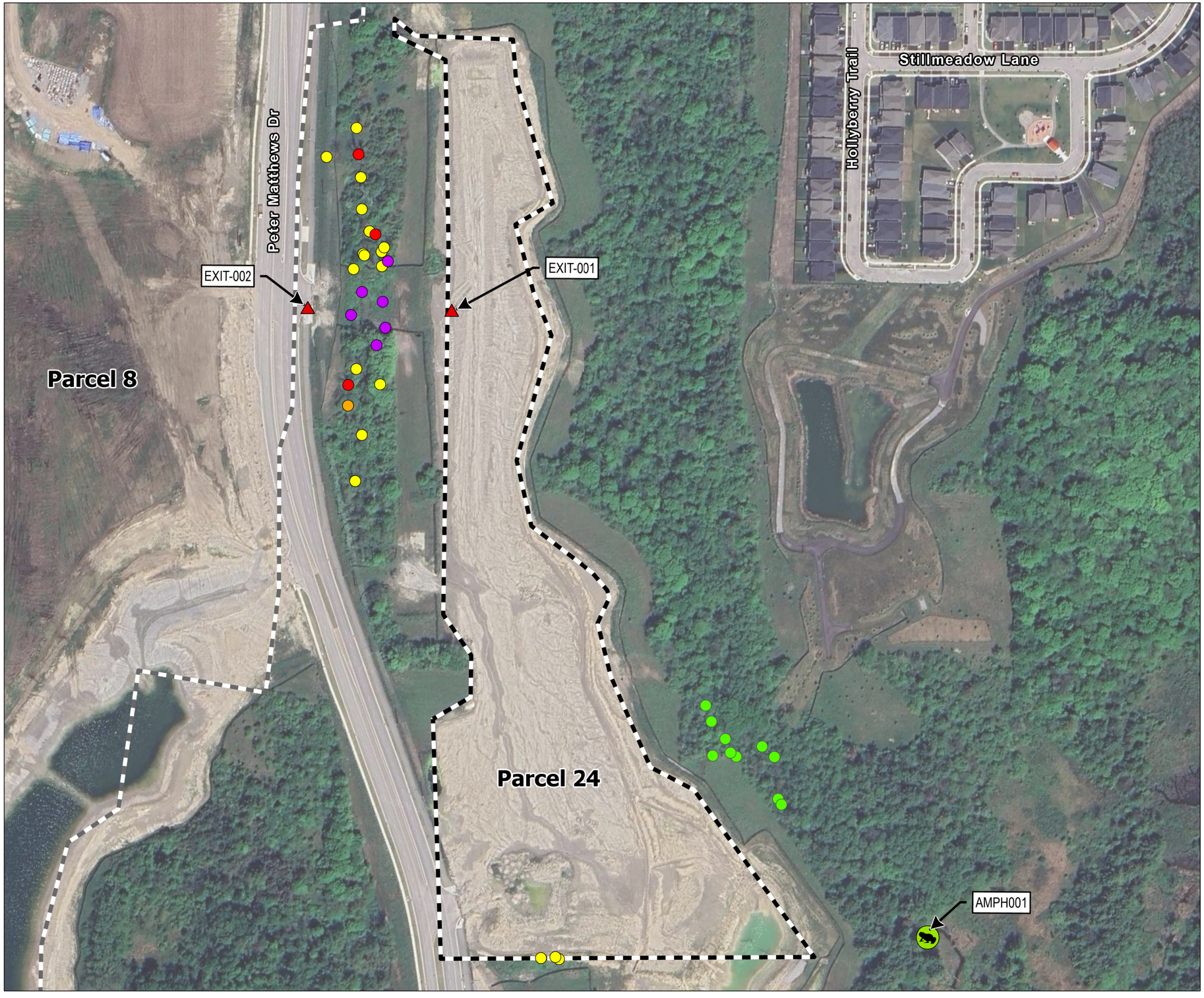
Results

Three anuran species were identified adjacent to the subject property in the NHS during targeted amphibian breeding call surveys: Green Frog (*Lithobates clamitans*), Spring Peeper (*Pseudacris crucifer*) and Gray Treefrog (*Dryophytes versicolor*) (See Table 3). All these species are ranked as S5 (Secure) in Ontario and considered common and widespread in the province. According to MNR's SWH Screening for Ecoregion 6E for amphibian breeding habitat (woodland), SWH is defined (in part) as two or more of the listed frog species with at least 20 individuals (adults or eggs masses), or two or more of the listed frog species with Call Level Codes of 3. While two of the listed species were present (Spring Peeper and Gray Treefrog), the results did not meet the criteria for significance.

Table 3: Amphibian Breeding Call Survey Results

Survey Date	Station ID	Species Observed	No. of Individuals
April 18, 2024	AMP-001	Spring Peeper	Full Chorus
May 23, 2024	AMP-001	Green Frog	2
	AMP-001	Gray Treefrog	2
June 18, 2024	AMP-001		

During the May 23 survey, Gray Treefrog was recorded in the interim sediment basin of the SWMF pond located within the development limits. Temporary ponding was present from recent rainfall events.



- Amphibian Survey Station
- Category 1 - Butternut
- Category 3 - Butternut
- Hybrid - Butternut
- Category TBD - Butternut
- Exit Survey Station
- Bat Habitat Tree - Snag
- Parcel 24
- Parcel 8

Sources:

1. Ministry of Natural Resources, © Queen's Printer for Ontario
2. Natural Resources Canada © Her Majesty the Queen in Right of Canada.

Disclaimer:

R.J. Burnside & Associates Limited and the above mentioned sources and agencies are not responsible for the accuracy of the spatial, temporal, or other aspects of the data represented on this map. It is recommended that users confirm the accuracy of the information represented.

This map is the product of a Geographic Information System (GIS). As such, the data represented on this map may be subject to updates and future reproductions may not be identical.

Datum: North American 1983 CSRS	
Coord. System: NAD 1983 CSRS UTM Zone 17N	
Projection: Transverse Mercator	
Central Meridian: 81°0'0.00"W	
False Easting: 500,000m	False Northing: 0m
Page Orientation: -19.23°	Scale Factor: 0.99960

N
True North

0 50 100 150 200
Metres

BURNSIDE

Client

TACCGATE DEVELOPMENTS INC.

Figure Title

WHITEVALE EAST

PRELIMINARY FLORA AND FAUNA SURVEYS

Drawn	Checked	Date	Figure No.
HN	AB	2024/12/13	3
Scale		Project No.	
H 1:2,500		300055189	

File Path: \\Elmo\gis\Project\300\055189 TACC Parcel 24 Print Date: 2024/12/13 Time:

File Path: C:\GIS\Projects\TACC Parcel 24\055189 Parcel 24\055189 Parcel 24 aprx Print Date: 2024/12/13 Time: 09:17 AM

3.3 SAR Screening

3.3.1 Butternut

Butternut searches have occurred on portions of the subject property and the surrounding areas as part of ongoing surveys for developments within Seaton. Incidental observations in 2018 identified two Butternut in the eastern NHS. Targeted surveys of the western hedgerow for the NHS crossing and southern hedgerow to be removed occurred on July 22, July 28, and August 18, 2022, and identified an additional 22 Butternut. On April 16, 2024, a targeted Butternut search in the vicinity of the proposed SWMF outfall in the eastern NHS identified ten Butternut. Further surveys of the eastern NHS adjacent to the development limits are scheduled for 2025 (see Figure 3).

Butternut Health Assessments were completed on August 18, 2022, for the Butternut identified in the western NHS. Of the 22 assessed, one was a Hybrid Butternut, 18 were Category 1, none were Category 2 and three were Category 3. Impacts from the NHS crossing to the three Category 3 Butternut were analyzed and shared with MECP. On November 16, 2022, MECP assessed that the Category 3 Butternuts would not be harmed by the NHS crossing or removal of the southern hedgerow (see correspondence in Appendix B).

3.3.2 Black Ash

A targeted search for Black Ash was completed on April 16, 2024, in the vicinity of the proposed SWMF outfall in the eastern NHS and none were found.

3.3.3 SAR Bats

As per MECP's *Species at Risk Bats Survey Note* (2022), potential woodland SAR bat habitat should be assessed according to the protocol *Treed Habitats – Maternity Roost Surveys* (2022). The protocol calls for Snag Surveys followed by Acoustic Monitoring Surveys.

3.3.3.1 Snag Surveys

Snag surveys are best performed during the fall to early spring, before leaves have started growing again, when visibility of cracks or crevices in tree snags is greatest. However, the surveys can be completed at any time of year if there is a clear view of trunks and branches. Snag surveys were conducted on July 13, 2022, to identify potential bat maternity roosting habitat for Little Brown Myotis (*Myotis lucifugus*), Northern Myotis (*Myotis septentrionalis*) and Tri-colored Bat (*Perimyotis subflavus*) within the footprint of the NHS crossing.

The following criteria were considered when identifying a candidate maternity roosting tree during this survey: snag height, presence of habitat characteristics, diameter at breast height (DBH), within 10 m of another tree and/or snag, amount of peeling bark, cavity height, species, percent canopy cover, and decay class.

Leaf clusters were also documented during this step, as they provide habitat for Tri-colored Bats. For each candidate tree, the above information was collected using Fulcrum and marked with a GPS waypoint.

3.3.3.2 Exit Surveys

Burnside staff completed two acoustic exit surveys on July 18, 2022, and July 21, 2022, within the footprint of the NHS crossing. Both surveys followed adapted methodology described in the MECP's *Use of Buildings by Species at Risk Bats Survey Methodology* (July 2018). The trees were surveyed from the start of sunset to one hour after the first emergence, up to a maximum of 90 minutes. Surveys took place during favourable weather conditions (i.e., nights above 15°C, during periods of low wind and no rain). Bat activity entering and exiting the trees were observed from two survey stations.

3.3.3.3 Results

Six snags were identified within the footprint of the NHS crossing. No SAR bats were observed exiting or entering the snags; therefore, they are not considered SAR bat habitat. Additional bat habitat screening and surveys, if required, will be conducted for the SWMF outfall once the location and impacts are better known.

See Figure 3 for locations of exit survey stations and bat snag trees.

3.3.4 Aquatic Habitat / Redside Dace

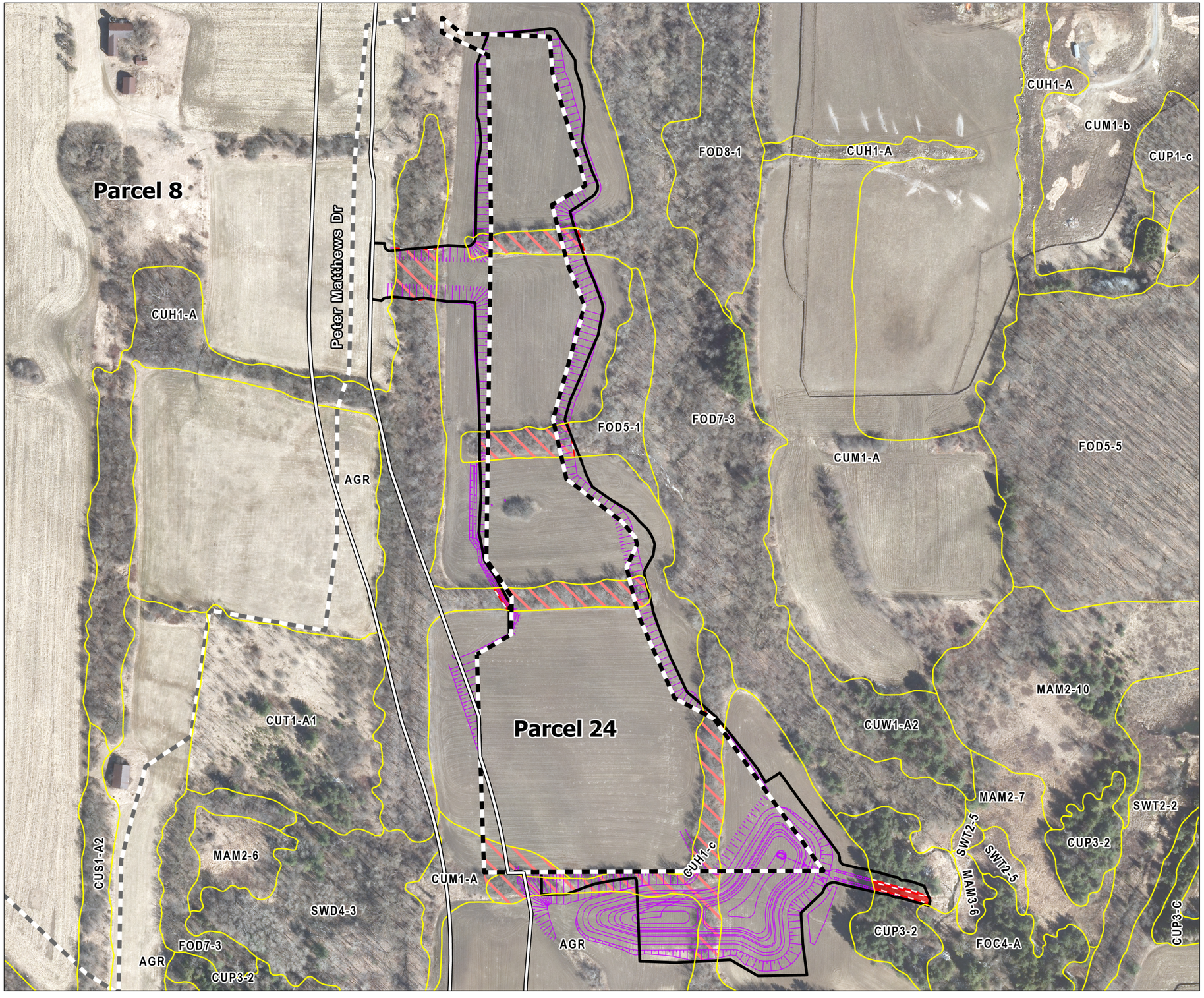
Ganatsekiagon Creek is cold water habitat as per the MNR ARA mapping. It is also classified as Occupied Redside Dace habitat south of Alexander Knox Road and east of Peter Matthews Drive and will not be reclassified as part of this project. On the east side of the subject property, an outfall from SWMF 25 is proposed, although a detailed design is not available at this time. The detailed design will be circulated to DFO, MECP and TRCA for various approvals.

An additional tributary is mapped through the southwest portion of the subject lands, reach G10-2. Burnside attended a site visit with TACC and TRCA staff in November 2024. It was confirmed at that site visit that a HDF and/or watercourse with a defined bed and bank is not present in this area.

4.0 Previous Impacts

Per SMD's FSSR (2024), permits and licenses have been secured through the efforts of previous owners and consultants to complete site works to date.

Hedgerows were cleared within the development limits for grading under previous ownership and TACCGATE. This is shown in Figure 4 with hatching. Beacon conducted a tree inventory and SAR screening under the cover of their Woody Vegetation Assessment and Tree Preservation Report: Teardrop Property (November 2019). One Category 1 Butternut was removed as part of the hedgerow clearing. The four hedgerows removed were mapped by TRCA Ecological Land Classification (ELC) as Dry-Fresh Sugar Maple Deciduous Forest (FOD5-1), Fresh-Moist Willow Lowland Deciduous Forest (FOD7-3), Treed Hedgerow (CUH1-A) and Buckthorn Hedgerow (CUH1-C). Tree Removal License M52355 from IO was obtained on March 17, 2020, for the vegetation removals.



Peter Matthews Drive Approximate Right of Way

Grading and SWM Design (Previous Design)

Grading and SWM Design (SMD Consultants, Nov 2024)

Previous Impacts

Proposed Impacts

Ecological Land Classification (TRCA)

Parcel 8

Parcel 24

*Aerial image shown is from 2018

Sources:

1. Ministry of Natural Resources, © Queen's Printer for Ontario
2. Natural Resources Canada © Her Majesty the Queen in Right of Canada.

Disclaimer:

R.J. Burnside & Associates Limited and the above mentioned sources and agencies are not responsible for the accuracy of the spatial, temporal, or other aspects of the data represented on this map. It is recommended that users confirm the accuracy of the information represented.

This map is the product of a Geographic Information System (GIS). As such, the data represented on this map may be subject to updates and future reproductions may not be identical.

Datum: North American 1983	
Coord. System: NAD 1983 UTM Zone 17N	
Projection: Transverse Mercator	
Central Meridian: 81°0'0.00"W	
False Easting: 500,000m	False Northing: 0m
Page Orientation: -19.23°	Scale Factor: 0.99960

N

True North

0 50 100 150 200

Metres

BURNSIDE

Client

TACCGATE DEVELOPMENTS INC.

Figure Title

WHITEVALE EAST

PREVIOUS AND PROPOSED IMPACTS

Drawn	Checked	Date	Figure No.
HN	HM	2024/12/13	4
Scale		Project No.	
H 1:2,750		300055189	

File Path: \\Elmo\gis\Project\300\055189 TACC Parcel 24 Print Date: 2024/12/13 Time:

File Path: C:\GIS\Projects\TACC Parcel 24\055189 Parcel 24\055189 Parcel 24.aprx Print Date: 2024/12/13 Time: 09:19 AM

The construction of the sediment basin was primarily located on agricultural land, but also required the removal of a hedgerow within the NHS. TRCA ELC mapped the hedgerow as Buckthorn Hedgerow (CUH1-C), with notes that European Buckthorn (*Rhamnus cathartica*) dominated the groundcover, shrub and understory layers, accounting for 70% of the composition. White Ash (*Fraxinus americana*) and Manitoba Maple (*Acer negundo*) dominated the canopy.

A road connecting Peter Matthews Drive to the development property is being proposed through the NHS to the west. The road will cross the Treed Hedgerow (CUH1-A). A tree inventory was completed by Burnside and a Tree Removal Plan (Sept 2022) was submitted to the City to obtain a tree clearing permit. Surveys for Butternut and SAR bats were conducted in 2022, as discussed in Section 3.3. No Butternuts were harmed, and no SAR bat habitat was present. The trees have since been removed, but the road has not yet been constructed.

5.0 Proposed Impacts

5.1 SWMF 25

A sediment basin is located at the southeast corner of the subject property and is partially in the NHS. The sediment basin was constructed under permitting and licensing acquired under previous ownership. As described in SMD's FSSR (2024), the sediment basin *"is utilized for both temporary sediment control for site runoff and to control stormwater runoff from a portion of Peter Matthews Drive which is conveyed to the temporary pond via open swale aligned just south of the site."*

The proposed final footprint of SWMF 25 will extend further west than the sediment basin, as shown in Figure 2. No additional vegetation removals are anticipated to accommodate the SWMF expansion. This shift in SWMF pond boundary is possible because the G10-2 tributary shown in the MESPA, was previously considered a constraining factor along the southwest corner of the subject property (outside the development limits). The northern limit of the pond and impact from the access road has been reduced from the previous design. Burnside attended a site walk with TRCA on November 22, 2024, to review existing conditions at G10-2. TRCA confirmed that there is no watercourse (i.e., channel with a defined bed and bank) or other feature present in this location. According to TRCA (email correspondence on December 5, 2024), previous approvals for Peter Matthews Drive did not approve a culvert to connect the wetland west of Peter Matthews Drive. TRCA has agreed, in principle, to shift the SWMF further west away from the main branch of Ganatsekiagon Creek. The benefits to this approach will be addressed through the EIS submission. Additional consultation with TRCA is required to determine if Wetland G8 downstream of the outfall would need to be hydrologically supported by the design.

As stated in SMD's FSSR (2024), *"The development will meet the standards as set out in the Ministry of the Environment Stormwater Management Planning and Design (SWMPD) Manual (March 2003), the City's Stormwater Management Design Guidelines, TRCA's Stormwater Management Criteria (August 2012), and MNR's Guidance for Development Activities in Redside Dace Protected Habitat (March 2016)."* Further design details can be found in Section 6.4 of the FSSR.

5.2 SWMF Outfall

The general location of the SWMF outfall was reviewed and approved by TRCA and the City, with Cole Engineering, GEO Morphix and Beacon on June 25, 2020, (See Appendix A). Draft plans continue to use the previously reviewed location. GEO Morphix will refine the design with the intention of meandering the alignment around larger trees and minimizing impacts as much as possible.

5.3 Grading

Updated grading plans in SMD's FSSR (2024) generally follows the grading previously developed by Cole Engineering. As the subject property has already been graded under previous permitting, very little vegetation removals are anticipated for the revised grading plan. Minor vegetation clearing may be required along the western boundary of the subject property, where the CUH1-A is present.

Proposed impacts are shown in Figure 4.

6.0 Future Permitting Requirements

The outfall design will be submitted to TRCA, MECP and DFO when available as part of the agency approval process. Depending on the results of additional surveys listed below in Section 7.0, other permitting and agency approvals may be required.

7.0 Future Studies

Additional surveys are proposed in 2025, in support of the EIS, listed in Table 4. A Terms of Reference (TOR) will be prepared in consultation with TRCA and the City prior to fieldwork commencing.

Table 4: Additional Surveys Proposed in 2025

Survey	Notes
ELC	Verify / update TRCA ELC for adjacent NHS
Tree Inventory at Outfall	While additional tree removals for the channel are not anticipated, this will be confirmed during future refinement of the outfall design. Additional studies will be completed, if required.
Butternut / Black Ash	Search for Butternut / Black Ash within 50 m of grading limits (a portion of the eastern NHS has not been surveyed). Health Assessment of trees found.
Aquatic Habitat Assessment	Aquatic habitat assessment to be conducted in the vicinity of the proposed outfall to assess potential impacts to aquatic habitat.
SAR Bats	SWMF outfall impacts on trees will be assessed for bat habitat and SAR presence.

The MESPA does not outline the need for a feature-based water balance. Currently, there are no plans to complete a wetland risk evaluation for Wetland G8. This will need to be confirmed through consultation with TRCA.

The future EIS will expand on this review and include a detailed discussion of the following:

- Summary of background secondary source information and existing ecological conditions based on field investigations completed by other consultants and Burnside biologists.
- Description of site alterations completed to date, the proposed development (i.e., SWMF outfall, LID features) and preliminary environmental constraints applied to natural heritage features.
- Confirmed SAR present on the subject lands (i.e., Butternut, Redside Dace) and summary of applicable permits or authorizations received to date (i.e., Fisheries Act, Endangered Species Act).
- Quantification of current and proposed impacts on any features in the NHS (temporary and permanent disturbance areas).
- Mitigation, restoration, and compensation strategies for areas of permanent disturbance in the NHS.
- Summary of future work that may be required (i.e., feature staking, environmental monitoring plan).

AB:af

Enclosure(s) Appendix A TRCA Correspondence
Appendix B MECP Correspondence Regarding Butternut

cc: Duncan Webster, TACCGATE Developments Inc.
Peter Slama, SMD Consultants Inc.
Stephanie Dore, TRCA
Shauna Fernandes Chagani, TRCA

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix A

TRCA Correspondence

Outlook

RE: TRCA Parcel 24 Site Walk - November 22, 2024

From Shauna Fernandes <Shauna.Fernandes@trca.ca>
Date Thu 12/5/2024 9:41 AM
To Matthew Moote <Matthew.Moote@rjburnside.com>; Duncan Webster <dwebster@taccdevelopments.com>; Vince Figliomeni <vfigliomeni@taccdevelopments.com>
Cc Hannah Maciver <Hannah.Maciver@rjburnside.com>; Ariana Burgener <Ariana.Burgener@rjburnside.com>; Stephanie Dore <Stephanie.Dore@trca.ca>

Hi Matthew,

Further, to your email, I've also reviewed the previous approvals for Peter Matthews and can confirm a culvert was not proposed to connect the wetland west of Peter Matthews Drive.

We can agree in principle to shifting the SWM pond further west away from the main corridor. As I mentioned on-site, we would need to see the benefit to this approach in the submission and whether the wetland downstream would need to be hydrologically supported by the design. Based on the concept drawing you provided the limit of the pond is further north then currently proposed and the impact of the access road would also be improved from this proposed design.

Future submissions for this file can be circulated to Stephanie Dore, Senior Planner.

Thanks,

Shauna

Shauna Fernandes Chagani, HB.Sc., MPA, EP (she/her)
Senior Ecologist
Planning Ecology | Policy Planning

T: (1 437-880-1971)
E: shauna.fernandes@trca.ca
A: 101 Exchange Avenue, Vaughan, ON, L4K 5R6 | trca.ca

Toronto and Region Conservation Authority

From: Matthew Moote <Matthew.Moote@rjburnside.com>
Sent: November 27, 2024 1:45 PM
To: Shauna Fernandes <Shauna.Fernandes@trca.ca>; Duncan Webster <dwebster@taccdevelopments.com>; Vince Figliomeni <vfigliomeni@taccdevelopments.com>
Cc: Hannah Maciver <Hannah.Maciver@rjburnside.com>; Ariana Burgener <Ariana.Burgener@rjburnside.com>
Subject: TRCA Parcel 24 Site Walk - November 22, 2024

EXTERNAL SENDER
Good Afternoon,

Outlook

TRCA Parcel 24 Site Walk - November 22, 2024

From Matthew Moote <Matthew.Moote@rjburnside.com>
Date Wed 11/27/2024 1:46 PM
To Shauna Fernandes <Shauna.Fernandes@trca.ca>; Duncan Webster <dwebster@taccdevelopments.com>; Vince Figliomeni <vfigliomeni@taccdevelopments.com>
Cc Hannah Maciver <Hannah.Maciver@rjburnside.com>; Ariana Burgener <Ariana.Burgener@rjburnside.com>

Good Afternoon,

Thanks again for meeting out on site at Seaton Parcel 24 last week. I am just following up on our site walk on Friday November 22 as we move forward with our next round of submissions. In summary:

- We observed existing conditions of Feature G11-2 on the east side of Peter Matthews Drive. Shauna was in agreement there is not a watercourse (i.e., channel with a defined bed and bank) or other feature present in this area.
- We did observe small occurrences of wetland plants on the east side of Peter Matthews Drive, but Shauna indicated they would not be classified as a wetland.

Based on these observations, please confirm the revised pond shape and alignment are approvable in principle from TRCA, and we can move ahead with further design and reporting requirements for the site.

If you have any questions, please let me know.

Thank you everyone,
Matt

BURNSIDE

Matthew Moote, H.B.Sc., C.Tech., CAN-CISEC
Project Manager / Aquatic Ecologist

R.J. Burnside & Associates Limited
292 Speedvale Avenue West, Unit 20, Guelph, Ontario N1H 1C4
Office: +1 800-265-9662 Direct: +1 226-486-1556
www.rjburnside.com

Outlook

RE: Seaton - Parcel 24 - Site Meeting

From Duncan Webster <dwebster@taccdevelopments.com>

Date Tue 11/12/2024 5:24 PM

To Stephanie Dore <Stephanie.Dore@trca.ca>; Hannah Maciver <Hannah.Maciver@rjburnside.com>; Matthew Moote <Matthew.Moote@rjburnside.com>; Shauna Fernandes <Shauna.Fernandes@trca.ca>; Jamie Milnes <Jamie.Milnes@trca.ca>

Cc Ariana Burgener <Ariana.Burgener@rjburnside.com>; Vince Figliomeni <vfigliomeni@taccdevelopments.com>; Marouchko, Irina <imarouchko@pickering.ca>

2 attachments (661 KB)

SWM 25_TACC Parcel 24.pdf; Parcel 24 - Proposed SWM Amendments.pdf;

Hi Stephanie, Shauna, and Jamie,

The fees have been submitted to our A/P department and will provide to the TRCA.

We wanted to provide some background prior to our walk, given the TRCA comments on SWM pond #25 below. TACC and Burnside went for a site-walk early October to survey the site and understand all environmental constraints prior to preliminary design and FSSR submissions. It was noticed that the eastern limits of the pond were directly abutting environmental features (ie. RSD area, the dripline offset, and a top of bank setback). The lands to the west of the pond were mapped within the MESPA to have a watercourse with an associated fisheries setback (MESPA page is attached). Since the construction of Peter Matthews and the adjacent lands, it is our perspective that the watercourse and fisheries setback are no longer existing on the west of the SWM Pond, as described by Matthew in the original email below.

Given these site investigations, it is our preference to shift the pond away from the red-side dace creek, drip-line, and stable top of bank to the east and instead utilize the lands to the west. We have attached a marked-up plan (Proposed SWM Amendments) to show the proposed revisions. The original pond is highlighted in orange, with the revised pond in black/grey. We have hatched the area in blue that we are shifting away from the east and extending to the west which is hatched in green. We are not changing our development limits, instead we are shifting the location within the NHS lands. In the MESPA, SWM25 has always been shown in the NHS, with a small section within the development lands, see below and attached. This also helps a comment received from the City, requesting a 4:1 length to width ratio for the pond. We are hoping the site walk on Friday will confirm our site walk, that the feature G10-2 within the MESPA is no longer existing and that area can be utilized for SWM.

Please let us know if you require more information prior to the walk on Friday.

Thank you,

Duncan Webster
Senior Development Manager

TACC DEVELOPMENTS

600 Applewood Crescent
Vaughan, ON L4K 4B4

c 647.502.8437
t 905.760.7300 x.3421
e dwebster@taccdevelopments.com

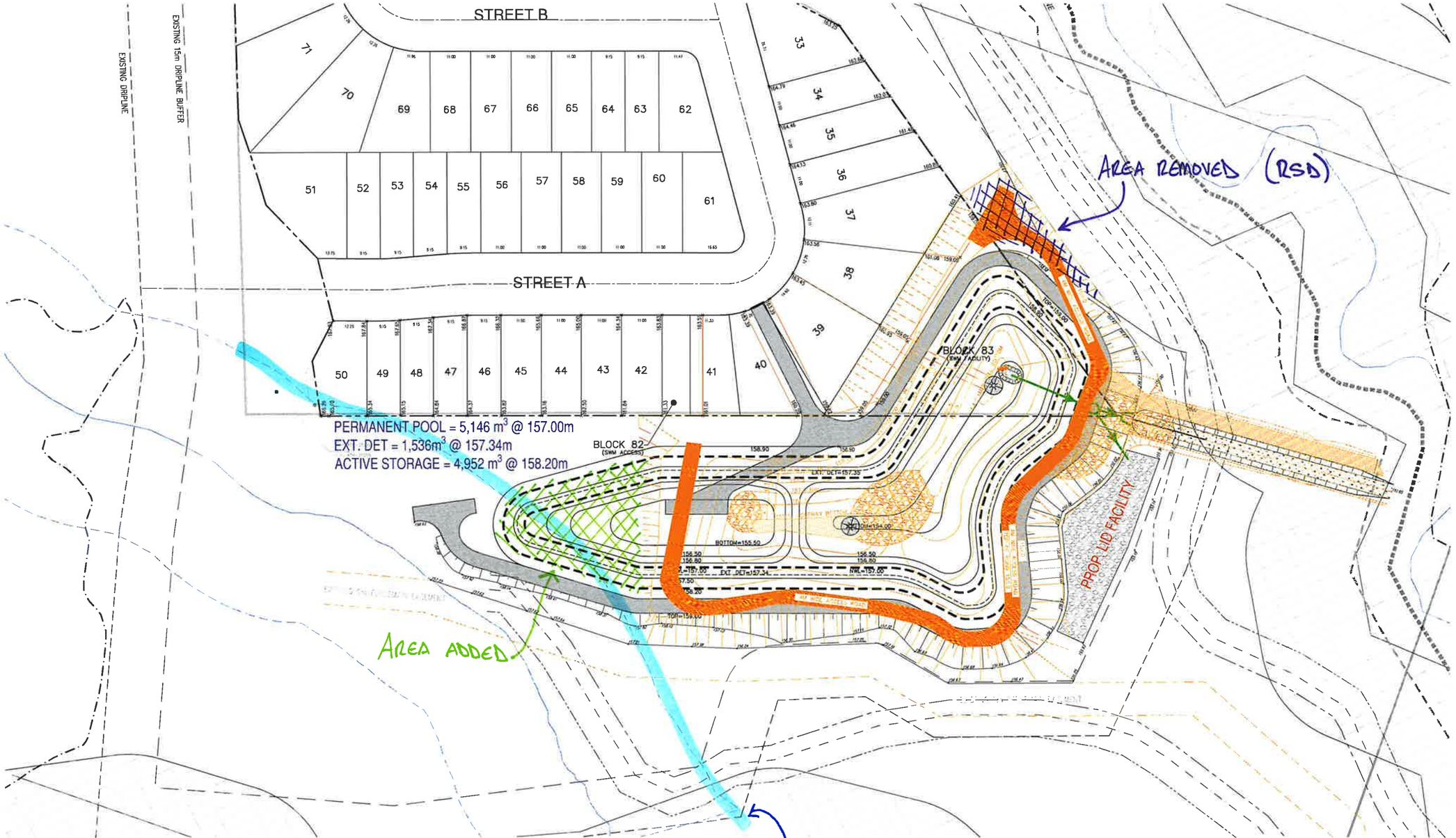
taccdevelopments.com

Please update your contact list with my new email address – dwebster@taccdevelopments.com

---

From: Stephanie Dore <Stephanie.Dore@trca.ca>
Sent: Tuesday, November 12, 2024 11:51 AM
To: Hannah Maciver <Hannah.Maciver@rjburnside.com>; Matthew Moote <Matthew.Moote@rjburnside.com>; Shauna Fernandes <Shauna.Fernandes@trca.ca>; Jamie Milnes <Jamie.Milnes@trca.ca>
Cc: Ariana Burgener <Ariana.Burgener@rjburnside.com>; Duncan Webster <dwebster@taccdevelopments.com>; Vince Figliomeni <vfigliomeni@taccdevelopments.com>; Marouchko, Irina <imarouchko@pickering.ca>
Subject: RE: Seaton - Parcel 24 - Site Meeting

Good Morning Hannah,


STREET B
STREET A
EXISTING DRIPLINE
EXISTING 15m DRIPLINE BUFFER
71
70
69
68
67
66
65
64
63
62
61
60
59
58
57
56
55
54
53
52
51
50
49
48
47
46
45
44
43
42
41
40
39
38
37
36
35
34
33
PERMANENT POOL = 5,146 m³ @ 157.00m
EXT. DET = 1,536m³ @ 157.34m
ACTIVE STORAGE = 4,952 m³ @ 158.20m
BLOCK 82
(SWM ACCESS)
BLOCK 83
(SWM FACILITY)
AREA REMOVED (RSD)
AREA ADDED
PROP. LID FACILITY
SITE WALK REQUIRED
↳ NOT EXISTING

Yes, Shauna and Jamie are both available to meet with your team on November 15th, I will be unable to attend. I have also copied Irina from the City of Pickering on this email as I understand she has an interest in participating.

For our team, we kindly ask that we start at 9:30am and conclude by 11am as staff have other commitments that they will have to travel to after this.

We look forward to receiving the required fees.

Regards,
Stephanie Dore, RPP, MCIP
Senior Planner
Development Planning and Permits | Development and Engineering Services

T: (437) 880-2469
E: stephanie.dore@trca.ca
A: 101 Exchange Avenue, Vaughan, ON, L4K 5R6 | trca.ca

Toronto and Region Conservation Authority

From: Hannah Maciver <Hannah.Maciver@rjburnside.com>
Sent: Monday, November 11, 2024 12:02 PM
To: Stephanie Dore <Stephanie.Dore@trca.ca>; Matthew Moote <Matthew.Moote@rjburnside.com>; Shauna Fernandes <Shauna.Fernandes@trca.ca>; Jamie Milnes <Jamie.Milnes@trca.ca>
Cc: Ariana Burgener <Ariana.Burgener@rjburnside.com>; Duncan Webster <dwebster@taccdevelopments.com>; Vince Figliomeni <vfigliomeni@taccdevelopments.com>
Subject: RE: Seaton - Parcel 24 - Site Meeting
Importance: High

EXTERNAL SENDER
Good morning, Stephanie:

I am replying on behalf of Matt Moote, who is off today/tomorrow.

Everyone is available November 15th, if that is still open for you. TACC will coordinate the required fees on their end.

Thank you,
Hannah

Hannah Maciver, B.E.S.
Project Manager/Senior Ecologist
R.J. Burnside & Associates Limited | www.rjburnside.com
Office: +1 800-265-9662 Mobile: +1 519-820-2562

From: Stephanie Dore <Stephanie.Dore@trca.ca>
Sent: Wednesday, November 06, 2024 9:32 AM
To: Matthew Moote <Matthew.Moote@rjburnside.com>; Shauna Fernandes <Shauna.Fernandes@trca.ca>; Jamie Milnes <Jamie.Milnes@trca.ca>
Cc: Hannah Maciver <Hannah.Maciver@rjburnside.com>; Ariana Burgener <Ariana.Burgener@rjburnside.com>; Duncan Webster <dwebster@taccdevelopments.com>; Vince Figliomeni <vfigliomeni@taccdevelopments.com>
Subject: RE: Seaton - Parcel 24 - Site Meeting

Good Morning Matt,

Thank you for your patience while we coordinated internally.

In order to go out on-site to review the feature in question, the following fees will be required to be received:

1. Draft Plan of Subdivision Top-Up Fee to November 2022 Fee Schedule: $8,535.00 (Current: $71,435.00 – Previously Paid: $62,900.00)
2. Reactivation Fee: $1,190.00

Our Planning Ecology team can also provide the following availability:

1. November 14th at 1pm
2. November 15th at 10am

Prior to going out on site we wanted to provide the following information as it relates to the existing development limits on site. It is the TRCA's perspective that we would like to see the pond remain within the development limits previously identified through the MESP and City of Pickering staff should be involved in these discussions moving forward due to their interests in the matter as well. TRCA staff can attend a site visit to gather information on the feature to continue further discussions; however it should be noted that appropriate times of the year for visits may also be applicable where other features overlap. Should any wetland limits need to be verified/reconfirmed, we would need to revisit this during the appropriate time of year as our wetland stakings have now closed for 2024.

Regards,

Stephanie Dore, RPP, MCIP
Senior Planner
Development Planning and Permits | Development and Engineering Services

T: (437) 880-2469
E: stephanie.dore@trca.ca
A: 101 Exchange Avenue, Vaughan, ON, L4K 5R6 | trca.ca

Toronto and Region Conservation Authority

From: Matthew Moote <Matthew.Moote@rjburnside.com>
Sent: Tuesday, November 5, 2024 10:36 AM
To: Shauna Fernandes <Shauna.Fernandes@trca.ca>; Jamie Milnes <Jamie.Milnes@trca.ca>
Cc: Hannah Maciver <Hannah.Maciver@rjburnside.com>; Ariana Burgener <Ariana.Burgener@rjburnside.com>; Duncan Webster <dwebster@taccdevelopments.com>; Vince Figliomeni <vfigliomeni@taccdevelopments.com>; Stephanie Dore <Stephanie.Dore@trca.ca>
Subject: Re: Seaton - Parcel 24 - Site Meeting

EXTERNAL SENDER
Hi Shauna,

Just following up on this site meeting request. Would either tomorrow or friday work for trca? I am also free wednesday through friday next week.

Thanks!
Matt

Get Outlook for iOS

Matthew Moote, H.B.Sc., C.Tech., CAN-CISEC
Project Manager / Aquatic Ecologist

R.J. Burnside & Associates
Limited | www.rjburnside.com
Office: +1 800-265-9662 Direct: +1 226-486-1556

From: Shauna Fernandes <Shauna.Fernandes@trca.ca>
Sent: Tuesday, October 29, 2024 3:38:05 PM
To: Matthew Moote <Matthew.Moote@rjburnside.com>; Jamie Milnes <Jamie.Milnes@trca.ca>
Cc: Hannah Maciver <Hannah.Maciver@rjburnside.com>; Ariana Burgener <Ariana.Burgener@rjburnside.com>; Duncan Webster <dwebster@taccdevelopments.com>; Vince Figliomeni <vfigliomeni@taccdevelopments.com>; Stephanie Dore <Stephanie.Dore@trca.ca>
Subject: RE: Seaton - Parcel 24 - Site Meeting

Hi Matthew,

My apologies on the delay, we are meeting internally this week to discuss coordinated approaches to these requests, and you will hear back from either Stephanie or I by the end of the week.

Thanks,

Shauna

Shauna Fernandes Chagani, HB.Sc., MPA, EP (she/her)
Senior Ecologist
Planning Ecology | Policy Planning

T: (1 437-880-1971)
E: shauna.fernandes@trca.ca
A: 101 Exchange Avenue, Vaughan, ON, L4K 5R6 | trca.ca

Toronto and Region Conservation Authority

From: Matthew Moote <Matthew.Moote@rjburnside.com>
Sent: October 29, 2024 3:28 PM
To: Shauna Fernandes <Shauna.Fernandes@trca.ca>; Jamie Milnes <Jamie.Milnes@trca.ca>
Cc: Hannah Maciver <Hannah.Maciver@rjburnside.com>; Ariana Burgener <Ariana.Burgener@rjburnside.com>; Duncan Webster <dwebster@taccdevelopments.com>; Vince Figliomeni <vfigliomeni@taccdevelopments.com>
Subject: FW: Seaton - Parcel 24 - Site Meeting

EXTERNAL SENDER
Good Afternoon,

Just following up on the email below. If you have availability over the next couple of weeks for a site visit, please let us know.

Thanks!
Matt

BURNSIDE

Matthew Moote, H.B.Sc., C.Tech, CAN-CISEC
Project Manager / Aquatic Ecologist

R.J. Burnside & Associates Limited
292 Speedvale Avenue West, Unit 20, Guelph ON N1H 1C4
Office: 800-265-9662 Direct: 226-486-1556
Cell: 519-830-5469 www.rjburnside.com

Matthew Moote, H.B.Sc., C.Tech., CAN-CISEC
Project Manager / Aquatic Ecologist

R.J. Burnside & Associates
Limited | www.rjburnside.com
Office: +1 800-265-9662 Direct: +1 226-486-1556

From: Matthew Moote
Sent: Wednesday, October 23, 2024 1:22 PM
To: Shauna Fernandes <Shauna.Fernandes@trca.ca>; jamie.milnes@trca.ca
Cc: Hannah Maciver <Hannah.Maciver@rjburnside.com>; Ariana Burgener <Ariana.Burgener@rjburnside.com>; Duncan Webster <dwebster@taccdevelopments.com>; Vince Figliomeni <vfigliomeni@taccdevelopments.com>
Subject: Seaton - Parcel 24 - Site Meeting

Hello,

We are in the early stages of SWM pond design and on-site ecological surveys for TACC Developments parcel 24 in the Seaton Whitevale Community.

We are hoping to schedule an on-site meeting to discuss the removal of a mapped feature at the site. The MESPA maps the feature as both a tributary (feature G-10-2) and a HDF (HDFC27). The MESPA states that HDFC27 is an agricultural swale that provides indirect fish habitat and a water balance for it is not required. Figures in the MESPA do not highlight the reach as Redside Dace habitat. I have attached a figure from the MESPA for reference to where the feature is (south of Alexander Knox, east of Peter Matthews Drive).

I was at the site last week and a channel with a defined bed and bank is not apparent on the landscape. A small CSP is present in the approximate location of the feature, but no standing or flowing water was present throughout the reach, east of Peter Matthews Drive.

The MESPA states a 30 m setback is to be applied from creek channels, although a defined channel is not present in this area. Given the information in the MESPA and the on-site conditions, we would like to proceed with removing the feature, but as it is mapped, we would like to meet with TRCA on-site to review and discuss it. Please let me know of your potential availability over the next 2 weeks (October 28 through November 8) and we will set up a time that works.

If you have any questions, please let me know.

Thanks,
Matt

COLE

Meeting Minutes

MEETING:	Seaton Pond 25 Outfall Site Walk	DATE:	June 25, 2020
LOCATION:	Seaton - Whitevale East	TIME:	1:00 pm
PROJECT NAME:	Whitevale East	PROJECT #:	UD16-0663
PURPOSE:	Review Pond 25 outfall location		

PRESENT:
Paal Helgesen, City of Pickering (PH);
Irina Marouchko, City of Pickering (IM);
Ross Pym, City of Pickering (RP);
Steve Heuchert, TRCA (SH);
Shauna Fernandes, TRCA (SF);
Geri Poisson, Beacon Environmental (GP);
Paul Villard, Geo Morphix Ltd. (PV);
Nick Karakis, Cole Engineering Group (NK);
Will Heywood, Cole Engineering Group (WH);
Terence Hart, Cole Engineering Group (TH)

REGRETS:
Lloyd Cherniak, Lebovic (LC);
Renato Caputo, Lebovic (RC);
Scott Cole, C2C Consulting (SC);
Rollie Orial, City of Pickering (RO);
Imran Khan, Beacon Environmental (IK);
Jamie Nairn, Beacon Environmental (JN);
Jessica Lysecki, Cole Engineering Group (JL);
Sukhmani Bola, TRCA (SB);
Natasha Fotini, MNRF (NF);
MECP, MOECP

ITEM	DESCRIPTION	ACTION BY
1.	• All attendees completed COVID-19 check before the meeting commenced. No issues were raised and physical distancing was exercised.	Info
2.	• Prior to the site walk, the proposed outfall location was staked. The alignment goes through a treed area prior to reaching the wetland.	Info
3.	• SH asked whether the outfall could be shifted south to the open area to lessen the impact to the treed area. There was a general discussion on possible alignments and the following is a summary of the conversation: ○ It was confirmed by IM and NK that there is a proposed sanitary easement in the open area that services the development to the east. Relocating the outfall to the open area will conflict with the sanitary easement.	Info
	○ Since the creek travels in a south east direction, downstream of the proposed outlet, shifting the outfall further south will increase its length and impact to the vegetated area.	Info
	○ Shifting the outfall location will not reduce the number of impacted trees.	Info

COLE ENGINEERING GROUP LTD.
HEAD OFFICE
70 Valleywood Drive, Markham, ON Canada L3R 4T5
T. 905 940 6161 | 416 987 6161 F. 905 940 2064
www.coleengineering.ca

ITEM	DESCRIPTION	ACTION BY
	○ Shifting the outfall location to the south will also mean that flows are not directed to the wetland.	Info
	○ The proposed outfall location provides the shortest distance to the wetland	Info
4.	• It was agreed by all that the general location of the outfall is okay.	Info
5.	• PV confirmed that the outfall location is ideal since there is room in the vicinity of the wetland for energy dispersion before reaching the creek	Info
6.	• GeoMorphix is to complete a detailed survey/staking to confirm the location of the draw (i.e. area of low ground) and to refine the outfall alignment so that some trees can be preserved, if possible, by meandering the alignment around trees. Pictures and possibly a drone video will be taken to show the proposed alignment based on the detailed survey/staking.	Geo Morphix
7.	• Another site walk may be required after the alignment is refined to confirm the number of trees impacted.	Info
8.	• There were discussions about keeping the location of the outfall headwall outside of the wetland. WH confirmed that it is not intended to have an outfall at the wetland. The headwall will be located on the pond side of the treed area and there will be a natural channel design between the headwall and wetland. The headwall is to be located out of the feature entirely to the limit of development and/or slightly within NHS. Minimizing access routes into the NHS and features is a prime concern to TRCA.	Info
9.	• SF stated that removal of larger trees should be avoided, while buckthorn trees are preferred to be removed. A compensation plan of 3:1 by area of disturbance footprint will be required. Compensation area to be reviewed includes the open space to the south	Info
10.	• PV asked if the felled trees can be used in the wetland for habitat creation and TRCA concurred.	Info

Minutes Recorded By: Terence Hart
Distribution: All present and regrets

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix B

MECP Correspondence Regarding Butternut

From: Buck, Kathleen (MECP)
Sent on: Wednesday, November 16, 2022 12:00:37 PM
To: Erica Mekli
CC: Hannah Maciver
Subject: RE: 055189 Butternut Habitat Encroachments – Seaton Whitevale North, Parcel 24 (I/O lands)

Hi Erica,

Thank you for the additional information on mitigation measures. Yes, I would also suggest installing fencing along the eastern edges as shown in the image below.

Based on the information provided it is reasonable to suggest that the Category 3 Butternut (Tree ID#015) will not be adversely impacted by the proposed works. Further, it is likely that the impacted habitat areas located within the 25-50m buffer radius of the Category 3 Butternut (temporary and permanently impacted areas) will likely not impact nut dispersal or seedling establishment, and therefore authorization under the *Endangered Species Act, 2007* (ESA) is not required.

We note that mitigation measures will be implemented as part of the project to ensure that unanticipated impacts to Butternut and its habitat do not occur. We encourage the Proponent (TACCGATE Developments Inc.) to carry out such mitigation measures and other best management practices as it deems appropriate.

MECP agrees with the conclusions made by R.J. Burnside and Associates Ltd. that the Category 3 Butternut (Tree ID#007) and its habitat may be adversely impacted by the proposed works. As such, MECP recommends registering under on Part 5 of the Ontario Regulation 830/21 and implementing the requirements identified in the regulation.

Should any of the project activities change, please notify MECP immediately to obtain advice on whether the changes require authorization under the ESA. Failure to carry out these projects as described could potentially result in contravention of the ESA. TACCGATE Developments Inc. remains responsible for ensuring compliance with the ESA and may be subject to prosecution or other enforcement action if their activities result in any harm to an at-risk species or habitat.

Our position here is based on the information that has been provided by R.J. Burnside and Associates Ltd. and its project team. Should information not have been made available and considered in our review or new information come to light that changes the conclusions made, or if on-site conditions and circumstances change so as to alter the basis for the conclusions made, please contact the Species at Risk Branch as soon as possible to discuss next steps.

We also note that while it does not appear that an ESA permit will be required, the proposed activities may be subject to other approvals, such as those issued by local municipalities and conservation authorities. Please be advised that it is the responsibility of the Proponent to be aware of and comply with all other relevant provincial or federal requirements, municipal by-laws or required approvals from other agencies. It is also the responsibility of the Proponent to ensure that all required approvals are obtained and relevant policies adhered to.

Kind regards,

Kathleen Buck
A/Regional Species at Risk Specialist
Permissions Section, Species at Risk Branch
Ministry of the Environment, Conservation & Parks

kathleen.buck@ontario.ca | ☎ 226-559-0025

~ *Pronouns: she / her* ~

Ontario

Please Note: As part of providing accessible customer service, please let me know if you have any accommodation needs or require communication supports or alternate formats.

From: Erica Mekli <Erica.Mekli@rjburnside.com>
Sent: November 16, 2022 10:29 AM
To: Buck, Kathleen (MECP) <Kathleen.Buck@ontario.ca>
Cc: Hannah Maciver <Hannah.Maciver@rjburnside.com>
Subject: RE: 055189 Butternut Habitat Encroachments – Seaton Whitevale North, Parcel 24 (I/O lands)

Good morning Kathleen,

Thank you so much for getting back to me!

There are planned mitigation measures to protect the trees during construction. There will be ESC fencing placed along the edge of the grading limit (as shown in purple in the clip below) as this will act as the limit of disturbance for construction work. So, in the case of tree 15, the RHPZ +5m will be fully protected by the fencing. No machinery will be able to access this area and no storage of materials will be allowed. If it is your preference, I can ensure the client also puts up fencing along the eastern edge of the tree (as shown in purple dash in my clip below) that will protect the RHPZ..

Thanks,

Erica

Erica Mekli, B.A., ISA certified Arborist
Project Coordinator / Terrestrial Ecologist
R.J. Burnside & Associates Limited | www.rjburnside.com
Office: +1 800-265-9662 Direct: +1 226-486-1540

From: Buck, Kathleen (MECP) <Kathleen.Buck@ontario.ca>
Sent: Wednesday, November 16, 2022 9:21 AM
To: Erica Mekli <Erica.Mekli@rjburnside.com>
Cc: Hannah Maciver <Hannah.Maciver@rjburnside.com>
Subject: RE: 055189 Butternut Habitat Encroachments – Seaton Whitevale North, Parcel 24 (I/O lands)

Hi Erica,

Would you be able to provide information on what mitigation measures will be taken to protect Tree ID# 15? This is needed to assess if the tree and its habitat will likely have any adverse impacts and whether or not registration would be recommended. E.g. will protective fencing be installed around the RHPZ? Will heavy machinery be restricted from entering the RHPZ?

Thanks,

Kathleen Buck
A/Regional Species at Risk Specialist
Permissions Section, Species at Risk Branch
Ministry of the Environment, Conservation & Parks

kathleen.buck@ontario.ca | ☎ 226-559-0025

~ *Pronouns: she / her* ~

Ontario

From: Erica Mekli <Erica.Mekli@rjburnside.com>
Sent: November 15, 2022 11:55 AM
To: Buck, Kathleen (MECP) <Kathleen.Buck@ontario.ca>
Cc: Hannah Maciver <Hannah.Maciver@rjburnside.com>
Subject: FW: 055189 Butternut Habitat Encroachments – Seaton Whitevale North, Parcel 24 (I/O lands)

Hi Kathleen,

I was wondering if you could help me track down some help on a request that I submitted on September 26, 2022. I followed up on October 20, 2022 but still have not heard back from MECP. I am working on a project that has some impacts to the 25m-50m zone of three Butternut trees. I conducted an assessment on whether these three Butternut's require registration based on the quantity of impact. The results of my assessment are that 1 of the 3 Butternut trees should be registered. Additional information is provided below and attached.

I was hoping you would be able to respond to my assessment and provide your opinion on which trees will require registration. Or would be able to connect me with the appropriate person to speak with.

Thank you very much,

Erica

Erica Mekli, B.A., ISA certified Arborist
Project Coordinator / Terrestrial Ecologist
R.J. Burnside & Associates Limited | www.rjburnside.com
Office: +1 800-265-9662 Direct: +1 226-486-1540

From: Erica Mekli
Sent: Thursday, October 20, 2022 1:15 PM
To: Species at Risk (MECP) <sarontario@ontario.ca>; Buck, Kathleen (MECP) <Kathleen.Buck@ontario.ca>
Cc: Hannah Maciver <Hannah.Maciver@rjburnside.com>
Subject: FW: 055189 Butternut Habitat Encroachments – Seaton Whitevale North, Parcel 24 (I/O lands)

Hello,

I submitted information to determine required Butternut registration to MECP for a project in Pickering Ontario on September 26th (see e-mail below). I am looking to get confirmation from MECP on the assessment I conducted on the Butternut trees based on the temporary and permanent encroachment.

In summary,
Tree 007- register
Tree 015- will not be registered
(please see full assessment below and attached)

I am hopeful that MECP can provide confirmation of my assessment so that the client can move forward with registration next steps. Please reach out if you have any additional questions.

Thanks in advance for your input,

Erica Mekli

From: Erica Mekli
Sent: Monday, September 26, 2022 9:13 AM
To: Species at Risk (MECP) <sarontario@ontario.ca>
Cc: Hannah Maciver <Hannah.Maciver@rjburnside.com>
Subject: 055189 Butternut Habitat Encroachments – Seaton Whitevale North, Parcel 24 (I/O lands)

Hello,

R.J. Burnside & Associates Ltd. has been retained by TACCGATE Developments Inc. to undertake SAR evaluations on a parcel of land in Seaton Whitevale North, Pickering. This parcel is currently referred to as Parcel 24 (“Teardrop”) and is owned by Infrastructure Ontario but is managed by TACCGATE. See attached figures. Based on assessments, construction work is proposed within the vicinity of two Category 3 Butternuts. There is a third Category 3 Butternut, but impacts have been adjusted to only occur outside of the 50m buffer. The construction work being completed by the client is limited to the proposed road crossing of the hedgerow (and associated grading), and the development parcel to the east (and associated grading).

A Butternut Health Assessment was completed and submitted to MECP on September 16, 2022 (Report # DAW189). A total of 22 Butternut were assessed resulting in 1 hybrid tree, 3 Category 3 trees, and 18 Category 1 trees.

I have attached a figure showing the amount of impact to each tree’s root harm prevention zone, root harm prevention zone +5, 25 m buffer, and 50 m buffer. I have also attached an excel sheet that breaks down the temporary and permanent impacts in each of the four buffer zones. There is no temporary or permanent impact within the Root Harm Prevention Zone (RHPZ) or the RHPZ + 5 m of any Butternut. A colleague of mine had received information from a Ministry employee that provided allowable thresholds for developing/grading/constructing near Category 2 or 3 Butternuts. I have used these numbers to assess whether the two Category 3 Butternut’s will require registration.

Tree 007-There is 16 sq m of temporary impact within the RHPZ +5m-25m zone. There is 1,254 sq m of temporary impact and 1,051 sq m of permanent impact within the 25- 50m zone. Although the area of temporary impact will be restored through seeding once construction is complete, these values are above the allowable threshold and would require a registration under O.Reg. 830/21.

Tree 015- There is 518 sq m of temporary impact and 69 sq m of permanent impact within the 25m-50m zone. The temporary impact will be restored through seeding once construction is complete. These areas of impact meet the allowable threshold information provided by MECP. I believe this impact does not require registration under O. Reg. 830/21

Tree 003- is a Category 3 tree but has no temporary or permanent impacts to the 50 m buffer.

Tree Diameter at Breast Height	Maximum Area Intrusion by Distance Zone from Tree Bole									
	0-2 metres		2-5 metres		5-15 metres		15-25 metres		25-50 metres regeneratable in OB	
	Perm	Temp	Perm	Temp + Perm	Perm	Temp + Perm	Perm	Temp + Perm	Perm	Temp + Perm
< 3 cm	0	0	3 sq m	6 sq m	50 sq m	100 sq m	500 sq m	1000 sq m	900 sq m	1800 sq m
3-14 cm	0	0	2 sq m	4 sq m	40 sq m	80 sq m	400 sq m	800 sq m	600 sq m	1200 sq m
15-34 cm	0	0	1 sq m	2 sq m	30 sq m	60 sq m	300 sq m	600 sq m	500 sq m	1000 sq m
35+ cm	0	0	0	1 sq m	20 sq m	40 sq m	200 sq m	400 sq m	400 sq m	800 sq m

I understand that no official habitat regulation for Butternuts exists currently, nor are these threshold values part of the regulation. That said, are these values viewed as acceptable by SAR Biologists at MECP?

Your consideration and advice are much appreciated. Please advise if the above conclusion of only registering Tree 007 is an acceptable course of action.

Thanks,

Erica Mekli
BHA #658

Appendix E

Erosion Threshold Analysis Summary Memo, by Geo Morphix Ltd.

December 13, 2024

TACCGATE Developments Inc.
600 Applewood Crescent
Vaughan, Ontario

Attn: **Vince Figliomeni**
Development Coordinator

Re: **Erosion Threshold Analysis Summary**
Ganastekiagon Creek Reach GB2 and G6
TACCGATE Parcel 24 Whitevale East
GEO Morphix Project No. 24118

Introduction

GEO Morphix Ltd. was retained to review previous work completed on **reaches G6** and **GB2** for the TACCGATE Parcel 24 property in the City of Pickering. Previously, an erosion assessment was completed for **Reach G6** and a detailed assessment was completed for **Reach GB2**, which are the receiving watercourses associated with Stormwater Management (SWM) Facility 25 within the Seaton Mid Block Lands.

It is our understanding that during a pre-con meeting for the Parcel 24 development Toronto and Region Conservation Authority (TRCA) requested an erosion threshold analysis be completed. This letter provides a summary of the previous work that has been completed in the area including the previous erosion threshold analysis completed as part of the MESPA (MESPA, 2014), to provide TRCA with a comfort level to defer additional analysis until detailed design once the SWM details have progressed to the ultimate condition. One stormwater management facility, Pond 25, is proposed within the property which will outlet to a tributary of Ganastekiagon Creek, **Reach GB2**, which flows into **Reach G6**. **Reach G6** was identified as the most sensitive reach downstream of the proposed stormwater management facilities. Previously, erosion threshold targets were set in principle for this development under the *Seaton Master Environmental Servicing Plan Addendum* (MESPA; The Sernas Group, 2014).

Summary of Previous Erosion Analysis Work

A memo titled *Identification of Potential Outfall Locations and Support in Identification of Erosion Concerns Associated with SWM Facilities, Seaton Mid Block, City of Pickering, Ontario (PN15048)* (GEO Morphix Ltd., 2015) was provided to support the stormwater management plan design being completed by Cole Engineering. This memo also rationalized the extent of the assessment required, provided support in determining the SWM outlet locations, and indicated if and where additional erosion threshold work is required.

As part of the *Identification of Potential Outfall Locations and Support in Identification of Erosion Concerns Associated with SWM Facilities report (GEO Morphix Ltd., 2015)* the following activities were completed:

- Review of the following background materials:
  - Topographic mapping and existing watershed conditions
  - Conceptual SWM facility drawings and the overall block plan
  - Previously completed Environmental reports including the *Seaton MESPA* (The Sernas Group, 2014) and the *Central Pickering Development Plan* (CPDP)
- Desktop analysis to determine the extent of watercourses to be assessed
- Delineation and confirmation of stream reaches in the study area
- Rapid geomorphological field assessments to determine the overall stability of the drainage features surrounding potential outlet locations

- Documentation of erosion-sensitive areas that may be of concern under post-development conditions

Field Observations

The study area is located in the north end of the City of Pickering. The Mid-Block is bounded by Taunton Road to the south, Ganatsekiagon Creek to the north and east, and a property boundary approximately 1 km west of Valley Farm Road to the west. Two watercourses run through the property: the main branch of Ganatsekiagon Creek (**Reach GB2**) and one of its tributaries (**Reach G10-2**). Both streams flow in a southeasterly direction and cross Taunton Road.

Rapid assessments and detailed assessments were completed as part of this study. Rapid geomorphological assessments for **Reach G6** and **GB2** were completed on August 7th, 2015 and November 24th, 2016 respectively. Detailed assessments for **Reach G6** were completed on November 18th, 2015 and for **Reach GB2** on December 13th, 2016.

Rapid Geomorphological Assessments

The rapid geomorphological field assessment was completed to identify existing channel erosion/instability issues and document stream habitat conditions. This included the following observations for each reach:

- Characterization of stream form, process, and evolution using the Rapid Geomorphological Assessment (RGA) (MOE, 2003; VANR, 2007), which evaluates degradation, aggradation, widening, and planimetric form adjustment at the reach scale
- Assessment of the ecological function of the watercourse using the Rapid Stream Assessment Technique (RSAT) (Galli, 1996), which evaluates stream health based on a number of biological indicators
- Instream estimates of bankfull channel geometry
- Bed and bank material composition and structure
- Georeferenced photographs to document the location of all observed erosion and infrastructure

Channel instability was objectively quantified through the application of the Ontario Ministry of the Environment's (MOE, 2003) Rapid Geomorphic Assessment (RGA). Observations were quantified using an index that identifies channel sensitivity based on evidence of aggradation, degradation, channel widening, and planimetric adjustment. The index produces values that indicate whether the channel is *stable/in regime* (score <0.20), *stressed/transitional* (score 0.21-0.40) or *adjusting* (score >0.41).

The Rapid Stream Assessment Technique (RSAT) was also employed to provide a broader view of the system and consider the ecological functioning of the watercourse (Galli, 1996). Observations were made of channel stability, channel scouring or sediment deposition, instream and riparian habitats, and water quality. The RSAT score ranks the channel as maintaining a *poor* (<13), *fair* (13-24), *good* (25-34) or *excellent* (35-42) degree of stream health.

A table summarizing the results of the general reach characteristics and measurements for the 2 reaches from the *Identification of Potential Outfall Locations and Support in Identification of Erosion Concerns Associated with SWM Facilities Report* (GEO Morphix Ltd., 2015) is provided in **Table 1** and Reach classification according to the RGA and RSAT are provided in **Table 2.**

Table 1. Reach characteristics (GEO Morphix Ltd., 2015)

Reach Name	Avg. Bankfull Width (m)	Avg. Bankfull Depth (m)	Riffle Substrate	Pool Substrate	Valley Type	Dominant Riparian Condition	Notes
G6	5.15	0.71	Gravel, cobble	Sand, gravel, cobble	Partially confined	Dense, mature forest cover	Cut-off channels common flow being redirected around debris jams, deposition of sand gravel and cobble common in these areas
GB2	4.9	0.48	Gravel, Cobble	Sand, gravel	Partially confined	Continuous coverage of mature trees	Numerous tributaries drain into reach GB2, Reach opens up at upstream extent to a wetland area with multiple flow paths, terracing, sandy basal scour, meander amplitudes of 23.3 m and 25 m, pool wetted depth of 0.33 m, Undercut of 0.30 m. Water quality clear with no odour.

Table 2. Reach classifications (GEO Morphix Ltd., 2015)

Reach Name	RGA (MOE, 2003)			RSAT (Galli, 1996)		
	Score	Condition	Dominant Systematic Adjustment	Score	Condition	Limiting Feature
G6	0.38	In transition /stress	Aggradation	25	Good	N/A
GB2	0.27	In transition/ stress	Widening	24	Fair	Channel Stability

Detailed Geomorphological Assessments

Following the initial rapid assessments, **Reach G6** and **GB2** were identified for a detailed assessment. These reaches were previously selected because they were identified as the most sensitive reaches downstream of the proposed stormwater management facilities given bank erosion and channel widening were common throughout each reach.

The detailed assessments were completed on November 18th, 2015 and December 13th, 2016, and included the following:

- Long-profile, level survey of the channel centre line
- Seven detailed cross-sectional surveys of the watercourse
- Detailed instream measurements at each cross-section location including bankfull channel geometry, riparian conditions, bank material, bank height/angle, and bank root density
- Bed material sampling at each cross-section following a modified Wolman's (1954) Pebble Count Technique or substrate sample
- Velocity and discharge measurements at select representative cross-sections

A summary of the detailed assessment results is provided in **Table 3** and **Appendix A**. The results from **Reach G6** were presented originally in the *Identification of Potential Outfall Locations and Support in Identification of Erosion Concerns Associated with SWM Facilities Report* (GEO Morphix Ltd., 2015).

Table 3: Bankfull parameters

Channel parameter	Results by Reach	
	G6	GB2
Measured		
Average bankfull channel width (m)	4.59	3.01
Average bankfull channel depth (m)	0.52	0.32
Bankfull channel gradient (%)	0.68	0.49
D_{50} (mm)	6.60	0.34
D_{84} (mm)	61.4	4.75
Manning's n roughness coefficient	0.050	0.035
Computed		
Bankfull discharge (m^3/s) [a]	2.56	0.92
Average bankfull velocity (m/s)	1.07	0.94
Unit stream power at bankfull discharge (W/m^2)	37.25	14.70
Tractive force at bankfull (N/m^2)	34.84	15.58
Critical shear stress (N/m^2) [b]	4.77	1.46
Flow competency for D_{50} (m/s) [c]	0.47	0.27
Flow competency for D_{84} (m/s) [c]	1.31	0.84

[a] Based on Manning's equation
[b] Based on Shields diagram from Miller et al. (1997)
[c] Based on Komar (1987)

Summary of Erosion Threshold Analysis

As part of the *Seaton Mid Block, Pickering, Ontario, Tributaries of Ganatsekiagon Creek, Erosion Assessment report (PN15089)* (GEO Morphix Ltd., 2017), an erosion threshold analysis was completed on **Reach G6**, which was previously approved by TRCA. Development of site-specific erosion thresholds requires an evaluation of sensitivity of the reaches within the receiving watershed through a field assessment. The observations collected during the rapid and detailed field assessments allowed for identification of sensitive reaches and quantification of erosion thresholds for comparison of pre- and post-development SWM scenarios. The erosion thresholds were then determined from detailed field observations. This is the theoretical point at which entrainment of sediment would occur based on bed and bank materials. Due to the variability between bed and bank composition and structure, erosion thresholds were determined for both the bed and banks. Threshold targets were determined using different methods that are dependent on channel and sediment characteristics. Detailed on the methods are provided in the *Erosion Assessment Report* (GEO Morphix Ltd., 2017).

Results of the erosion threshold analysis as per the *Seaton Mid Block, Pickering, Ontario, Tributaries of Ganatsekiagon Creek, Erosion Assessment report (PN15089)* (GEO Morphix Ltd., 2017), are provided below in **Table 4**.

Table 4. Erosion thresholds for Ganatsekiagon Creek (GEO Morphix Ltd., 2017)

Channel parameter	Results by Reach
	G6
Measured	
Average bankfull channel width (m)	4.59
Average bankfull channel depth (m)	0.39
Bankfull channel gradient (%)	0.68
D_{50} (m)	0.00660
Average bankfull velocity (m/s)	1.34
Bankfull discharge (m^3/s) *	3.20
Bankfull shear stress (N/m^2)	34.84
Calculated for Bed Materials	
Critical velocity (m/s)	0.47*
Critical discharge (m^3/s)	0.38
Apparent shear stress (N/m^2)	13.50
Calculated for Bank Materials	
Critical velocity (m/s)	0.41
Critical discharge (m^3/s)	0.27
Critical shear stress (N/m^2)†	8.00

* Based on Komar (1987) for D50
** Based on Julien (1998) for fine sand
† Based on Chow (1959)

Summary of Previous Erosion Modelling

Additional analyses were completed using our own in-house model on **Reach G6** within the *Seaton Mid Block, Pickering, Ontario, Tributaries of Ganatsekiagon Creek, Erosion Assessment report (PN15089)* (GEO Morphix Ltd., 2017), based on four indices:

1) Cumulative time of exceedance
2) Number of exceedance events
3) Cumulative effective discharge
4) Cumulative effective work index (i.e. cumulative effective stream power)

These indices have been applied elsewhere in CH, TRCA, CVC, and other jurisdictions. They, as a product, provide an evaluation of the number of events, period of transport, and magnitude. We note that the most relevant indicator is the cumulative effective stream power.

Cole Engineering Group Ltd. developed two scenarios for each pond proposed within the Seaton Mid Block study area. The scenarios differed in terms of the drawdown times for each pond. The first scenario simulated a 120-hour drawdown for each pond. The second scenario provided quantity control, but no drawdown. Cole Engineering also generated continuous flow results at the outlet of each pond and provided the results in 5-minute increments. The results simulate annual event flows from 1986 through 1991.

The scenarios provided by Cole Engineering. were analyzed to identify an ideal scenario with minimal impacts to the downstream channel morphology. **Tables 5** and **6** provide the results of the assessment for each respective scenario, based on the hydrographs provided by Cole Engineering used for the *Erosion Assessment Report* (GEO Morphix Ltd., 2017) for **Reach G6**.

Table 5. Erosion targets based on pre- and post-development continuous modelling. Scenario 1: with 120 hr drawdown (GEO Morphix Ltd., 2017)

	CED (m^3/s)	ω_{eff} (N/m)	t_{ex} (hours)	Exceedance #
G6 (PRE)	6660	18954898	610	48
G6 (POST)	6625	18837961	609	48
Percent Change	-1	-1	0	0

Table 6. Erosion targets based on pre- and post-development continuous modelling. Scenario 2: with no drawdown (GEO Morphix Ltd., 2017)

	CED (m^3/s)	ω_{eff} (N/m)	t_{ex} (hours)	Exceedance #
G6 (PRE)	6660	18954898	610	48
G6 (POST)	6625	18837961	609	48
Percent Change	-1	-1	0	0

The continuous modelling demonstrates that with a 120-hour drawdown, there is little change in CED and CEWI for the majority of reaches under the post-development condition, when compared to the pre-development condition. There are decreases of 1% in CED and 1% in CEWI for **Reach G6**.

With quantity control and no drawdown, there are decreases of 1% in both CED and CEWI in the post-development condition for **Reach G6**.

Given the results of the previous erosion assessment reports will be used to inform the pond design as the development progresses to detailed design. Once the ultimate pond designs have been completed erosion modelling will be completed to confirm there are no adverse impacts to the downstream reaches.

Summary and Recommendations

The objective of this memo was to summarize previous work completed to determine an appropriate erosion threshold for Ganatsekiagon Creek **Reach G6** in support of the TACCGATE Parcel 24 development. Additionally, these previous reports completed by GEO Morphix provided an analysis and mitigation plan to address post-development impacts downstream of the proposed SWM facilities.

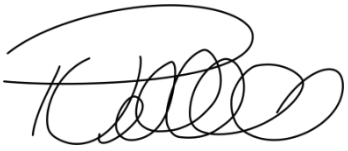
Reach delineation and rapid field assessments previously identified areas of potential erosion sensitivity downstream of the proposed SWM facilities. Detailed assessments were completed in the sensitive reaches identified and a critical discharge of 0.27 m^3/s was determined for **Reach G6**.

The results of the continuous modelling indicated that for **Reach G6**, the erosion indices under post-development conditions are effectively matched with the pre-development conditions, if either a 120-hour drawdown or no drawdown was implemented. A 120-hour drawdown results in a net reduction in erosion potential for most reaches than with no drawdown. The results of the previous work will be used to inform the ultimate design of Pond 25.

We would recommend that as pat of detailed design once the ultimate stormwater management pond has been completed that an erosion threshold analysis be completed for **Reach GB2**, to ensure there is no negative impacts to the receiving watercourse and the erosion threshold analysis be confirmed for **Reach G6**. A detailed assessment will be completed to update the previous field work that was completed in 2016, which will inform the erosion assessment that will be completed using continuous modelling provided by the water resources engineer. Additionally, at detailed design an appropriate stormwater outfall will be designed as per the recommendations provided in the *MESPA* (The Sernas Group, 2014).

We trust this report meets your requirements. Should you have any questions please contact the undersigned.

Respectfully submitted,



Paul Villard, Ph.D., P.Geo., CAN-CISEC, EP, CERP
Director, Principal Geomorphologist

Lindsay Davis, M.Sc., P. Geo., CAN-CISEC
Project Manager, Geomorphologist

References

Chow, V.T. 1959. Open channel hydraulics. McGraw Hill, New York.

Galli, J. 1996. Rapid Stream Assessment Technique, Field Methods. Metropolitan Washington Council of Governments.

Geo Morphix Ltd. 2015. Identification of Potential Outfall Locations and Support in Identification of Erosion Concerns Associated with SWM Facilities, Seaton Mid Block, City of Pickering, Ontario (PN15048). Technical Memo.

Geo Morphix Ltd. 2017. Seaton Mid Block, Pickering, Ontario, Tributaries of Ganatsekiagon Creek, Erosion Assessment (PN15089). Technical Report.

Julien, P. Y. 1998. Erosion and Sedimentation (1st ed.). Cambridge University Press.

Komar, P.D. 1987. Selective gravel entrainment and the empirical evaluation of flow competence. Sedimentology, 34: 1165-1176

Miller, M.C., McCave, I.N. and Komar, P.D. 1977. Threshold of sediment erosion under unidirectional currents. Sedimentology, 24: 507-527.

Ministry of Environment (MOE). 2003. Ontario Ministry of Environment. Stormwater Management Guidelines.

The Sernas Group. 2014. Master Environmental Servicing Plan Amendment, Seaton Community.

Appendix A
Detailed Assessment Summary

Detailed Geomorphological Assessment Summary

Project Number:	PN15089	**Date:**	November 18, 2015
Client:	1133373 Ontario Inc. Seaton Mid-Block	**Length Surveyed (m):**	120.9
Location:	Reach G6, Sideline 22, Pickering	**# of Cross-Sections:**	8

Reach Characteristics

Drainage Area:	Not measured	**Dominant Riparian Vegetation Type:**	Trees
Geology/Soils:	Modern alluvium	**Extent of Riparian Cover:**	Continuous
Surrounding Land Use:	Forest	**Width of Riparian Cover:**	>10 channel widths
Valley Type:	Partially confined	**Age Class of Riparian Vegetation:**	Mature (>30 years)
Dominant Instream Vegetation Type:	None	**Extent of Encroachment into Channel:**	None
Portion of Reach with Vegetation:	0%	**Density of Woody Debris:**	Moderate

Hydrology

Measured Discharge (m^3/s):	0.02	**Calculated Bankfull Discharge (m^3/s):**	2.56
Modelled 2-year Discharge (m^3/s):	Not modelled	**Calculated Bankfull Velocity (m/s):**	1.07
Modelled 2-year Velocity (m/s):	Not modelled		

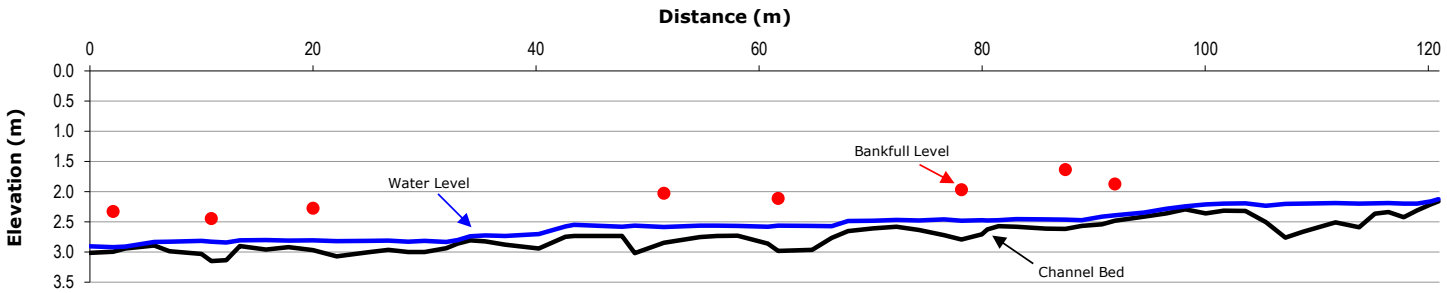
Profile Characteristics

Bankfull Gradient (%):	0.68
Channel Bed Gradient (%):	0.63
Riffle Gradient (%):	4.25
Riffle Length (m):	8.75
Riffle-Pool Spacing (m):	29.08

Planform Characteristics

Sinuosity:	1.28
Meander Belt Width (m):	Not measured
Radius of Curvature (m):	Not measured
Meander Amplitude (m):	Not measured
Meander wavelength (m):	Not measured

Longitudinal Profile



Bank Characteristics

	Minimum	Maximum	Average
Bank Height (m):	0.30	1.00	0.60
Bank Angle (deg):	20	90	61
Root Depth (m):	0.00	0.80	0.43
Root Density (%):	0	90	17
Bank Undercut (m):	0.05	0.45	0.21

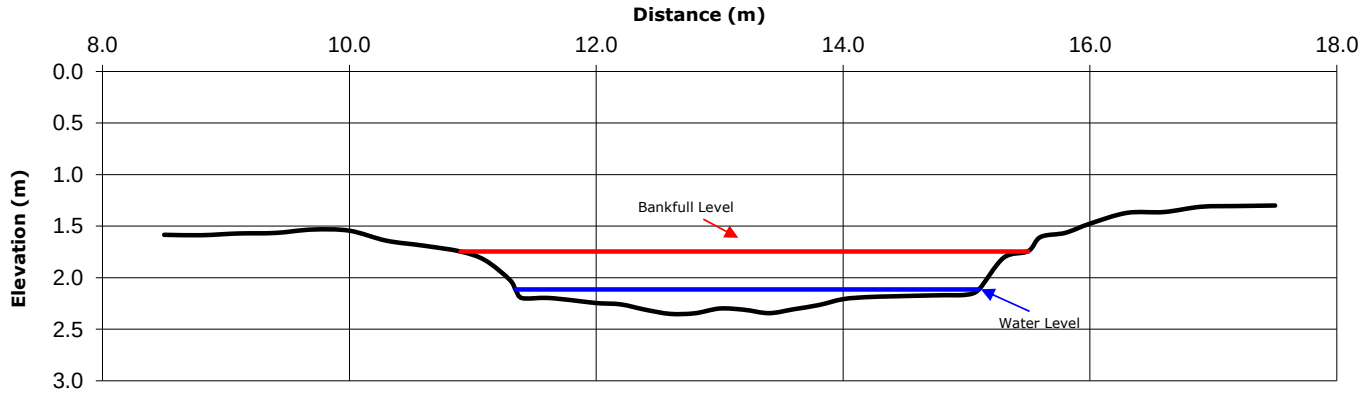
	Minimum	Maximum	Average
Torvane Value (kg/cm^2):		Not measured	
Penetrometer Value (kg/cm^3):		Not measured	
Bank Material (range):		Silt to clay	

Cross-Sectional Characteristics

	Minimum	Maximum	Average
Bankfull Width (m):	3.60	5.70	4.59
Average Bankfull Depth (m):	0.39	0.66	0.52
Bankfull Width/Depth (m/m):	5.72	13.60	9.25
Wetted Width (m):	1.85	3.75	2.88
Average Water Depth (m):	0.08	0.25	0.16
Wetted Width/Depth (m/m):	13.21	28.04	20.10
Entrenchment (m):		Not entrenched	
Entrenchment Ratio (m/m):		Not entrenched	
Maximum Water Depth (m):	1.85	3.75	2.88
Manning's *n* :		0.050	

Photograph at cross-section 3 (looking downstream)

Representative Cross-Section #3



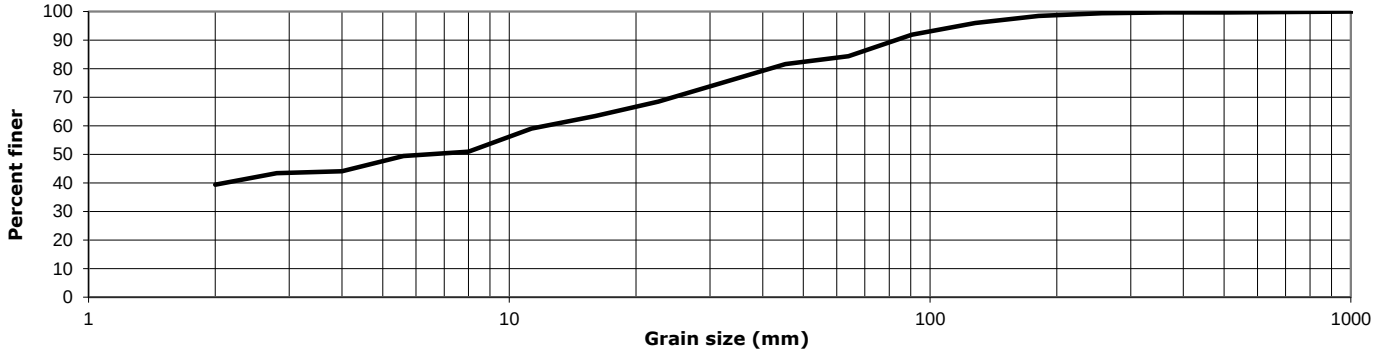
Substrate Characteristics

Particle Size (mm)

D_{10} :	<	2.0
D_{50} :		6.6
D_{90} :		83.9

Subpavement:	Sand and gravel
Particle shape:	Sub-rounded and sub-angular
Embeddedness (%):	5 to 60%
Particle range (riffle):	Sand to boulder
Particle Range (pool):	Sand to boulder

Cumulative Particle Size Distribution



Channel Thresholds

Flow Competency (m/s):		**Tractive Force at Bankfull (N/m^2):**	34.84
for D_{50}:	0.47	**Tractive Force at 2-year flow (N/m^2):**	Not modelled
for D_{84}:	1.31	**Critical Shear Stress (D_{50}) (N/m^2):**	4.77
Unit Stream Power at Bankfull (W/m^2):	37.25		

General Field Observations

Channel Description

This sinuous reach lies along the main branch of Ganatsekiagon creek, within a forested valley surrounded by agricultural land. Average bankfull width and depth were 4.59 m and 0.52 m, respectively. Geomorphic units were well developed and riffle to pool spacing averaged 29 m. Bank substrate was primarily silt and sand. Bank angles ranged from 20° to 90°. Riffle bed material consisted of sand to boulders. Pool bed material ranged from sand to boulders, with a higher percentage of sand. Particle sorting and sand/gravel bar formation was also observed. Erosion was observed on both banks with undercutting up to 0.45 m. Low to moderate woody debris was present within the channel.

Cross Section 7 - Looking Upstream

Detailed Geomorphological Assessment Summary

Reach GB2

Project Number:	PN16106	**Date:**	December 13, 2016
Client:	Lebovic Enterprises	**Length Surveyed (m):**	105.0
Location:	Ganatsekiagon Creek, Pickering, ON	**# of Cross-Sections:**	7

Reach Characteristics

Drainage Area:	Not measured	**Dominant Riparian Vegetation Type:**	Herbaceous
Geology/Soils:	Till (sandy silt to silty sand)	**Extent of Riparian Cover:**	Continuous
Surrounding Land Use:	Forest	**Width of Riparian Cover:**	>10 Channel widths
Valley Type:	Unconfined	**Age Class of Riparian Vegetation:**	Mature (>30 years)
Dominant Instream Vegetation Type:	Watercress	**Extent of Encroachment into Channel:**	Minimal
Portion of Reach with Vegetation:	20%	**Density of Woody Debris:**	High

Hydrology

Measured Discharge (m^3/s):	0.008	**Calculated Bankfull Discharge (m^3/s):**	0.92
Modelled 2-year Discharge (m^3/s):	Not modelled	**Calculated Bankfull Velocity (m/s):**	0.94
Modelled 2-year Velocity (m/s):	Not modelled		

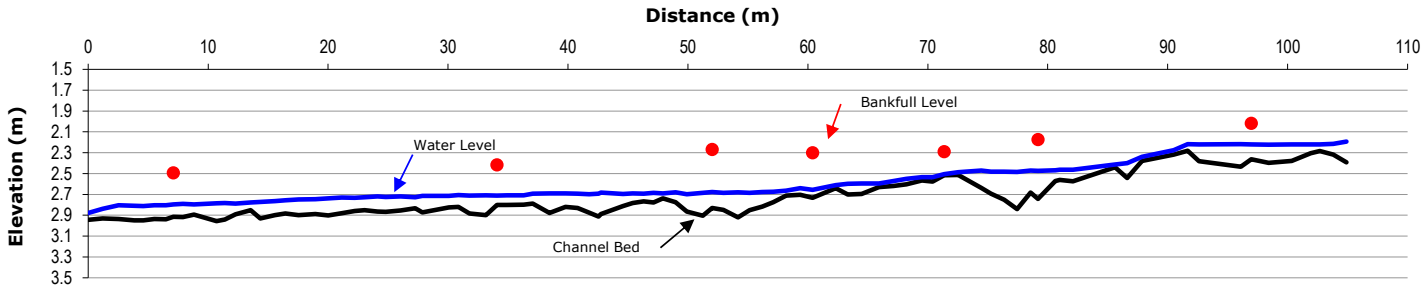
Profile Characteristics

Bankfull Gradient (%):	0.49
Channel Bed Gradient (%):	0.57
Riffle Gradient (%):	1.36
Riffle Length (m):	5.22
Riffle-Pool Spacing (m):	21.68

Planform Characteristics

Sinuosity:	2.37
Meander Belt Width (m):	Not measured
Radius of Curvature (m):	Not measured
Meander Amplitude (m):	Not measured
Meander wavelength (m):	Not measured

Longitudinal Profile



Bank Characteristics

	Minimum	Maximum	Average
Bank Height (m):	0.3	1.20	0.74
Bank Angle (deg):	25	90	59
Root Depth (m):	0.00	75.00	4.72
Root Density (%):	0	45	6
Bank Undercut (m):	0.1	0.27	0.18

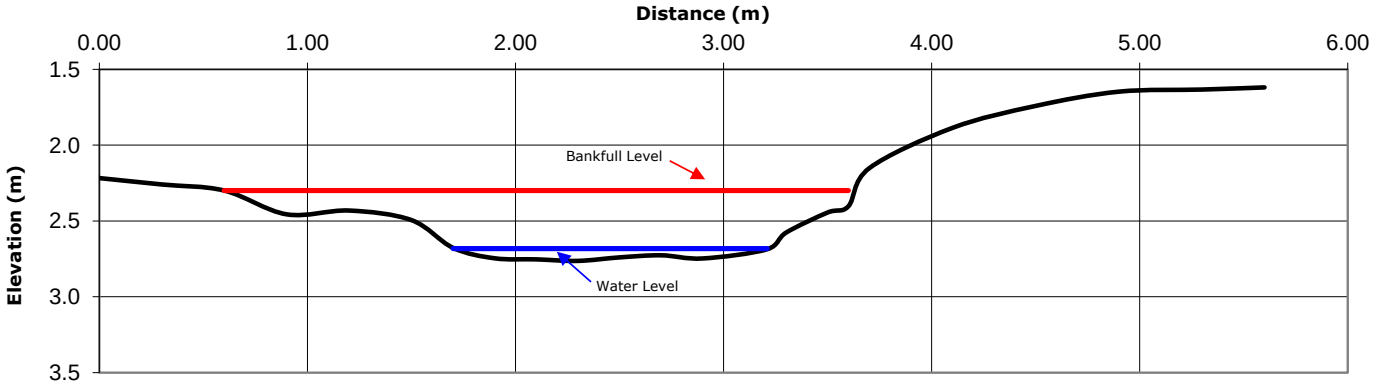
	Minimum	Maximum	Average
Torvane Value (kg/cm^2):		Not measured	
Penetrometer Value (kg/cm^3):		Not measured	
Bank Material (range):		Clay to small cobble	

Cross-Sectional Characteristics

	Minimum	Maximum	Average
Bankfull Width (m):	2.40	3.70	3.01
Average Bankfull Depth (m):	0.22	0.43	0.32
Bankfull Width/Depth (m/m):	6	17	10
Wetted Width (m):	0.56	2.23	1.43
Average Water Depth (m):	0.05	0.14	0.10
Wetted Width/Depth (m/m):	8	24	15
Entrenchment (m):		Not measured	
Entrenchment Ratio (m/m):		Not measured	
Maximum Water Depth (m):	0.06	0.21	0.13
Manning's *n* :		0.035	

Photograph at cross section 4 (looking downstream)

Representative Cross-Section # 4



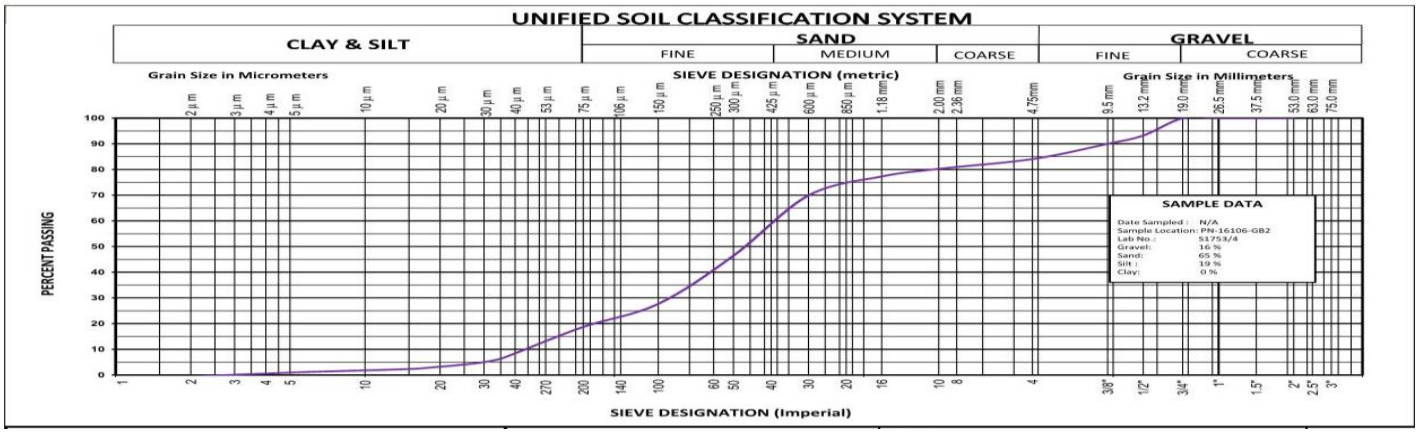
Substrate Characteristics

Particle Size (mm)

D_{10} :	0.044
D_{50} :	0.34
D_{84} :	4.75

Samples were analyzed by SHAD and Associates Inc.

Subpavement:	Sand and Gravel
Particle shape:	Sub-Rounded
Embeddedness (%):	0 - 100%
Particle range (riffle):	Gravel and Cobble
Particle Range (pool):	Sand and Gravel



Channel Thresholds

Flow Competency (m/s):		**Tractive Force at Bankfull (N/m^2):**	15.58
for D_{50}:	0.27	**Tractive Force at 2-year flow (N/m^2):**	Not modelled
for D_{84}:	0.84	**Critical Shear Stress (D_{50}) (N/m^2):**	1.46
Unit Stream Power at Bankfull (W/m^2):	14.70		

General Field Observations

Channel Description

This reach is meandering, has a low gradient and is within a partially confined valley. The riparian zone consisted primarily of cedar trees with no vegetative encroachment. Average bankfull width and depth were 4.02 m and 0.26 m, respectively. Bank material was primarily silt and sand, but ranged from clay to small cobble. Bank angles ranged from 30° to 90°. Erosion on both banks and undercuts of up to 0.30 m were observed. Riffle bed material consisted of gravel and cobbles. Pool bed material consisted of sand and gravel. High densities of woody debris were present within the channel and cutbank.

Cross Section 3 - Facing Upstreamstream

DRAWINGS

ALEXANDER KNOX ROAD

PETER MATTHEWS DRIVE

DOVERWOOD AVENUE

EVENINGSTAR BLVD

EX. TRCA SUBCATCHMENT 35

EX. TRCA SUBCATCHMENT 34

1-PRE
7.31ha
SUB-CATCH 35

2-PRE
2.48ha
SUB-CATCH 34

3-PRE
0.78ha
PETER MATTHEWS SUB-CATCH 34

FLOW SPLIT

MINOR SYSTEM FLOW (10-YEAR)

MAJOR SYSTEM FLOW

TO EXISTING SWM POND 14

ULTIMATE OUTLET

GANATSEKIAGON CREEK EAST BRANCH

MEANDER BELT + 30m RSI HABITAT

EX. 675mmø CSP CULVERT

EX. 200ø HDPE SANITARY FORCEMAIN

EXISTING 9m FORCEMAIN EASEMENT

STATUS OF EXISTING DRAW AND BUFFERS TO BE REVIEWED BY TRCA

TOTAL DRAINAGE AREA TOWARDS ULTIMATE SITE OUTLET

AREA 1-PRE 7.31 ha +
AREA 2-PRE 2.48 ha +
AREA 3-PRE 0.78 ha
TOTAL AREA = 10.57 ha

DRAINAGE DIVERSION FROM SUBCATCHMENT #34 TO #35

AREA 2-PRE 2.48 ha +
AREA 3-PRE 0.78 ha
TOTAL AREA = 3.26 ha

LEGEND

- PROPERTY LIMIT
- 205 — ORIGINAL GROUND CONTOUR
- × 265.15 — EXISTING/ORIGINAL GROUND GRADE
- DUFFINS CREEK WATERSHED SUBCATCHMENT BOUNDARY (TRCA)
- DRAINAGE AREA BOUNDARY
- EX. OVERLAND FLOW DIRECTION
- 2-PRE / 3.26ha — DRAINAGE AREA IDENTIFIER / DRAINAGE AREA IN HECTARES
- CONTRIBUTING REDSIDE DACE HABITAT

SMD CONSULTANTS INC.

PRE-DEVELOPMENT STORM DRAINAGE AREA PLAN PARCEL 24

TACCGATE DEVELOPMENTS LTD.
CITY OF PICKERING
REGION OF DURHAM

DATE:	DECEMBER 2024	PROJECT No.:	24-017
SCALE:	1:1000	FIGURE No.:	DAP-1

File : P:\Projects\2024\24-017 TACCGATE - Parcel 24\400 - CAD\402 - Detailed Design\Sheets\24-017 - STORM DRAINAGE PRE & POST.dwg, Date : Dec 16, 2024 - 12:20pm, Edit By : donie

ALEXANDER KNOX ROAD

PETER MATTHEWS DRIVE

DOVERWOOD AVENUE

EVENINGSTAR BLVD

PETER MATTHEWS DRIVE

BLOCK 86 (OPEN SPACE)

EXT-1
1.25ha
70
WOODLOT

EXT-2
1.93ha
70
WOODLOT

UNC-3
0.53ha

BIO
0.08ha

A-26
5.39ha
67%
PARCEL 24

A-3
0.78ha
87%
PETER MATTHEWS

UNC-2
0.06ha

A-25
1.23ha
90%
SWMP25

UNC-1
0.03ha

PROP. CULVERT

PROP. ROADSIDE BIOSWALE

STREET A

STREET B

STREET C

BLOCK 81

BLOCK 80

BLOCK 78

BLOCK 79

BLOCK 82 (OPEN SPACE)

BLOCK 85 (OPEN SPACE)

BLOCK 83 (SWM ACCESS)

BLOCK 84 (SWM FACILITY)

REAR OF FUTURE HOUSE LINE (21.5m FROM STREETLINE)

GANATSEKIAGON CREEK EAST BRANCH

MEANDER BELT + 30m RSD HABITAT

EX. TRCA SUBCATCHMENT 35

EX. TRCA SUBCATCHMENT 34

FLOW SPLIT

MINOR SYSTEM FLOW (10 YEAR)

MAJOR SYSTEM FLOW

TO EXISTING SWM POND 14

DRAINAGE AREAS TO DETERMINE TARGET FLOW RATE

A 25 (SWMP 25) 1.23 ha +
A 26 (PARCEL 24) 5.39 ha +
EXT 1 (WOODLOT) 1.25 ha +
EXT 2 (WOODLOT) 1.93 ha -
UNC-1 0.03 ha -
UNC-2 0.06 ha -
UNC-3 0.53 ha
TOTAL AREA FOR TARGET FLOW RATE = 9.17 ha

LEGEND

- PROPERTY LIMIT
- 205 — ORIGINAL GROUND CONTOUR
- × 265.15 — EXISTING/ORIGINAL GROUND GRADE
- DUFFINS CREEK WATERSHED SUBCATCHMENT BOUNDARY (TRCA)
- POST-DEV. DRAINAGE AREA BOUNDARY
- EX. OVERLAND FLOW DIRECTION
- PROPOSED OVERLAND FLOW DIRECTION
- A-26 / 5.39ha / 67% — POST-DEV. DRAINAGE AREA IDENTIFIER; DRAINAGE AREA IN HECTARES; % IMPERVIOUS OR CN
- UNC-3 / 0.53ha — UNCONTROLLED DRAINAGE AREA IDENTIFIER & AREA IN HECTARES
- UNCONTROLLED DRAINAGE AREA
- CONTRIBUTING REDSIDE DACE HABITAT
- INFILTRATION GALLERY
- DRAINAGE AREA TO ROADSIDE BIOSWALE
- PROP. 3:1 SLOPE

SMD CONSULTANTS INC.

POST-DEVELOPMENT STORM DRAINAGE AREA PLAN PARCEL 24

TACCGATE DEVELOPMENTS LTD.
CITY OF PICKERING
REGION OF DURHAM

DATE:	DECEMBER 2024	PROJECT No.:	24-017
SCALE:	1:1000	FIGURE No.:	DAP-2

File : P:\Projects\2024\24-017 TACCGATE - Parcel 24\400 - CAD\402 - Detailed Design\Sheets\24-017 - STORM DRAINAGE PRE & POST.dwg, Date : Dec 16, 2024 - 12:20pm, Edit By : donie

LEGEND

Symbol	Description	Symbol	Description
—	PROPERTY LIMIT	—	PROPOSED VALVE & BOX
205	ORIGINAL GROUND CONTOUR	—	PROPOSED HYDRANT
× 265.15	EXISTING/ORIGINAL GROUND GRADE	—	TACTILE WALKING SURFACE PLATES
× 265.15	PROPOSED GRADE	—	PROPOSED OVERLAND FLOW DIRECTION
—	EXISTING STORM MANHOLE	—	EX. OVERLAND FLOW DIRECTION
—	EXISTING SANITARY MANHOLE	135	PROPOSED LOT NUMBER
—	PROPOSED STORM MANHOLE	F	PROPOSED FRONT DRAINAGE LOT
—	PROPOSED SANITARY MANHOLE	S	PROPOSED SPLIT DRAINAGE LOT
—	CATCH BASIN–NO ICD	D	PROPOSED DECK LOT
—	DOUBLE CATCH BASIN	TR	PROPOSED TRANSITION LOT
—	CATCH BASIN – WITH ICD TYPE "A"=19.8 L/S	FW	PROPOSED FRONT WALKUP LOT
—	CATCH BASIN – WITH ICD TYPE "B"=28.3 L/S	WO	PROPOSED WALKOUT LOT
—	CATCH BASIN – WITH ICD TYPE "C"=36.8 L/S	*	LOT CONTAINS ENGINEERED FILL

PROPOSED SWALE
PROPOSED 3:1 SLOPE
CONTRIBUTING REDSIDE DACE HABITAT
PROP. BUILDING ENVELOPE (AS PER ZONING BYLAW FOR LD1–T & LD2)
INFILTRATION GALLERY

1.5m CONC SIDEWALK
PROPERTY LINE
SIDEWALK
DRIVEWAY LOCATION
WATERMAIN
CONC. CURB & GUTTER
DEPRESSED CURB

FRONTAGE	DWY WIDTH
< 9.0m	3.0m
9.0–11.0m	4.6m
11.0–18.0m	6.0m

R — ALL ROOF LEADERS (FRONT & REAR) TO CONNECT DIRECTLY TO ROOF DRAIN COLLECTOR SEWER SYSTEM {No RDC System in Parcel 24 design}

S — ALL ROOF LEADERS (FRONT & REAR) TO CONNECT DIRECTLY TO STORM SEWER SYSTEM (FOR LOTS LESS THAN 12.0m FRONTAGE)

U — ALL ROOF LEADERS (FRONT & REAR) TO DISCHARGE TO SURFACE VIA SPLASH PAD (FOR LOTS GREATER THAN 12.0m FRONTAGE AND NOT BACKING ON NHS)

F — ALL ROOF LEADERS (FRONT & REAR) TO DISCHARGE TO SURFACE VIA SPLASH PAD AT FRONT YARD OF LOT ONLY (FOR LOTS GREATER THAN 12.0m FRONTAGE AND BACKING ON NHS)

M — FRONT ROOF LEADERS TO CONNECT DIRECTLY TO STORM SEWER SYSTEM. REAR ROOF LEADERS DISCHARGE TO SURFACE VIA SPLASH PAD (WHEN DRAINING DIRECTLY TO SWM POND)

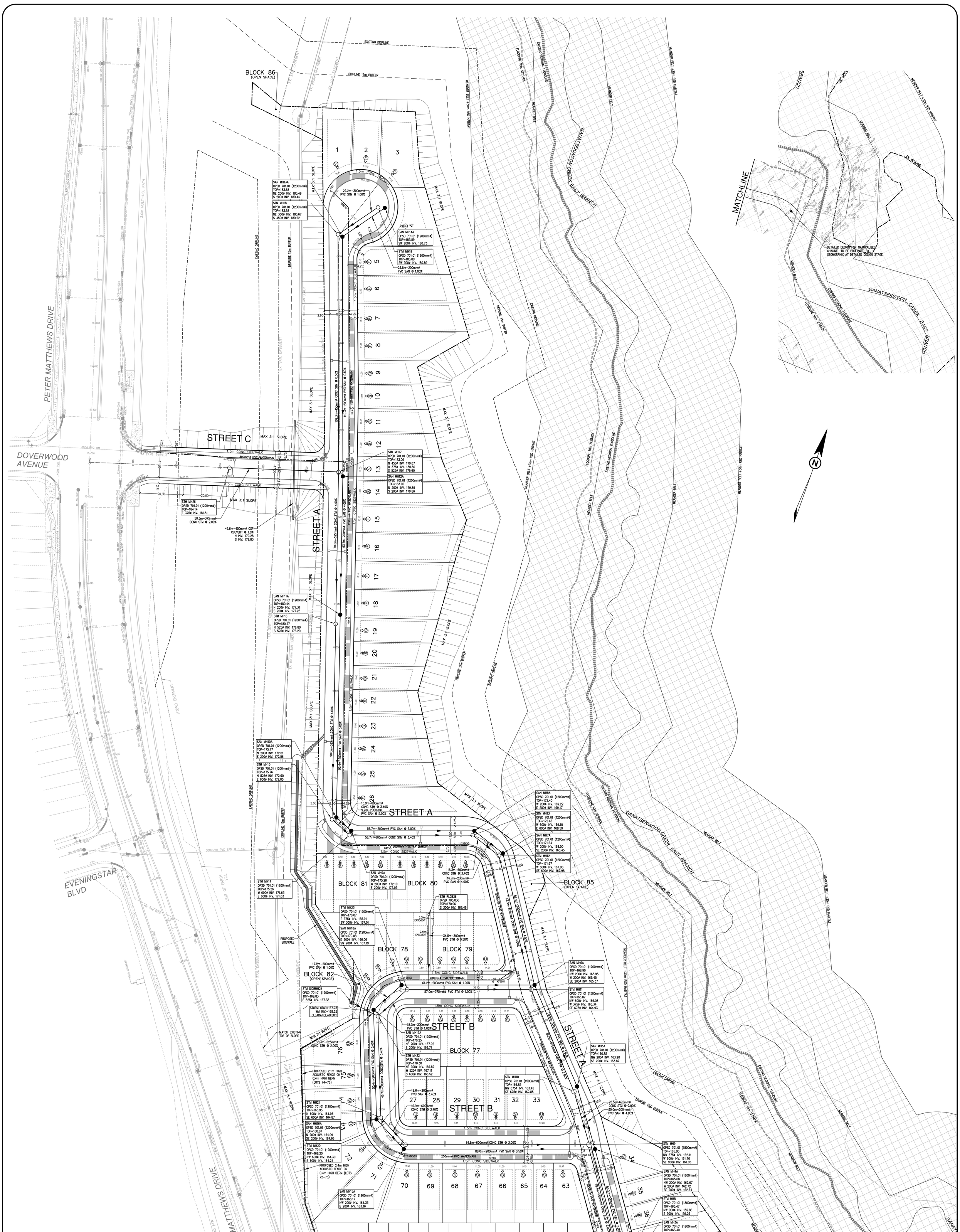
SMD CONSULTANTS INC.

NOTES:
1. TOPSOIL DEPTH IS TO BE 300mm FOR ALL LANDSCAPED SURFACES WITHIN LOTS, BLOCKS AND PUBLIC RIGHT OF WAY BOULEVARDS

FUNCTIONAL GRADING PLAN
PARCEL 24

TACCGATE DEVELOPMENTS LTD.
CITY OF PICKERING
REGION OF DURHAM

DATE:	DECEMBER 2024	PROJECT No.:	24-017
SCALE:	1:500	FIGURE No.:	GR-1



LEGEND

- PROPERTY LIMIT
- 205 ORIGINAL GROUND CONTOUR
- × 265.15 EXISTING/ORIGINAL GROUND GRADE
- EXISTING STORM MANHOLE
- EXISTING SANITARY MANHOLE
- PROPOSED STORM MANHOLE
- PROPOSED SANITARY MANHOLE
- CATCH BASIN–NO ICD
- DOUBLE CATCH BASIN
- CATCH BASIN – WITH ICD TYPE "A"=19.8 L/S
- CATCH BASIN – WITH ICD TYPE "B"=28.3 L/S
- CATCH BASIN – WITH ICD TYPE "C"=36.8 L/S
- PROPOSED VALVE & BOX
- PROPOSED HYDRANT
- TACTILE WALKING SURFACE PLATES
- 135 PROPOSED LOT NUMBER
- PROPOSED SWALE
- PROPOSED 3:1 SLOPE
- CONTRIBUTING REDSIDE DACE HABITAT
- PROP. BUILDING ENVELOPE (AS PER ZONING BYLAW FOR LD1–T & LD2)
- INFILTRATION GALLERY

1.5m CONC SIDEWALK
- PROPERTY LINE
- SIDEWALK
- DRIVEWAY LOCATION

FRONTAGE	DWY WIDTH
< 9.0m	3.0m
9.0–11.0m	4.6m
11.0–18.0m	6.0m

- WATERMAIN
- CONC. CURB & GUTTER
- DEPRESSED CURB

(R) ALL ROOF LEADERS (FRONT & REAR) TO CONNECT DIRECTLY TO ROOF DRAIN COLLECTOR SEWER SYSTEM {No RDC System in Parcel 24 design}

(S) ALL ROOF LEADERS (FRONT & REAR) TO CONNECT DIRECTLY TO STORM SEWER SYSTEM (FOR LOTS LESS THAN 12.0m FRONTAGE)

(U) ALL ROOF LEADERS (FRONT & REAR) TO DISCHARGE TO SURFACE VIA SPLASH PAD (FOR LOTS GREATER THAN 12.0m FRONTAGE AND NOT BACKING ON NHS)

(F) ALL ROOF LEADERS (FRONT & REAR) TO DISCHARGE TO SURFACE VIA SPLASH PAD AT FRONT YARD OF LOT ONLY (FOR LOTS GREATER THAN 12.0m FRONTAGE AND BACKING ON NHS)

(M) FRONT ROOF LEADERS TO CONNECT DIRECTLY TO STORM SEWER SYSTEM. REAR ROOF LEADERS DISCHARGE TO SURFACE VIA SPLASH PAD (WHEN DRAINING DIRECTLY TO SWM POND)

SMD CONSULTANTS INC.

FUNCTIONAL SERVICING PLAN
PARCEL 24

TACCGATE DEVELOPMENTS LTD.
CITY OF PICKERING
REGION OF DURHAM

DATE:	DECEMBER 2024	PROJECT No.:	24-017
SCALE:	1:500	FIGURE No.:	SP-1

File: P:\Projects\2024\24-017 TACCGATE - Parcel 24\MXD - CAD\MXD - Detailed Design\Drawn\24-017 - SERVICING PLAN.dwg, Date: Dec 16, 2024 - 11:32am, Edit By: dane

STREET A

PROPOSED 2.1m HIGH ACOUSTIC FENCE ON 0.4m HIGH BERM (LOT 52)

PROPOSED 2.1m HIGH ACOUSTIC FENCE

1.5m CONC SIDEWALK

200mmø PVC WATERMAIN

59.4m–900mmø CONC STM @ 2.00%
16.6m–900mmø CONC STM @ 2.00%

44.5m–375mmø PVC STM @ 2.60%

72.4m–375mmø PVC STM @ 4.00%

36.73m @ 6.00%

L=49.00m K=7.00

L=60.00m K= 6.00

BOULEVARD AND SIDEWALK TO BE REVERSE GRADED FOR OVERLAND FLOW PATH

STM MH8
OPSD 701.01 (1800mmø)
TOP=163.47
NW 900ø INV. 159.86
S 900ø INV. 159.26

STM MH7
OPSD 701.01 (1800mmø)
TOP=163.21
N 900ø INV. 158.93
W 375ø INV. 160.30
SE 900ø INV. 158.33

STM MH6
OPSD 701.01 (1800mmø)
TOP=160.94
NW 900ø INV. 157.64
S 1050ø INV. 157.49

STM MH25
OPSD 701.01 (1200mmø)
TOP=166.44
W 375ø INV. 163.27
E 375ø INV. 163.20

STM MH3
OPSD 701.01 (1800mmø)
TOP=159.58
E 1050ø INV. 157.13
S 1050ø INV. 157.10

STM MH4
OPSD 701.01 (1800mmø)
TOP=159.00
NE 1050ø INV. 157.39
W 1050ø INV. 157.36

STM MH5
OPSD 701.01 (1800mmø)
TOP=158.84
N 1050ø INV. 157.45
SW 1050ø INV. 157.42

STM MH2
OPSD 701.01 (1800mmø)
TOP=158.95
N 1050ø INV. 157.07
SE 1050ø INV. 157.04

STM HW1
OPSD 804.040
TOP=158.40
NW 1050ø INV. 157.00

STM MH27
OPSD 701.01 (2400mmø)
TOP=158.95
NW 450ø INV. 157.00
E 450ø INV. 156.10
SE 300ø INV. 155.80
ORIFICES TO BE INSTALLED IN BAFFLE WALL
NW ORIFICE 75ø INV. 157.00
NW ORIFICE 110ø INV. 157.40
NW ORIFICE 120ø INV. 157.81
NW ORIFICE 250(L)x100(H) INV. 158.03

STM HW2
OPSD 804.040
TOP=156.53
W 450ø INV. 156.00

OUTLET SUMP INV. 153.70
LINED WITH 100mmø
RIP–RAP, 300mm THICK

BLOCK 83 (SWM ACCESS)

BLOCK 84 (SWM FACILITY)

4.0m WIDE PAVED ACCESS PATH

MAX 4:1 SLOPE

3:1 SLOPE

4:1 SLOPE

6:1 SLOPE

BOTTOM=155.50

BOTTOM=154.00

TOP=159.00

NWL=157.00

100–YEAR MWL=158.30

158.90

157.50

156.50

156.80

Ext. DET=157.36

6.5m–1050mmø CONC STM @ 0.50%

7.6m–1050mmø CONC STM @ 0.50%

45.0m–1050mmø CONC STM @ 0.50%

8.8m–1050mmø CONC STM @ 0.50%

6.7m–1050mmø CONC STM @ 0.50%

27.8m–450mmø HDPE STM (REVERSE GRADED)

10.4m–450mmø CONC STM @ 1.00%

18.4m–300mmø PVC STM @ 2.45%

200mmø RIP–RAP PLACED 400mm THICK ON TERRAFIX 270R GEOTEXTILE

PERFORATED 300mmø PVC PIPE WRAPPED IN TERRAFIX 270R GEOTEXTILE. PIPES LAID FLAT AT INV. 155.35

IMPERMEABLE LINER TO BE INSTALLED BEHIND INFILTRATION FACILITY

PROPOSED 5mm ROOF DRAINAGE LID (INFILTRATION GALLERY)
MIN. 300m² x 0.6m DEPTH x 0.4 VOID RATIO = 72m³ VOL.
BASE OF STONE ELEV. = 155.20m
TOP OF STONE ELEV. = 155.80m
FINISHED GROUND ABOVE GALLERY = 156.70m
GROUNDWATER ELEV. = 153.82 (JULY 2020)

300mmø CLEANOUT AT END OF PIPE (TYP.)

300mmø PLUG (TYP.)

STATUS OF EXISTING DRAW AND BUFFERS TO BE REVIEWED BY TRCA

MATCH EXISTING TOE OF SLOPE

MAX 3:1 SLOPE

MAX 4:1 SLOPE

PETER MATTHEWS DRIVE

3.0m MULTI–USE PATH

1.5m SIDEWALK

EX. 675mmø CSP CULVERT

EX. 900mm SAN SEWER

EX. 400mm ø 250ø SANITARY @1.6%

EX. 200ø HDPE SANITARY FORCEMAIN

EXISTING 9m FORCEMAIN EASEMENT

SANMH102

SANMH101A

VC1

TOP OF BANK +10m SETBACK

EROSION HAZARD LIMIT

EX. TOP OF BANK

DRIPLINE 10m BUFFER

EXISTING DRIPLINE

MEANDER BELT

MEANDER BELT +30m RSD WIDTH

EROSION HAZARD LIMIT

TOP OF BANK +10m SETBACK

GANATSEKIAGON CREEK EAST BRANCH

EX. TOP OF BANK

EX. TOP OF BANK

DETAILED DESIGN FOR NATURALIZED CHANNEL TO BE PRODUCED BY GEOMORPHIX AT DETAILED DESIGN STAGE

EXISTING REGIONAL FLOODLINE

FLOODLINE 10m SETBACK

SMD CONSULTANTS INC.

LEGEND

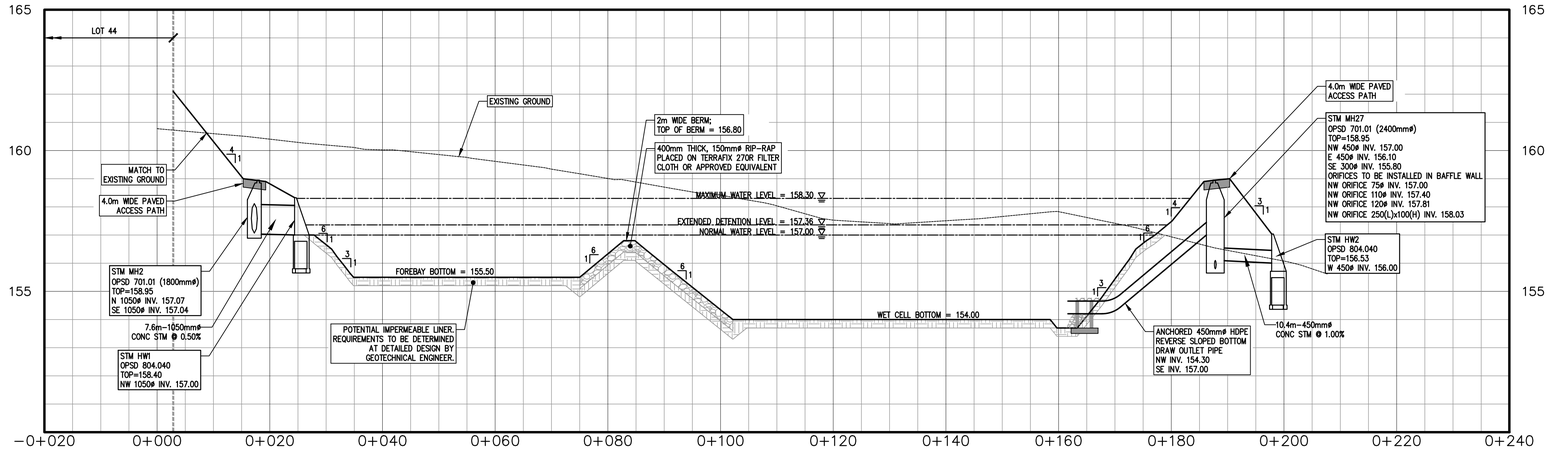
- PROPERTY LIMIT
- PROPOSED STORM MANHOLE
- 135 PROPOSED LOT NUMBER
- CATCH BASIN–NO ICD
- DOUBLE CATCH BASIN
- CATCH BASIN – WITH ICD TYPE "A"=19.8 L/S
- CATCH BASIN – WITH ICD TYPE "B"=28.3 L/S
- CATCH BASIN – WITH ICD TYPE "C"=36.8 L/S
- CONTRIBUTING REDSIDE DACE HABITAT
- PROP. BUILDING ENVELOPE (AS PER ZONING BYLAW FOR LD1–T & LD2)
- INFILTRATION GALLERY
- CROSS–SECTION – SEE DRAWING SWMF–2 FOR DETAILS

SWMF POND 25 - PLAN VIEW
PARCEL 24
TACCGATE DEVELOPMENTS LTD.
CITY OF PICKERING
REGION OF DURHAM

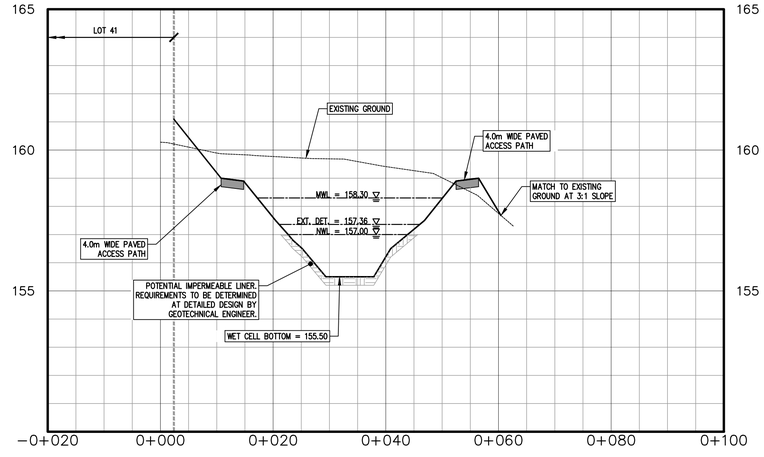
DATE:	DECEMBER 2024	PROJECT No.:	24-017
SCALE:	1:400	FIGURE No.:	SWMF-1

File - P:\Projects\2024\24-017 TACCGATE - Parcel 24\400 - CAD\402 - Detailed Design\Sheets\24-017 - SWMF 25 PLAN.dwg, Date: Dec 16, 2024 - 11:50am, Edit By: donie

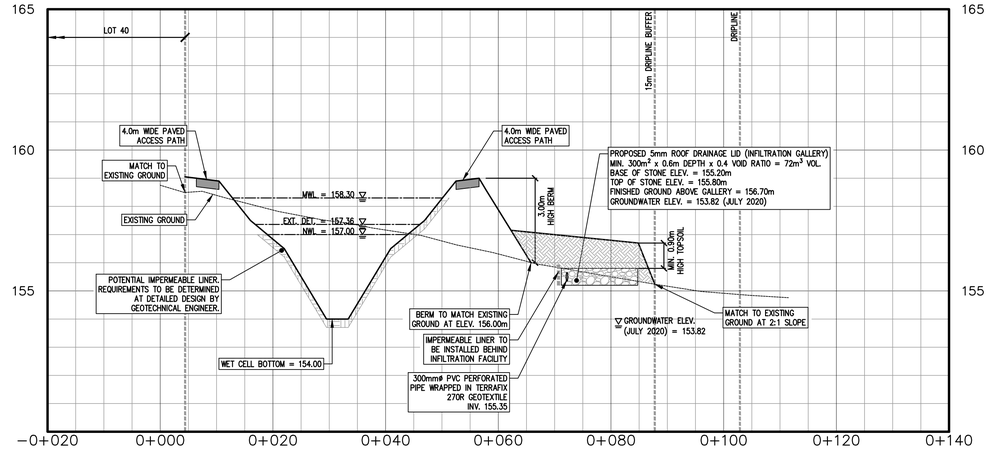
SECTION A-A



SECTION B-B



SECTION C-C



SMD CONSULTANTS INC.

LEGEND

SWMF POND 25 - CROSS SECTIONS
PARCEL 24
TACCGATE DEVELOPMENTS LTD.
CITY OF PICKERING
REGION OF DURHAM

DATE:	DECEMBER 2024	PROJECT No.:	24-017
SCALE:	HOR - 1:500 VERT - 1:100	FIGURE No.:	SWMF-2