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FUNCTIONAL SERVICING REPORT

Marsville Estates Residential Subdivision

063076 County Road 3
S/W corner of County Road 3 / County Road 24
Community of Marsville
Township of East Garafraxa
County of Dufferin

April 2020
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1.0 INTRODUCTION

Valdor Engineering Inc. has been retained by Marsville Estate Inc. to provide consulting engineering services for the proposed estate residential subdivision located on a 26.1 ha parcel on the southwest corner of County Road 24 and County Road 3 in the Community of Marsville, in the Township of East Garafraxa, as illustrated in **Figure 1**. The subject site is known municipally as 063076 County Road 3.

1.1 Existing Conditions

The subject site is currently vacant, consisting of agricultural fields with a woodlot near the south corner. The site is bounded to the north-west by County Road 3, to the north-east by County Road 24, to the south-east by agricultural fields, and to the south-west by the East Garafraxa Public School.

The subject site is located at the upstream end of the Brouwer Drain, which begins at County Road 3 and drains in a westerly direction towards Butler Creek, and ultimately the Grand River. The site topography consists of a low-point along County Road 3 which captures all drainage from the site, as well as external lands located to the south, and conveys it to the Brouwer Drain via an existing 800 mm diameter CSP culvert under County Road 3. The existing site is equipped with a farm tile drainage system discharging to the Brouwer Drain.

The subsurface soils consist of sandy silt overlain by a layer of topsoil. The soil and groundwater conditions are described in a Geotechnical Investigation Report prepared by Alston Geotechnical Consultants Inc. and in a Hydrogeological Investigation Report prepared by Palmer Environmental Consulting Group Inc. based on a series of test pits and groundwater monitoring wells.

1.2 Proposed Development

The proposed development consists of 78 residential lots for detached dwellings, with an average lot area of 0.25 Ha. The development will also include municipal road allowances, a stormwater management block and an open space block containing a bypass channel to safely convey drainage from the external lands to the south of the site to the Brouwer Drain.

It is anticipated that the housing forms will range from an 1,800 sq.ft. bungalow with attached double or triple car garage to a 3,000 sq.ft. two storey dwelling with attached double or triple car garage. The development statistics and the equivalent population data are summarized in **Table 1**. A copy of the draft plan of subdivision indicating the configuration of the lots is included in **Appendix "A"**.

Other current development proposals in the area include the Marsville North Subdivision and the Marsville South Subdivision, both of which are owned by Thomasfield Homes Ltd. The locations of these two proposed developments are indicated in **Figure 1**.

Table 1. Development Statistics

Land Use	Area (Ha)	Residential Units (No.)
Residential Lots	19.75	78
SWM Pond Block	1.82	
Open Space Block – Drainage Channel	1.61	
Road Allowances & Widening	3.71	
TOTAL	26.89	78

1.3 Purpose of Report

This report has been prepared in support of the application for draft plan approval for the subject property. The primary intent of the report is to demonstrate the viability of water and wastewater servicing, storm drainage and stormwater management, and grading, as well as vehicular and pedestrian access for the proposed development with respect to applicable guidelines, policies and design criteria. This report will provide guidance for detailed engineering design of the subdivision.

This report has been prepared based on a review of the topographic survey and background studies and correspondence with the Township's engineering consultant. This report reflects the recommended wastewater servicing strategy as presented in the Servicing Options Report for the Marsville urban area as prepared by GM Blueplan Engineering Limited for Marsville Estate Inc. and Thomasfield Homes Ltd. (owner of Marsville North Subdivision and Marsville South Subdivision). This report also reflects the proposed municipal water servicing system as established by the Marsville Water System Expansion Municipal Class Environmental Assessment Study that was completed by the Township of East Garafraxa.

2.0 WATER SERVICING

Dwellings, farms, businesses and institutional properties in the community of Marsville are serviced by individual private water wells except for the existing 33 dwellings in the Thunderbird Subdivision (Victoria Boulevard, Maple Street & Grand Crescent). This existing municipal water system servicing the 33 dwellings is supplied by two production wells, one being active and one being a back-up, located at the north end of Grand Crescent.

In order to service the proposed subdivision, an expansion to the existing municipal water system is proposed as per the Preferred Alternative established by the Marsville Water System Expansion Municipal Class Environmental Assessment Study that was completed by the Township of East Garafraxa. In this regard, two new wells are proposed that will be connected to a new site for treatment and storage. Fire protection will be provided from hydrants in the water distribution system. The location of the proposed wells and the proposed treatment and storage site is provided in **Figure 2B**. A copy of the Notice of Completion for the Municipal Class Environment Assessment Study is included in **Appendix "B"**.

The following is a summary of the water servicing requirements for the subject site.

2.1 Domestic Demand

The domestic water demand is to be calculated using the Township and Ministry of the Environment design standards which includes the following parameters:

Residential Average Day Demand:	450 L/person/day
Maximum Day Factor:	2.00
Peak Hour Factor	3.00

A detailed tabulation of the domestic water demand calculation is detailed in **Table B1 of Appendix "B"**. The domestic demands are summarized in **Table 2**. The proposed configuration of the water distribution system within the subject site is illustrated in **Figure 2A**.

Table 2. Domestic Water & Fire Flow Demand

Land Use	Equivalent Population (Persons)	Domestic Demand (L/min)	Maximum Day Demand (L/min)	Peak Hour Demand (L/min)	Fire Flow (L/min)	Maximum Day Plus Fire Flow (L/min)
Detached Dwellings	312	97.5	195.0	292.5	7,000	
TOTAL	312	97.5	195.0	292.5	7,000	7,195

2.4 Fire Protection

The fire flow required for the proposed dwelling units was calculated using the criteria indicated in the *Water Supply for Public Fire Protection Manual*, 2020, by the Fire Underwriters Survey (FUS). The calculation incorporates various parameters such as coefficient for fire-resistant construction, an area reduction accounting for a fire-resistant (one hour rating) protection, a reduction for low-hazard occupancies, and a factor for neighbouring building proximity.

The calculation was completed to reflect the governing conditions which are the largest detached dwelling and the largest interior townhouse unit. Based on the calculations, the minimum fire suppression flow required for the detached dwellings is 7,000 L/min. The detailed fire flow calculation is shown in **Table B2-1 of Appendix "B"**. In accordance with the Township standards, this flow must be available at the nearest hydrant with a minimum pressure of 140 KPa. Fire hydrants will be provided along the municipal roads such that a fire hydrant will be available within 90m of the principal entrance of each unit.

3.0 WASTEWATER SERVICING

There are currently no municipal sanitary sewer systems within the Township of East Garafraxa. Given that the proposed lot sizes and soil conditions are favourable it is proposed to service the development with individual private on-site sewage systems on each lot similar to other residential lots in the Marsville community and elsewhere in the Township. The implementation of individual

private on-site sewage systems reflects the recommendations of the Servicing Options Report for the Marsville urban area.

The following sections detail the sizing of the private on-site sewage systems in accordance with the Ontario Building Code.

3.1 Wastewater Design Flow

In accordance with Part 8 of the Ontario Building Code (OBC) the daily design flow for a dwelling is to be calculated based on the floor area of the dwelling, the number of bedrooms and the number of fixture units.

Although architectural house plans are not yet available, for the purpose of confirming servicing feasibility, it is assumed that the proposed detached dwellings will have four bedrooms, 279 m² (3,000 sq.ft.) of floor area with 26 fixture units. Based on these parameters the design sewage flow has been calculated to be 2,800 L/day as summarized in **Table 3**. The calculation of the design flow is provided in **Table C1** and the listing of fixture units is provided in **Table C2** which are both included in **Appendix "C"**. With regards to the employment lands, the use is not known at this time and therefore the sizing of septic systems within the employment lands block will be addressed at the site plan application stage.

The Hydrogeological Investigation Report determined that the native soils across all of the lots consist of sandy silt. With regards to the preliminary sizing of septic systems, a percolation rates ("T" time) of 25 min/cm has been used as indicated in the report.

Table 3. Wastewater Flow

House Size:	279 m ² (3,000 sq.ft.), 4 bedrooms, 26 fixture units
Design Flow, Q:	2,800 L/day
Native Soils:	Sandy Silt
Percolation Rate:	25 minutes / cm
Conventional Raised Septic Bed	
Septic Tank Size:	6,800 L
Required Length of Distribution Pipe:	140.0m, 6 runs @ 23.4m = 140.4
Bed Area:	23.4m x 23.0m = 538.2 sq.m. (including 15m mantle)
Tertiary Treatment Septic System	
Anaerobic Digester Tank	5,664 L
Waterloo Biofilter® Tank	Model AD-7480
Area Bed: Stone Layer:	37.3 sq.m.
Sand Layer:	175.0 sq.m.

3.2 Septic System Design

The septic system for a detached dwelling is to be design in accordance with Part 8 of the Ontario Building Code (OBC). The OBC allows for the use of both conventional systems having standard septic tanks and tertiary treatment systems which have specially designed treatment units. The following is a summary of the sizing of both systems:

3.2.1 Conventional Septic Systems

The conventional septic system is comprised of several components as follows:

Septic Tank

A 100mm diameter gravity sanitary drain will convey sewage flows to the septic tank from plumbing fixtures on the main floor of the dwelling and above. Fixtures in the basement will typically require an internal sewage ejector to pump flow up to the gravity sanitary drain.

In accordance with Section 8.2.2.3 of the OBC the septic tank volume is to be a minimum of twice the daily design flow as follows:

$$\text{Minimum Tank Size} = 2,800 \text{ L/day} \times 2 = 5,600 \text{ L}$$

$$\text{Commercially Available Sizes} = 4,500 \text{ L}, 6,800 \text{ L}, 9,000 \text{ L} \text{ \& } 13,500 \text{ L}$$

$$\text{Selected Tank Size} = 6,800 \text{ L}$$

In accordance with Section 8.6.2.1 of the OBC, an effluent filter is to be installed in the outlet of the septic tank. Access risers over both the inlet and outlet of the tank are to extend to finished grade to allow for inspection and maintenance.

Pump Tank

When using conventional raised beds or if the daily sewage flow is higher than 3,000 L/day effluent is to be pumped to the disposal bed. The pump is to be installed in a pump tank which is to be located downstream of the septic tank.

Subsurface Disposal: Conventional Raised Septic Tile Bed

Given that the percolation rate of the native soils is higher than 20 min/cm, conventional in-ground tile beds are not typically used and therefore conventional raised beds would be appropriate.

Conventional raised septic tile beds require imported sand fill and have a solid header pipe with a series of perforated distribution pipes. The total length of distribution pipe is calculated as follows:

$$\text{Length of Pipe} = Q \times T / 200 \quad \text{where } Q = \text{design flow in L/Day} \\ T = \text{Percolation Rate in min/cm}$$

$$\text{Length of Pipe} = 2,800 \times 10 / 200 = 140.0\text{m}$$

Based on 6 runs of distribution pipe each being 23.4m long the total length of distribution pipe is 140.4m. Using the required pipe spacing of 1.6m the size of the in-ground septic bed would be approximately 538 m² in area with the dimensions 8.0m (5 x 1.6m) x 23.4m plus a 15m long mantle as summarized in **Table 3**. The septic bed sizing calculations are included in **Appendix "C"**.

The location of the envelope required for a conventional raised septic tile bed together with a reserve area on each lot is indicated in **Figure 3**. As indicated in **Figure 4A** and **Figure 4B**, the lots have sufficient area for a septic system, a house envelope and a rear yard amenity area in accordance with the Township requirements.

3.2.2 Tertiary Treatment Septic Systems

There are several alternative treatment systems available which have been approved by the Ministry of Municipal Affairs & Housing (MMAH) and recognized in the OBC. Alternative treatment systems designed as "Treatment Units" other than septic tanks must meet the requirements of Section 8.6.2.2 of the OBC and must produce tertiary quality effluent. One such technology providing tertiary treatment is the Waterloo Biofilter[®] manufactured by Waterloo Biofilter Systems Inc.

Although there are several tertiary treatment systems available, the following is a summary of the sizing of a Waterloo Biofilter[®] system:

Anaerobic Digester Tank

A 100mm diameter gravity sanitary drain will convey sewage flows to the Waterloo Biofilter Anaerobic Digester tank from plumbing fixtures on the main floor of the dwelling and above. Fixtures in the basement will require an internal sewage ejector to pump flow up to the gravity sanitary drain.

In accordance with Section 8.2.2.3 of the OBC the tank volume is to be a minimum of twice the daily design flow as follows:

Minimum Tank Size =	2,800 L/day x 2 =	5,600 L
Available Anaerobic Digester Tank Size =		5,664 L

Pump Tank

Given that the effluent from the anaerobic digester must be pumped to the treatment unit a pump tank is required. Based on a design flow of 2,800 L/day a Waterloo Biofilter[®] tank model PT-3000 is required.

Tertiary Treatment Unit - Waterloo Biofilter[®]

The Waterloo Biofilter® is an aerobic trickling filter that uses an absorbent synthetic filter material developed by researchers at the University of Waterloo and was incorporated into the OBC in 1998. Effluent is applied intermittently over modules of plastic foam pieces (patented biofilter medium) contained in wire mesh baskets. This synthetic media is a support for microbiological growth, and these microorganisms are responsible for the aerobic breakdown of the wastewater. Approximately 50% of the effluent exiting the unit is pumped back to the septic tank, while the other half is directed to a disposal bed.

In accordance with the manufacturer's guidelines, based on a design flow of 2,800 L/day the Waterloo Biofilter® model AD-7480 is required.

Subsurface Disposal: Area Bed

An area bed dispersal system is typically utilized with alternative treatment systems for subsurface disposal. The area bed is to be comprised of a stone layer overlying a sand layer where the stone layer is to be a minimum of 250mm in depth, wrapped with a permeable geo-textile fabric, and comprised of stone meeting the requirements of either Subclause 8.7.3.3.(1)(b)(i) or (ii) of the OBC. Distribution pipes having 75mm diameter are to be spaced evenly within the stone layer with spacing not exceeding 1.2m. The sand layer is to be a minimum of 300mm in depth having a percolation rate ("T" time) of 6 to 10 min/cm. The sand layer covers the entire area bed. The sizing of the stone layer and sand layer is as follows:

Stone Layer:

Given that the daily design flow is less than 3,000 L, the loading on the surface of the stone layer is calculated as follows:

$$\text{Minimum Surface Area} = Q / 75 = 2,800 / 75 = 37.2 \text{ m}^2$$

$$\text{Design Surface Area} = 37.8 \text{ m}^2$$

Sand Layer:

This sand layer is to extend over an area which is calculated as follows:

$$\text{Minimum Surface Area} = Q \times T / 400 = 2,800 \times 25 / 400 = 175.0 \text{ m}^2$$

$$\text{Design Surface Area} = 176.7 \text{ m}^2$$

The area bed absorption system also includes a mantle extending a minimum of 15m beyond the distribution pipe allows an additional area for the effluent to seep laterally into the native underlying soils.

A summary of the tertiary treatment sizing is provided in **Table 3** which indicates that area bed for a tertiary treatment system is considerably smaller than a conventional raised septic tile bed. The septic bed sizing calculations are included in **Appendix "C"**.

4.0 STORM CONVEYANCE SYSTEM

The subject site is located within the Grand River watershed which is under the jurisdiction of the Grand River Conservation Authority. At 6,800 km², The Grand River watershed is the largest in southern Ontario and includes all the land drained by the Grand River and its tributaries. The Grand River begins as a small stream in Dufferin County and travels 280 km before emptying into Lake Erie. The Grand River starts in the Dufferin Highlands at an elevation of 525 m above sea level and flows south about 310 km to Lake Erie at Port Maitland, which is about 174 m above sea level.

The subject site is located in the Butler Creek sub-watershed, which includes the Brouwer Drain drainage area. The Butler Creek is located within the Upper Grand River watershed. Maps illustrating the watershed and sub-watershed are contained in **Appendix "D"**.

In accordance with the Township's requirements, a major / minor system storm conveyance concept has been incorporated into the functional servicing design for the subject development. The following sections provide a brief summary of the storm drainage components:

4.1 Minor System Design

The proposed development is to be serviced with a drainage system designed to convey runoff from the 25-year storm event (i.e. the minor system flow). For this development, the minor system will consist of roadside ditches and culverts conveying flow to the SWM pond (two inlets located to either side of the SWM block). Storm sewers are not proposed due to the inability to achieve the minimum required cover without an excessive volume of fill. A schematic design of the minor system is illustrated on **Figure 7**.

The rainfall intensity values, I , are calculated in accordance with the rainfall intensity duration frequency data (IDF) from the Fergus Shand Dam Atmospheric Environment Weather Station (Environment Canada). Based on this data the rainfall intensity for the 25- and 100-year rainfall events is calculated as follows:

$$I_{25} = \frac{3123.820}{(t+18.098)^{0.917}} \quad I_{100} = \frac{4764.902}{(t+21.75)^{0.948}}$$

The IDF curve data is included in **Appendix "D"**.

As per the hydrologic modelling completed for the proposed development (refer to *Section 6.0*), the 25-year flow to the SWM pond is 1.181 cms for drainage to the west inlet (*Catchment 201*, 7.34 ha, as per **Figure 6**), and 1.799 cms for drainage to the east inlet (*Catchment 202*, 11.35 ha, as per **Figure 6**). As indicated on **Figure 7**, the largest drainage area to a single roadside ditch is 2.34 ha for the west side (*Catchment W-1*) and 3.75 ha for the east side (*Catchment E-1*). The *Flood Transposition of Flood Discharges Method* (MTO Drainage Management Manual, 1997, Eq. 8.31) was used to determine the peak flow from each of these drainage areas, using the following formula:

$$Q_2 = Q_1 \left(\frac{A_2}{A_1} \right)^{0.75}$$

where:

Q_1 = known peak discharge

Q_2 = unknown peak discharge

A_1 = known basin area

A_2 = unknown basin area

Based on this, the peak 25-year flow from *Catchment W-1* is 0.501 cms, and 0.784 cms from *Catchment E-1*.

$$Q_{W-1} = 1.181 \left(\frac{2.34}{7.34} \right)^{0.75} = 0.501$$

$$Q_{E-1} = 1.799 \left(\frac{3.75}{11.35} \right)^{0.75} = 0.784$$

The roadside ditches have been sized to adequately convey the governing minor system flow (0.784 cms), and will consist of grass-lined triangular ditches with a minimum depth of 0.97 m, a top width of 7.4 m, and 4:1 side slopes. *FlowMaster* modelling output is provided in **Appendix "F"**. A cross-section detail of the right-of-way, including the roadside ditches, is provided in **Appendix "H"**.

The existing property is currently serviced by a tile drainage system to facilitate the current farming operation. This tile drainage system will be removed in conjunction with the servicing of the proposed subdivision.

4.2 Major System Design

The major system will be comprised of an overland flow route along the municipal road network directing drainage to the SWM pond. This major system will convey flows which are in excess of the capacity of the roadside ditch system (i.e. in excess of the 25-year event). The major system flow route is illustrated in **Figure 6**.

As per the hydrologic modelling completed for the proposed development (refer to *Section 6.0*), the 100-year peak flow to the SWM pond is 1.736 cms for drainage to the west inlet (*Catchment 201*, 7.34 ha, as per **Figure 6**), and 2.646 cms for drainage to the east inlet (*Catchment 202*, 11.35 ha, as per **Figure 6**). As indicated on **Figure 7**, the largest drainage area to a single road section is 4.07 ha for the west side (sum of *Catchments W-1 & W-2*) and 6.22 ha for the east side (sum of *Catchments E-1 & E-2*). The *Flood Transposition of Flood Discharges Method* (MTO Drainage Management Manual, 1997, Eq. 8.31) was used to determine the peak flow from each of these drainage areas, using the following formula:

$$Q_2 = Q_1 \left(\frac{A_2}{A_1} \right)^{0.75}$$

where:

Q_1 = known peak discharge

Q_2 = unknown peak discharge

A_1 = known basin area

A_2 = unknown basin area

Based on this, the peak flow from *Catchment W-1/2* is 1.116 cms, and 1.685 cms from *Catchment E-1/2*.

$$Q_{W-1/2} = 1.736 \left(\frac{4.07}{7.34} \right)^{0.75} = 1.116$$

$$Q_{E-1/2} = 2.646 \left(\frac{6.22}{11.35} \right)^{0.75} = 1.685$$

FlowMaster modelling has been completed to demonstrate that the right-of-way cross-section has adequate capacity to convey the governing major system flow (1.685 cms). *FlowMaster* modelling output is provided in **Appendix “F”**. A cross-section detail of the right-of-way is provided in **Appendix “H”**.

4.3 Foundation Drainage

It is anticipated that the proposed dwellings will have conventional basements which will have foundation weeping tile. Given the rural nature of the development, storm service connections will not be provided, and sump pumps will therefore be required. The sump pumps are to discharge over splash pads to grassed areas. The sump pumps are not to discharge to the septic system.

4.4 Roof Drainage

It is anticipated that the proposed dwellings will have conventional peaked roof with eaves troughs and downspouts. As per standard practice, the downspouts are to discharge to grade over splash pads, preferably towards sodded areas.

5.0 FLOODPLAIN ANALYSIS

As indicated on **Figures 5 & 6**, there is a large external drainage area located to the south of the subject site (*Catchment 102*, 46.03 ha). Under existing conditions, runoff from this area enters the site at the southern corner, and flows in a northern direction to the site low point along County Road 3, before being conveyed to the Brouwer Drain on the north-west side of County Road 3 via an existing 800 mm diameter CSP culvert.

Under proposed conditions, this external drainage will be conveyed through the site via a 680 m long grass-lined bypass channel located within a 20 m wide open space block along the west limits of the subject site, as indicated on **Figure 8**. This bypass channel will capture external drainage entering along the south and south-west limits of the site, as well as the rear-draining runoff from lots backing onto the channel, and convey flows directly to the existing 800 mm diameter CSP culvert under County Road 3.

A HEC-RAS Version 4.1.0 hydraulic model was prepared based on the topographic survey completed for the subject site. The 0.5 m contour interval base mapping available on the Grand River Conservation Authority’s mapping website was utilized to define the model geometry where the model sections extend beyond the limits of the site. The HEC-RAS model cross-section locations are indicated on **Figure 8**.

A hydrologic model using Visual OTTHYMO Version 5.0 (VO5) was prepared in order to determine the peak flows to be used in the hydraulic model (refer to *Section 6.0*). Based on the

results of this model, the pre-development peak flows to the existing culvert under County Road 3 are as follows:

Pre-Development 100-year Flow:

To Ex. County Road 3 Culvert: 5.229 cms

Pre-Development Regional Flow:

To Ex. County Road 3 Culvert: 8.193 cms

The post-development uncontrolled peak flows were also determined for to both the channel and the existing culvert under County Road 3, as follows:

Uncontrolled Post-Development 100-year Flow:

To Bypass Channel: 3.464 cms

To Ex. County Road 3 Culvert: 6.906 cms

Uncontrolled Post-Development Regional Flow:

To Bypass Channel: 5.777 cms

To Ex. County Road 3 Culvert: 8.024 cms

Based on the above, it was determined that the Regional flow results in the higher peak flow, and is therefore the critical storm to be used in the HEC-RAS model. Furthermore, it was determined that the uncontrolled post-development Regional peak flow is slightly less than the pre-development Regional peak flow (due to a shift in the time to peak for the proposed development). As such, it was determined that a pre-development floodplain analysis was not required because:

- a) The flows are not increased under post-development conditions.
- b) There are no proposed modifications to the existing 800 mm diameter CSP culvert under County Road 3 (i.e. no change in downstream conditions).

Instead, only the post-development floodplain analysis was completed in order to ensure the proposed bypass channel is adequately sized and that the proposed development is adequately floodproofed.

Flows were entered into the HEC-RAS model at the upstream end of the corresponding reaches. Flow to the bypass channel (5.777 cms) was entered at XS-22, and flow to the existing culvert under County Road 3 (8.024 cms) was entered at XS-6.

As indicated in **Figure 8**, the existing culvert under County Road 3 does not have enough capacity to convey the Regional flow, resulting in the road being overtopped with a maximum flow depth of approximately 0.20 m over the crown of the road at the low point. The floodplain elevation within the subject site (487.60 m) is therefore governed primarily by the backwater effect caused by the flow over the road. As a result, the proposed development must be filled above this elevation, with a minimum freeboard of 0.30 m (487.90 m), to ensure it is adequately floodproofed.

Based on the results of the HEC-RAS model, the Regional flow will be fully contained within the bypass channel, with a minimum freeboard of 0.30 m. Supporting HEC-RAS model output is provided in **Appendix “E”**.

The proposed bypass channel will be grass-lined trapezoidal channel consisting of a 5.00 m wide bottom, a minimum depth of 1.00 m, and 3:1 - 4:1 side slopes. Preliminary grading details for the bypass channel are provided on **Drawing GR-2**.

6.0 STORMWATER MANAGEMENT

6.1 Storm Drainage Areas

Based on the topographic survey and the proposed draft plan of subdivision, the following is a summary of the pre- and post-development drainage areas.

6.1.1 Pre-Development

The subject site is located at the upstream end of the Brouwer Drain, which begins at County Road 3 and drains in a westerly direction towards Butler Creek, and ultimately the Grand River. The overall site topography falls westerly towards the site low point along County Road 3, and to the Brouwer Drain via an existing 800 mm diameter CSP culvert. Site elevations vary from 492.50 m along the south-east boundary, to 485.50 m at the site low point along the north-west boundary (County Road 3). The existing slopes range from approximately 0.6% to 3%.

The existing site (*Catchment 101*, 26.05 ha) consists of agricultural land use with a woodlot near the south corner, and is equipped with a tile drainage system discharging to the Brouwer Drain.

There is an external drainage area located to the south of the subject site (*Catchment 102*, 46.03 ha), which consists primarily of agricultural land use, along with some wooded areas, open space areas (i.e. lawns) or institutional lands (i.e. the East Garafraxa Public School). Runoff from this external drainage area discharges through the subject site to the Brouwer Drain.

Figure 5 shows the drainage patterns for existing conditions.

6.1.2 Post-Development

The proposed development consists of 78 residential lots for detached dwellings, with lot sizes ranging from 0.2 to 0.8 ha. The development will also include municipal road allowances, a woodlot, a SWM block, and an open space block containing a bypass channel to safely convey drainage from the external lands to the south of the site to the Brouwer Drain.

Drainage patterns will generally follow existing conditions, with all the drainage from the site being directed to the Brouwer Drain. Runoff from the majority the proposed development (*Catchments 201-203*, 19.78 ha) will be directed to the SWM pond for

quality, quantity and erosion control, whereas the remaining areas backing onto either County Road 3 (1.03 ha) or the bypass channel (5.24 ha) will drain uncontrolled (*Catchment 204*, 6.27 ha).

Figure 6 shows the details of the proposed drainage plan for the subject site.

6.2 Stormwater Management Design Criteria

The proposed SWM facility shall be designed to provide the following levels of control as per the requirements of the Ministry of the Environment (MOE) and the Grand River Conservation Authority (GRCA):

- **Quality control:** The permanent pool shall be sized to provide Normal (Level 2) treatment of stormwater runoff for the proposed development.
- **Erosion control:** Stormwater runoff from the 25 mm storm event shall be stored and released over a minimum 24 hour period.
- **Flood control:** Flood storage and control shall be provided to maintain peak outflows from the pond at or below pre-development levels for the 2-year through 100-year design storm events.

6.3 Stormwater Management Pond Design

A wet stormwater management pond is proposed to serve the subject development area. This SWM pond will discharge directly to the Brouwer Drain via an outlet pipe under County Road 3. The total service area for the SWM pond is approximately 19.78 ha. The proposed SWM pond is located to the east of County Road 3, south of the proposed *Street "C"*, as illustrated in **Figure 9**.

Per the MOE SWM pond criteria, the SWM facility design includes 5H:1V side slopes for 3 m to either side of the permanent pool, with 3:1 side slopes elsewhere. A 4.0 m wide access road is provided to allow maintenance access from both *Streets "B" & "C"*. Anti-seepage collars shall be provided on the SWM pond outlet pipes. The preliminary details of the proposed SWM facility are provided on **Figure 9**.

6.3.1 Quality Control

Various source controls, conveyance and end-of-pipe SWM facilities were considered to provide the appropriate level of stormwater quality control. Reduced lot grades, rear and side yard swales, and discharge of roof leaders to pervious surfaces will augment the control provided by the SWM facility and promote infiltration where possible. Based on a preliminary review of available controls, it appears that the primary and most effective option to provide water quality control for runoff from the contributing drainage areas is a SWM facility. The options reviewed are as follows:

- **Roof Leader to Ponding Areas or Soakaway Pits (Lot Level):** Roof leaders will discharge directly to pervious surfaces to encourage infiltration and filtration on the lots. Soakaway pits can be an effective means of improving infiltration of stormwater, but require a large area in comparison to typical residential rear yard dimensions. As a result, soakaway pits are proposed to meet the

water balance requirements (refer to *Section 7.4*), but will not be relied upon to provide quality control for the development.

- Grassed Swales (Conveyance): Rear and side yard swales will be incorporated into the grading plan, in addition to the road-side ditches.
- Stormwater Management Facilities (End-of-Pipe): SWM facilities are required to provide water quality, extended detention and flood control of stormwater runoff. A stormwater management facility (i.e. wet SWM pond) will be constructed within the subject property.
- Oil/Grit Separation Technologies (End-of-Pipe): These SWM facilities can be effective for smaller, high impervious sites where spill protection is desired and when area for a stormwater pond is unavailable. The construction of the stormwater pond will eliminate the need for any oil/grit separation units.
- Infiltration Trenches/Basins (End-of-Pipe): These SWM facilities are most effective in areas with highly pervious soils and large areas.

The developed drainage area to the SWM facility consists of approximately 19.78 ha. The total assumed imperviousness of the drainage area to the SWM facility is 50%. The required permanent pool volume for the SWM facility based on a wet pond design and the Normal (Level 2) level of quality control is provided below.

SWM Facility (Wetland) Permanent Pool Volume Calculation

Volume required for catchment with 50% imperviousness:	105.0 m ³ /ha
<u>Less 40 m³/ha of extended detention storage zone:</u>	<u>- 40.0 m³/ha</u>
Permanent pool volume required:	65.0 m ³ /ha

The permanent pool storage volume required for the wetland SWM facility is therefore $65.0 \text{ m}^3/\text{ha} \times 19.78 \text{ ha} = 1,286 \text{ m}^3$.

The requirement for a pond liner will be confirmed at detailed design in order to maintain a permanent pool of water in the pond and to prevent the mixing of surface water with ground water.

The normal water level of the permanent pool for the pond is set at an elevation of 486.00 m. The bottom of the pond is set at an elevation of 484.25 m in the forebay and 485.00 m in the main cell. This provides a permanent pool depth of 1.75 m and 1.00 m in the forebay and main cell, respectively.

The actual permanent pool storage volume provided is approximately 2,716 m³ which is greater than the minimum required volume to meet the Normal (Level 2) quality control requirement. The required and provided quality control volume together with the elevation of the normal water level are summarized in **Table 5**.

The forebay is located on the west side of the pond. Runoff from the east side of the development will be conveyed to the low point on *Street "C"*, and to the forebay via a grass-lined swale within the pond block. The forebay has been sized based on MOE design criteria and supporting calculations are provided below.

Forebay Sizing Calculations

Using the methodology provided in the Stormwater Management Planning and Design Manual, the minimum recommended forebay length based on particulate settling is calculated using the following expression:

$$Dist = \sqrt{\frac{r \cdot Q_p}{V_s}} \quad [1]$$

where: *Dist* is the forebay length (m)
r is the length-to-width ratio of the forebay (2:1 or $r = 2$)
Q_p is the pond's peak discharge (0.020 m³/s, VO modelling of 25 mm storm)
V_s is the settling velocity (0.0003 m/s for 150 µm particles)

Solving [1] gives:

$$Dist = \sqrt{\frac{2 \times 0.020}{0.0003}} = 11.5 \text{ m}$$

The recommended forebay length based on flow dispersion calculations is calculated using the following expression:

$$Dist = \frac{8 \cdot Q}{d \cdot V_f} \quad [2]$$

where: *Dist* is the forebay length (m)
Q is the peak inlet flow (1.213 m³/s from the VO modeling of the 2-year storm)
d is the depth of the permanent pool in the forebay, assuming 1.00 m depth of sediment accumulation (0.75 m)
V_f is the desired velocity in the forebay (0.50 m/s)

Solving [2] gives:

$$Dist = \frac{8 \times 1.213}{0.75 \times 0.50} = 25.9 \text{ m}$$

The proposed forebay length is approximately 44 m. The proposed design therefore satisfies the minimum forebay length recommendations.

The minimum recommended forebay bottom width is calculated as follows, based on the maximum distance from the calculations above:

$$\text{Width} = \frac{\text{Dist}}{8} = \frac{25.9}{8} = 3.3 \text{ m} \quad [3]$$

The design proposes an average forebay bottom width of approximately 13.0 m, which satisfies this criterion.

In accordance with the SWMP Manual, it is recommended that the maximum average velocity in the forebay is 0.15 m/s. This velocity corresponds the maximum permissible velocity that can be achieved before erosion will start to occur. The minor system flow into the forebay is 1.213 cms. The average cross-sectional area of the forebay (assuming 0.75 m depth) is approximately 15.0 m². The average velocity is therefore 0.12 m/s (1.213 m³/s ÷ 10.0 m² = 0.12 m/s), which is less than the maximum permissible velocity of 0.15 m/s.

6.3.2 Erosion Control

In accordance with the GRCA guidelines, erosion control shall be provided using an extended detention active storage zone sized to capture the runoff resulting from a 25 mm rainfall event and to release the runoff over a period of at least 24 hours. Based on results using the Visual OTTHYMO 5.1 (VO) model, the required erosion volume for the SWM facility is 2,200 m³, based on a runoff depth of 11.12 mm over a total drainage area of 19.78 ha. The VO model parameters and the results are included in **Appendix "F"**.

Based on the design for the SWM pond, the erosion control volume provided is 2,535 m³ at an elevation of 486.65 m. This exceeds the required erosion volume requirement of 2,200 m³ for the pond. The proposed extended detention depth is 0.65m, which is less than the maximum recommended extended detention depth of 1.00m.

The required detention time and release rate will be achieved using an orifice plate installed within the pond outlet control structure.

The extended detention active storage zone will capture the runoff volume resulting from a 25 mm rainfall event and release it over a period exceeding the required 24-hour detention. A 4-hour, 25 mm Chicago distribution storm was used for this analysis. The drawdown time for the proposed SWM facility is approximately 50.0 hours with a 120 mm diameter orifice, which exceeds the minimum 24-hour release criteria (48 hours is considered preferable). More detailed calculations are provided in **Table F.8** in **Appendix "F"**.

The orifice size, erosion control release rate, draw down time, extended detention volume and water level are summarized in **Table 5**.

6.3.3 Quantity Control

Per the GRCA's requirements, the SWM facility shall be designed to control the post-development peak flow to pre-development levels for the 2-year through 100-year design storms and to safely convey the Regional flow. The SWM facility will be sized to control post-development peak flows to pre-development levels up to and including the 100-year storm using the VO model and the 6-hour SCS storm distribution, created using the latest Fergus Shand Dam IDF data obtained from Environment Canada. The pre-development flow targets are provided in **Table 4**. The VO model output and supporting documentation is provided in **Appendix "F"**.

Table 4 shows the peak flows calculated in VO for each return period. **Table 5** shows the SWM facility performance characteristics for each return period event based on the preliminary outlet structure design and rating curve. The rating curve includes quality and quantity control structures and an emergency spillway. The actual pond performance, outlet structure design and rating curve will be confirmed at detailed design.

The SWM pond has been designed with a total active storage volume of 8,692 m³ at an elevation of 487.75 m. From the modelling completed, the maximum expected storage required during 100-year storm condition is approximately 7,257 m³. The provided active storage for the pond is therefore sufficient. As shown in **Table 4**, the peak discharge rates are equal to or less than the target release rates. The preliminary rating curve is presented in **Table F.5** which is included in **Appendix "F"** together with the output from the VO modeling of the SWM pond.

Table 4. Summary of Storm Drainage Peak Flows

Return Period	Existing Flows (26.05 ha) (m ³ /s)	Proposed Pond Flow (19.78 ha) (m ³ /s)	Proposed Uncontrolled Flow (6.27 ha) (m ³ /s)	Proposed Total Flow (26.05 ha) (m ³ /s)
2-year	0.279	0.044	0.048	0.070
5-year	0.639	0.269	0.113	0.364
10-year	0.928	0.510	0.168	0.675
25-year	1.325	0.862	0.247	1.109
50-year	1.647	1.056	0.314	1.370
100-year	1.963	1.225	0.381	1.604

6.3.4 Thermal Mitigation Measures

Mitigation measures shall be incorporated into the SWM pond design to minimize thermal impacts to the receiving watercourse. These measures include a bottom draw pipe and a planting strategy to promote shading along the pond perimeter.

Bottom Draw Pipe

Instead of the common perforated riser configuration, a bottom draw pipe will be implemented for the extended detention component to discharge water from the deepest section of the pond where the water temperature is lowest. This outlet consists of a submerged intake headwall and a bottom draw pipe which discharges via an orifice plate in the quality control structure. Given that this pipe is sized for frequent rainfall events (25 mm storm), it will provide the greatest benefit to the thermal regime of the receiving watercourse.

Planting Strategy

In accordance with the requirements of the GRCA, the SWM facility will be planted to provide a natural appearance and to provide environmental benefits. The landscape plan will specify shade producing species to minimize solar heating of the permanent pool during summer months. The forebay design provides additional pond perimeter where shade producing vegetation can be planted.

6.3.5 SWM Pond Inspection & Maintenance

The stormwater management facility should be inspected periodically to determine the frequency of maintenance activities. As such, maintenance activities will be performed on an as-required basis. During the first two years of operation, it is recommended that the stormwater management facility be inspected following significant storm events to determine if and when maintenance activities are required. Subsequently, inspections should be carried out twice per year. The following items should be considered when inspecting the pond:

- Sediment accumulation to determine cleanout requirements;
- Erosion of side slopes and outfall channel;
- Safety hazards;
- Hydraulic operation of the pond;
- Drawdown time following a rainfall event (extended drawdown time greater than 50.0 hours may indicate a blocked orifice or intake);
- Condition of terrestrial and aquatic vegetation;
- Trash accumulation near hydraulic structures; and
- Surface sheen indicating possible oil contamination.

Table 5. Stormwater Facility Performance Summary

Quality Control		
	Protection Level	Level 2 (Normal)
	Permanent Pool Required (m ³)	1,286
	Permanent Pool Provided (m ³)	2,716
	Normal Water Level, NWL (m)	486.00

Erosion Control		
25-mm 4-hour Chicago	Orifice Size (mm)	120
	Draw Down Time (hrs)	50.0
	Flow In (m ³ /s)	0.612
	Flow Out (m ³ /s)	0.020
	Storage Used (m ³)	1,926
	Pond W.S. Elevation (m)	486.51

Quantity Control		
2-year Storm	Flow in (m ³ /s)	1.213
	Flow Out (m ³ /s)	0.071
	Storage Used (m ³)	3,272
	Pond W.S. Elevation (m)	486.81
5-year Storm	Flow in (m ³ /s)	1.984
	Flow Out (m ³ /s)	0.318
	Storage Used (m ³)	4,165
	Pond W.S. Elevation (m)	486.98
10-year Storm	Flow in (m ³ /s)	2.507
	Flow Out (m ³ /s)	0.565
	Storage Used (m ³)	4,800
	Pond W.S. Elevation (m)	487.11
25-year Storm	Flow in (m ³ /s)	3.196
	Flow Out (m ³ /s)	0.910
	Storage Used (m ³)	5,621
	Pond W.S. Elevation (m)	487.25
50-year Storm	Flow in (m ³ /s)	4.054
	Flow Out (m ³ /s)	1.090
	Storage Used (m ³)	6,409
	Pond W.S. Elevation (m)	487.39
100-year Storm	Flow in (m ³ /s)	4.679
	Flow Out (m ³ /s)	1.248
	Storage Used (m ³)	7,257
	Pond W.S. Elevation (m)	487.53
Regional Storm (Hurricane Hazel)	Flow in (m ³ /s)	2.958
	Flow Out (m ³ /s)	2.523
	Storage Used (m ³)	9,583
	Pond W.S. Elevation (m)	487.88

7.0 Site Water Balance

In accordance with the requirements of the GRCA, an annual site water balance assessment is included in the Hydrogeological Investigation Report prepared by Palmer Environmental Consulting Group. The findings of the water balance analysis are summarized below.

7.1 Pre-Development Infiltration Volume

As per Section 4.2.1 of the *Hydrogeological Investigation Report*, the estimated pre-development infiltration rate is 49,774 m³/year.

7.2 Post-Development Infiltration Volume (Unmitigated)

As per Section 4.2.2 of the *Hydrogeological Investigation Report*, the estimated post-development infiltration rate, without infiltration enhancements, is 31,271 m³/yr. This corresponds to an infiltration deficit of 18,502 m³/yr compared to the pre-development condition (a 37% decrease).

The decrease in annual infiltration indicates the need for Low Impact Development (LID) strategies be implemented in order to maintain pre-development infiltration rates. The LID measures that are proposed in order to meet the infiltration deficit include roof downspout disconnections, and soakaway pits. The design of these LID measures are presented below.

7.3 Proposed Infiltration BMP – Roof Downspout Disconnection

As per Section 4.3 – *Roof Downspout Disconnection* of the *Low Impact Development Stormwater Management Planning and Design Guide* (Credit Valley Conservation, Toronto and Region Conservation, 2010), roof downspout disconnection is a common practice to achieve water balance benefits. In order to achieve the required infiltration, roof downspout disconnections must meet the following design criteria:

- *Available Space: Simple downspout disconnection requires a minimum flow path length across the pervious area (at least 5 metres) and suitable soil conditions. If the flow path length is less than 5 metres and soils are hydrologic soil group (HSG) C or D, roof downspouts should be directed to another LID practice such as a rainwater harvesting system, soakaway, swale, bioretention area or perforated pipe system.*

In order to meet this design criteria, houses will be required to direct roof downspouts to a discharge location a minimum distance of 5 m from the road right-of-way. For runoff draining the back yard of the lot (split-drainage lots), a minimum flow length of 5 m will be achieved. For runoff draining to the front, a minimum distance of 7.5 m is provided between the building envelope and the road right-of-way. Where required, roof downspouts shall discharge to the side of the house into a side swale in order to meet the flow minimum length requirement.

According to the hydrologic modelling completed for this site, the soils generally fall into the hydrologic soil groups B and BC, which is considered to be acceptable for roof downspout disconnections.

- *Site Topography: Disconnected downspouts should discharge to a gradual slope that conveys runoff away from the building. The slope should be between 1% and 5%. Grading should discourage flow from reconnecting with adjacent impervious surfaces.*

In order to meet this design criteria, lots will generally be graded at 2%. Grading will be designed to discourage flow from reconnecting with adjacent impervious surfaces for a minimum of 5 m from the downspout discharge location.

- *Soils: If the infiltration rate of soils in the pervious area is less than 15 mm/hr (i.e., hydraulic conductivity less than 1×10^{-6} cm/s), as determined from measurements (see Appendix C for acceptable methods), they should be tilled to a depth of 300 mm and amended with compost to achieve an organic content in the range of 8 to 15% by weight or 30 to 40% by volume.*

As per Table 4 of the *Hydrogeological Investigation Report*, the average percolation rate is 27.5 min/cm. This corresponds to an infiltration rate of 21.8 mm/hr, which is considered acceptable.

- *Drainage Area: For simple downspout disconnection the roof drainage area should not be greater than 100 square metres.*

It is assumed roof areas will not exceed 2,500 SF, or 230 m². Assuming a minimum of four roof downspouts (i.e. one at each corner of the roof), the average roof drainage area per downspout is 57.5 m², which is considered acceptable.

Section 4.3 – Roof Downspout Disconnection of the Low Impact Development Stormwater Management Planning and Design Guide indicates that “a conservative runoff reduction rate estimate for roof downspout disconnection is 25% for hydrologic soil group (HSG) C and D soils and 50% for HSG A and B soils. These values apply to disconnections that meet the physical suitability and constraints criteria outlined in this section.” As demonstrated above, the roof downspout disconnection design and applicable roof area meet the outlined design requirements. A runoff reduction of 37.5% is assumed for HSC BC soils (average of 50% for A & B soils and 25% for C & D soils). A corresponding infiltration volume of 37.5%, is therefore considered acceptable.

Assuming a total of 78 lots with 230 m² of roof area, the total roof area is 17,940 m². Based on an annual precipitation depth is 901.6 mm/yr, this corresponds to a roof runoff volume of 16,175 m³/yr. Assuming an infiltration rate of 37.5%, the infiltration volume due to roof downspout disconnections is therefore 6,065 m³/yr.

The estimated post-development infiltration rate, with roof downspout disconnections, is therefore 37,336 m³/year (31,271 m³/year + 6,065 m³/yr). This corresponds to a remaining

infiltration deficit of 12,438 m³/yr compared to the pre-development condition (a 25% decrease).

7.4 Proposed Infiltration BMP – SWM Pond Infiltration Trench

In order to reduce the remaining infiltration deficit, an infiltration trench is proposed at the outlet of the SWM pond to infiltrate discharge from the quality control outlet, as shown on **Figure 9**. Once the volume of the infiltration pit is exceeded, discharge will continue to the quantity control outlet.

Based on a preliminary infiltration trench sizing calculation, accounting for a 2.5 times safety factor, this infiltration volume can be achieved by installing an infiltration trench with a total bottom area of 2,196 m² (122 m long by 18 m wide). The preliminary infiltration pit sizing calculation is provided in **Table G.1** in **Appendix “G”**.

With the inclusion of the proposed infiltration trench, the annual infiltration is increased by 12,558 m³/yr to 49,894 m³/yr, which exceeds the pre-development annual infiltration volume of 49,774 m³/yr. The pre-development infiltration rate is therefore maintained under post-development conditions.

8.0 VEHICULAR ACCESS

The layout of the proposed subdivision has been developed with consideration for efficient and safe access and circulation of vehicular and traffic.

8.1 Municipal Roads

The subject site has frontage on County Road 3 and County Road 24 which are both under the jurisdiction of Dufferin County. These existing road allowances consist of a two-lane rural paved road with roadside ditches. The vehicular access to the subdivision will be facilitated by one road proposed connection to County Road 3 and one proposed connection to County Road 24.

The proposed municipal roads will be contained within 20.0m wide road allowances and will be constructed to a rural standard which includes a 7.0m asphalt pavement width, crowned with 2% cross fall and edged with 1.2m wide gravel shoulders and road side ditches. As requested by the Township, the road side ditches will have 4:1 side slopes so the back slopes will extend into the adjacent lots. The longitudinal slope of the road will generally be 0.50% with some length of road ranging up to 2.8% slope. Given that the Township does not have a standard detail, a copy of the proposed road cross section is included in **Appendix “H”**.

8.2 Driveways

Each dwelling will have an attached garage and driveway. It is anticipated that the slope of driveways is to be within the range of 2.0% to 6.0% and will be designed in conjunction with the individual site grading plans at the building permit stage. Each driveway will require a culvert for the crossing of the road side ditch.

9.0 GRADING

As is typical with all subdivision, earthmoving is required, to varying degrees, in order to achieve the municipal design criteria and accommodate the development form.

9.1 Grading Criteria

The Township does not have engineering design guidelines which detail the grading design criteria. Despite the foregoing, the subject site is to be graded in accordance with the typical grading standards which dictates that road grades are to range from 0.5% to 6.0% and that sodded yard areas are to range from 2.0% to 5.0%. For large grade differentials, a maximum slope 3H : 1V can be used for sodded embankments. In areas where space is limited, retaining walls can be utilized to accommodate grade differentials, however, their use should be minimized.

The subdivision earthworks should be limited to just the road allowance, front yards and the building envelope. Earthworks within the rear yard of each lot should be completed in conjunction with an approved site grading plan for the individual lot at the building permit stage in order to minimize disturbance to the existing ground with respect to the septic tile beds.

9.2 Preliminary Design

Based on the topographic survey, the proposed subdivision configuration and the typical grading criteria, a preliminary grading design has been prepared and is provided on the **Functional Grading Plans (Dwg FGP-1 & FGP-2)**. The preliminary grading design, considered the following factors:

- Achieve the typical lot grading criteria.
- Meet the typical vertical road design parameters.
- Minimize the depth of cut and of fill.
- Minimize the requirement for retaining walls.
- Match existing grades along the adjacent properties and road allowances.
- Create a drainage channel to safely convey external drainage through the site.
- Provide an overland flow route to direct drainage to the stormwater management pond.
- Establish a suitable building envelope on each lot as well as a rear yard amenity area and a septic system envelope with a reserve area.
- The basement floor elevation for the proposed dwellings is to be located above the groundwater table elevation.

Based on the preliminary design, no significant difficulties are anticipated in achieving the municipal grading design standards or an earthworks balance.

9.3 Permitting

A review of the Regulation Mapping indicates that a portion of the subject site is located within an area that is regulated by the GRCA. A grading permit is therefore required from their office under Ontario Regulation 166/06 prior to commencing topsoil stripping and earthworks. The permit application should be submitted in conjunction with the detailed design at the subdivision engineering stage. A copy of the GRCA regulation map is included in **Appendix "D"**.

10.0 EROSION & SEDIMENT CONTROL DURING CONSTRUCTION

Construction activity, especially operations involving the handling of earthen material, dramatically increases the availability of particulate matter for erosion and transport by surface drainage. In order to mitigate the adverse environmental impacts caused by the release of silt-laden stormwater runoff into receiving watercourses, measures for erosion and sediment control are required for construction sites. This is an extremely important component of land development that plays a large role in the protection of downstream watercourses and aquatic habitat. It is of particular concern for this site given the proximity of the site to a watercourse.

The impact of construction on the environment is recognized by the Greater Golden Horseshoe Area Conservation Authorities. Their document titled Erosion & Sediment Control Guidelines for Urban Construction (ESC Guideline) provides guidance for the preparation of effective erosion and sediment control plans.

Control measures must be selected that are appropriate for the erosion potential of the site and it is important that they be implemented and modified on a staged basis to reflect the site activities. Furthermore, their effectiveness decreases with sediment loading and therefore inspection and maintenance is required. The selection, implementation, inspection and maintenance of the control features are summarized as follows:

10.1 Control Measures

On relatively large sites, measures for erosion and sediment control typically include the use of silt fencing, a mud mat, rock check dams and temporary sediment basin. The following is a description of the sediment controls to be implemented on the subject site:

- **Silt Fences** are to be installed adjacent to all property limits subject to drainage from the development area prior to topsoil stripping and in other locations, such as at the bases of topsoil stockpiles. The silt fences are to be constructed with 150 x 150mm wire farm fence fabric to properly support the geotextile.
- **Mud Mat** is to be installed at the construction entrance prior to commencing earthworks to minimize the tracking of mud onto municipal roads.
- **Rock Check Dams** are to be constructed in swales and ditches to reduce velocities and trap sediment.
- **Temporary Sediment Control Basin** is commonly used to clarify silt-laden stormwater runoff by promoting sedimentation of the suspended particles in the runoff through long detention times. In this case, the proposed SWM Pond will be utilized as temporary sediment control basins during construction.

10.2 Construction Sequencing

The following is a summary of the scheduling of construction activities and the related implementation of sediment controls:

Stage 1 – Subdivision Earthworks – Road Allowance

1. Construct mud mat for temporary construction access.
2. Install silt fencing around the limits of grading prior to topsoil stripping.
3. Strip topsoil, stockpile where indicated and install silt fence around the perimeter.
4. Rough grade the site by placing cut material in fill areas and spreading and compacting of imported fill. Maintain the mud mat to minimize the tracking of silt onto the municipal road and provide street sweeping as necessary.

Stage 3 – Subdivision Servicing & Road Construction

1. Construct the roads and ditches and install the underground utility servicing.
2. Install rock check dams in the ditches.

Stage 4 – House Construction

1. Construct house, install the septic system, pave the driveway and stabilize the lot with topsoil and hydroseed.
2. Remove silt fencing on a phased basis as areas are stabilized.

10.3 ESC Inspection & Maintenance

In order to ensure that the erosion and sediment control measures operate effectively, they are to be regularly monitored and they will require periodic cleaning (e.g., removal of accumulated silt), maintenance and/or re-construction.

Inspections of all of the erosion and sediment controls on the construction site should be undertaken with the following frequency:

- On a weekly basis
- After every rainfall event
- After significant snow melt events
- Prior to forecasted rainfall events

If damaged control measures are found they should be repaired and/or replaced within 48 hours. Site inspection staff and construction managers should refer to the Erosion and Sediment Control Inspection Guide (2008) prepared by the Greater Golden Horseshoe Area Conservation Authorities. This Inspection Guide provides information related to the inspection reporting, problem response and proper installation techniques.

11.0 UTILITIES

While some external upgrades may be necessary by the utility providers, it is anticipated that utilities such as hydro (Hydro One Networks Inc.), natural gas (Enbridge Gas Distribution Inc.), the telecommunications providers will be available to service the subject development. As per standard practice in subdivisions, utilities will be installed underground. Co-ordination with the local hydro authority and the various utility companies will be undertaken at the detailed engineering design stage to determine appropriate locations for pedestals, transformers and street lights.

It is recommended that the utility installation be in the form of a joint trench. The process of joint trenching allows all of the utility companies to co-ordinate the placement of their lines in a common trench excavated by a single utility contractor. Joint trenching maximizes the efficiency of the available area in the utility corridor and provides for a safe installation. The location of the joint utility trench is indicated on the road cross section in **Appendix “H”**.

12.0 SUMMARY

Based on the analysis contained herein, the proposed residential subdivision can be adequately serviced (watermain, wastewater and storm) in accordance with the standards of the Township of East Garafraxa, Dufferin County and the Grand River Conservation Authority design criteria as follows:

Water

- Dwellings, farms, businesses and institutional properties in the community of Marsville are serviced by individual private water wells except for the existing 33 dwellings in the Thunderbird Subdivision (Victoria Boulevard, Maple Street & Grand Crescent) which is serviced by a municipal water system supplied by two production wells, one being active and one being a back-up.
- In order to service the proposed subdivision, an expansion to the existing municipal water system is proposed as per the Preferred Alternative established by the Marsville Water System Expansion Municipal Class Environmental Assessment Study that was completed by the Township of East Garafraxa. In this regard, two new wells are proposed that will be connected to a new site for treatment and storage. Fire protection will be provided from hydrants in the water distribution system.

Waste Water

- There are no municipal sanitary sewers in the Township of East Garafraxa and therefore each lot within the development will be serviced by an individual private on-site sewage system in accordance with the recommendations of the Servicing Options Report.
- Based on the percolation rate for the native soils, the proposed lots are of sufficient size that the dwellings can each be serviced with individual private septic systems being either conventional systems or tertiary treatment systems, in accordance with the Ontario Building Code, while providing sufficient area for a building envelope, rear yard amenity area as well as a reserve bed area.

Storm Drainage

- The subject site is tributary to the Brouwer Drain located in the Butler Creek sub-watershed which is located in the Upper Grand River watershed. External drainage to the south of the site drains to the Brouwer Drain through the subject site. This drainage will be conveyed through the proposed development via a drainage channel.
- The subject site will be serviced by minor system comprised of roadside ditches sized for the 25-year storm event.
- The major system will be comprised of an overland flow route which will convey runoff from rainfall events in excess of the capacity of the roadside ditches to the proposed SWM Pond.

Floodplain

- A floodplain analysis has been undertaken to confirm the capacity of the proposed external drainage bypass channel, and to determine the minimum site grades to ensure adequate floodproofing of lots.

- The Regional flow will exceed the capacity of the existing culvert under County Road 3 and will overtop the road to a maximum depth of 0.20 m. No changes are proposed to this existing culvert.

Stormwater Management

- A stormwater management facility will be constructed to service the subject property. This facility has been designed as a wet pond to provide a minimum Normal (Level 2) water quality treatment, extended detention for erosion control and flood control using the calculated pre-development flow targets up to and including the 100-year storm event. The wet pond consists of a sediment forebay and a main cell separated by a forebay berm.
- Thermal mitigation measures are to be incorporated in the design of the pond including bottom draw pipe and a planting strategy to provide shading around the pond perimeter.

Site water Balance

- A site water balance was completed to determine the infiltration deficit under post-development conditions. Infiltration BMPs such as roof downspout disconnections and an infiltration trench at the SWM pond quality control outlet are proposed to enhanced post-development infiltration rates. The pre-development infiltration volumes will be maintained under post-development conditions.

Vehicular Access

- The vehicular access to the subdivision will be facilitated by one road proposed connection to County Road 3 and one proposed connection to County Road 24.
- The local roads will be constructed to a rural standard with a 7.0m wide asphalt paved road surface, 1.2m wide gravel shoulders and road side ditches within 20.0m wide road allowances.

Grading

- As is typical with subdivision development, earthmoving will be required to achieve the proposed subdivision grading necessary to meet the criteria of the Township. A detailed analysis of the earthworks will be conducted at the detailed design stage to optimize the cut and fill volumes. Based on the preliminary design, no significant difficulties are anticipated in achieving the municipal grading design standards.
- Since a part of the subject site is located in an area which regulated by the GRCA, a permit will be required from their office prior to commencing earthworks.

Erosion & Sediment Control During Construction

- Erosion and sediment control (ESC) measures are to be implemented during construction to prevent silt laden runoff downstream in accordance with the Erosion & Sediment Control Guidelines for Urban Construction (2019). The ESC plans are to be prepared at the detailed engineering design stage and are to reflect the various construction stages.

Subdivision Engineering Design

- Detailed design for the proposed development is to be prepared at the subdivision engineering stage. This detailed design is to include servicing and grading plans as well as a stormwater management report based on the criteria established in this Functional Servicing Report.

13.0 REFERENCES & BIBLIOGRAPHY

- Ontario Ministry of Environment, **Stormwater Management Planning and Design Manual**, March 2003.
- Greater Golden Horseshoe Area Conservation Authorities, **Erosion & Sediment Control Guidelines for Urban Construction**, 2019.
- Credit Valley Conservation & Toronto and Region Conservation, **Low Impact Development Stormwater Management Planning and Design Guide**, 2010.
- Ministry of Municipal Affairs & Housing, **Ontario Building Code**, 2024.
- Waterloo Biofilter, **Design & Installation Guide**, January 2020.
- Alston Geotechnical Consultants Inc., **Geotechnical Investigation Report**, March 23, 2020.
- Palmer Environmental Consulting Group Inc., **Hydrogeological Investigation Report**, February 2, 2021.
- LEA Consulting Ltd., **Noise Impact Study**, January 2021.
- Cotyledon Environmental Consulting, **Baseline Ecological Assessment**, Sept. 16, 2020.
- Black, Shoemaker, Robinson & Donaldson Ltd., **Plan of Survey Showing Topographic Features of Part of Lot 5, Concession 14, Township of East Garafraxa, County of Dufferin**, February 3, 2020.
- GM Blueplan Engineering Limited, **Servicing Options Report**, November 2021.

Respectfully Submitted,

VALDOR ENGINEERING INC.



David Giugovaz, P.Eng.
Senior Project Manager

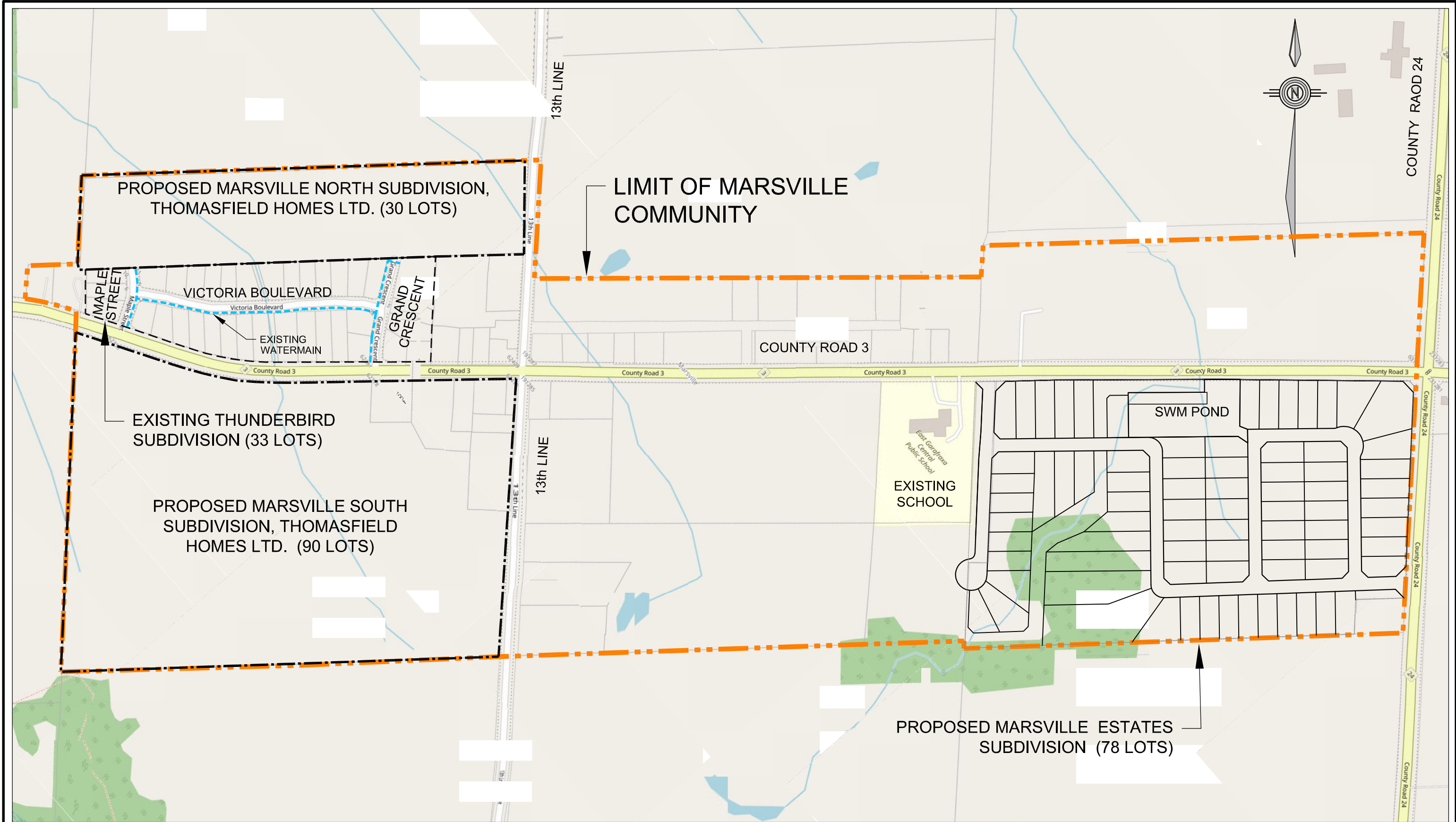
dgiugovaz@valdor-engineering.com
905-264-0054 x 224



Fanche Petkovski, P.Eng.
Water Resources

fpetkovski@valdor-engineering.com
905-264-0054 x 111

This report was prepared by Valdor Engineering Inc. for the account of Marsville Estate Inc. The comments, recommendations and material in this report reflect Valdor Engineering Inc.'s best judgment in light of the information available to it at the time of preparation. Any use of which a third party makes of this report, or any reliance on, or decisions made based on it, are the responsibility of such third parties. Valdor Engineering Inc. accepts no responsibility whatsoever for any damages, if any, suffered by any third party as a result of decisions made or actions based on this report.



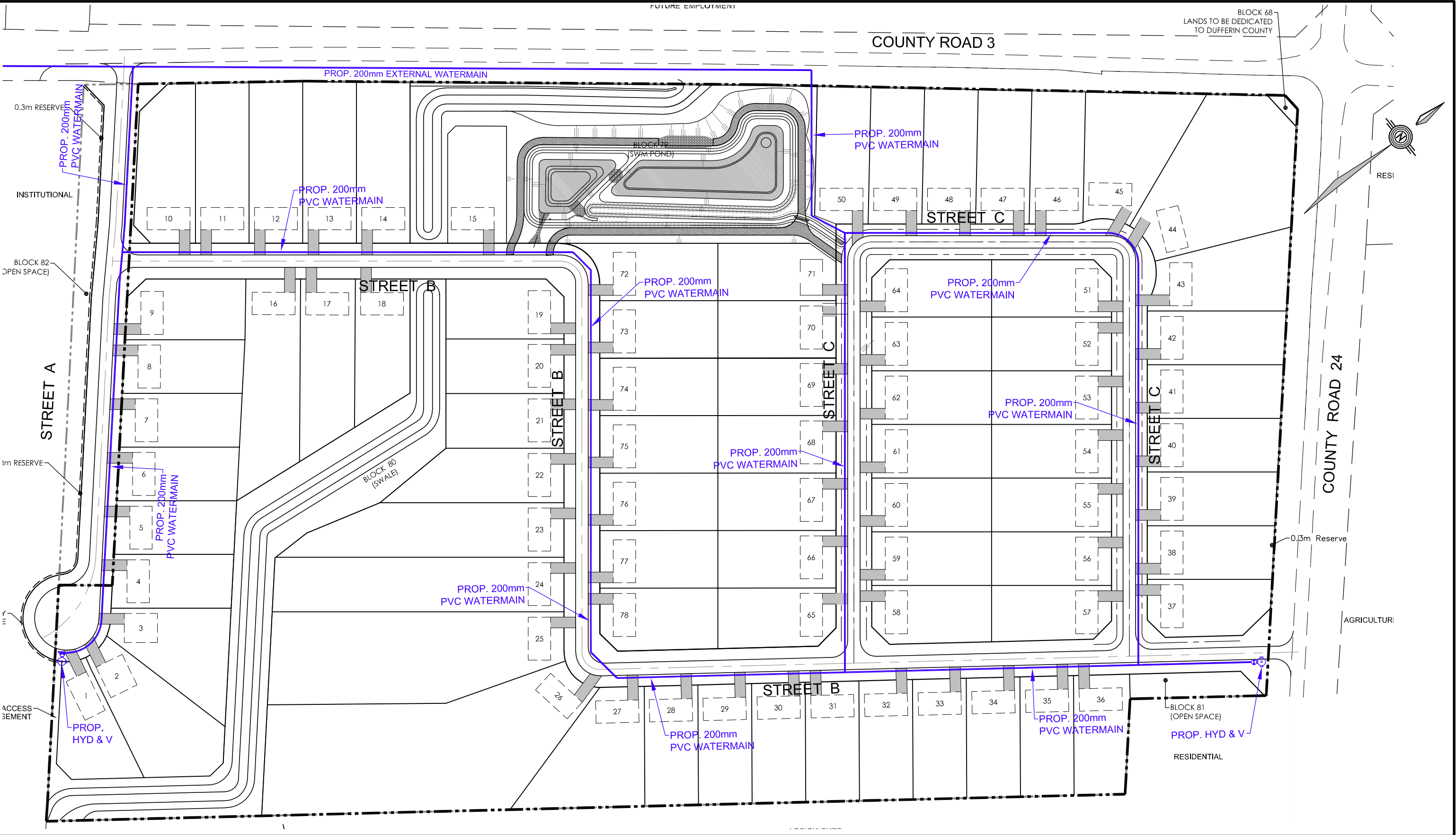
MARSVILLE SUBDIVISION
Township of East Garafraxa

SITE LOCATION PLAN



VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
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TEL (905)264-0054, FAX (905)264-0069
E-MAIL: info@valdor-engineering.com
www.valdor-engineering.com

SCALE: 25 0 25 50 75 100 meters	DRAWN.BY: D.N.Z.	DWG: FIGURE 1
DATE: APR. 09, 2026	CKD.BY: D.A.G.	PROJECT: 20102



MARSVILLE SUBDIVISION
Township of East Garafraxa

INTERNAL
WATERMAINS

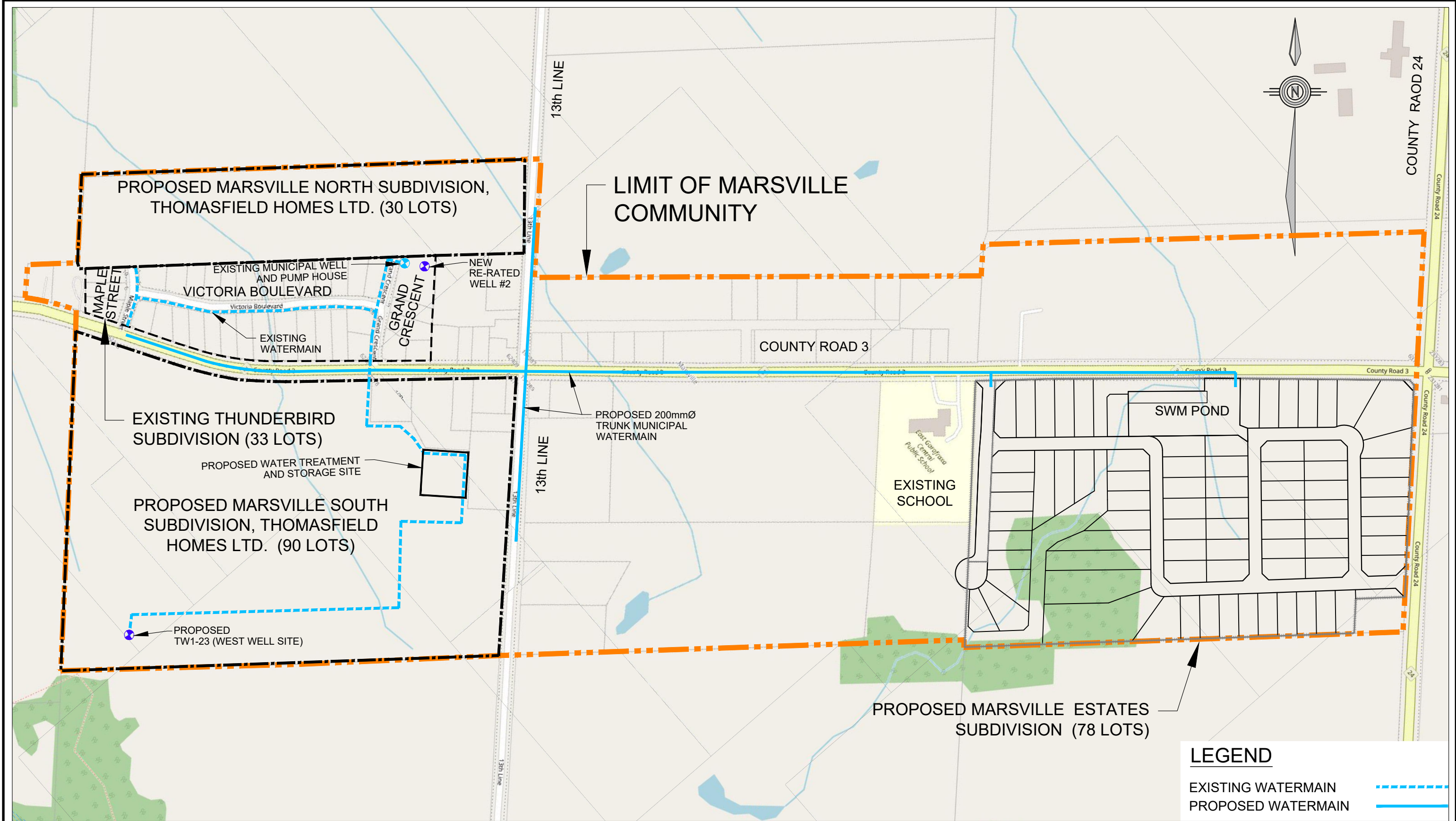
LEGEND:

- BOUNDARY
- BUILDING ENVELOPE
- LOT NUMBER
- DRIVEWAY
- PROP. FIRE HYDRANT
- PROP. WATERMAIN

VALDOR ENGINEERING INC.
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SCALE: 1:2000	DRAWN BY: D.N.Z.	DWG: FIGURE 2A
DATE: APR. 09, 2026	CKD BY: D.A.G.	PROJECT: 20102

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MARSVILLE SUBDIVISION

Township of East Garafraxa

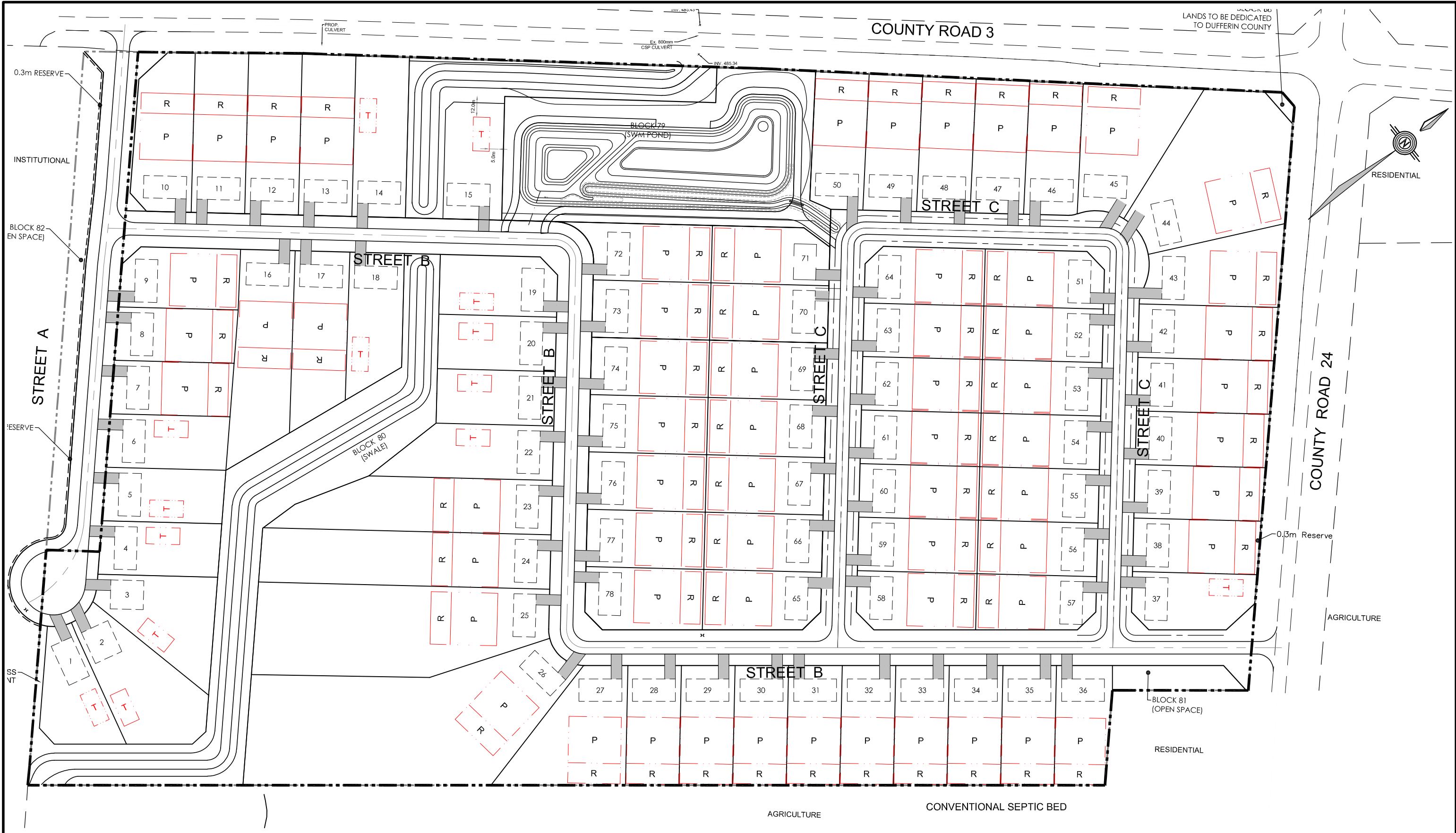
EXTERNAL WATER

SERVICING PLAN



VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
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SCALE: 25 0 25 50 75 100 meters	DRAWN BY: D.N.Z.	DWG: FIGURE 2B
DATE: APR. 08, 2026	CKD BY: D.A.G.	PROJECT: 20102



MARSVILLE SUBDIVISION
Township of East Garafraxa

WASTEWATER
SERVICING PLAN

LEGEND:

BOUNDARY
BUILDING ENVELOPE
LOT NUMBER
DRIVEWAY
CONVENTIONAL SEPTIC BED

67

TERTIARY TREATMENT SEPTIC BED

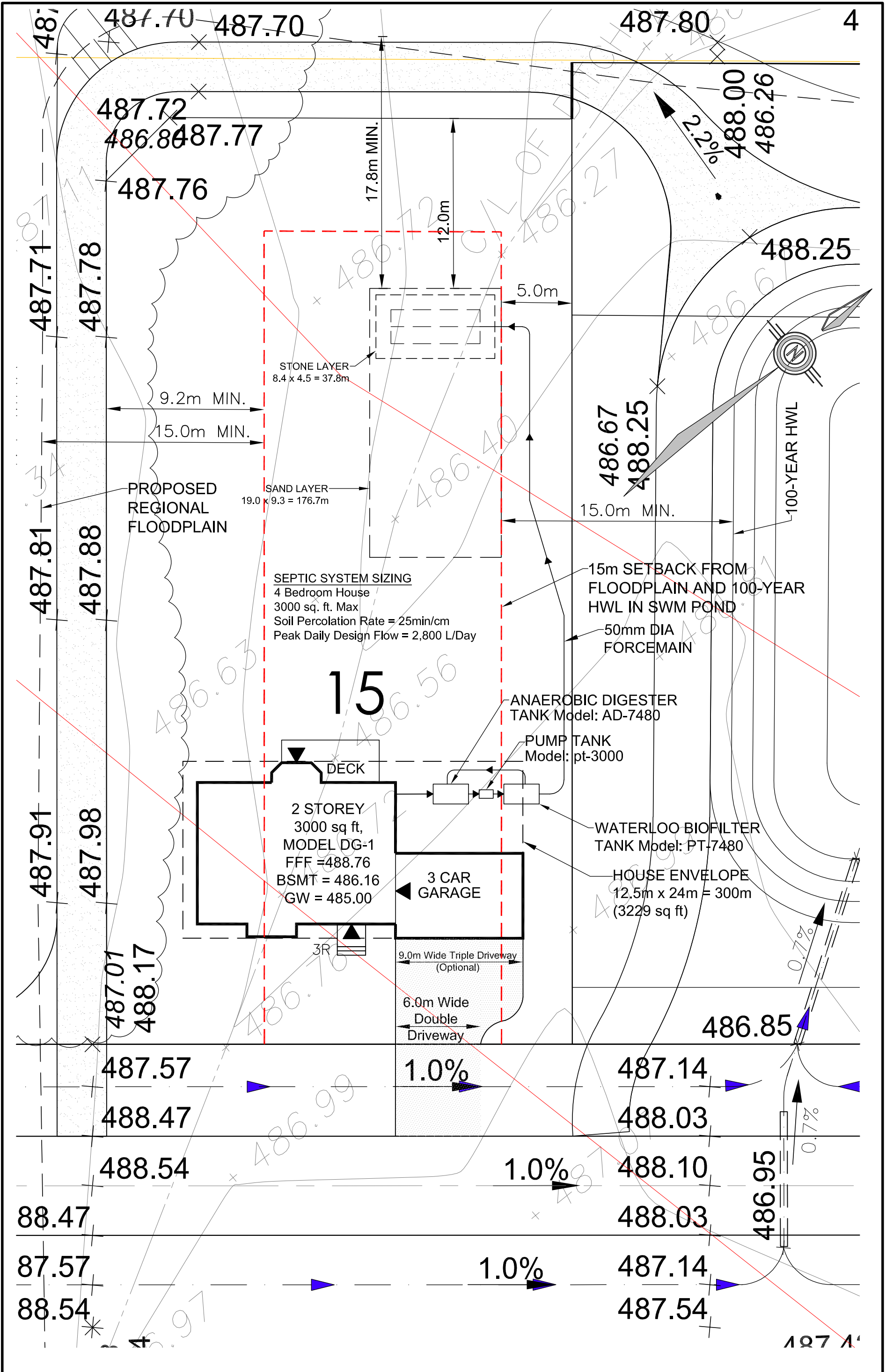
RAISED SEPTIC TILE BED
6 RUNS @ 23.4m
= 140m OF PIPE
RESERVE SEPTIC BED AREA



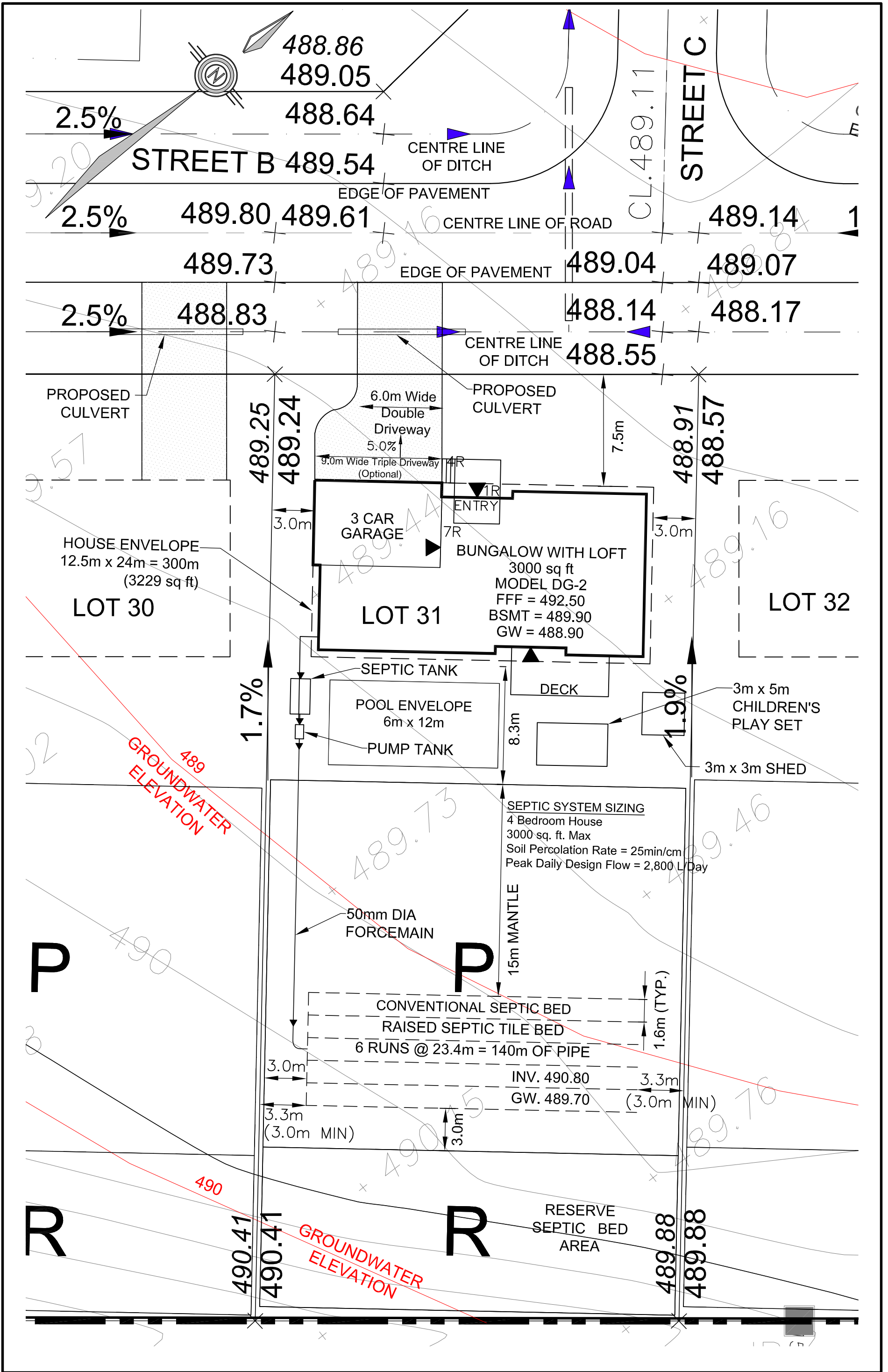
VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
571 Chrissie Road, Unit 4, 2nd Floor, Woodbridge, Ontario, L4L 8A2
TEL (905)264-0054, FAX (905)264-0069
E-MAIL: info@valdor-engineering.com
www.valdor-engineering.com

SCALE: 1:2000	DRAWN BY: D.N.Z.	DWG: FIGURE 3
DATE: APR. 09, 2026	CKD BY: D.A.G.	PROJECT: 20102

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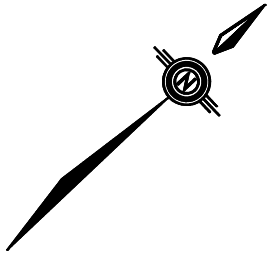
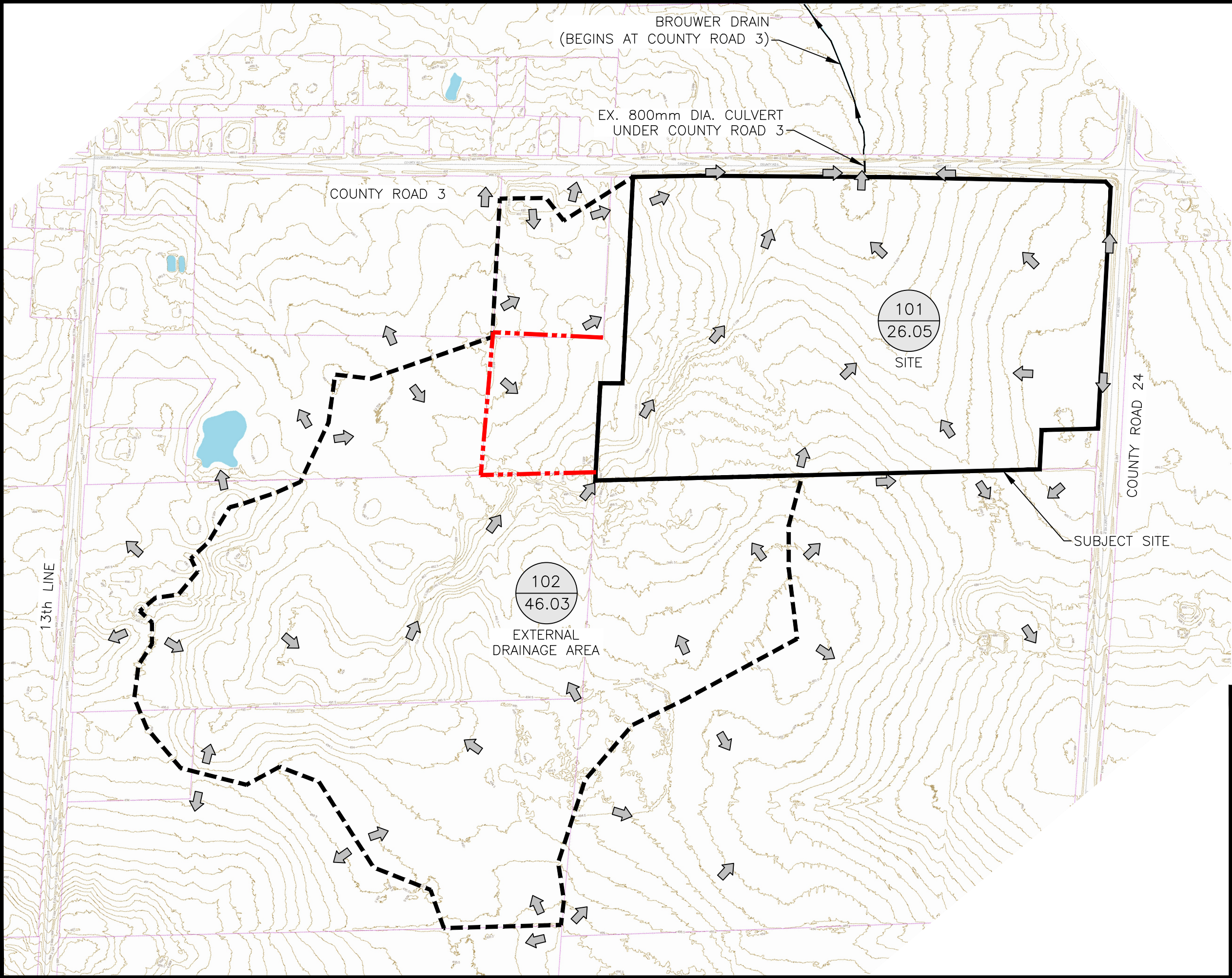
MARSVILLE SUBDIVISION Township of East Garafraxa		 VALDOR ENGINEERING INC. Consulting Engineers - Project Managers 571 Chrislea Road, Unit 4, 2nd Floor, Woodbridge, Ontario, L4L 8A2 TEL (905)264-0054, FAX (905)264-0069 E-MAIL: info@valdor-engineering.com www.valdor-engineering.com	
PRELIMINARY HOUSE SITING - LOT 1		SCALE: 1:250	DRAWN BY: D.N.Z.
		DATE: APR. 08, 2026	DWG: FIGURE 4A
		CKD BY: D.A.G.	PROJECT: 20102



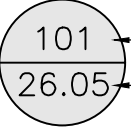
MARSVILLE SUBDIVISION Township of East Garafraxa PRELIMINARY HOUSE SITING - LOT 31	 VALDOR ENGINEERING INC. Consulting Engineers - Project Managers 571 Chrislea Road, Unit 4, 2nd Floor, Woodbridge, Ontario, L4L 8A2 TEL (905)264-0054, FAX (905)264-0069 E-MAIL: info@valdor-engineering.com www.valdor-engineering.com		
	SCALE: 1:250 DATE: APR. 09, 2026	DRAWN.BY: D.N.Z. CKD.BY: D.A.G.	DWG: FIGURE 4B PROJECT: 20102

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ACAD File: N:\Projects\20102\Hydrotechnical\0-Working\Figures\20102_SWM Drainage Plan.dwg Layout: FIG-5_Existing Printed: Apr. 09, 2026

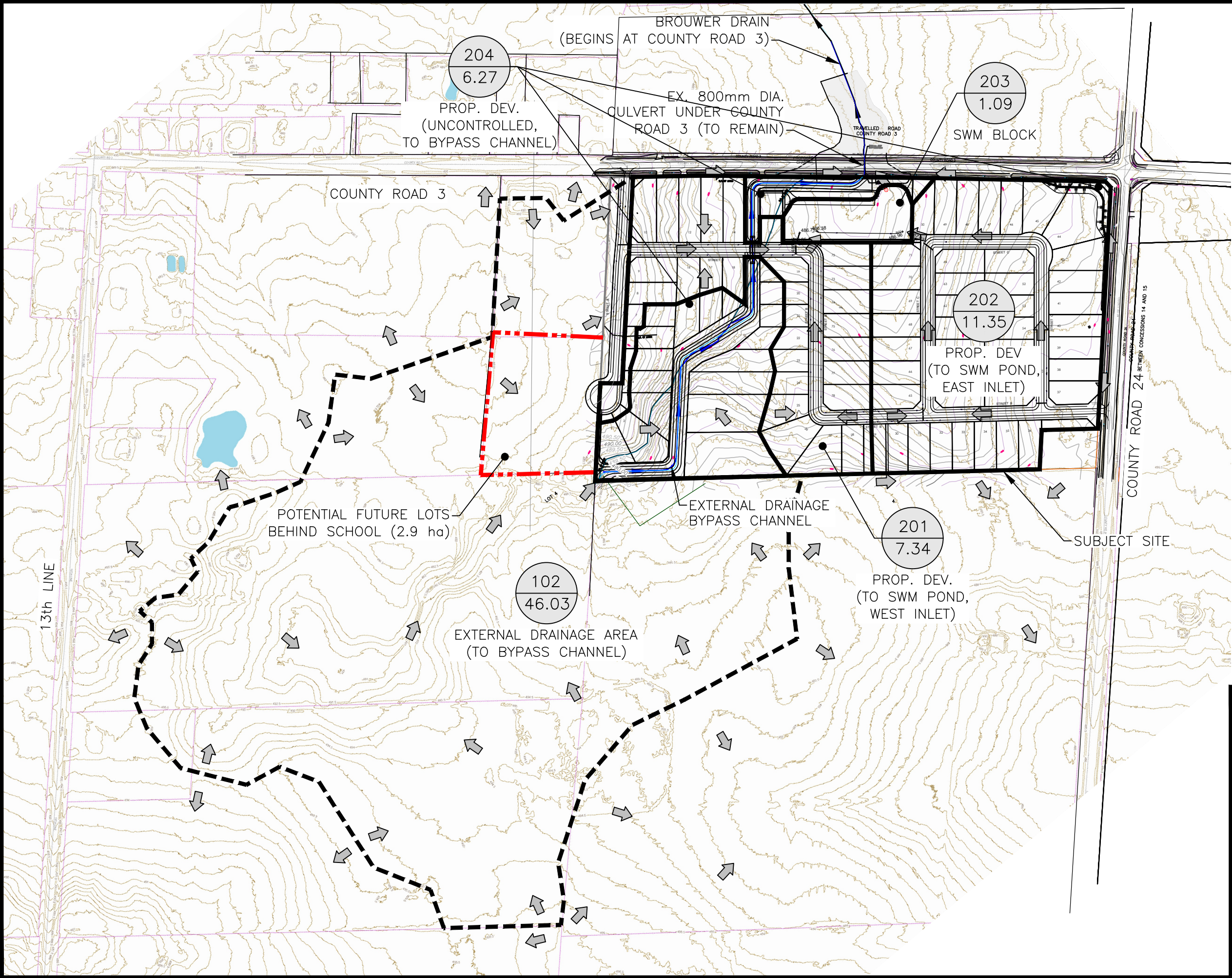


LEGEND

-  CATCHMENT ID
AREA (HA)
-  SITE DRAINAGE BOUNDARY
-  EXTERNAL DRAINAGE BOUNDARY
-  OVERLAND FLOW

PROJECT MARSVILLE ESTATES SUBDIVISION TOWNSHIP OF EAST GARAFRAXA			
TITLE STORM DRAINAGE PLAN PRE-DEVELOPMENT			
 VALDOR ENGINEERING INC. Consulting Engineers - Project Managers 571 Chrislea Road, Unit 4, 2nd Floor, Woodbridge, Ontario, L4L 8A2 TEL (905)264-0054, FAX (905)264-0069 E-MAIL: info@valdor-engineering.com www.valdor-engineering.com			
PREPARED BY	O.B.	CHECKED BY	F.P.
SCALE	NTS	DATE	APRIL. 9, 2026
PROJECT	20102	FIGURE 5	

ACAD File: N:\Projects\20102\Hydrotechnical\0-Working\Figures\20102_SWM Drainage Plan.dwg Layout: FIG-6_Proposed Printed: Apr. 09, 2026

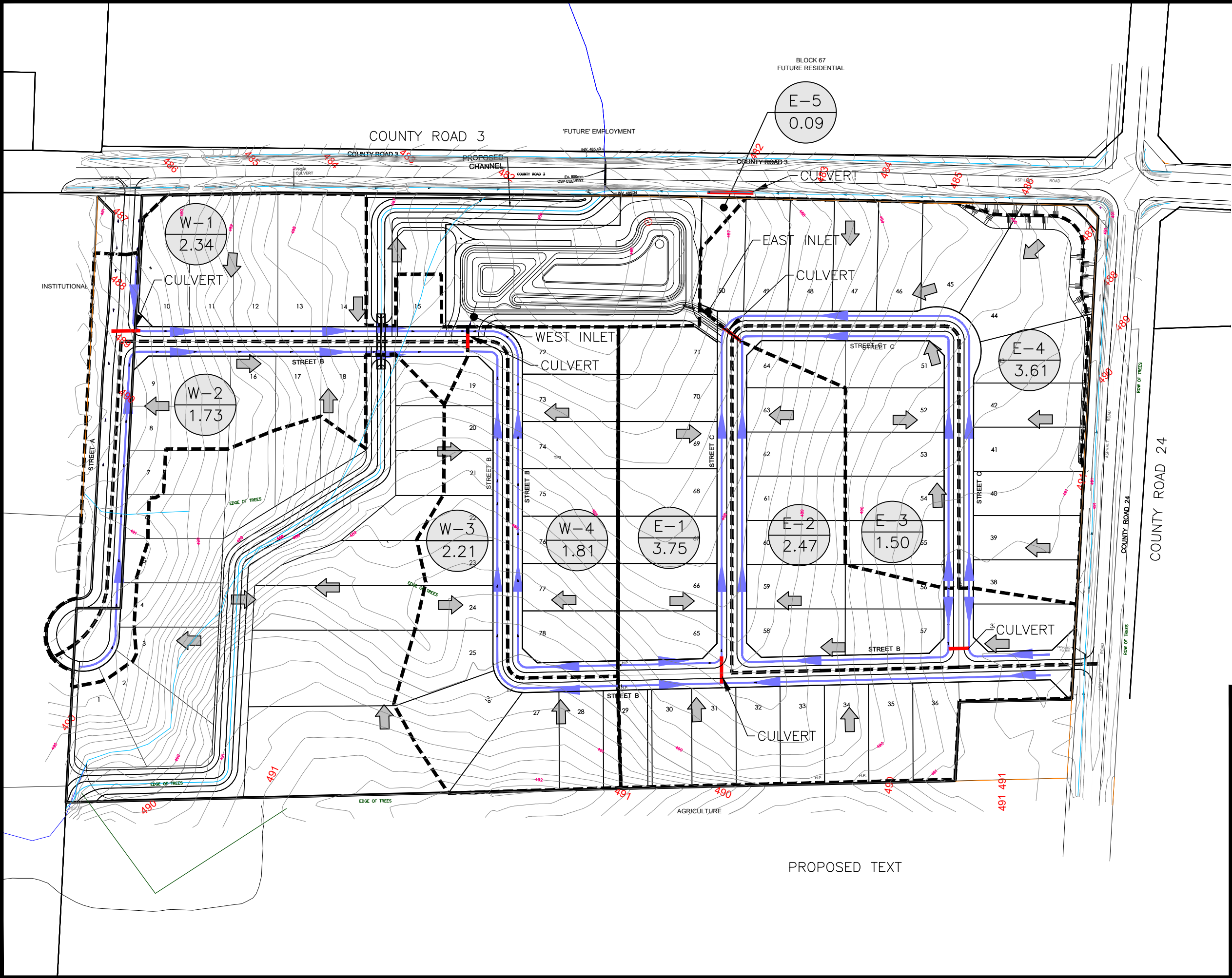


LEGEND

- 201
8.80
CATCHMENT ID
AREA (HA)
- SITE DRAINAGE
BOUNDARY
- EXTERNAL DRAINAGE
BOUNDARY
- OVERLAND FLOW

PROJECT		MARSVILLE ESTATES SUBDIVISION TOWNSHIP OF EAST GARAFRAXA	
TITLE		STORM DRAINAGE PLAN POST-DEVELOPMENT	
		 VALDOR ENGINEERING INC. Consulting Engineers - Project Managers 571 Chrislea Road, Unit 4, 2nd Floor, Woodbridge, Ontario, L4L 8A2 TEL (905)264-0054, FAX (905)264-0069 E-MAIL: info@valdor-engineering.com www.valdor-engineering.com	
PREPARED BY	F.P.	CHECKED BY	F.P.
SCALE	NTS	DATE	APRIL. 9, 2026
PROJECT	20102	FIGURE 6	

ACAD File: N:\Projects\20102\Hydrotechnical\0-Working\Figures\20102_Ditch Drainage Plan.dwg Layout: FIG-7_Ditch Plan Printed: Apr. 09, 2026



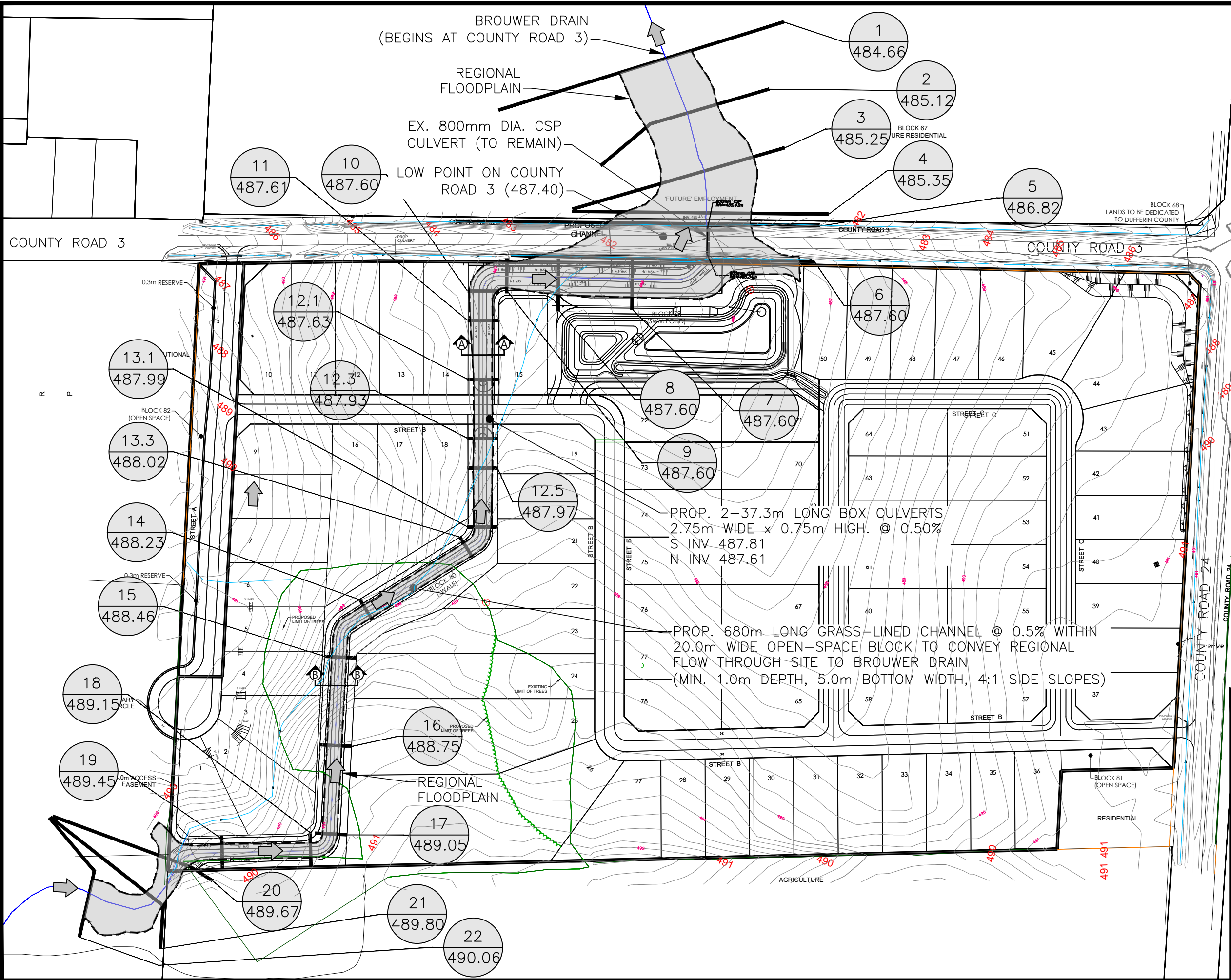
LEGEND

- W-1
1.72
CATCHMENT ID
AREA (HA)
- PROP. DITCH
- PROP. CULVERT
- PROP. DITCH DRAINAGE BOUNDARY
- OVERLAND FLOW

PROJECT		MARSVILLE ESTATES SUBDIVISION TOWNSHIP OF EAST GARAFRAXA	
TITLE		ROADSIDE DITCH DRAINAGE PLAN	
		 VALDOR ENGINEERING INC. Consulting Engineers - Project Managers 571 Chrislea Road, Unit 4, 2nd Floor, Woodbridge, Ontario, L4L 8A2 TEL (905)264-0054, FAX (905)264-0069 E-MAIL: info@valdor-engineering.com www.valdor-engineering.com	
PREPARED BY	O.B.	CHECKED BY	F.P.
SCALE	1:2500	DATE	APRIL. 9, 2026
PROJECT	20102	FIGURE 7	

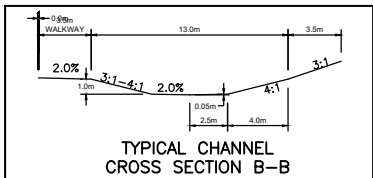
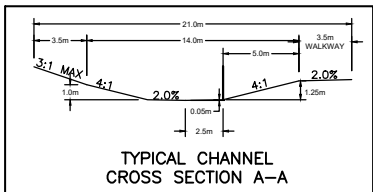
PROPOSED TEXT

ACAD File: N:\Projects\20102\Hydrotechnical\0-Working\Figures\20102_Floodplain Mapping.dwg Layout: FIG-8_Proposed Printed: Apr. 09, 2026



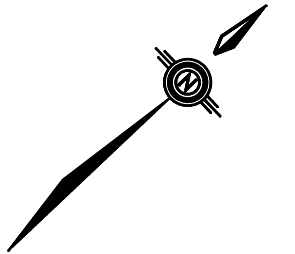
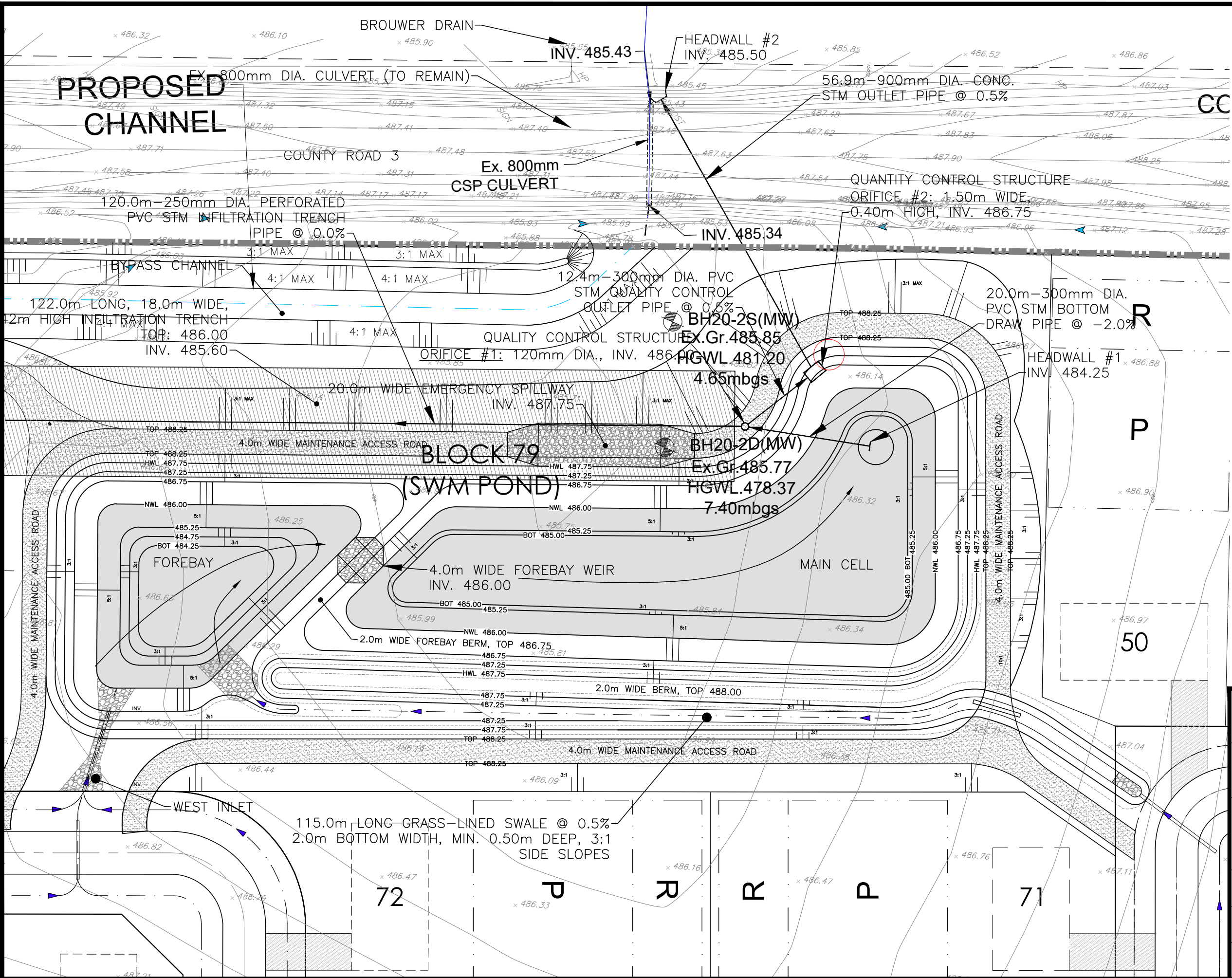
LEGEND

- 6 — HEC-RAS XS ID
- 487.60 — REGIONAL WSE (m)
- HEC-RAS XS
- REGIONAL FLOODPLAIN



PROJECT		MARSVILLE ESTATES SUBDIVISION TOWNSHIP OF EAST GARAFRAXA	
TITLE		PROPOSED FLOODPLAIN MAPPING	
		 VALDOR ENGINEERING INC. Consulting Engineers - Project Managers 571 Chrislea Road, Unit 4, 2nd Floor, Woodbridge, Ontario, L4L 8A2 TEL (905)264-0054, FAX (905)264-0069 E-MAIL: info@valdor-engineering.com www.valdor-engineering.com	
PREPARED BY	O.B.	CHECKED BY	F.P.
SCALE	1:2500	DATE	APRIL. 9, 2026
PROJECT	20102	FIGURE 8	

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LEGEND

- PERMANENT POOL
- RIP-RAP
- MAINTENANCE ACCESS ROAD

PROJECT		MARSVILLE ESTATES SUBDIVISION TOWNSHIP OF EAST GARAFRAXA	
TITLE		PRELIMINARY SWM POND	
		 VALDOR ENGINEERING INC. Consulting Engineers - Project Managers 571 Chrislea Road, Unit 4, 2nd Floor, Woodbridge, Ontario, L4L 8A2 TEL (905)264-0054, FAX (905)264-0069 E-MAIL: info@valdor-engineering.com www.valdor-engineering.com	
PREPARED BY	O.B.	CHECKED BY	F.P.
SCALE	1:600	DATE	APRIL. 9, 2026
PROJECT	20102	FIGURE 9	

APPENDIX “A”

Draft Plan



DRAFT PLAN OF SUBDIVISION

063076 COUNTY ROAD 3 AND PART 23, PLAN 7R-5924
IN THE
TOWNSHIP OF EAST GARAFRAXA
COUNTY OF DUFFERIN
Scale 1:12,000

- LEGEND**
- SUBJECT LANDS (268,934.36m² / 26.89ha)
 - MULTI - USE TRAIL

OWNER'S CERTIFICATE
I HEREBY AUTHORIZE INNOVATIVE PLANNING SOLUTIONS TO PREPARE THIS DRAFT PLAN OF SUBDIVISION AND SUBMIT THIS DRAFT PLAN OF SUBDIVISION FOR APPROVAL.

Date KEN MICHAUD
MARSVILLE ESTATE INC.

SURVEYOR'S CERTIFICATE
I CERTIFY THAT THE BOUNDARIES OF THE LAND TO BE SUBDIVIDED AND THEIR RELATIONSHIP TO ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

Date RAYMOND SIBTHORP, O.L.S.
BSR & D

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

- | | |
|------------------|--|
| a) SHOWN ON PLAN | g) SHOWN ON PLAN |
| b) SHOWN ON PLAN | h) MUNICIPAL WATER CURRENTLY UNAVAILABLE |
| c) SEE KEY PLAN | i) SAND, SILT GLACIAL TILL |
| d) RESIDENTIAL | j) SHOWN ON PLAN |
| e) SHOWN ON PLAN | k) PRIVATE SEWAGE SERVICES |
| f) SHOWN ON PLAN | l) NONE |

LAND USE STATISTICS			
LAND USE	LOT No.	BLOCK No.	AREA (ha)
Residential	1 - 78		19.75
SWM Pond		79	1.75
Swale		80	1.23
Open Space		81 - 82	0.38
Walkway		83	0.07
Lands to be Dedicated to Dufferin County		84	0.01
Street 'A' - 'C'			3.70
TOTAL	78	84	26.89

IPS INNOVATIVE PLANNING SOLUTIONS
PLANNERS • PROJECT MANAGERS • LAND DEVELOPERS
647 WELHAM RD., UNIT 9, BARRIE, ONTARIO, L4N 0B7
tel: 705 • 812 • 3281 fax: 705 • 812 • 3438 e: info@ipsconsultinginc.com www.ipsconsultinginc.com

Date:	Aug. 29, 2023	Drawn By:	AS
File:	19-869	Checked:	DV / KT

APPENDIX “B”

Water Demand Calculations

**VALDOR ENGINEERING INC.**

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Tel: 905-264-0054 Fax: 905-264-0069 info@valdor-engineering.com
www.valdor-engineering.com

TABLE: B1**DOMESTIC WATER DEMAND CALCULATION**

Project Name: **Marsville estates Subdivision**

File: 20102

Date: April 2026

Conditions:

Residential Average Day Demand	450 L/person/day
Maximum Day Factor	2.0
Peak Hour Factor	3.0
Persons Per Unit	4.00

Land Use	Equivalent Population (persons)		Domestic Demand (L/min)	Maximum Day Demand (L/min)	Peak Hour Demand (L/min)
Detached Dwellings	312		97.5	195.0	292.5
Total	312		97.5	195.0	292.5

**VALDOR ENGINEERING INC.**

571 Chrislea Road, Unit 4, Woodbridge, ON L4L 8A2
 Tel: 905-264-0054 Fax: 905-264-0069 info@valdor-engineering.com
 www.valdor-engineering.com

TABLE: B2-1**CALCULATION OF REQUIRED FIRE FLOW**

In accordance to Water Supply for Public Fire Protection, Fire Underwriters Survey 2020

Project Name: **Marsville Estates Subdivision**

File: 20102

Date: April 2026

Notes: **DETACHED DWELLING**

Assume:

- 3,000 sq ft two storey

- Basement > 50% underground

Type of Construction - Wood Frame

$C = 1.5$

Total Floor Area: 279 sq.m

$A = 279$ sq.m

(Total Floor Area includes all storeys, but excludes basements at least 50 percent below grade)

$$F = 220 C \sqrt{A}$$

$F = 5,512$ L/min

$F = 6,000$ (to nearest 1,000 Lmin)

Occupancy Factor

Type: Limited Combustible Charge -15%
 $f_1 = -15\%$

$$F' = F \times (1 + f_1)$$

$F' = 5,100$ L/min

Sprinkler Credit

		Charge
NFPA 13 Sprinkler Standard:	NO	0%
Standard Water Supply:	NO	0%
Fully Supervised System:	NO	0%
Total Charge to Fire Flow:	$f_2 =$	0%

Exposure Factor

		Charge
Side 1 - Distance to Building (m):	0 to 3m	15%
Side 2 - Distance to Building (m):	0 to 3m	11%
Side 3 - Distance to Building (m):	10.1 to 20m	0%
Side 4 - Distance to Building (m):	20.1 to 30m	8%
	$f_3 =$	34% (maximum of 75%)

$$F'' = F' + F' \times f_2 + F' \times f_3$$

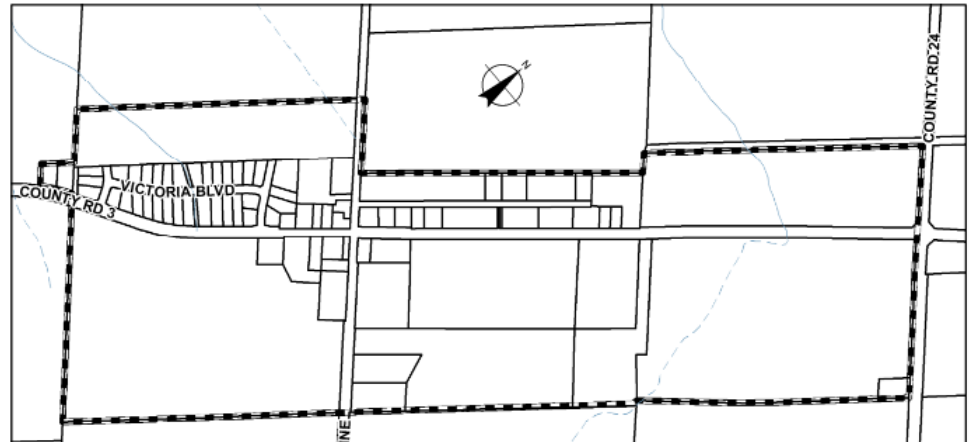
$F'' = 6,834$ L/min

REQUIRED FIRE FLOW

$F'' = 7,000$ L/min (to nearest 1,000 L/min)

The Study

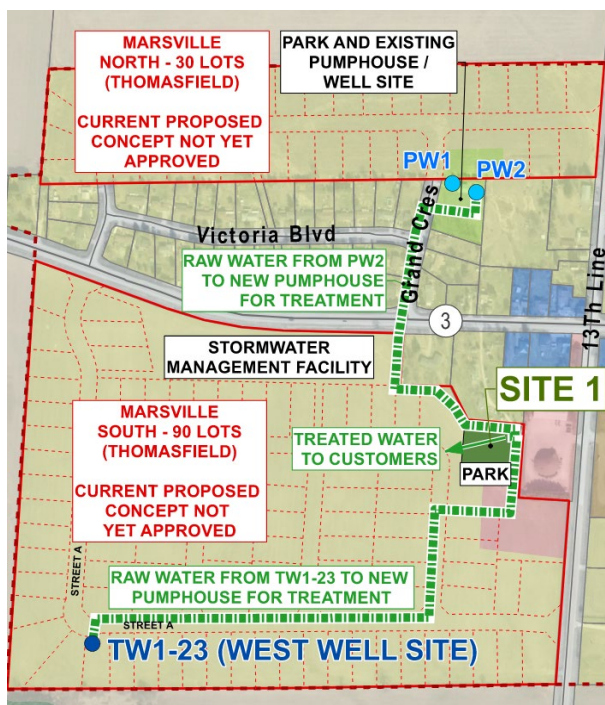
The Township of East Garafraxa has identified that the existing water system in Marsville does not have capacity to support future water demands for approved growth. The Township completed a Municipal Class Environmental Assessment (EA) to identify the preferred method of providing these demands. All lands designated within the current Community Boundary of Marsville in the Official Plan were considered.



Preferred Alternative

The preferred alternative included new municipal wells in the areas of test wells TW1-23 and PW2, with connection to a new site for treatment and storage near the Public Works Yard on the Marsville South Subdivision property. Fire protection will be provided from hydrants in the water distribution system and will be sized to provide 69-74 L/s once the system is fully looped. Watermain sizes are expected to range from 150 to 250 mm and will be determined through detailed design as developments progress. There is reliance on the Marsville South Subdivision property for the preferred alternative. Should the development not be advanced in time for other developments, the following should be considered as a backup to the preferred alternative.

- Obtain the land needed to construct the treatment / storage site near the Public Works Yard. Temporarily, the existing PW1 well and a new well near PW2 could be utilized as a well supply source until the Marsville South Subdivision is sufficiently advanced to construct the final production well near TW1-23. This temporary condition requires the well pump to be replaced at PW1. Existing right of ways would be utilized for raw water and treated water distribution pipes unless arrangements could be made with the Marsville South Subdivision Property Owner; or
- Obtain another suitable piece of land for the purposes of a treatment / storage site. Temporarily, the existing PW1 well and a new well near PW2 could be utilized as a well supply source until the Marsville South Subdivision is sufficiently advanced to construct the final production well near TW1-23. This temporary condition requires replacement of the well pump at PW1. Existing right of ways would be utilized for raw water and treated water distribution pipes unless arrangements could be made with the Marsville South Subdivision Property Owner. This option is expected to require an amendment to the MCEA to identify and evaluate a new site option.



These schematics are a general representative of the preferred alternative. The treatment / storage site would be in proximity to the public works yard and the final location of the components would be determined at detailed design. The raw water lines and watermain distribution system will be developed based on staging of developments and their locations could vary from what is shown. The final municipal well locations will be near the PW2 and TW1-23 sites.

The Process

This study was carried out in accordance with the requirements of a Schedule “B” undertaking (Phase 1 and 2) as outlined in the Municipal Engineers Association Municipal Class Environmental Assessment document (2000, as amended in 2007, 2011 and 2015). The Class EA planning process includes public and regulatory agencies consultation, evaluation of alternatives, assessment of the effects of the proposed upgrades and identification of measures to mitigate adverse impacts. The Class EA process included consultation with the public, agencies, and stakeholders. A Notice of Study Commencement was placed on the Township’s website on May 6, 2022, to inform residents that the study was being initiated and that the Township would be holding a future Public Information Centre (PIC). The PIC was held on June 15, 2023. Along with the notice for the PIC, letters were sent to agencies and stakeholders.

Project File Report

In accordance with the EA Act, the project file documenting Phase 1 and 2 of the project has been placed on the public record and is available for review for a minimum of 30 days starting September 8, 2023 and ending October 13, 2023. An electronic copy is available on the Township’s website (<https://www.eastgarafraxa.ca/en/municipal-government/planning-and-development.aspx#Planning-Notices>) and a hard copy of the project file will be available at the Township office, located at 065371 Dufferin County Road 3, Unit 2 in East Garafraxa. If you are unable to visit the website or require additional assistance with the materials, or to provide comments or concerns about this project, please contact Carley Dixon and Peter Avgoustis by October 13, 2023.

R.J. Burnside & Associates Ltd.
Carley Dixon, P.Eng. - Project Manager
15 Townline
Orangeville ON L9W 3R4
Phone: 226-486-1542
Carley.Dixon@rjburnside.com

Township of East Garafraxa
Peter Avgoustis - Chief Administrative Officer
065371 Dufferin County Road 3, Unit 2
East Garafraxa ON L9W 7J8
Phone: 226-259-9400
pavgoustis@eastgarafraxa.ca

If there are outstanding concerns regarding potential adverse impacts to constitutionally protected Aboriginal and treaty rights, a request for an order requiring a higher level of study or conditions on those matters should be addressed in writing to the Minister of the Environment and the Director of the Environmental Assessment Branch. Requests should include the requester contact information and full name. The request should be sent by October 13, 2023, to the addresses below as well as to Carley Dixon and Peter Avgoustis.

Minister
Ministry of the Environment, Conservation and Parks
777 Bay Street, 5th Floor
Toronto ON M7A 2J3
Minister.mecp@ontario.ca

Director
Environmental Assessment Branch
Ministry of the Environment, Conservation and Parks
135 St. Clair Avenue West, 1st Floor
Toronto ON M4V 1P5
EABDirector@ontario.ca

More information about a request for an order (referred to as a Section 16(6) Order) can be found at the following website:

<https://www.ontario.ca/page/class-environmental-assessments-section-16-order>

Comments about other project concerns should be directed to the Township for a response. If no orders are received, the Township intends to proceed with detailed design and construction as outlined in the project file report subject to approvals needed for detail design, municipal priorities, and financial arrangements with developers.

Project and notice information will be made accessible upon request in accordance with the Accessibility Standard for Information and Communication under the Accessibility for Ontarians with Disabilities Act, 2005. Please note that information will be collected in accordance with the Freedom of Information and Protection of Privacy Act. With the exception of personal information, all comments will become part of the public record.

Notice first issued on September 8, 2023.

APPENDIX “C”

Wastewater Servicing Details & Calculations

VALDOR ENGINEERING INC.

File: 20102
March 2020

PROJECT: **Proposed Estate Residential Subdivision**
63077 County Road 3, Marsville
Township of East Garafraxa

TABLE C1

House Data	
House Model	
Number of bedrooms	4
Floor Area (ft ²)	3,000
Floor Area (m ²)	278.7
Fixture Count (see attached calcs)	26.0

Soils Data	
t-time for native soil (min/cm)	25
t-time for fill (min/cm)	10

Daily Design Flow*		
Dwelling Flow (L/day) up to 5 bedrooms		2,000
Additional Flow:		800
i) for over 5 bedrooms	0	
ii) area - A	800	
area - B	0	
area - C	0	
iii) fixtures over 20 units	300	
Peak Daily Design Flow (L/day)		2,800
Total Peak Daily Design Flow (L/day)		2,800
Septic Tank Capacity (L)	Minimum:	5,600
(Available Sizes 4500L, 6800L, 9000L, 13500L)	Use:	6,800
* based on Ontario Building Code Table 8.2.1.3.A		

if t ≤ 20min - Trench In-Ground Bed		
Length of pipe (m)	L = [Q*t/200]	350.0
Approx Bed Area (m ²)	A = [L*1.6]	560.0
if t > 20min - Raised Conventional Bed		
Length of pipe (m)	L = [Q*t/200]	140.0
Minimum Loading Area (m ²)		350.0
if t > 20min - Raised Filter Bed		
Bed Area Required (m ²)		350.0
Minimum Contact Area (m ²)		82.4
Effective Filter Area Required (m ²)		37.3
BMEC Area Bed		
Minimum Stone Layer (m ²)		37.3
Minimum Sand Layer (m ²)		175.0

Dwelling design flows (L/day)*		
a) 1 Bedroom	1	750
b) 2 Bedroom	2	1100
c) 3 Bedroom	3	1600
d) 4 Bedroom	4	2000
e) 5 Bedroom	5	2500
f) Additional for:		
i) each bedroom over 5		500
ii) A) each 10m ² (or part thereof) over 200m ² up to 400m ²		100
B) each 10m ² (or part thereof) over 400m ² up to 600m ²		75
C) each 10m ² (or part thereof) over 600m ² , or		50
iii) each fixture unit over 20 fixture units		50
* part of Ontario Building Code Table 8.2.1.3.A		

Loading Rates*	
Percolation Time of Soil (min/cm)	Loading Rates (L/m ² /day)
1 < t ≤ 20	10
20 < t ≤ 35	8
35 < t ≤ 50	6
t > 50	4
* part of Ontario Building Code Table 8.7.4.1.A	

VALDOR ENGINEERING INC.

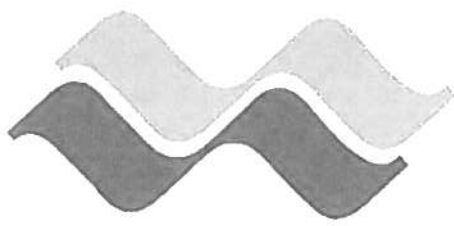
File: 20102
March 2020

PROJECT: **Proposed Estate Residential Subdivision**
63077 County Road 3, Marsville
Township of East Garafraxa

TABLE C2

FIXTURE COUNTS			
Fixture	Load* (units)	Number of Fixtures	Calculated Units
BASEMENT			
Kitchen sink	1.5		0.0
Dishwasher	1.0		0.0
Toilet	4.0		0.0
Bidet	1.0		0.0
Tub/shower	1.5		0.0
Shower	1.5		0.0
Lavatory	1.0		0.0
Whirlpool	1.5		0.0
Other sink	1.5		0.0
Clothes washer	1.5		0.0
Laundry tub	1.5		0.0
Bathroom group	6.0		0.0
2" Floor Drain	2.0	1	2.0
3" Floor Drain	3.0		0.0
Other			0.0
Main Floor			
Kitchen sink	1.5	1	1.5
Dishwasher	1.0	1	1.0
Toilet	4.0	1	4.0
Bidet	1.0		0.0
Tub/shower	1.5		0.0
Shower	1.5		0.0
Lavatory	1.0	1	1.0
Whirlpool	1.5		0.0
Other sink	1.5		0.0
Clothes washer	1.5	1	1.5
Laundry tub	1.5	1	1.5
Bathroom group	6.0		0.0
Other			0.0
Second Floor			
Kitchen sink	1.5		0.0
Dishwasher	1.0		0.0
Toilet	4.0		0.0
Bidet	1.0		0.0
Tub/shower	1.5		0.0
Shower	1.5	1	1.5
Lavatory	1.0		0.0
Whirlpool	1.5		0.0
Other sink	1.5		0.0
Clothes washer	1.5		0.0
Laundry tub	1.5		0.0
Bathroom group	6.0	2	12.0
Other			0.0
TOTAL			26.0

* part of Ontario Building Code Table 7.4.9.3



Waterloo
BIOFILTER

Design & Installation Guide

CAN/BNQ 3680-600

Class B-IV

**Version 4.0
January 2020**

Waterloo Biofilter Systems Inc.

143 Dennis Street, PO Box 400
Rockwood ON N0B 2K0

Tel: 519-856-0757 Fax: 519-856-0759

1-866-366-4329

info@waterloo-biofilter.com

www.waterloo-biofilter.com

CAN/BNQ 3680-600



2312

Certification

The Waterloo Biofilter is an onsite residential wastewater treatment system complying with the CAN/BNQ 3680-600 Standard, Certification No. 2312.

CAN/BNQ 3680-600



2312

Class of Treatment: B-IV (10 mg/L TSS, 10 mg/L cBOD₅).

Influent Temperature: Temperature condition *b*) – controlled to assure a minimum influent temperature of 10°C.

Scope: The CAN/BNQ 3680-600 standard applies only to onsite residential wastewater treatment technologies used to treat wastewater from isolated dwellings.

It is not the intention of the standard to apply to water reuse technologies, or technologies for other buildings similar to isolated dwellings, such as service stations, restaurants, etc.

The standard does not cover the part of a treatment system used for distribution and disposal of treated effluent.

Capacity: 1,100 L/day – 10,000 L/day.

For information on systems outside the scope of this document, such as commercial, light industrial, communal or clustered applications, please contact us at 1-866-366-4329.

Introduction

The Waterloo Biofilter system uses a patented, highly engineered foam filtration medium to passively treat wastewater. The absorbent foam filter medium creates an ideal environment for microbial attachment. Beneficial bacteria colonize the interior surfaces of the filter medium where they are protected from predators, desiccation, and freezing. These microbes degrade and oxidize organic pollutants, coliform bacteria, ammonium, and other contaminants as the wastewater is retained in the filter medium by capillarity. Air passively circulates throughout the filter media providing an aerobic treatment environment without the need for forced aeration. The Waterloo Biofilter provides both physical filtration and biological treatment of wastewater in one step – ensuring high levels of pollutants are removed before water is returned to the natural environment.

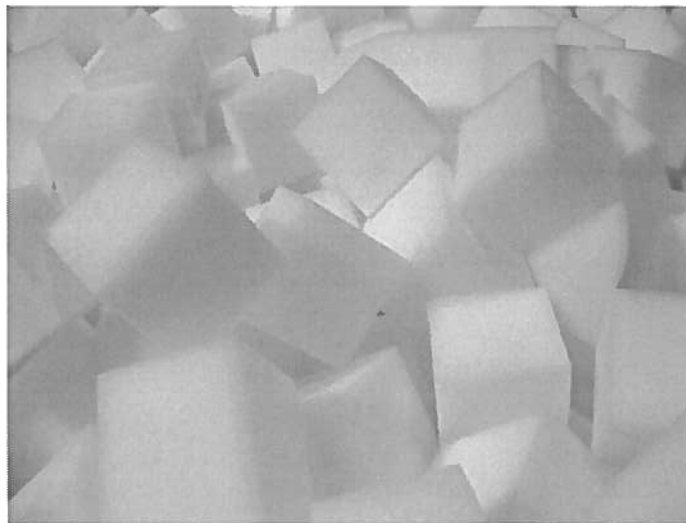


Figure 1. Waterloo Biofilter foam filter media

This attached growth process outperforms activated sludge or suspended growth (suspended sludge) processes with lower energy requirements, fewer moving parts, simpler operation, less maintenance, and a better ability to handle shock loads of chemical addition or hydraulic overloads. Of high importance in Canada, the Waterloo Biofilter is proven in frigid -50°C temperatures, treating cold sewage with influent temperatures as low as 3°C. Compared to other media-based trickling filters, the Waterloo Biofilter does not slough off microbes in the form of aerobic sludge, does not need media replacement, has longer retention times, and can accept much higher organic and hydraulic loads without plugging.

Advantages

Waterloo Biofilters have been treating residential wastewaters onsite since 1993. Besides an excellent and thoroughly tested product, when working with Waterloo Biofilter Systems Inc. you also receive system design assistance, troubleshooting, and technical support from our knowledgeable staff. We pride ourselves on the high level of customer support we offer to our designers, installers, and end users.

A few of the distinct advantages of the Waterloo Biofilter technology include:

- Permanent filter media warranted for 20 years
- Very low energy consumption, up to 85% less than aeration technology
- Simple maintenance with few moving parts
- Compact footprint
- No noisy, high maintenance air compressors
- Variety of system configurations designed for different site constraints
- Simple system components that are lightweight and easy to install
- Accepts high hydraulic loading rates without plugging
- Easily handles seasonal use and surge flows
- Robust technology easily recovers from misuse such as chemical use



Permanent Filter Medium

Never needs to be cleaned or replaced.

Warrantied for 20 years, and will likely last for generations.

[Learn More](#)

Figure 2. Waterloo Biofilter foam media warranty

The Waterloo Biofilter foam filter medium retains moisture even during prolonged periods of no use. Microbial colonies do not desiccate (dry out) and die, instead they go dormant until the system starts up again resulting in a short start-up period. This makes the Waterloo Biofilter system ideal for seasonal use applications such as cottages and cabins.

All Waterloo Biofilter treatment units are designed with installation and maintenance in mind. Units are lightweight and can be easily manoeuvred onsite or even barged to islands. All system components come pre-assembled wherever possible to speed up the installation process and minimize potential errors. Float switch controls come colour coordinated at both ends simplifying installation and reducing errors. Care is taken in the design of our systems to ensure that components are easily accessible and replaceable for maintenance – from providing lifting ropes on all pumps to external electrical splice boxes to prevent pulling wires, we strive to ensure simple and easy installation and ongoing maintenance for high quality septic infrastructure.

The Waterloo Biofilter treatment process itself requires no energy; pumps are used simply to move the water around within the system. If the homeowners are not using water at the residence, either for short or extended periods of time, the system will not use any energy beyond powering the control panel. This results in very low electricity usage – even less than recirculating sand filters.

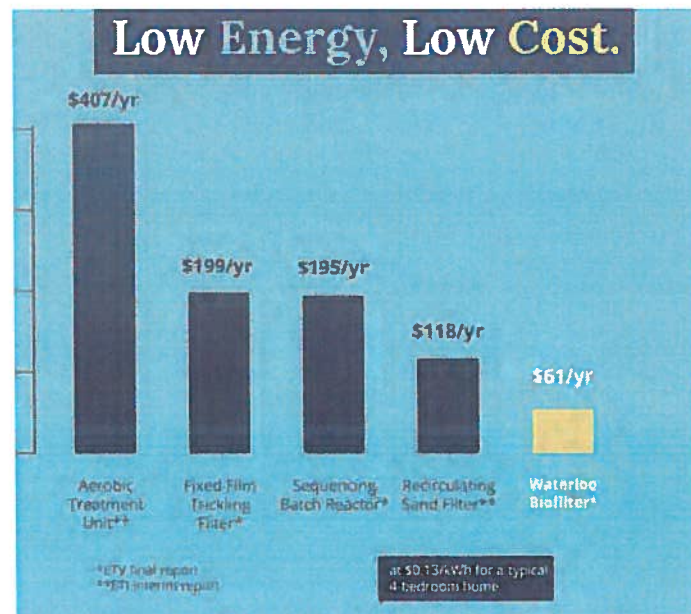


Figure 3. Energy use comparison

Treatment Train

The Waterloo Biofilter process consists of three elements:

1. Anaerobic digester
2. Biofilter dosing pump chamber (internal to anaerobic digester) OR pump tank (external to anaerobic digester)
3. Waterloo Biofilter treatment unit

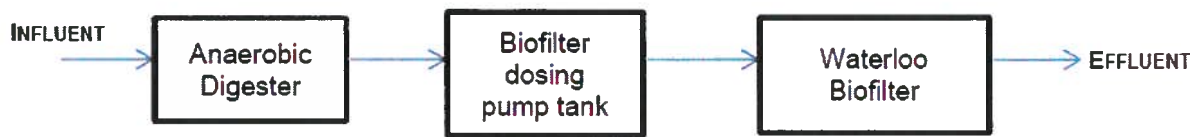


Figure 4. Waterloo Biofilter flow diagram

1. Wastewater from the dwelling first enters the anaerobic digester for pre-treatment. The anaerobic digester function is similar to that of a standard septic tank, however the anaerobic digester is designed to improve treatment by minimizing short circuiting, reducing scum formation, and improving solids digestion by the addition of an InnerTube™ pipe.
2. Effluent from the anaerobic digester is then dosed to the Waterloo Biofilter treatment unit in short frequent doses. This can be accomplished using either an internal pump chamber housed inside the anaerobic digester, or an external pump tank following the anaerobic digester. Dosing to the treatment unit is always controlled on a timed frequency-duration basis.
3. The Waterloo Biofilter treatment unit houses the foam filter media in either an above-ground, at-grade, or below-ground container. Anaerobic digester effluent is evenly distributed over the foam media using pressurized spray nozzles or perforated pipes, where it then trickles down through and is absorbed by the foam media. Passive air vents allow atmospheric oxygen to enter the container providing an aerobic environment without energy use. The foam filter media is free-draining and treated effluent exits the bottom of the foam where it is directed to final dispersal via either gravity or a second pump. Recirculation of treated effluent back to the anaerobic digester is often used to increase nitrogen removal, moderate flow rates, and generally improve treatment performance.

Sizing Chart

Anaerobic digesters are sized using the design flow of the dwelling based on a minimum retention time of 1.89 days (**1.89 x Q**), of which a minimum 0.2 days (**0.2 x Q**) retention is inside the InnerTube pipe, or the minimum listed in the chart below. The volume of the InnerTube pipe is included in the minimum capacity of the anaerobic digester.

The following Table outlines the minimum sizing requirements for the anaerobic digester and the InnerTube pipe:

Table 3. Anaerobic Digester Sizing

	Flow Rate (L/day)	Minimum Anaerobic Digester Volume (L)	Minimum InnerTube Volume (L)
	1,100	3,021	320
	1,600	3,021	320
	2,000	3,776	400
	2,500	4,720	500
→	3,000	5,664	600
	3,500	6,608	700
	4,000	7,552	800
	4,500	8,496	900
	5,000	9,440	1,000
	5,500	10,384	1,100
	6,000	11,328	1,200
	6,500	12,272	1,300
	7,000	13,216	1,400
	7,500	14,160	1,500
	8,000	15,104	1,600
	8,500	16,048	1,700
	9,000	16,992	1,800
	9,500	17,936	1,900
	10,000	18,880	2,000

2020 Waterloo Biofilter Tank Sizing

Orangeville Precast Concrete Ltd.

Phone: 519-941-4050 | Email: info@orangevilleprecast.com | Orangeville ON
 Select Option 1 to dose Biofilter from the internal pump chamber
 Select Option 2 to dose Biofilter from the external pump tank
 Please contact concrete provider to order the necessary tankage

Design Capacity (L/day)	Option 1 Anaerobic Digester with Internal Pump Chamber (ADIPC)	Option 2 Anaerobic Digester (AD) with External Pump Tank (PT)		Basket Biofilter Tank (BT)
1,600	ADIPC-4750	AD-3600	PT-1800	BT-5400
2,000	ADIPC-5400	AD-4750	PT-1800	BT-5400
2,500	ADIPC-7480	AD-5400	PT-1800	BT-7480
→ 3,000	ADIPC-9000	AD-7480	PT-3000	BT-7480
3,500	ADIPC-9000	AD-9000	PT-3600	BT-9000
4,000	ADIPC-11250	AD-9000	PT-3600	BT-9000
4,500	ADIPC-11250	AD-9000	PT-4750	BT-11250
5,000	ADIPC-13500	AD-11250	PT-4750	BT-11250
5,500	N/A	AD-11250	PT-5400	BT-11250
6,000		AD-11250	PT-5400	BT-13500
6,500		AD-13500	PT-5400	BT-13500
7,000		AD-13500	PT-7480	BT-18000
7,500		AD-18000	PT-7480	BT-18000
8,000		AD-18000	PT-7480	BT-18000
8,500		AD-18000	PT-9000	BT-18000
9,000		AD-18000	PT-9000	BT-18000
9,500		AD-22980	PT-9000	BT-22980
10,000		AD-22980	PT-9000	BT-22980

System Diagram – Baskets in Concrete Tank

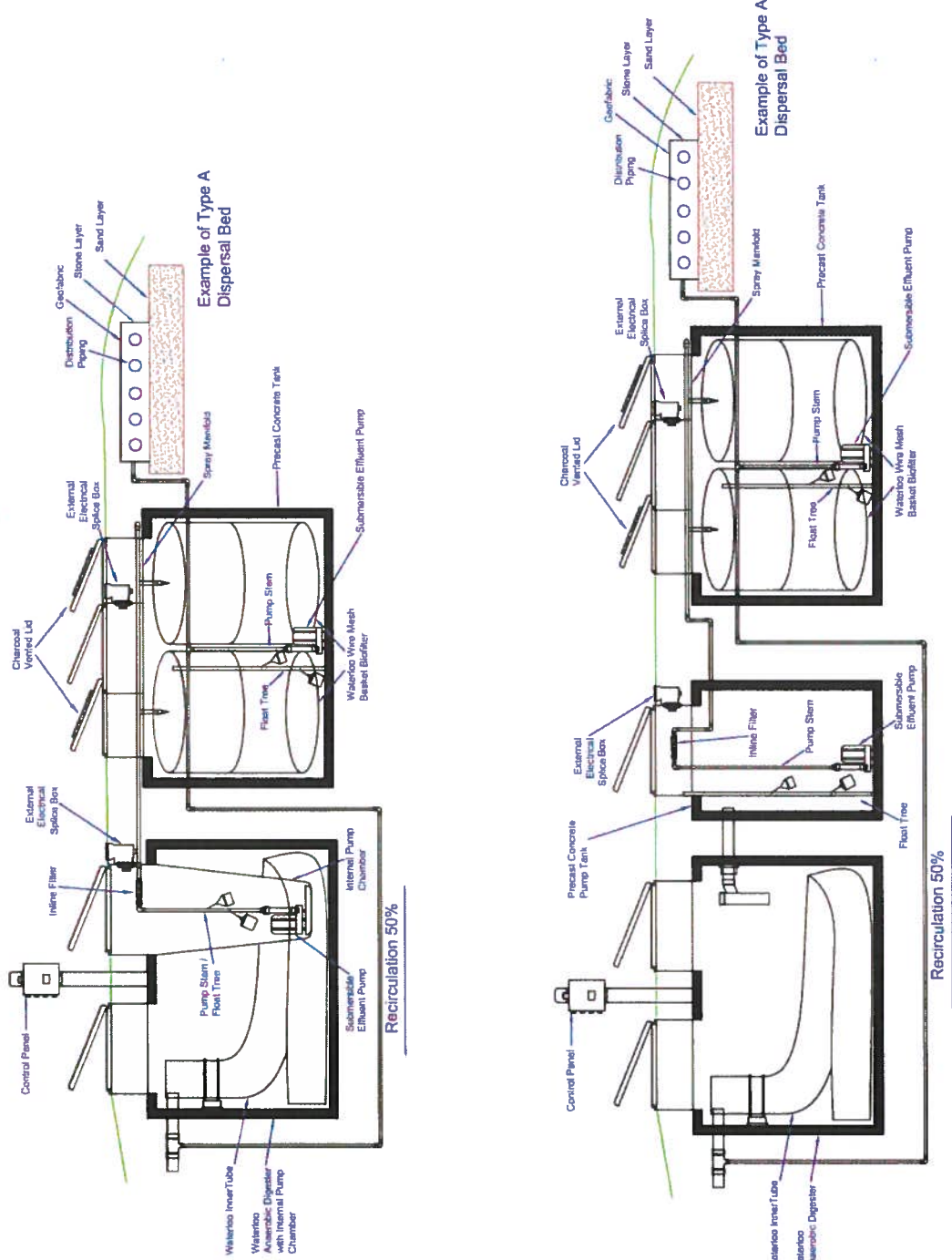


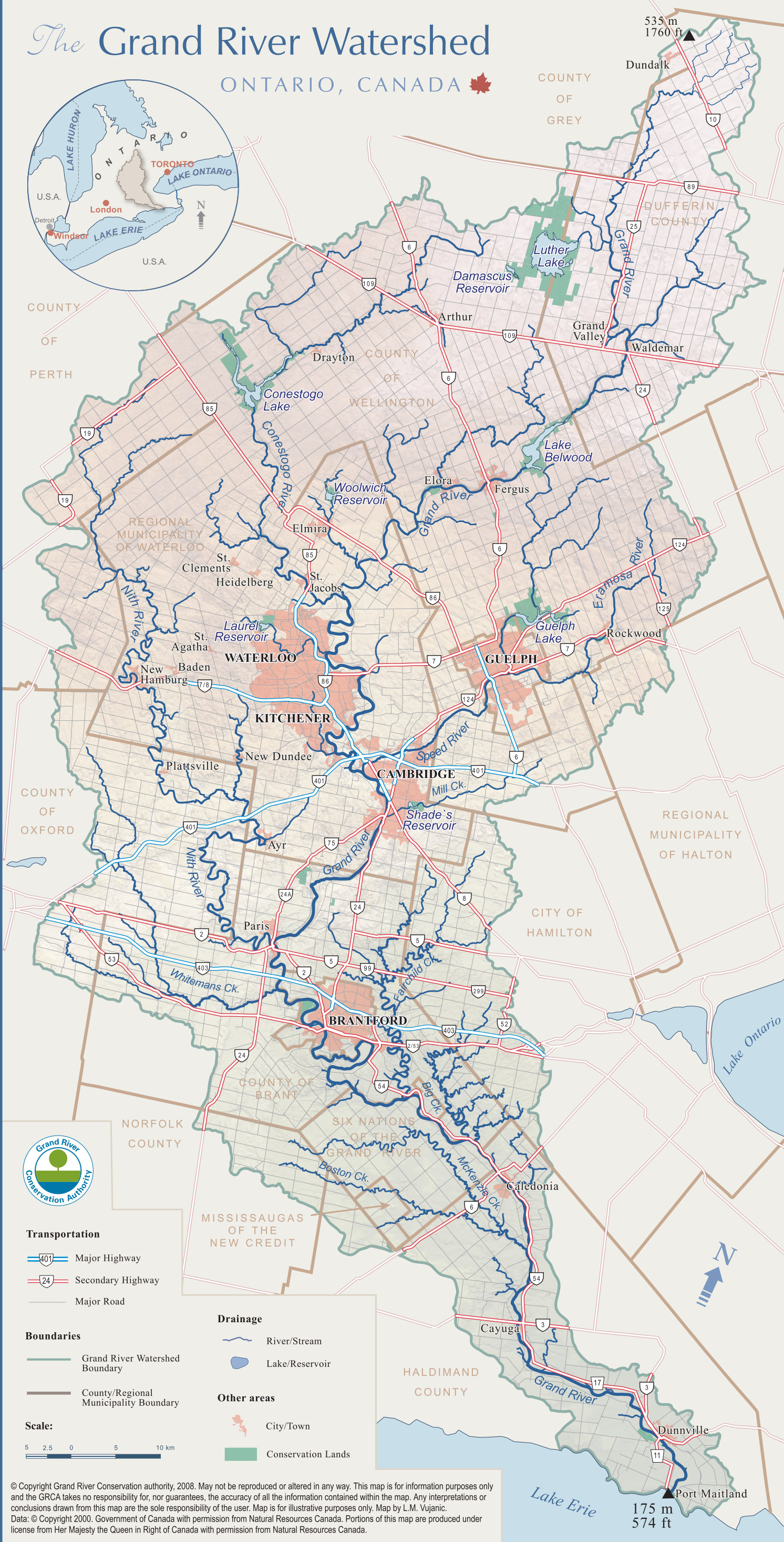
Figure 42. Baskets in concrete tank system diagram

APPENDIX “D”

Watershed Map, Regulation Mapping & IDF Data

The Grand River Watershed

ONTARIO, CANADA



Transportation

- 401 Major Highway
- 24 Secondary Highway
- Major Road

Boundaries

- Grand River Watershed Boundary
- County/Regional Municipality Boundary

Scale:

5 2.5 0 5 10 km

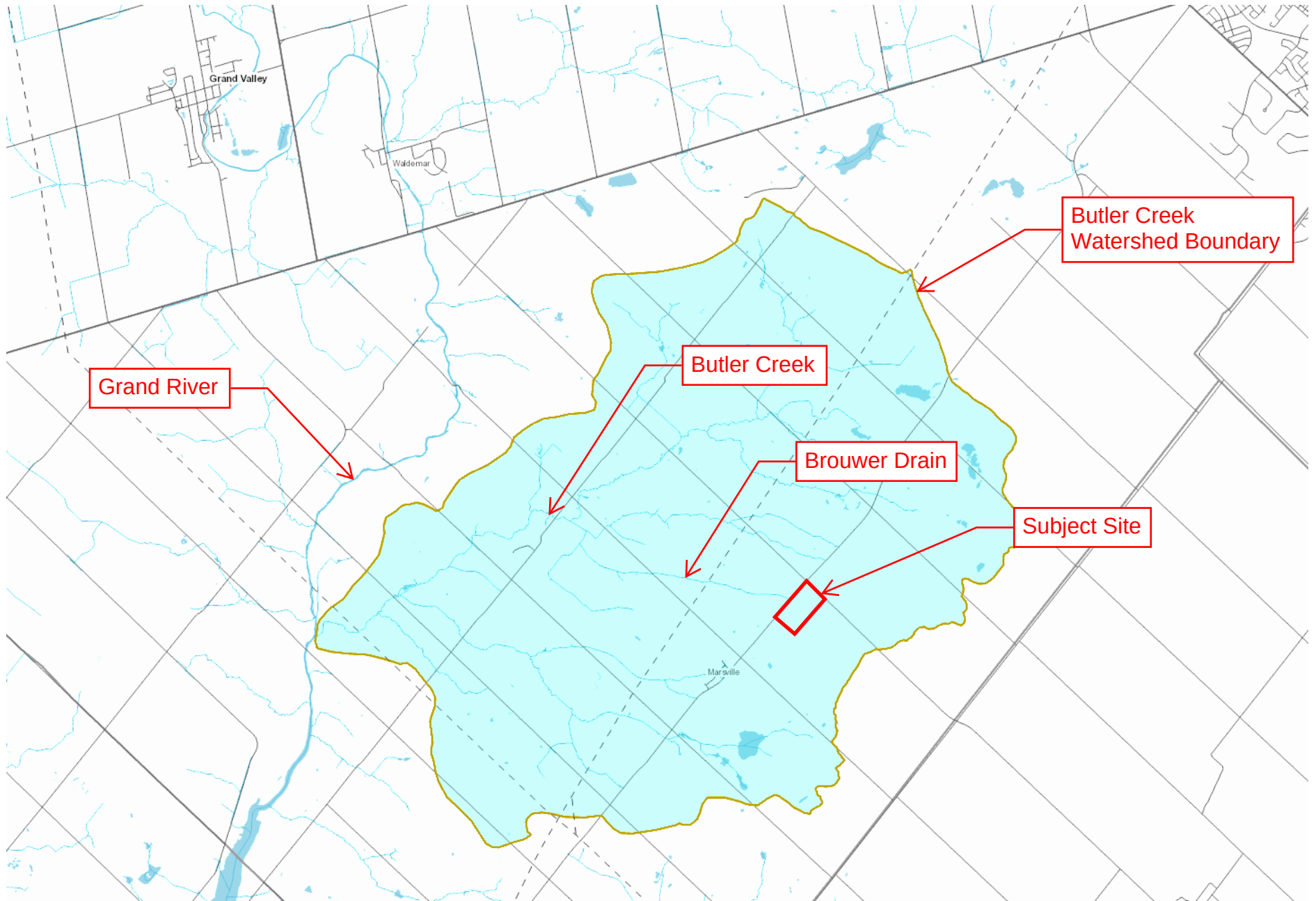
Drainage

- River/Stream
- Lake/Reservoir

Other areas

- City/Town
- Conservation Lands

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Butler Creek Watershed Map



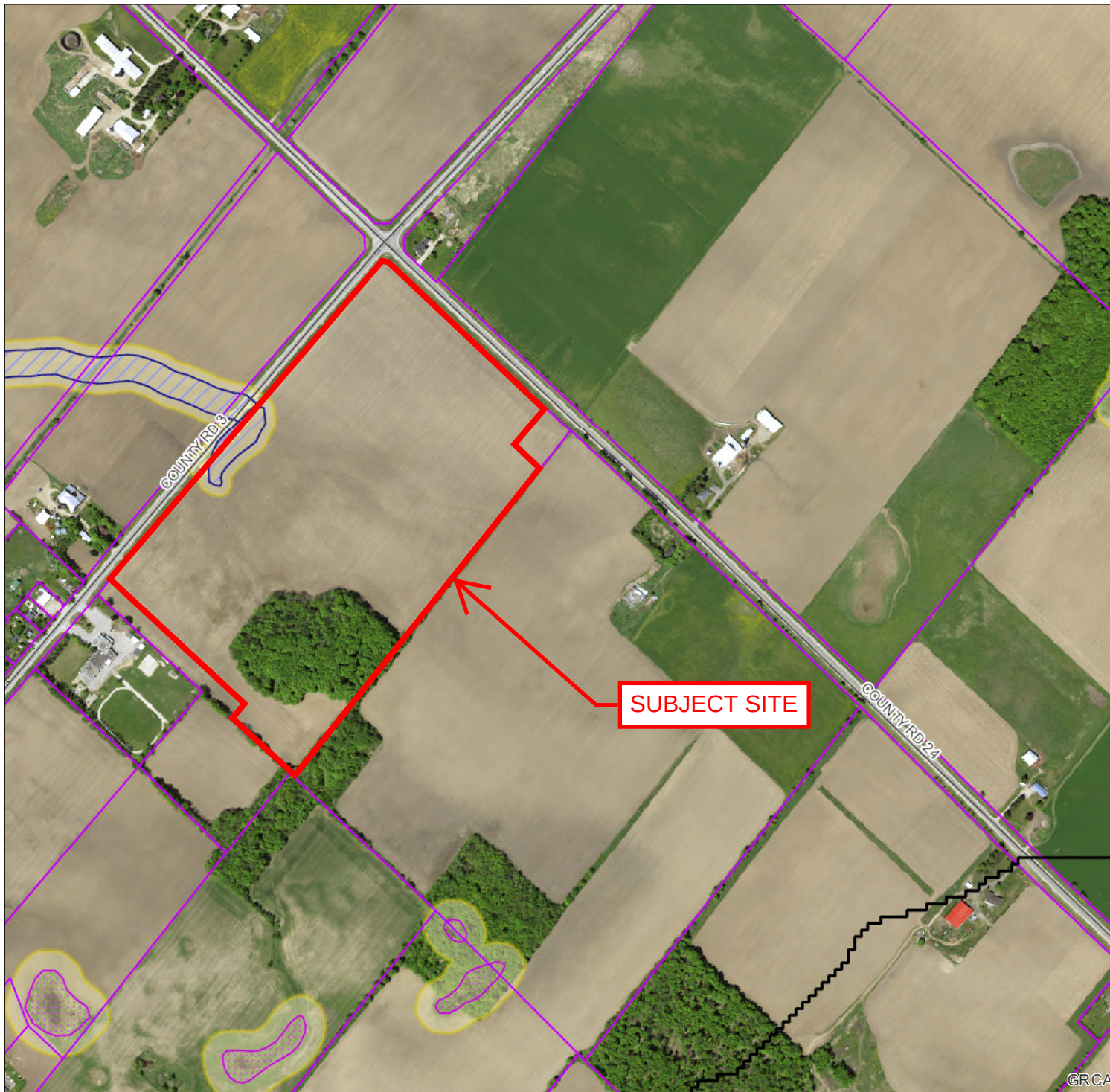
20102 GRCA Reg Map

Legend

- Regulation Limit (GRCA)
- Regulated Watercourse (GRCA)
- Regulated Waterbody (GRCA)
- Wetland (GRCA)
- Floodplain (GRCA)
 - Engineered
 - Estimated
 - Approximate
 - Special Policy Area
- Slope Valley (GRCA)
 - Steep
 - Oversteep
 - Steep
- Slope Erosion (GRCA)
 - Oversteep
 - Toe
- Lake Erie Flood (GRCA)
- Lake Erie Shoreline Reach (GRCA)
- Lake Erie Dynamic Beach (GRCA)
- Lake Erie Erosion (GRCA)
- Parcel - Assessment (MPAC/MNRF)

This legend is static and may not fully reflect the layers shown on the map. The text of Ontario Regulation 150/06 supercedes the mapping as represented by these layers.

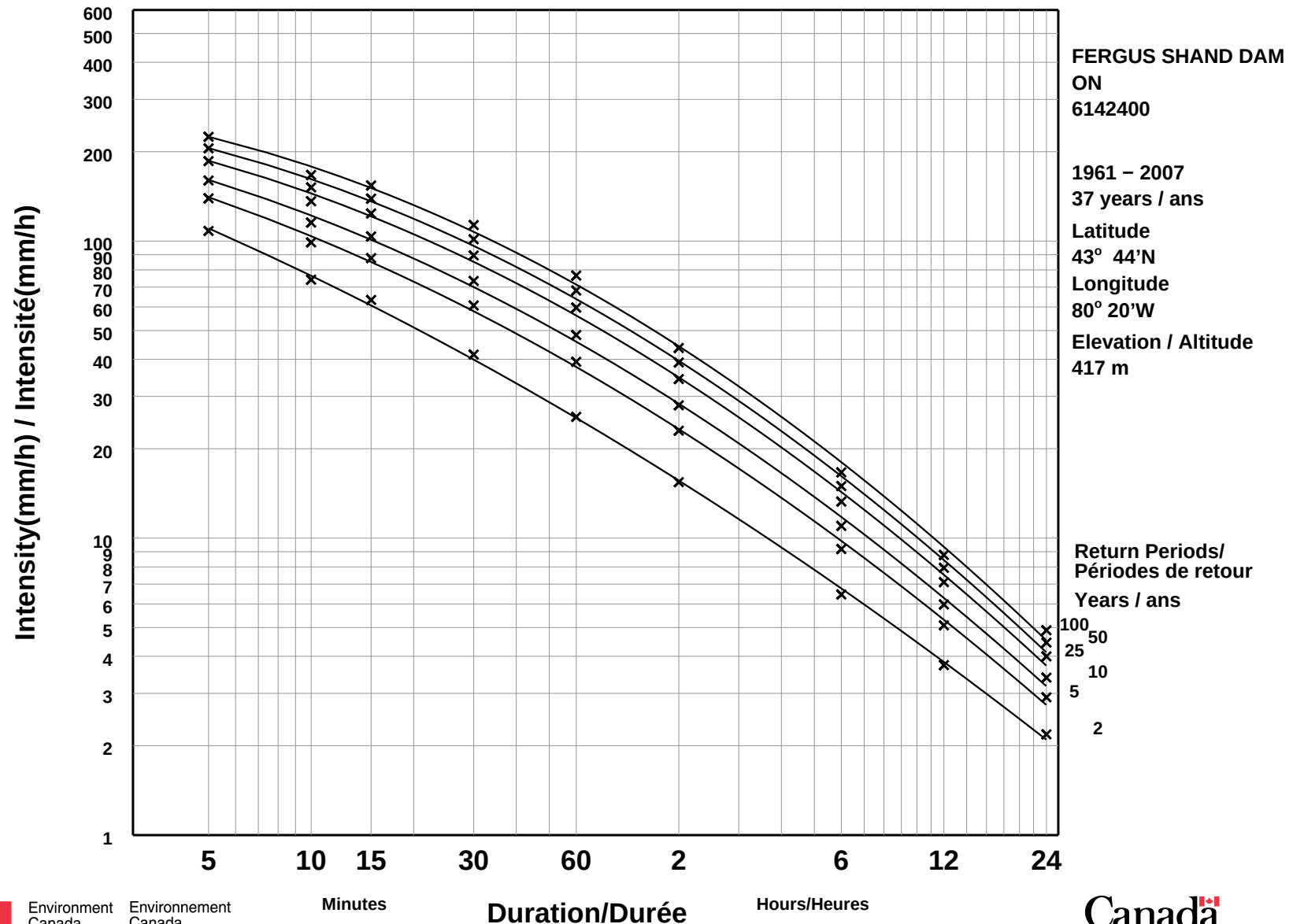
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The source for each data layer is shown in parentheses in the map legend. For a complete listing of sources and citations go to: <https://maps.grandriver.ca/Sources-and-Citations.pdf>



Short Duration Rainfall Intensity–Duration–Frequency Data

2014/12/21

Données sur l'intensité, la durée et la fréquence des chutes de pluie de courte durée



APPENDIX “E”

Floodplain Mapping

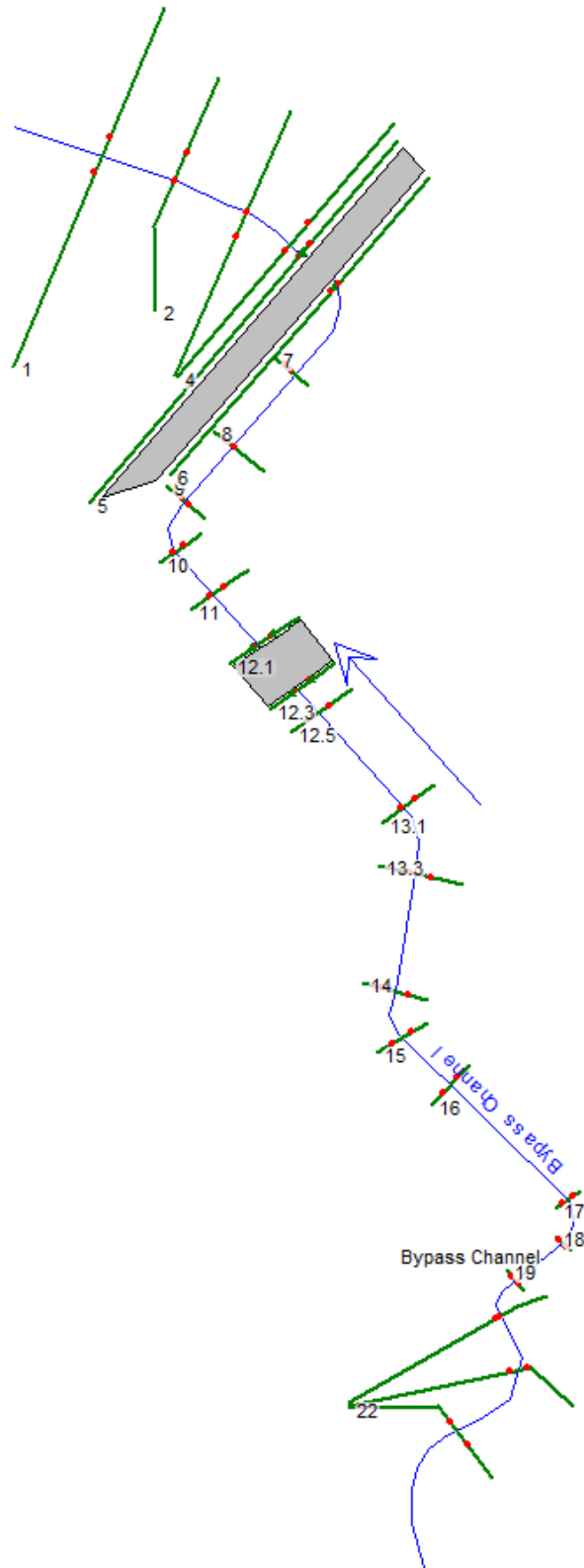


Figure E.1: HEC-RAS Model Schematic

VALDOR ENGINEERING INC.

Project: Marsville Estates Subdivision

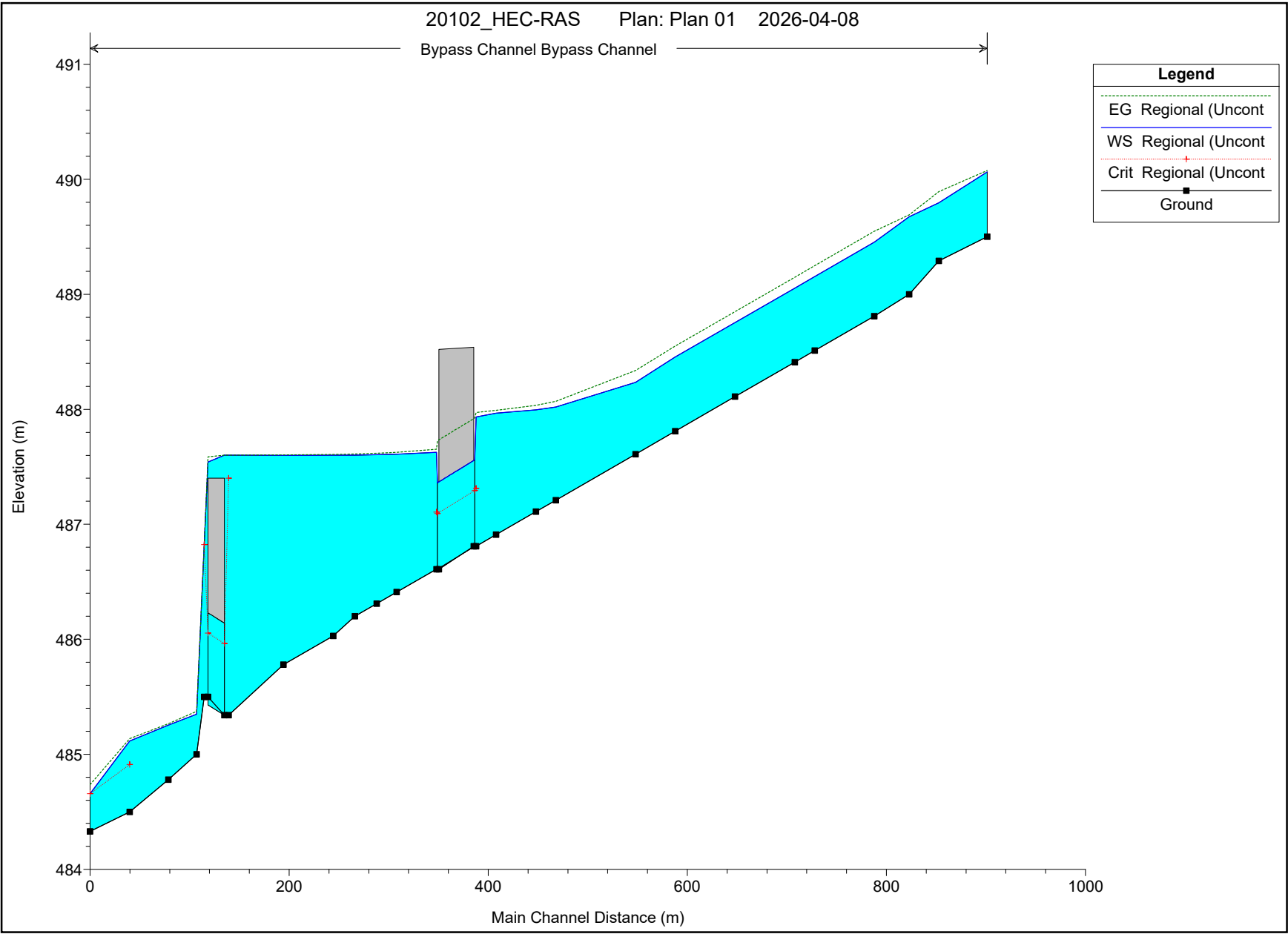
File: 14119

Date: April 2026

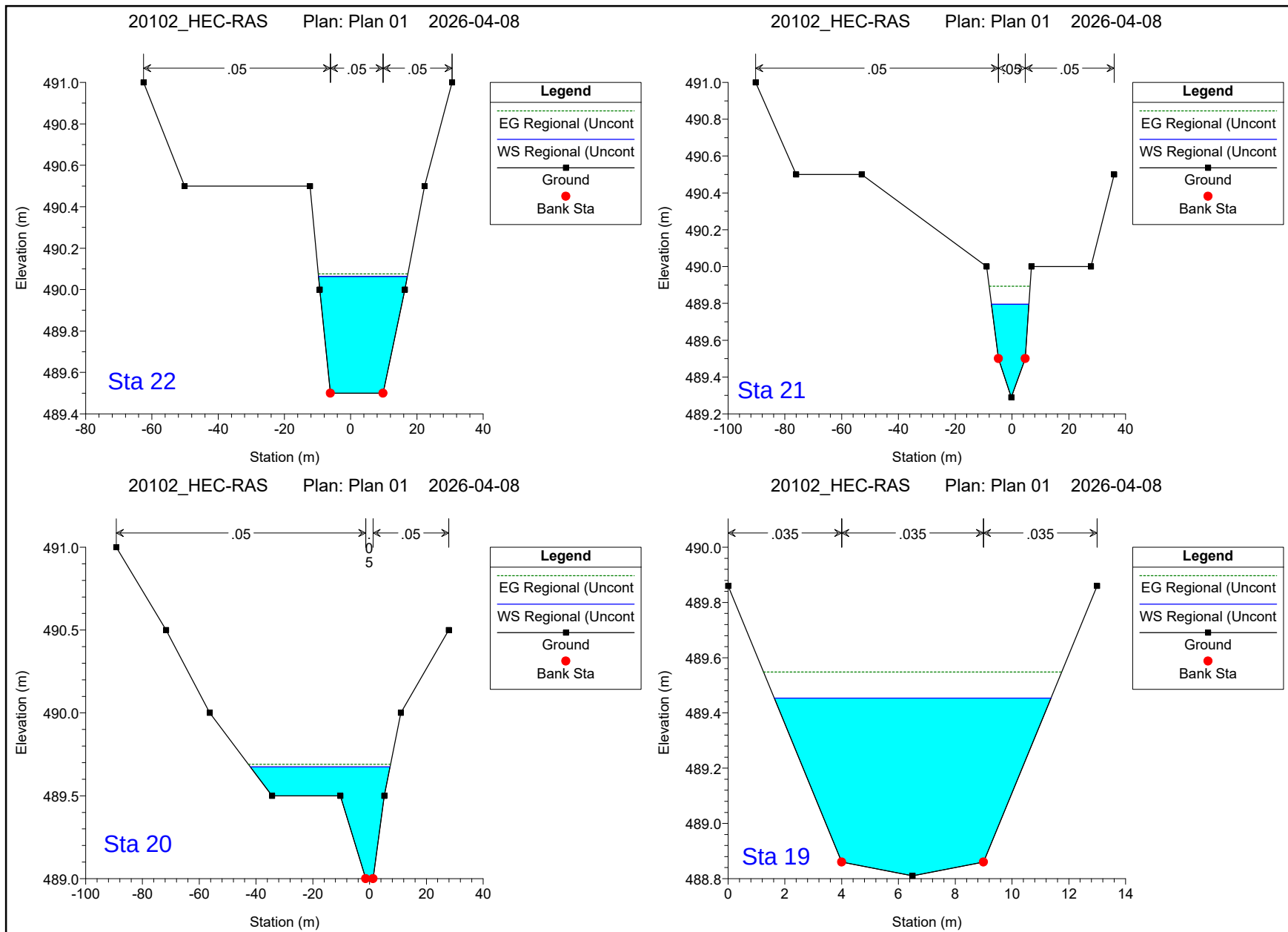
Table E.1: HEC-RAS Model Output

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Bypass Channel	22	Regional (Uncont	5.78	489.50	490.06		490.08	0.001507	0.53	12.05	26.81	0.23
Bypass Channel	21	Regional (Uncont	5.78	489.29	489.80		489.89	0.017062	1.42	4.34	13.19	0.72
Bypass Channel	20	Regional (Uncont	5.78	489.00	489.67		489.69	0.003037	0.85	12.22	49.19	0.33
Bypass Channel	19	Regional (Uncont	5.78	488.81	489.45		489.55	0.005	1.47	4.50	9.75	0.60
Bypass Channel	18	Regional (Uncont	5.78	488.51	489.15		489.25	0.005001	1.47	4.50	9.75	0.60
Bypass Channel	17	Regional (Uncont	5.78	488.41	489.05		489.15	0.005005	1.47	4.50	9.75	0.60
Bypass Channel	16		5.78	488.11	488.75		488.85	0.004992	1.47	4.50	9.75	0.59
Bypass Channel	15	Regional (Uncont	5.78	487.81	488.46		488.55	0.004954	1.46	4.52	9.76	0.59
Bypass Channel	14	Regional (Uncont	5.78	487.61	488.23		488.34	0.005639	1.52	4.32	9.59	0.63
Bypass Channel	13.3	Regional (Uncont	5.78	487.21	488.02		488.07	0.001997	1.09	6.23	11.08	0.39
Bypass Channel	13.1	Regional (Uncont	5.78	487.11	487.99		488.03	0.001399	0.97	7.08	11.67	0.33
Bypass Channel	12.5		5.78	486.91	487.97		487.99	0.0007	0.77	9.02	12.73	0.24
Bypass Channel	12.3	Regional (Uncont	5.78	486.81	487.93	487.31	487.97	0.000881	0.90	6.49	12.73	0.27
Bypass Channel	12.2	Regional (Uncont	Culvert									
Bypass Channel	12.1	Regional (Uncont	5.78	486.61	487.63	487.11	487.65	0.000792	0.80	8.70	12.73	0.26
Bypass Channel	11	Regional (Uncont	5.78	486.41	487.61		487.63	0.000407	0.64	11.21	14.91	0.19
Bypass Channel	10	Regional (Uncont	5.78	486.31	487.61		487.62	0.000296	0.58	12.70	16.13	0.16
Bypass Channel	9	Regional (Uncont	5.78	486.20	487.60		487.61	0.000208	0.51	14.82	18.42	0.14
Bypass Channel	8	Regional (Uncont	5.78	486.03	487.60		487.61	0.000116	0.41	18.65	20.58	0.11
Bypass Channel	7	Regional (Uncont	5.78	485.78	487.60		487.60	0.000066	0.34	22.46	21.30	0.08
Bypass Channel	6	Regional (Uncont	8.02	485.34	487.60	487.40	487.60	0	0.03	313.12	198.81	0.01
Bypass Channel	5.5		Culvert									
Bypass Channel	5	Regional (Uncont	8.02	485.50	486.82	486.82	486.82	0.000016	0.10	121.04	227.47	0.03
Bypass Channel	4	Regional (Uncont	8.02	485.00	485.35		485.37	0.006498	0.80	12.28	52.48	0.43
Bypass Channel	3	Regional (Uncont	8.02	484.78	485.25		485.27	0.002327	0.49	18.33	65.35	0.26
Bypass Channel	2	Regional (Uncont	8.02	484.50	485.12	484.91	485.14	0.004953	0.72	13.12	50.76	0.38
Bypass Channel	1	Regional (Uncont	8.02	484.33	484.66	484.66	484.74	0.029231	1.33	7.31	50.96	0.86

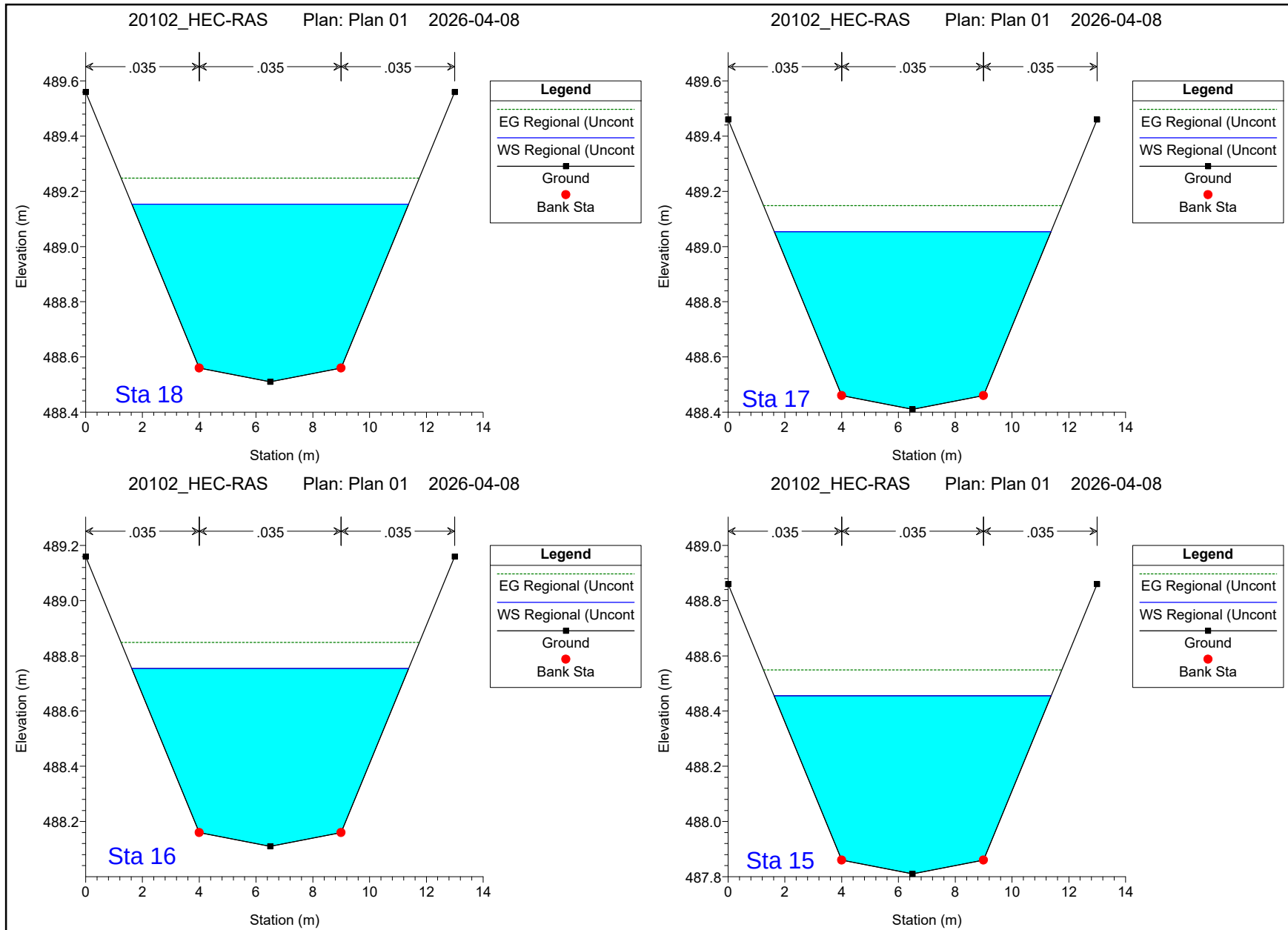
HEC-RAS Proposed Channel Profile



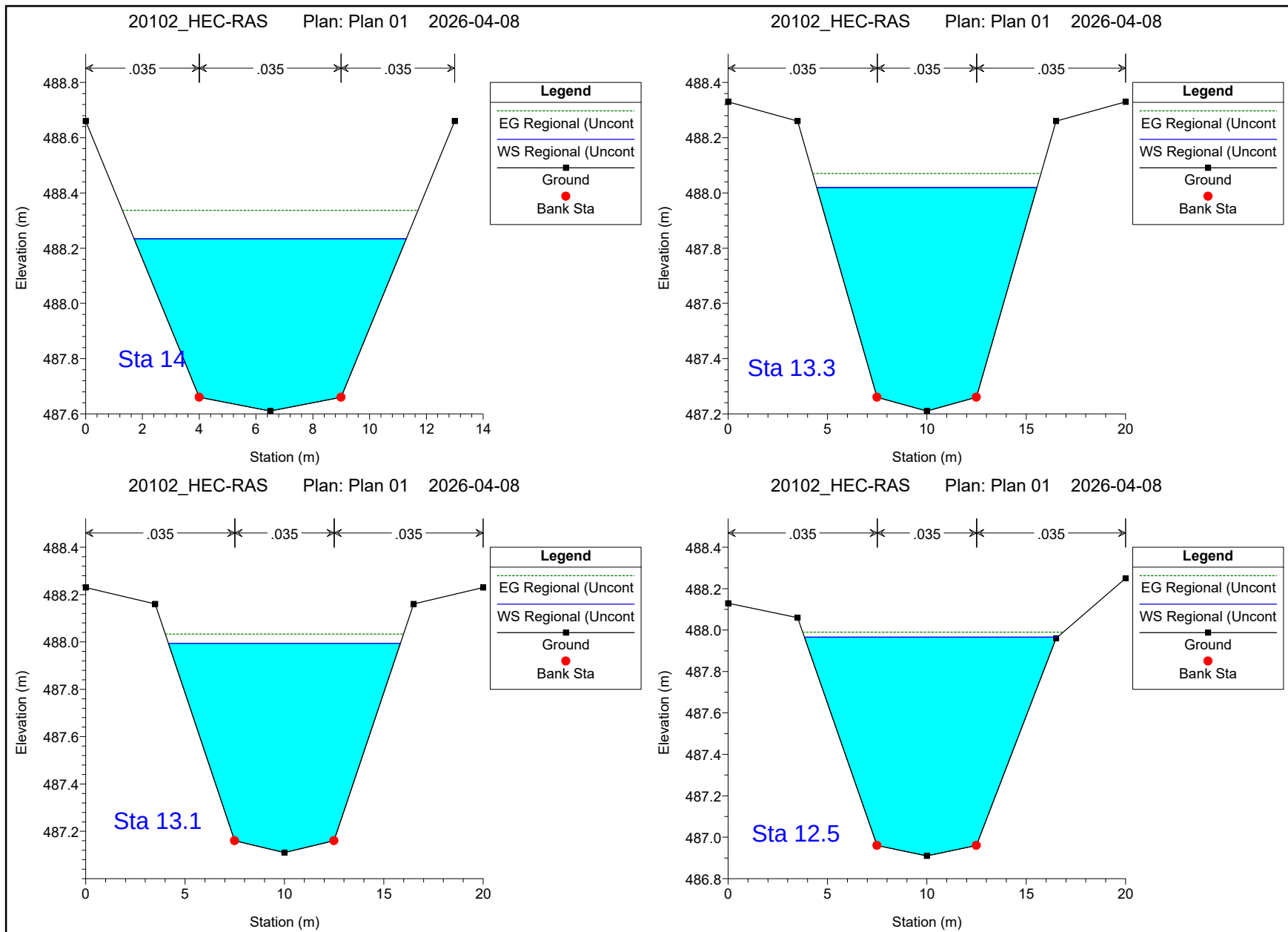
HEC-RAS Proposed Channel Sections



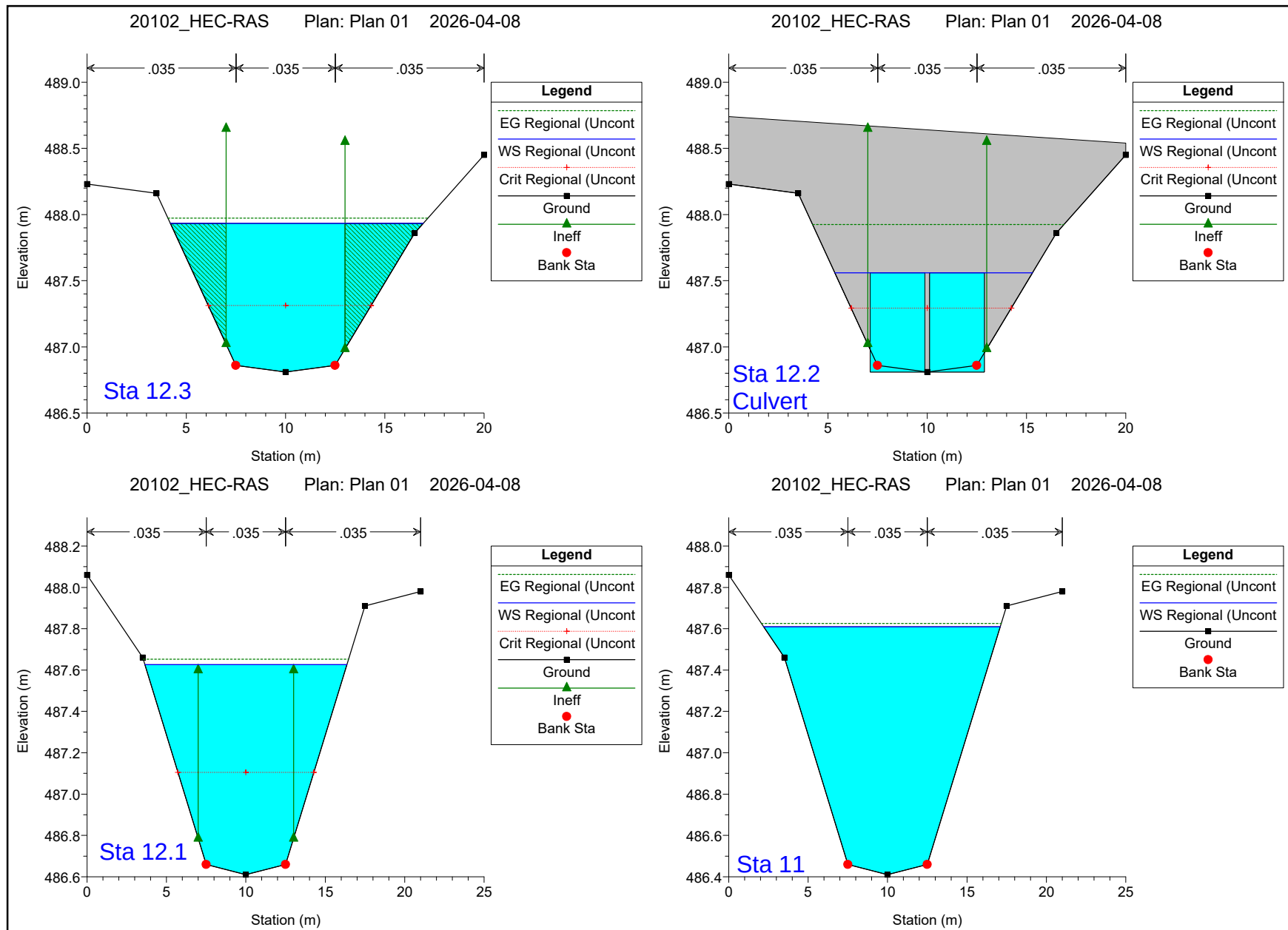
HEC-RAS Proposed Channel Sections



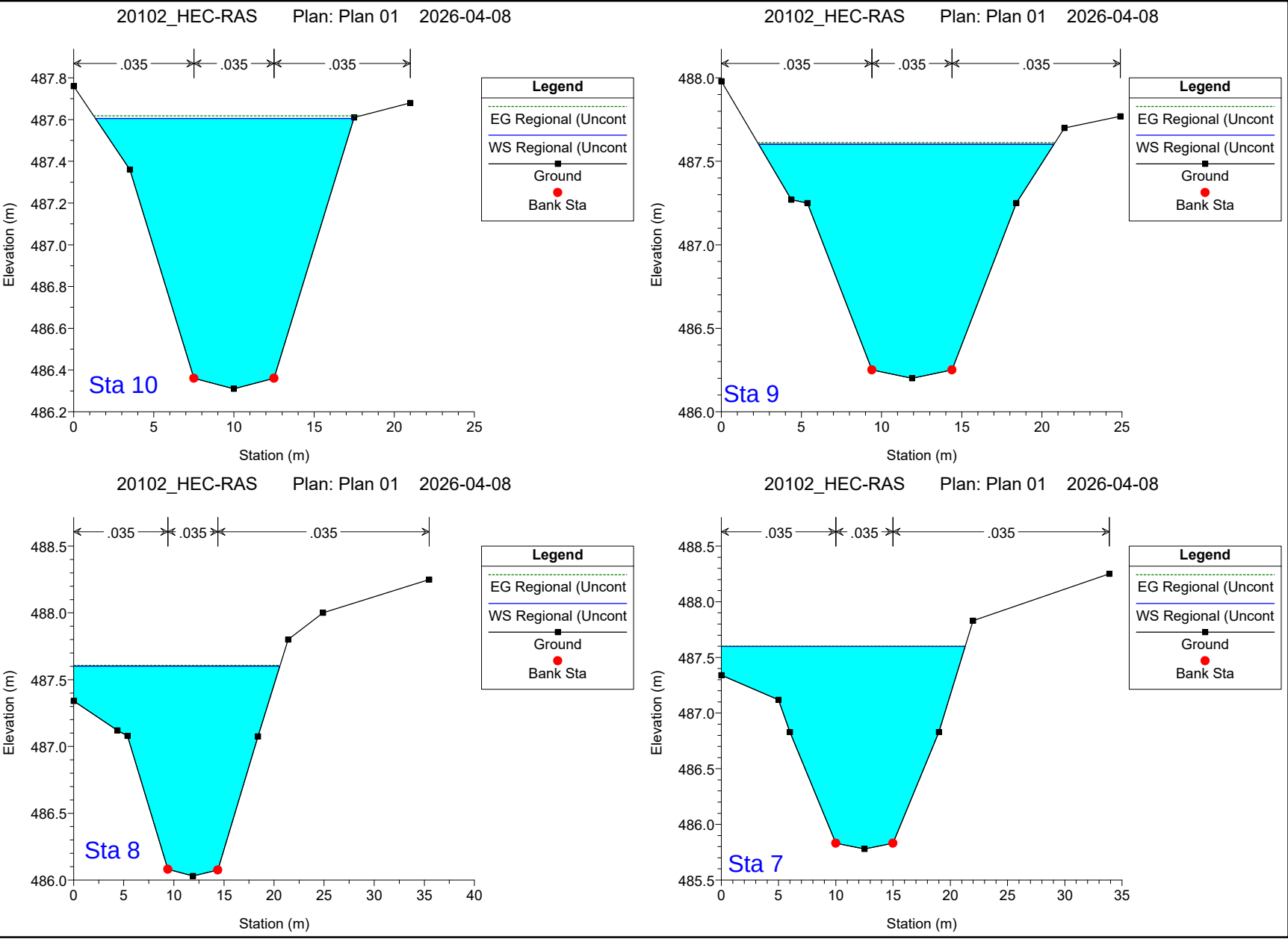
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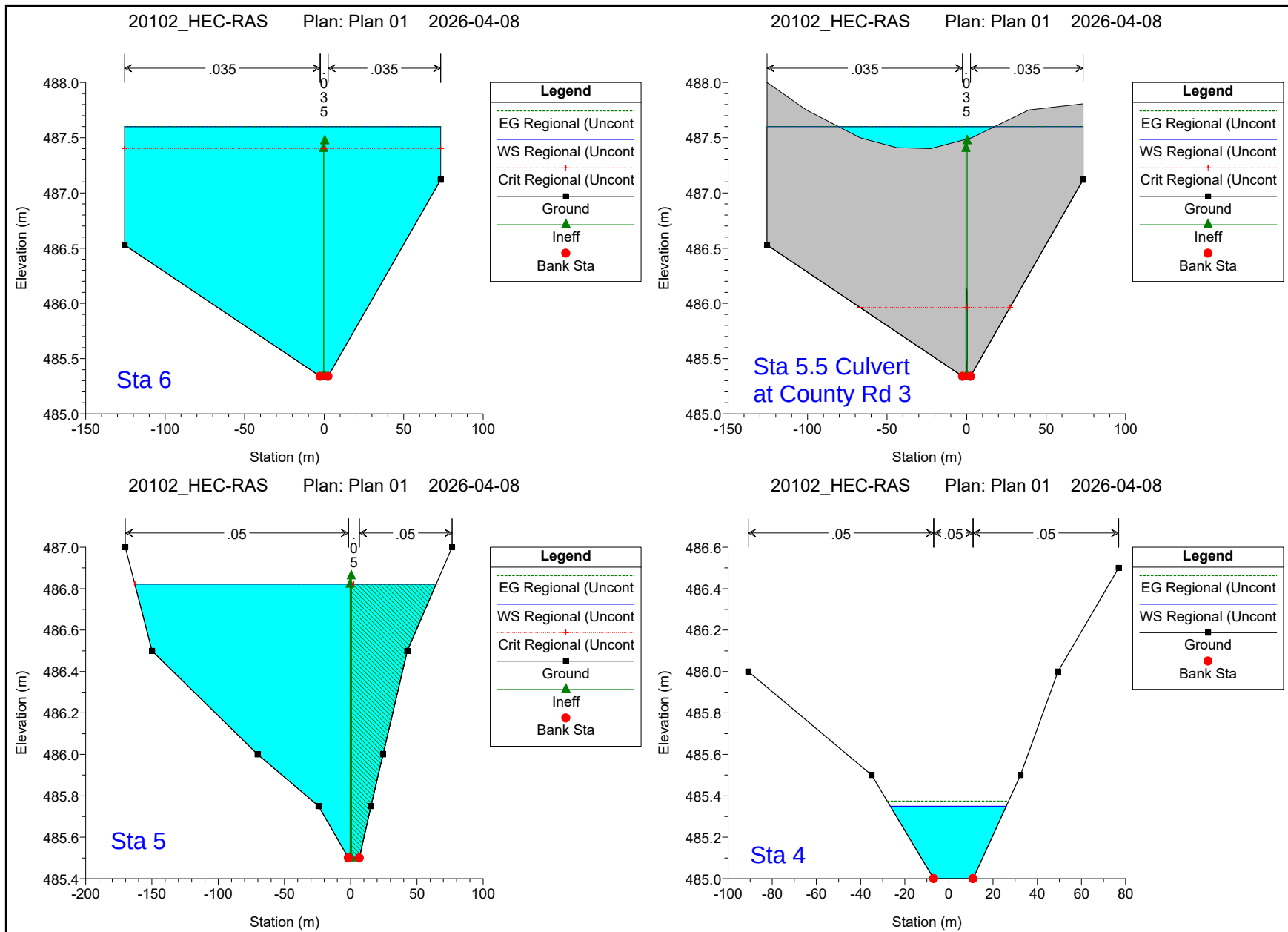
HEC-RAS Proposed Channel Sections



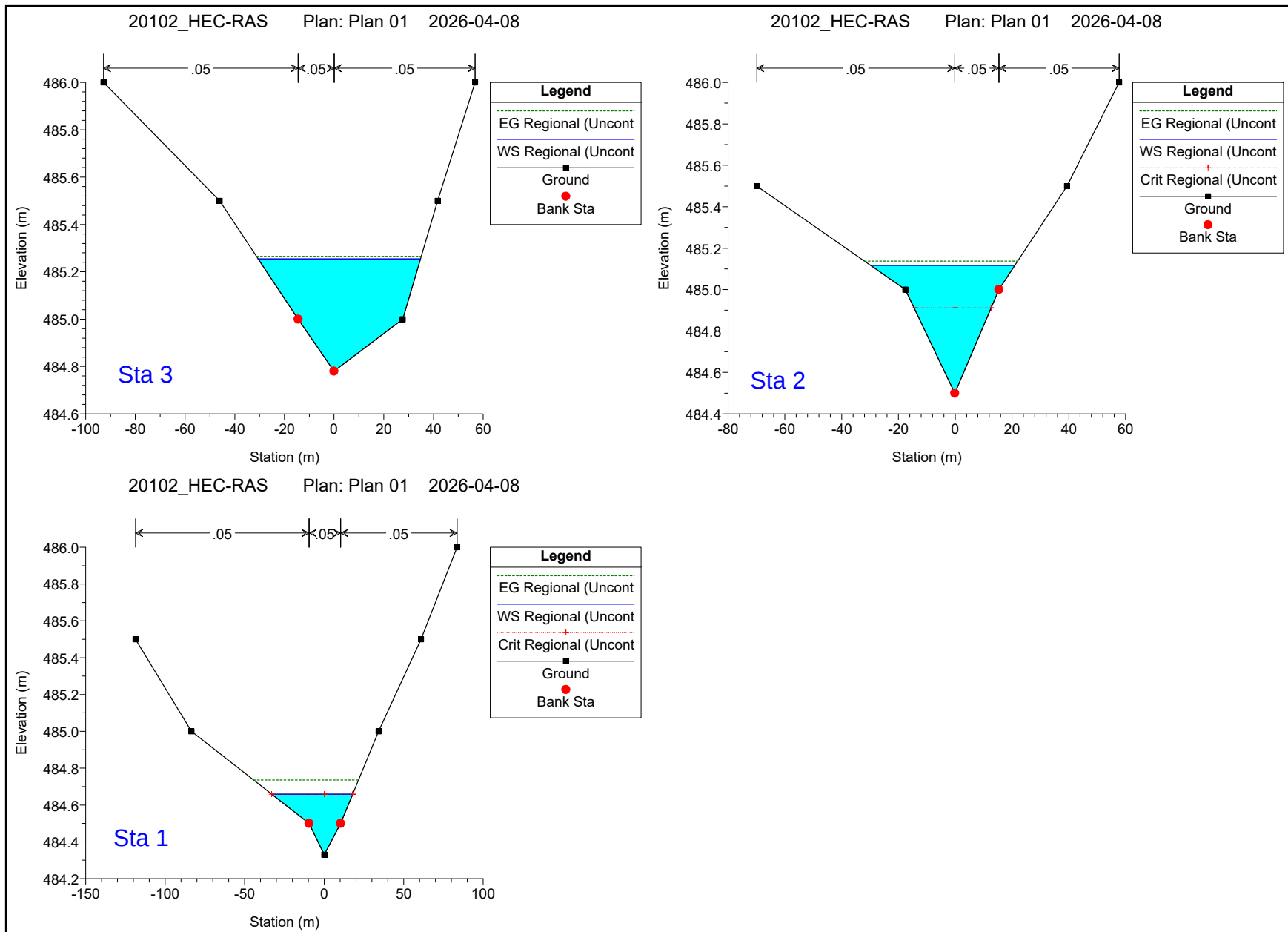
HEC-RAS Proposed Channel Sections



HEC-RAS Proposed Channel Sections



HEC-RAS Proposed Channel Sections



APPENDIX “F”

Stormwater Management Calculations

VALDOR ENGINEERING INC.

Project: Marsville Estates Subdivision

File: 20102

Date: April 2026

Table F.1: VO Model Parameters - Pre-Development

Catchment	Area (ha)	VO5 Routine	TIMP	XIMP	CN II	CN III	IA (mm)	Tp (hr)
101	26.05	NasHyd	-	-	81	92	7.4	0.78
102	46.03	NasHyd	-	-	78	90	7.2	0.77
Total	72.08							

VALDOR ENGINEERING INC.

Project: Marsville Estates Subdivision

File: 20102

Date: April 2026

Table F.2: VO5 Model Parameters - Post-Development

Catchment	Area (ha)	VO5 Routine	TIMP	XIMP	CN II	CN III	IA (mm)	Tp (hr)
102	46.03	NasHyd	-	-	78	90	7.2	0.77
201	7.34	StandHyd	0.50	0.35	68	84	5.0	-
202	11.35	StandHyd	0.50	0.35	68	84	5.0	-
203	1.09	StandHyd	0.50	0.50	68	84	5.0	-
204	6.27	NasHyd	0.35	0.25	68	84	6.0	-
Total	26.05							

VALDOR ENGINEERING INC.

Project: Marsville Estates Subdivision

File: 20102

Date: April 2026

Table F.3: Calculation of CN Values, Initial Abstractions and Runoff Coefficients

Subcatchment	Area (ha)	Land Use and Land Cover		CN II	Area Weighted CN II	IA (mm)	Area Weighted IA (mm)	C-Value	Area Weighted C-Value
		Type	Area (ha)						
101	26.05	Forest (HSG 'B')	2.96	55	81	10	7.4	0.25	0.34
		Forest (HSG 'BC')	0.32	63		10		0.25	
		Row Crops (HSG 'B')	3.64	81		7		0.35	
		Row Crops (HSG 'BC')	19.13	85		7		0.35	
102	46.03	Forest (HSG 'B')	5.11	55	78	10	7.2	0.25	0.33
		Forest (HSG 'BC')	0.26	63		10		0.25	
		Meadow (HSG 'B')	0.82	58		8		0.28	
		Row Crops (HSG 'B')	29.27	81		7		0.35	
		Row Crops (HSG 'BC')	6.90	85		7		0.35	
		Open Space (HSG 'B')	0.91	61		5		0.11	
		Open Space (HSG 'BC')	2.03	68		5		0.11	
		Other Impervious	0.73	98		2		0.95	

VALDOR ENGINEERING INC.

Project: Marsville Estates Subdivision

File: 20102

Date: April 2026

Table F.4: Calculation of Time to Peak

Catchment	A Area (ha)	C Runoff Coefficient (Area Weighted)	L (m) Catchment Length	Highest Elevation (m)	Lowest Elevation (m)	S (%) Catchment Slope	^{1,2} T _c Method	T _c (min)	^{1,2} T _p (hr)
101	26.05	0.34	600	489.00	485.00	0.67	Airport	69.6	0.78
102	46.03	0.33	770	497.00	489.00	1.04	Airport	68.7	0.77
204	6.27	0.34	585	492.00	485.00	1.20	Airport	56.2	0.63

Notes:1) T_p calculation for catchments with C < 0.40 is based on the Airport Formula:

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

2) T_p calculation for catchments with C > 0.40 is based on the Bransby-Williams Formula:

$$T_c = (0.057)(L) / (S_w)^{0.2} (A)^{0.1}$$

$$T_p = 0.67 T_c$$

Date: April 2026

Stage Storage Curve						Outlet Structure							Comments:
Elevation	Sec Area	Avg Area	Sec Volume	Cumulative Volume	Volume Above NWL	Invert Elevation (m) Diameter (mm)/Length (m) Height (m) Orifice Area (m ²)	Stage Active (m)	Discharge m ³ /s					
(m)	(m ²)	(m ²)	(m ³)	(m ³)	(m ³)			Orifice #1	Orifice #2		Spillway	Total	
									(Weir Flow)	(Orifice Flow)			
								486.00	486.75	486.75	487.75	Flow	
								120	1.50	1.50	20.00		
								-	0.40	0.40			
								0.0113	-	0.6000	-		
Forebay Below NWL						Bottom of Forebay - NWL							Weir Equation: Q=1.837xLxH ^{1.5} Orifice Eq'n: Q = 0.6A(2gH) ^{0.5} Spillway Design: Q=1.67xLxH ^{1.5}
484.25	280	-	-	0									
484.75	404	342	171	171									
485.25	551	478	239	410									
486.00	948	750	562	972									
Main Cell Below NWL						Bottom of Main Cell NWL							
485.00	1,276	-	-	0									
485.25	1,436	1,356	339	339									
486.00	2,310	1,873	1,405	1,744									
Forebay & Main Cell Above NWL						NWL	0.00						Permanent Pool Provided
486.00	3,258	-	-	2,716	0								
486.15	3,555	3,406	511	3,227	511								
486.25	3,752	3,653	365	3,592	876								
486.35	3,950	3,851	385	3,977	1,261		0.35	0.016				0.016	
486.45	4,148	4,049	405	4,382	1,666		0.45	0.019				0.019	
486.55	4,346	4,247	425	4,807	2,091		0.55	0.021				0.021	
486.65	4,543	4,444	444	5,251	2,535	Ext. Det. HWL	0.65	0.023				0.023	Extended Detention Provided
486.75	4,741	4,642	464	5,715	3,000		0.75	0.025	0.000	-		0.025	
486.85	4,919	4,830	483	6,198	3,483		0.85	0.027	0.079	-		0.106	
486.95	5,098	5,009	501	6,699	3,984		0.95	0.028	0.224	-		0.252	
487.05	5,276	5,187	519	7,218	4,502		1.05	0.030	0.412	-		0.442	
487.15	5,455	5,365	537	7,754	5,039		1.15	0.031	0.634	-		0.665	
487.25	5,633	5,544	554	8,309	5,593		1.25	0.033	-	0.873		0.906	
487.35	5,859	5,746	575	8,883	6,168		1.35	0.034	-	1.009		1.043	
487.45	6,085	5,972	597	9,481	6,765		1.45	0.035	-	1.128		1.163	
487.55	6,310	6,198	620	10,100	7,385		1.55	0.037	-	1.235		1.272	
487.65	6,536	6,423	642	10,743	8,027		1.65	0.038	-	1.334		1.372	100-year Storage Provided
487.75	6,762	6,649	665	11,408	8,692	Emergency Spillway	1.75	0.039	-	1.426	0.000	1.465	
487.85	6,940	6,851	685	12,093	9,377		1.85	0.040	-	1.513	1.056	2.609	
487.95	7,118	7,029	703	12,795	10,080		1.95	0.041	-	1.595	2.987	4.623	
488.05	7,295	7,207	721	13,516	10,800		2.05	0.042	-	1.672	5.488	7.203	
488.15	7,473	7,384	738	14,255	11,539		2.15	0.043	-	1.747	8.450	10.240	
488.25	7,651	7,562	756	15,011	12,295	Top of Berm (Inside Edge)	2.25	0.044	-	1.818	11.809	13.671	Top of Berm

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Project: Marsville Estates Subdivision

File: 20102

Date: April 2026

Table F.6: Permanent Pool Volume Requirements

Protection Level	SWMP Type	Storage Volume (m ³ /ha) for			
		Impervious Level			
		35%	55%	70%	85%
Level 1	<i>Infiltration</i>	25	30	35	40
	<i>Wetlands</i> ²	80	105	120	140
	<i>Wet Pond</i> ²	140	190	225	250
	<i>Hybrid Wet Pond/Wetland</i> ⁴	110	150	175	195
Level 2	<i>Infiltration</i>	20	20	25	30
	<i>Wetlands</i>	60	70	80	90
	<i>Wet Pond</i>	90	110	130	150
	<i>Hybrid Wet Pond/Wetland</i>	75	90	105	120
Level 3	<i>Infiltration</i>	20	20	20	20
	<i>Wetlands</i>	60	60	60	60
	<i>Wet Pond</i>	60	75	85	95
	<i>Hybrid Wet Pond/Wetland</i>	60	70	75	80
	<i>Dry Pond</i>	90	150	200	240

Source: Stormwater Management Planning and Design Manual (Table 3.2),
Ministry of the Environment, Ontario, March 2003

- Table 3.2 was based on specific design parameters (depth, length to width ratio) for each type of end-of-pipe stormwater management facility. The values of these parameters are provided in Appendix I of the Manual. All values in Table 4.1 are based on a 24 hour detention.
- For wetlands, wet ponds and hybrid ponds, all of the storage, except 40 m³/ha, in Table 3.2 represents the permanent pool volume. The 40 m³/ha represents the extended detention storage.
- For hybrid ponds, 50% to 60% of the permanent pool volume shall be contained in deeper portions of the facility.

PERMANENT POOL VOLUME CALCULATOR

SWMP Type:	WET POND	(IN - infiltration, WET - wetlands, WP - wet pond, HYB - hybrid wet pond/wetland, DP - dry pond)
Protection Level:	2	(1 - 80% TSS, 2 - 70% TSS, 3 - 60% TSS)
Average Imperviousness:	50.0 %	
Volume Level:	65.0 m ³ /ha	Excluding Extended Detention
Area:	19.78 ha	
Total Required Volume:	1,286 m³	

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Project: Marsville Estates Subdivision

File: 20102

Date: April 2026

Table F.7: Extended Detention Requirements

Event	Area (ha)	R.V. (mm)	Required Ext. Det. Volume (m³)	Provided Ext. Det. Volume (m³)
25mm 4-hour Chicago Storm	19.78	11.12	2,200	2,535

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Project: Marsville Estates Subdivision

File: 20102

Date: April 2026

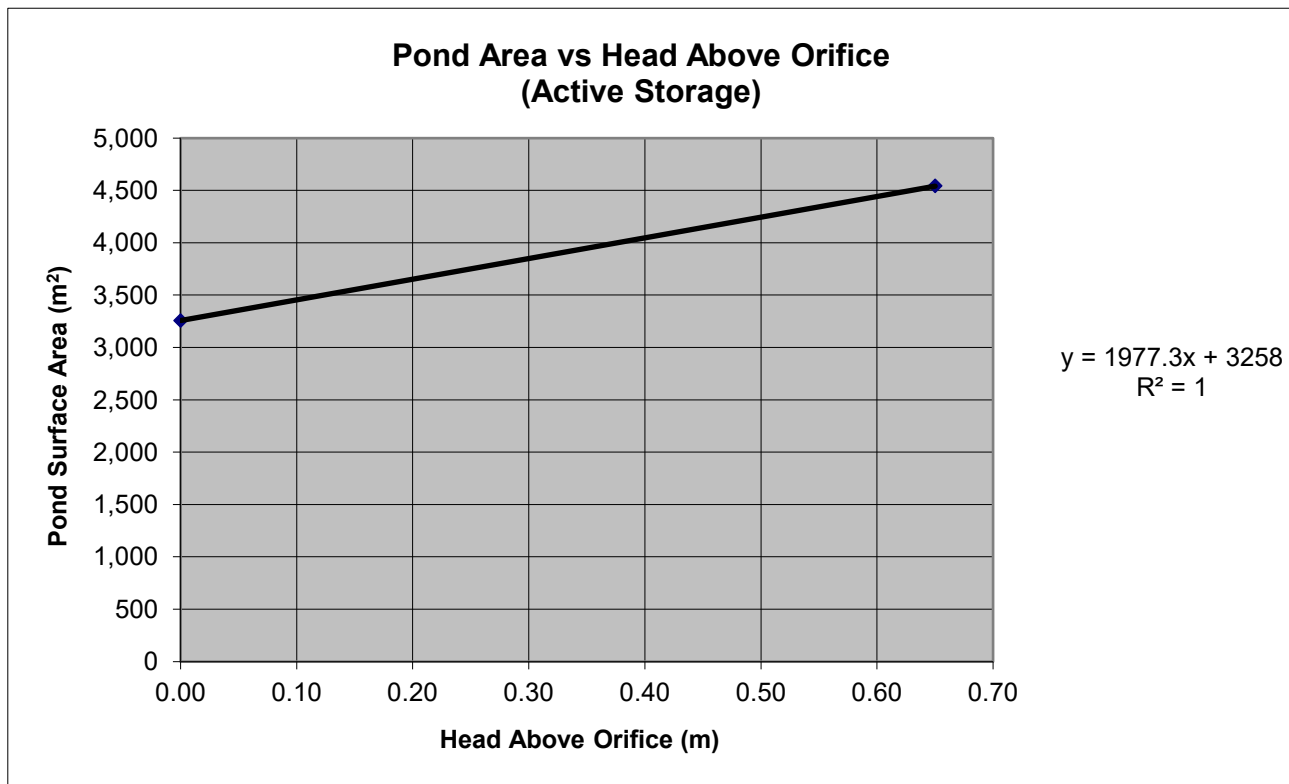
Table F.8: Extended Detention Drawdown Time**Extended Detention - SWM Pond**

Orifice Sizing	
Orifice Size	120 mm
Orifice Inve	486.00 m
Orifice Area	0.011309734 sq. m
¹ EDL _{erosion}	486.65 m
NWL	486.00 m
C ₂	1977.3
C ₃	3258.0
h	0.5900 m
Drawdown T	50.0 hr

$$y = mx + b$$

$$C_2 = m$$

$$C_3 = b$$



20m ROW, Roadside Ditch: 25yr Flow

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.00500	m/m
Left Side Slope	4.00	m/m (H:V)
Right Side Slope	4.00	m/m (H:V)
Bottom Width	0.00	m
Discharge	0.784	m³/s

Results

Normal Depth	0.50	m
Flow Area	1.00	m²
Wetted Perimeter	4.12	m
Hydraulic Radius	0.24	m
Top Width	4.00	m
Critical Depth	0.38	m
Critical Slope	0.02178	m/m
Velocity	0.79	m/s
Velocity Head	0.03	m
Specific Energy	0.53	m
Froude Number	0.50	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	m
Length	0.00	m
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	m
Profile Description		
Profile Headloss	0.00	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	0.50	m
Critical Depth	0.38	m
Channel Slope	0.00500	m/m
Critical Slope	0.02178	m/m

20m ROW: 100yr Flow

Project Description

Friction Method Manning Formula

Solve For Normal Depth

Input Data

Channel Slope 0.00500 m/m

Discharge	1.685 m³/s
-----------	------------

Section Definitions

Station (m)	Elevation (m)
0+00.00	1.08
0+08.00	0.87
0+12.70	0.97
0+17.40	0.87
0+25.40	1.08

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.08)	(0+08.00, 0.87)	0.035
(0+08.00, 0.87)	(0+17.40, 0.87)	0.013
(0+17.40, 0.87)	(0+25.40, 1.08)	0.035

Options

Current Roughness Weighted Method Pavlovskii's Method

Open Channel Weighting Method Pavlovskii's Method

Closed Channel Weighting Method	Pavlovskii's Method
$W_{\text{closed}} = \frac{1}{N} \sum_{i=1}^N \frac{1}{\sigma_i^2}$	$W_{\text{Pavlovskii}} = \frac{1}{N} \sum_{i=1}^N \frac{1}{\sigma_i^2}$

Results

Normal Depth 0.20 m

Elevation Range	0.87 to 1.08 m
-----------------	----------------

Flow Area	2.85 m ²
-----------	---------------------

Wetted Perimeter	24.38	m
------------------	-------	---

Hydraulic Radius	0.12 m
------------------	--------

Top Width	24.38	m
-----------	-------	---

Normal Depth 0.20 m

Critical Depth 0.15 m

20m ROW: 100yr Flow

Results

Critical Slope	0.01810	m/m
Velocity	0.59	m/s
Velocity Head	0.02	m
Specific Energy	0.21	m
Froude Number	0.55	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	m
Length	0.00	m
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	m
Profile Description		
Profile Headloss	0.00	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	0.20	m
Critical Depth	0.15	m
Channel Slope	0.00500	m/m
Critical Slope	0.01810	m/m

SWM Pond_East Inlet Swale_2yr Flow

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.050	
Channel Slope	0.00500	m/m
Left Side Slope	3.00	m/m (H:V)
Right Side Slope	3.00	m/m (H:V)
Bottom Width	2.00	m
Discharge	0.674	m³/s

Results

Normal Depth	0.37	m
Flow Area	1.15	m²
Wetted Perimeter	4.34	m
Hydraulic Radius	0.27	m
Top Width	4.22	m
Critical Depth	0.20	m
Critical Slope	0.04595	m/m
Velocity	0.58	m/s
Velocity Head	0.02	m
Specific Energy	0.39	m
Froude Number	0.36	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	m
Length	0.00	m
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	m
Profile Description		
Profile Headloss	0.00	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	0.37	m
Critical Depth	0.20	m
Channel Slope	0.00500	m/m
Critical Slope	0.04595	m/m

SWM Pond_Forebay Weir

Project Description

Solve For Discharge

Input Data

Headwater Elevation		486.75	m
Crest Elevation		486.00	m
Tailwater Elevation		486.00	m
Crest Surface Type	Gravel		
Crest Breadth		4.00	m
Crest Length		4.00	m

Results

Discharge	4.276	m³/s
Headwater Height Above Crest	0.75	m
Tailwater Height Above Crest	0.00	m
Weir Coefficient	1.65	SI
Submergence Factor	1.00	
Adjusted Weir Coefficient	1.65	SI
Flow Area	3.00	m²
Velocity	1.43	m/s
Wetted Perimeter	5.50	m
Top Width	4.00	m

SWM Pond_Emergency Spillway_100yr Uncontrolled

Project Description

Solve For Headwater Elevation

Input Data

Discharge		4.679	m³/s
Crest Elevation		487.75	m
Tailwater Elevation		487.60	m
Crest Surface Type	Gravel		
Crest Breadth		4.00	m
Crest Length		20.00	m

Results

Headwater Elevation	488.03	m
Headwater Height Above Crest	0.28	m
Tailwater Height Above Crest	-0.15	m
Weir Coefficient	1.55	SI
Submergence Factor	1.00	
Adjusted Weir Coefficient	1.55	SI
Flow Area	5.66	m²
Velocity	0.83	m/s
Wetted Perimeter	20.57	m
Top Width	20.00	m

Culvert Calculator Report

SWM Pond_Outlet Pipe_100-year Controlled

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	486.75 m	Headwater Depth/Height	0.80
Computed Headwater Elev.	486.53 m	Discharge	1.2480 m³/s
Inlet Control HW Elev.	486.47 m	Tailwater Elevation	486.00 m
Outlet Control HW Elev.	486.53 m	Control Type	Entrance Control

Grades			
Upstream Invert	485.80 m	Downstream Invert	485.50 m
Length	58.90 m	Constructed Slope	0.005093 m/m

Hydraulic Profile			
Profile	CompositeS1S2	Depth, Downstream	0.50 m
Slope Type	Steep	Normal Depth	0.44 m
Flow Regime	N/A	Critical Depth	0.46 m
Velocity Downstream	1.70 m/s	Critical Slope	0.004270 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.013
Section Material	Concrete	Span	0.91 m
Section Size	900 mm	Rise	0.91 m
Number Sections	2		

Outlet Control Properties			
Outlet Control HW Elev.	486.53 m	Upstream Velocity Head	0.18 m
Ke	0.50	Entrance Loss	0.09 m

Inlet Control Properties			
Inlet Control HW Elev.	486.47 m	Flow Control	Unsubmerged
Inlet Type	Square edge w/headwall	Area Full	1.3 m²
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

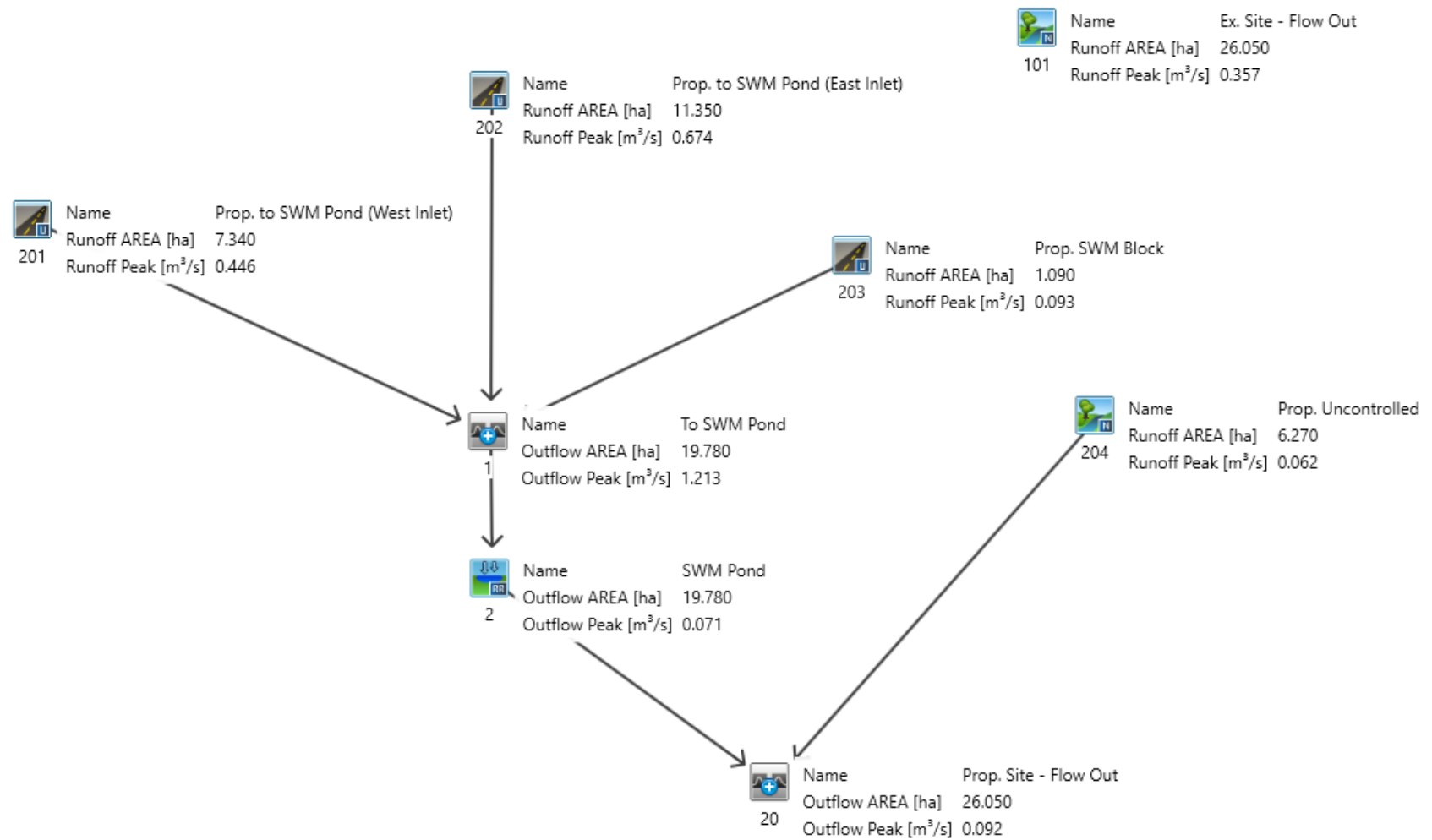


Figure F.1: VO Model Schematic – Stormwater Management


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*****
V   V   I   SSSS   U   U   A   L   (v 6.2.2019)
V   V   I   SS     U   U   A A   L
V   V   I   SS     U   U   AAAAA L
V   V   I   SS     U   U   A   A L
VV      I   SSSS   UUUUU   A   A LLLLL

OOO   TTTT   TTTT   H   H   Y   Y   M   M   OOO   TM
O   O   T   T   H   H   Y   Y   MM MM   O   O
O   O   T   T   H   H   Y   M   M   O   O
OOO   T   T   H   H   Y   M   M   OOO

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```

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

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DATE: 03-31-2026 TIME: 04:33:41

USER:

COMMENTS: _____

```
*****
** SIMULATION : 25mm Chicago **
*****
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READ STORM	Filename: C:\Users\FPetkovski\AppData\Local\Temp\ead415e-8ceb-438b-a348-aa4b2932daf2\862dea6a
Ptotal= 25.02 mm	Comments: Chicago_25mm

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

CALIB	
NASHYD (0101)	Area (ha)= 26.05 Curve Number (CN)= 81.0
ID= 1 DT= 5.0 min	Ia (mm)= 7.40 # of Linear Res. (N)= 3.00
	U.H. Tp(hrs)= 0.78

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

----- TRANSFORMED HYETOGRAPH -----								
TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	'	hrs	mm/hr	hrs	mm/hr
0.083	2.17	1.083	6.20	2.083	5.62	3.08	2.95	
0.167	2.17	1.167	6.20	2.167	5.62	3.17	2.95	
0.250	2.38	1.250	12.18	2.250	4.80	3.25	2.76	
0.333	2.38	1.333	12.18	2.333	4.80	3.33	2.76	
0.417	2.66	1.417	41.67	2.417	4.21	3.42	2.62	
0.500	2.66	1.500	41.67	2.500	4.21	3.50	2.62	
0.583	3.03	1.583	15.28	2.583	3.78	3.58	2.47	
0.667	3.03	1.667	15.28	2.667	3.78	3.67	2.47	
0.750	3.58	1.750	9.22	2.750	3.45	3.75	2.35	
0.833	3.58	1.833	9.22	2.833	3.45	3.83	2.35	
0.917	4.47	1.917	6.88	2.917	3.18	3.92	2.23	
1.000	4.47	2.000	6.88	3.000	3.18	4.00	2.23	

Unit Hyd Qpeak (cms)= 1.276

PEAK FLOW (cms)= 0.107 (i)
TIME TO PEAK (hrs)= 2.917
RUNOFF VOLUME (mm)= 4.023
TOTAL RAINFALL (mm)= 25.023
RUNOFF COEFFICIENT = 0.161

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

CALIB	
NASHYD (0204)	Area (ha)= 6.27 Curve Number (CN)= 67.0
ID= 1 DT= 5.0 min	Ia (mm)= 6.00 # of Linear Res. (N)= 3.00
	U.H. Tp(hrs)= 0.63

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

----- TRANSFORMED HYETOGRAPH -----								
TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	'	hrs	mm/hr	hrs	mm/hr
0.083	2.17	1.083	6.20	2.083	5.62	3.08	2.95	
0.167	2.17	1.167	6.20	2.167	5.62	3.17	2.95	
0.250	2.38	1.250	12.18	2.250	4.80	3.25	2.76	
0.333	2.38	1.333	12.18	2.333	4.80	3.33	2.76	
0.417	2.66	1.417	41.67	2.417	4.21	3.42	2.62	
0.500	2.66	1.500	41.67	2.500	4.21	3.50	2.62	
0.583	3.03	1.583	15.28	2.583	3.78	3.58	2.47	
0.667	3.03	1.667	15.28	2.667	3.78	3.67	2.47	
0.750	3.58	1.750	9.22	2.750	3.45	3.75	2.35	
0.833	3.58	1.833	9.22	2.833	3.45	3.83	2.35	
0.917	4.47	1.917	6.88	2.917	3.18	3.92	2.23	
1.000	4.47	2.000	6.88	3.000	3.18	4.00	2.23	

Unit Hyd Qpeak (cms)= 0.380

PEAK FLOW (cms)= 0.018 (i)
TIME TO PEAK (hrs)= 2.583
RUNOFF VOLUME (mm)= 2.511
TOTAL RAINFALL (mm)= 25.023
RUNOFF COEFFICIENT = 0.100

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

CALIB	
STANDHYD (0201)	Area (ha)= 7.34
ID= 1 DT= 5.0 min	Total Imp(%)= 50.00 Dir. Conn.(%)= 35.00

Surface Area	(ha)=	IMPERVIOUS	PERVIOUS (i)
		3.67	3.67

Dep. Storage (mm) = 1.00 5.00
 Average Slope (%) = 0.50 2.00
 Length (m) = 221.21 70.00
 Mannings n = 0.013 0.250

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.17	1.083	6.20	2.083	5.62	3.08	2.95
0.167	2.17	1.167	6.20	2.167	5.62	3.17	2.95
0.250	2.38	1.250	12.18	2.250	4.80	3.25	2.76
0.333	2.38	1.333	12.18	2.333	4.80	3.33	2.76
0.417	2.66	1.417	41.67	2.417	4.21	3.42	2.62
0.500	2.66	1.500	41.67	2.500	4.21	3.50	2.62
0.583	3.03	1.583	15.28	2.583	3.78	3.58	2.47
0.667	3.03	1.667	15.28	2.667	3.78	3.67	2.47
0.750	3.58	1.750	9.22	2.750	3.45	3.75	2.35
0.833	3.58	1.833	9.22	2.833	3.45	3.83	2.35
0.917	4.47	1.917	6.88	2.917	3.18	3.92	2.23
1.000	4.47	2.000	6.88	3.000	3.18	4.00	2.23

Max.Eff.Inten.(mm/hr)= 41.67 3.72
 over (min) 5.00 45.00
 Storage Coeff. (min)= 7.19 (ii) 44.04 (ii)
 Unit Hyd. Tpeak (min)= 5.00 45.00
 Unit Hyd. peak (cms)= 0.17 0.03

TOTALS
 PEAK FLOW (cms)= 0.24 0.02 0.244 (iii)
 TIME TO PEAK (hrs)= 1.50 2.50 1.50
 RUNOFF VOLUME (mm)= 24.02 3.96 10.98
 TOTAL RAINFALL (mm)= 25.02 25.02 25.02
 RUNOFF COEFFICIENT = 0.96 0.16 0.44

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

CALIB STANDHYD (0203) ID= 1 DT= 5.0 min	Area (ha)= 1.09 Total Imp(%)= 50.00	Dir. Conn.(%)= 50.00	
IMPERVIOUS PERVIOUS (i)			
Surface Area (ha)= 0.55	0.55		
Dep. Storage (mm)= 1.00	5.00		
Average Slope (%)= 0.50	2.00		
Length (m)= 85.24	70.00		
Mannings n = 0.013	0.250		

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.17	1.083	6.20	2.083	5.62	3.08	2.95
0.167	2.17	1.167	6.20	2.167	5.62	3.17	2.95
0.250	2.38	1.250	12.18	2.250	4.80	3.25	2.76
0.333	2.38	1.333	12.18	2.333	4.80	3.33	2.76
0.417	2.66	1.417	41.67	2.417	4.21	3.42	2.62
0.500	2.66	1.500	41.67	2.500	4.21	3.50	2.62
0.583	3.03	1.583	15.28	2.583	3.78	3.58	2.47
0.667	3.03	1.667	15.28	2.667	3.78	3.67	2.47

0.750 3.58 | 1.750 9.22 | 2.750 3.45 | 3.75 2.35
 0.833 3.58 | 1.833 9.22 | 2.833 3.45 | 3.83 2.35
 0.917 4.47 | 1.917 6.88 | 2.917 3.18 | 3.92 2.23
 1.000 4.47 | 2.000 6.88 | 3.000 3.18 | 4.00 2.23

Max.Eff.Inten.(mm/hr)= 41.67 1.80
 over (min) 5.00 55.00
 Storage Coeff. (min)= 4.06 (ii) 53.27 (ii)
 Unit Hyd. Tpeak (min)= 5.00 55.00
 Unit Hyd. peak (cms)= 0.24 0.02
 TOTALS
 PEAK FLOW (cms)= 0.06 0.00 0.059 (iii)
 TIME TO PEAK (hrs)= 1.50 2.83 1.50
 RUNOFF VOLUME (mm)= 24.02 2.87 13.42
 TOTAL RAINFALL (mm)= 25.02 25.02 25.02
 RUNOFF COEFFICIENT = 0.96 0.11 0.54

***** 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.

CALIB STANDHYD (0202) ID= 1 DT= 5.0 min	Area (ha)= 11.35 Total Imp(%)= 50.00	Dir. Conn.(%)= 35.00	
IMPERVIOUS PERVIOUS (i)			
Surface Area (ha)= 5.68	5.68		
Dep. Storage (mm)= 1.00	5.00		
Average Slope (%)= 0.50	2.00		
Length (m)= 275.08	70.00		
Mannings n = 0.013	0.250		

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.17	1.083	6.20	2.083	5.62	3.08	2.95
0.167	2.17	1.167	6.20	2.167	5.62	3.17	2.95
0.250	2.38	1.250	12.18	2.250	4.80	3.25	2.76
0.333	2.38	1.333	12.18	2.333	4.80	3.33	2.76
0.417	2.66	1.417	41.67	2.417	4.21	3.42	2.62
0.500	2.66	1.500	41.67	2.500	4.21	3.50	2.62
0.583	3.03	1.583	15.28	2.583	3.78	3.58	2.47
0.667	3.03	1.667	15.28	2.667	3.78	3.67	2.47
0.750	3.58	1.750	9.22	2.750	3.45	3.75	2.35
0.833	3.58	1.833	9.22	2.833	3.45	3.83	2.35
0.917	4.47	1.917	6.88	2.917	3.18	3.92	2.23
1.000	4.47	2.000	6.88	3.000	3.18	4.00	2.23

Max.Eff.Inten.(mm/hr)= 41.67 3.72
 over (min) 10.00 50.00
 Storage Coeff. (min)= 8.19 (ii) 45.04 (ii)
 Unit Hyd. Tpeak (min)= 10.00 50.00
 Unit Hyd. peak (cms)= 0.13 0.02
 TOTALS
 PEAK FLOW (cms)= 0.32 0.03 0.326 (iii)
 TIME TO PEAK (hrs)= 1.58 2.50 1.58
 RUNOFF VOLUME (mm)= 24.02 3.96 10.98
 TOTAL RAINFALL (mm)= 25.02 25.02 25.02
 RUNOFF COEFFICIENT = 0.96 0.16 0.44

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

ADD HYD (0001)	AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0201):	7.34	0.244	1.50	10.98
+ ID2= 2 (0202):	11.35	0.326	1.58	10.98
ID = 3 (0001):	18.69	0.552	1.50	10.98

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0001)	AREA	QPEAK	TPEAK	R.V.
3 + 2 = 1	(ha)	(cms)	(hrs)	(mm)
ID1= 3 (0001):	18.69	0.552	1.50	10.98
+ ID2= 2 (0203):	1.09	0.059	1.50	13.42
ID = 1 (0001):	19.78	0.612	1.50	11.12

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0002)	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	0.4415	0.4502
	0.0090	0.0511	0.6651	0.5039
	0.0131	0.0876	0.9062	0.5593
	0.0162	0.1261	1.0427	0.6168
	0.0188	0.1666	1.1630	0.6766
	0.0210	0.2091	1.2719	0.7386
	0.0231	0.2535	1.3720	0.8030
	0.0250	0.3000	1.4653	0.8690
	0.1059	0.3483	2.6092	0.9380
	0.2524	0.3984	4.6233	1.0080
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0001)	19.780	0.612	1.50	11.12
OUTFLOW: ID= 1 (0002)	19.780	0.020	4.83	11.04

PEAK FLOW REDUCTION [Qout/Qin](%) = 3.29
 TIME SHIFT OF PEAK FLOW (min)=200.00
 MAXIMUM STORAGE USED (ha.m.) = 0.1926

ADD HYD (0020)	AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0002):	19.78	0.020	4.83	11.04
+ ID2= 2 (0204):	6.27	0.018	2.58	2.51
ID = 3 (0020):	26.05	0.035	2.75	8.99

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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V V I SSSS U U A L (v 6.2.2019)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLL

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OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y MM MM O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

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

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
 Output filename: C:\Users\FPetkovski\AppData\Local\Civica\XH5\ld605a61-9146-4ab0-b1ab-422fd6022bab\4425226-3199-48f8-90fe-0ffc3d1d060a\s
 Summary filename: C:\Users\FPetkovski\AppData\Local\Civica\XH5\ld605a61-9146-4ab0-b1ab-422fd6022bab\4425226-3199-48f8-90fe-0ffc3d1d060a\s

DATE: 03-31-2026

TIME: 04:33:41

USER:

COMMENTS: _____

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*****
** SIMULATION : CHI_04hr_002yr **
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CHICAGO STORM	IDF curve parameters: A= 713.836
Ptotal= 35.61 mm	B= 6.094
	C= 0.796
used in: INTENSITY = A / (t + B)^C	
Duration of storm = 4.00 hrs	
Storm time step = 15.00 min	
Time to peak ratio = 0.33	

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	2.67	1.00	63.03	2.00	4.64	3.00	2.52
0.25	3.52	1.25	16.93	2.25	3.80	3.25	2.28
0.50	5.33	1.50	8.78	2.50	3.24	3.50	2.08
0.75	12.84	1.75	6.03	2.75	2.83	3.75	1.92

CALIB	Area (ha)= 26.05	Curve Number (CN)= 81.0
NASHYD (0101)	Ia (mm)= 7.40	# of Linear Res.(N)= 3.00
ID= 1 DT= 5.0 min	U.H. Tp(hrs)= 0.78	

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

----- TRANSFORMED HYETOGRAPH -----							
TIME	RAIN	TIME	RAIN	' TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.67	1.083	63.03	2.083	4.64	3.08	2.52
0.167	2.67	1.167	63.03	2.167	4.64	3.17	2.52
0.250	2.67	1.250	63.03	2.250	4.64	3.25	2.52
0.333	3.52	1.333	16.93	2.333	3.80	3.33	2.28
0.417	3.52	1.417	16.93	2.417	3.80	3.42	2.28
0.500	3.52	1.500	16.93	2.500	3.80	3.50	2.28
0.583	5.33	1.583	8.78	2.583	3.24	3.58	2.08
0.667	5.33	1.667	8.78	2.667	3.24	3.67	2.08
0.750	5.33	1.750	8.78	2.750	3.24	3.75	2.08
0.833	12.84	1.833	6.03	2.833	2.83	3.83	1.92
0.917	12.84	1.917	6.03	2.917	2.83	3.92	1.92
1.000	12.84	2.000	6.03	3.000	2.83	4.00	1.92

Unit Hyd Qpeak (cms) = 1.276

PEAK FLOW (cms) = 0.279 (i)
 TIME TO PEAK (hrs) = 2.250
 RUNOFF VOLUME (mm) = 9.064
 TOTAL RAINFALL (mm) = 35.609
 RUNOFF COEFFICIENT = 0.255

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

CALIB			
NASHYD (0204)	Area (ha) = 6.27	Curve Number (CN) = 67.0	
ID= 1 DT= 5.0 min	Ia (mm) = 6.00	# of Linear Res. (N) = 3.00	
	U.H. Tp(hrs) = 0.63		

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

----- TRANSFORMED HYETOGRAPH -----							
TIME	RAIN	TIME	RAIN	' TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.67	1.083	63.03	2.083	4.64	3.08	2.52
0.167	2.67	1.167	63.03	2.167	4.64	3.17	2.52
0.250	2.67	1.250	63.03	2.250	4.64	3.25	2.52
0.333	3.52	1.333	16.93	2.333	3.80	3.33	2.28
0.417	3.52	1.417	16.93	2.417	3.80	3.42	2.28
0.500	3.52	1.500	16.93	2.500	3.80	3.50	2.28
0.583	5.33	1.583	8.78	2.583	3.24	3.58	2.08
0.667	5.33	1.667	8.78	2.667	3.24	3.67	2.08
0.750	5.33	1.750	8.78	2.750	3.24	3.75	2.08
0.833	12.84	1.833	6.03	2.833	2.83	3.83	1.92
0.917	12.84	1.917	6.03	2.917	2.83	3.92	1.92
1.000	12.84	2.000	6.03	3.000	2.83	4.00	1.92

Unit Hyd Qpeak (cms) = 0.380

PEAK FLOW (cms) = 0.048 (i)
 TIME TO PEAK (hrs) = 2.083
 RUNOFF VOLUME (mm) = 5.666
 TOTAL RAINFALL (mm) = 35.609
 RUNOFF COEFFICIENT = 0.159

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

CALIB			
STANDHYD (0201)	Area (ha) = 7.34		
ID= 1 DT= 5.0 min	Total Imp(%) = 50.00	Dir. Conn.(%) = 35.00	

IMPERVIOUS PERVIOUS (i)

Surface Area (ha) = 3.67 3.67
 Dep. Storage (mm) = 1.00 5.00
 Average Slope (%) = 0.50 2.00
 Length (m) = 221.21 70.00
 Mannings n = 0.013 0.250

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

----- TRANSFORMED HYETOGRAPH -----							
TIME	RAIN	TIME	RAIN	' TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.67	1.083	63.03	2.083	4.64	3.08	2.52
0.167	2.67	1.167	63.03	2.167	4.64	3.17	2.52
0.250	2.67	1.250	63.03	2.250	4.64	3.25	2.52
0.333	3.52	1.333	16.93	2.333	3.80	3.33	2.28
0.417	3.52	1.417	16.93	2.417	3.80	3.42	2.28
0.500	3.52	1.500	16.93	2.500	3.80	3.50	2.28
0.583	5.33	1.583	8.78	2.583	3.24	3.58	2.08
0.667	5.33	1.667	8.78	2.667	3.24	3.67	2.08
0.750	5.33	1.750	8.78	2.750	3.24	3.75	2.08
0.833	12.84	1.833	6.03	2.833	2.83	3.83	1.92
0.917	12.84	1.917	6.03	2.917	2.83	3.92	1.92
1.000	12.84	2.000	6.03	3.000	2.83	4.00	1.92

Max.Eff.Inten.(mm/hr) = 63.03 11.83
 over (min) = 5.00 30.00
 Storage Coeff. (min) = 6.09 (ii) 29.28 (ii)
 Unit Hyd. Tpeak (min) = 5.00 30.00
 Unit Hyd. peak (cms) = 0.19 0.04

TOTALS
 PEAK FLOW (cms) = 0.42 0.07 0.434 (iii)
 TIME TO PEAK (hrs) = 1.25 1.67 1.25
 RUNOFF VOLUME (mm) = 34.61 8.16 17.41
 TOTAL RAINFALL (mm) = 35.61 35.61 35.61
 RUNOFF COEFFICIENT = 0.97 0.23 0.49

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

CALIB			
STANDHYD (0203)	Area (ha) = 1.09		
ID= 1 DT= 5.0 min	Total Imp(%) = 50.00	Dir. Conn.(%) = 50.00	

IMPERVIOUS PERVIOUS (i)
 Surface Area (ha) = 0.55 0.55
 Dep. Storage (mm) = 1.00 5.00
 Average Slope (%) = 0.50 2.00
 Length (m) = 85.24 70.00
 Mannings n = 0.013 0.250

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

----- TRANSFORMED HYETOGRAPH -----							
TIME	RAIN	TIME	RAIN	' TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.67	1.083	63.03	2.083	4.64	3.08	2.52
0.167	2.67	1.167	63.03	2.167	4.64	3.17	2.52
0.250	2.67	1.250	63.03	2.250	4.64	3.25	2.52
0.333	3.52	1.333	16.93	2.333	3.80	3.33	2.28
0.417	3.52	1.417	16.93	2.417	3.80	3.42	2.28
0.500	3.52	1.500	16.93	2.500	3.80	3.50	2.28
0.583	5.33	1.583	8.78	2.583	3.24	3.58	2.08

0.667	5.33	1.667	8.78	2.667	3.24	3.67	2.08
0.750	5.33	1.750	8.78	2.750	3.24	3.75	2.08
0.833	12.84	1.833	6.03	2.833	2.83	3.83	1.92
0.917	12.84	1.917	6.03	2.917	2.83	3.92	1.92
1.000	12.84	2.000	6.03	3.000	2.83	4.00	1.92

Max.Eff.Inten.(mm/hr)= 63.03 6.30
over (min) 5.00 35.00
Storage Coeff. (min)= 3.44 (ii) 33.27 (ii)
Unit Hyd. Tpeak (min)= 5.00 35.00
Unit Hyd. peak (cms)= 0.26 0.03

PEAK FLOW (cms)= 0.09 0.01 *TOTALS*
TIME TO PEAK (hrs)= 1.25 1.83 0.095 (iii)
RUNOFF VOLUME (mm)= 34.61 6.24 20.41
TOTAL RAINFALL (mm)= 35.61 35.61 35.61
RUNOFF COEFFICIENT = 0.97 0.18 0.57

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

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

CALIB
STANDHYD (0202)
ID= 1 DT= 5.0 min
Area (ha)= 11.35
Total Imp(%)= 50.00 Dir. Conn.(%)= 35.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 5.68 5.68
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 0.50 2.00
Length (m)= 275.08 70.00
Mannings n = 0.013 0.250

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

--- TRANSFORMED HYETOGRAPH ---							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.67	1.083	63.03	2.083	4.64	3.08	2.52
0.167	2.67	1.167	63.03	2.167	4.64	3.17	2.52
0.250	2.67	1.250	63.03	2.250	4.64	3.25	2.52
0.333	3.52	1.333	16.93	2.333	3.80	3.33	2.28
0.417	3.52	1.417	16.93	2.417	3.80	3.42	2.28
0.500	3.52	1.500	16.93	2.500	3.80	3.50	2.28
0.583	5.33	1.583	8.78	2.583	3.24	3.58	2.08
0.667	5.33	1.667	8.78	2.667	3.24	3.67	2.08
0.750	5.33	1.750	8.78	2.750	3.24	3.75	2.08
0.833	12.84	1.833	6.03	2.833	2.83	3.83	1.92
0.917	12.84	1.917	6.03	2.917	2.83	3.92	1.92
1.000	12.84	2.000	6.03	3.000	2.83	4.00	1.92

Max.Eff.Inten.(mm/hr)= 63.03 11.83
over (min) 5.00 35.00
Storage Coeff. (min)= 6.94 (ii) 30.13 (ii)
Unit Hyd. Tpeak (min)= 5.00 35.00
Unit Hyd. peak (cms)= 0.17 0.04

PEAK FLOW (cms)= 0.63 0.10 *TOTALS*
TIME TO PEAK (hrs)= 1.25 1.75 0.649 (iii)
RUNOFF VOLUME (mm)= 34.61 8.16 17.41
TOTAL RAINFALL (mm)= 35.61 35.61 35.61
RUNOFF COEFFICIENT = 0.97 0.23 0.49

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

ADD HYD (0001)				
1	+	2	=	3
AREA		QPEAK	TPEAK	R.V.
(ha)		(cms)	(hrs)	(mm)
ID1= 1 (0201):	7.34	0.434	1.25	17.41
+ ID2= 2 (0202):	11.35	0.649	1.25	17.41
ID = 3 (0001):	18.69	1.084	1.25	17.41

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0001)				
3	+	2	=	1
AREA		QPEAK	TPEAK	R.V.
(ha)		(cms)	(hrs)	(mm)
ID1= 3 (0001):	18.69	1.084	1.25	17.41
+ ID2= 2 (0203):	1.09	0.095	1.25	20.41
ID = 1 (0001):	19.78	1.179	1.25	17.58

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0002)				
IN= 2---> OUT= 1				
DT= 5.0 min				
OVERFLOW IS OFF				
OUTFLOW	STORAGE	OUTFLOW	STORAGE	
(cms)	(ha.m.)	(cms)	(ha.m.)	
0.0000	0.0000	0.4415	0.4502	
0.0090	0.0511	0.6651	0.5039	
0.0131	0.0876	0.9062	0.5593	
0.0162	0.1261	1.0427	0.6168	
0.0188	0.1666	1.1630	0.6766	
0.0210	0.2091	1.2719	0.7386	
0.0231	0.2535	1.3720	0.8030	
0.0250	0.3000	1.4653	0.8690	
0.1059	0.3483	2.6092	0.9380	
0.2524	0.3984	4.6233	1.0080	

AREA	QPEAK	TPEAK	R.V.
(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0001)	19.780	1.179	1.25
OUTFLOW: ID= 1 (0002)	19.780	0.044	4.17
			17.50

PEAK FLOW REDUCTION [Qout/Qin](%)= 3.72
TIME SHIFT OF PEAK FLOW (min)=175.00
MAXIMUM STORAGE USED (ha.m.)= 0.3113

ADD HYD (0020)				
1	+	2	=	3
AREA		QPEAK	TPEAK	R.V.
(ha)		(cms)	(hrs)	(mm)
ID1= 1 (0002):	19.78	0.044	4.17	17.50
+ ID2= 2 (0204):	6.27	0.048	2.08	5.67
ID = 3 (0020):	26.05	0.070	2.08	14.65

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH
=====

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V V I SSSS U U A L (v 6.2.2019)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLL

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y M M O O
O O T T H H Y Y M M O O
OOO T T H H Y M M OOO

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

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
Output filename: C:\Users\FPetkovski\AppData\Local\Civica\XH5\ld605a61-9146-4ab0-blab-422fd6022bab\fd0733654-91c3-471a-8d86-07ae4dd0099a\s
Summary filename: C:\Users\FPetkovski\AppData\Local\Civica\XH5\ld605a61-9146-4ab0-blab-422fd6022bab\fd0733654-91c3-471a-8d86-07ae4dd0099a\s

DATE: 03-31-2026

TIME: 04:33:41

USER:

COMMENTS: _____

** SIMULATION : CHI_04hr_005yr **

CHICAGO STORM
Ptotal= 51.82 mm

IDF curve parameters: A=1516.506
B= 12.024
C= 0.861

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

Duration of storm = 4.00 hrs
Storm time step = 15.00 min
Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	3.33	1.00	88.74	2.00	6.53	3.00	3.10
0.25	4.66	1.25	28.64	2.25	5.12	3.25	2.74
0.50	7.74	1.50	13.96	2.50	4.21	3.50	2.46
0.75	21.28	1.75	8.96	2.75	3.57	3.75	2.23

CALIB
NASHYD (0101) Area (ha)= 26.05 Curve Number (CN)= 81.0

ID= 1 DT= 5.0 min | Ia (mm)= 7.40 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.78

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

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	3.33	1.083	88.74	2.083	6.53	3.08	3.10
0.167	3.33	1.167	88.74	2.167	6.53	3.17	3.10
0.250	3.33	1.250	88.74	2.250	6.53	3.25	3.10
0.333	4.66	1.333	28.64	2.333	5.12	3.33	2.74
0.417	4.66	1.417	28.64	2.417	5.12	3.42	2.74
0.500	4.66	1.500	28.64	2.500	5.12	3.50	2.74
0.583	7.74	1.583	13.96	2.583	4.21	3.58	2.46
0.667	7.74	1.667	13.96	2.667	4.21	3.67	2.46
0.750	7.74	1.750	13.96	2.750	4.21	3.75	2.46
0.833	21.28	1.833	8.96	2.833	3.57	3.83	2.23
0.917	21.28	1.917	8.96	2.917	3.57	3.92	2.23
1.000	21.28	2.000	8.96	3.000	3.57	4.00	2.23

Unit Hyd Qpeak (cms)= 1.276

PEAK FLOW (cms)= 0.639 (i)
TIME TO PEAK (hrs)= 2.167
RUNOFF VOLUME (mm)= 18.972
TOTAL RAINFALL (mm)= 51.820
RUNOFF COEFFICIENT = 0.366

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

CALIB
NASHYD (0204) Area (ha)= 6.27 Curve Number (CN)= 67.0
ID= 1 DT= 5.0 min | Ia (mm)= 6.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.63

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

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	3.33	1.083	88.74	2.083	6.53	3.08	3.10
0.167	3.33	1.167	88.74	2.167	6.53	3.17	3.10
0.250	3.33	1.250	88.74	2.250	6.53	3.25	3.10
0.333	4.66	1.333	28.64	2.333	5.12	3.33	2.74
0.417	4.66	1.417	28.64	2.417	5.12	3.42	2.74
0.500	4.66	1.500	28.64	2.500	5.12	3.50	2.74
0.583	7.74	1.583	13.96	2.583	4.21	3.58	2.46
0.667	7.74	1.667	13.96	2.667	4.21	3.67	2.46
0.750	7.74	1.750	13.96	2.750	4.21	3.75	2.46
0.833	21.28	1.833	8.96	2.833	3.57	3.83	2.23
0.917	21.28	1.917	8.96	2.917	3.57	3.92	2.23
1.000	21.28	2.000	8.96	3.000	3.57	4.00	2.23

Unit Hyd Qpeak (cms)= 0.380

PEAK FLOW (cms)= 0.113 (i)
TIME TO PEAK (hrs)= 2.000
RUNOFF VOLUME (mm)= 12.283
TOTAL RAINFALL (mm)= 51.820
RUNOFF COEFFICIENT = 0.237

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

CALIB STANDHYD (0201) ID= 1 DT= 5.0 min	Area (ha)= 7.34 Total Imp(%)= 50.00 Dir. Conn.(%)= 35.00
--	--

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	3.67	3.67
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	0.50	2.00
Length (m)=	221.21	70.00
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	3.33	1.083	88.74	2.083	6.53	3.08	3.10
0.167	3.33	1.167	88.74	2.167	6.53	3.17	3.10
0.250	3.33	1.250	88.74	2.250	6.53	3.25	3.10
0.333	4.66	1.333	28.64	2.333	5.12	3.33	2.74
0.417	4.66	1.417	28.64	2.417	5.12	3.42	2.74
0.500	4.66	1.500	28.64	2.500	5.12	3.50	2.74
0.583	7.74	1.583	13.96	2.583	4.21	3.58	2.46
0.667	7.74	1.667	13.96	2.667	4.21	3.67	2.46
0.750	7.74	1.750	13.96	2.750	4.21	3.75	2.46
0.833	21.28	1.833	8.96	2.833	3.57	3.83	2.23
0.917	21.28	1.917	8.96	2.917	3.57	3.92	2.23
1.000	21.28	2.000	8.96	3.000	3.57	4.00	2.23

Max.Eff.Inten.(mm/hr)=	88.74	27.57
over (min)	5.00	25.00
Storage Coeff. (min)=	5.31 (ii)	21.84 (ii)
Unit Hyd. Tpeak (min)=	5.00	25.00
Unit Hyd. peak (cms)=	0.21	0.05

PEAK FLOW (cms)=	0.60	0.17	0.660 (iii)
TIME TO PEAK (hrs)=	1.25	1.58	1.25
RUNOFF VOLUME (mm)=	50.82	16.45	28.48
TOTAL RAINFALL (mm)=	51.82	51.82	51.82
RUNOFF COEFFICIENT =	0.98	0.32	0.55

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

CALIB STANDHYD (0203) ID= 1 DT= 5.0 min	Area (ha)= 1.09 Total Imp(%)= 50.00 Dir. Conn.(%)= 50.00
--	--

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.55	0.55
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	0.50	2.00
Length (m)=	85.24	70.00
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	3.33	1.083	88.74	2.083	6.53	3.08	3.10
0.167	3.33	1.167	88.74	2.167	6.53	3.17	3.10

0.250	3.33	1.250	88.74	2.250	6.53	3.25	3.10
0.333	4.66	1.333	28.64	2.333	5.12	3.33	2.74
0.417	4.66	1.417	28.64	2.417	5.12	3.42	2.74
0.500	4.66	1.500	28.64	2.500	5.12	3.50	2.74
0.583	7.74	1.583	13.96	2.583	4.21	3.58	2.46
0.667	7.74	1.667	13.96	2.667	4.21	3.67	2.46
0.750	7.74	1.750	13.96	2.750	4.21	3.75	2.46
0.833	21.28	1.833	8.96	2.833	3.57	3.83	2.23
0.917	21.28	1.917	8.96	2.917	3.57	3.92	2.23
1.000	21.28	2.000	8.96	3.000	3.57	4.00	2.23

Max.Eff.Inten.(mm/hr)=	88.74	15.21
over (min)	5.00	25.00
Storage Coeff. (min)=	3.00 (ii)	23.97 (ii)
Unit Hyd. Tpeak (min)=	5.00	25.00
Unit Hyd. peak (cms)=	0.28	0.05

PEAK FLOW (cms)=	0.13	0.01	0.138 (iii)
TIME TO PEAK (hrs)=	1.25	1.58	1.25
RUNOFF VOLUME (mm)=	50.82	13.18	31.99
TOTAL RAINFALL (mm)=	51.82	51.82	51.82
RUNOFF COEFFICIENT =	0.98	0.25	0.62

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

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

CALIB STANDHYD (0202) ID= 1 DT= 5.0 min	Area (ha)= 11.35 Total Imp(%)= 50.00 Dir. Conn.(%)= 35.00
--	---

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	5.68	5.68
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	0.50	2.00
Length (m)=	275.08	70.00
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	3.33	1.083	88.74	2.083	6.53	3.08	3.10
0.167	3.33	1.167	88.74	2.167	6.53	3.17	3.10
0.250	3.33	1.250	88.74	2.250	6.53	3.25	3.10
0.333	4.66	1.333	28.64	2.333	5.12	3.33	2.74
0.417	4.66	1.417	28.64	2.417	5.12	3.42	2.74
0.500	4.66	1.500	28.64	2.500	5.12	3.50	2.74
0.583	7.74	1.583	13.96	2.583	4.21	3.58	2.46
0.667	7.74	1.667	13.96	2.667	4.21	3.67	2.46
0.750	7.74	1.750	13.96	2.750	4.21	3.75	2.46
0.833	21.28	1.833	8.96	2.833	3.57	3.83	2.23
0.917	21.28	1.917	8.96	2.917	3.57	3.92	2.23
1.000	21.28	2.000	8.96	3.000	3.57	4.00	2.23

Max.Eff.Inten.(mm/hr)=	88.74	27.57
over (min)	5.00	25.00
Storage Coeff. (min)=	6.05 (ii)	22.59 (ii)
Unit Hyd. Tpeak (min)=	5.00	25.00
Unit Hyd. peak (cms)=	0.19	0.05

PEAK FLOW (cms)=	0.92	0.26	0.999 (iii)
------------------	------	------	-------------

TIME TO PEAK (hrs) = 1.25 1.58 1.25
 RUNOFF VOLUME (mm) = 50.82 16.45 28.48
 TOTAL RAINFALL (mm) = 51.82 51.82 51.82
 RUNOFF COEFFICIENT = 0.98 0.32 0.55

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

```

-----
| ADD HYD ( 0001) |
| 1 + 2 = 3 |
-----
          AREA   QPEAK   TPEAK   R.V.
          (ha)   (cms)   (hrs)   (mm)
ID1= 1 ( 0201):  7.34  0.660  1.25  28.48
+ ID2= 2 ( 0202): 11.35  0.999  1.25  28.48
=====
ID = 3 ( 0001): 18.69  1.659  1.25  28.48
  
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0001) |
| 3 + 2 = 1 |
-----
          AREA   QPEAK   TPEAK   R.V.
          (ha)   (cms)   (hrs)   (mm)
ID1= 3 ( 0001): 18.69  1.659  1.25  28.48
+ ID2= 2 ( 0203): 1.09  0.138  1.25  31.99
=====
ID = 1 ( 0001): 19.78  1.797  1.25  28.67
  
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| RESERVOIR( 0002) |
| IN= 2--> OUT= 1 |
| DT= 5.0 min |
-----
          OVERFLOW IS OFF
          OUTFLOW   STORAGE   OUTFLOW   STORAGE
          (cms)     (ha.m.)   (cms)     (ha.m.)
0.0000   0.0000   0.4415   0.4502
0.0090   0.0511   0.6651   0.5039
0.0131   0.0876   0.9062   0.5593
0.0162   0.1261   1.0427   0.6168
0.0188   0.1666   1.1630   0.6766
0.0210   0.2091   1.2719   0.7386
0.0231   0.2535   1.3720   0.8030
0.0250   0.3000   1.4653   0.8690
0.1059   0.3483   2.6092   0.9380
0.2524   0.3984   4.6233   1.0080

          AREA   QPEAK   TPEAK   R.V.
          (ha)   (cms)   (hrs)   (mm)
INFLOW : ID= 2 ( 0001) 19.780  1.797  1.25  28.67
OUTFLOW: ID= 1 ( 0002) 19.780  0.269  2.50  28.60
  
```

PEAK FLOW REDUCTION [Qout/Qin](%) = 14.96
 TIME SHIFT OF PEAK FLOW (min) = 75.00
 MAXIMUM STORAGE USED (ha.m.) = 0.4031

```

-----
| ADD HYD ( 0020) |
| 1 + 2 = 3 |
-----
          AREA   QPEAK   TPEAK   R.V.
          (ha)   (cms)   (hrs)   (mm)
ID1= 1 ( 0002): 19.78  0.269  2.50  28.60
+ ID2= 2 ( 0204): 6.27  0.113  2.00  12.28
  
```

```

=====
ID = 3 ( 0020): 26.05  0.364  2.42  24.67
  
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

=====
V   V   I   SSSSS U   U   A   L   (v 6.2.2019)
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   TTTT   TTTT   H   H   Y   Y   M   M   OOO   TM
O   O   T   T   H   H   Y   Y   MM MM   O   O
O   O   T   T   H   H   Y   Y   M   M   O   O
OOO   T   T   H   H   Y   Y   M   M   OOO

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```

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

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
 Output filename: C:\Users\FPetkovski\AppData\Local\Civica\XH5\ld605a61-9146-4ab0-blab-422fd6022bab\847ce880-ac25-4ec3-a982-f115be106a2b\s
 Summary filename: C:\Users\FPetkovski\AppData\Local\Civica\XH5\ld605a61-9146-4ab0-blab-422fd6022bab\847ce880-ac25-4ec3-a982-f115be106a2b\s

DATE: 03-31-2026

TIME: 04:33:41

USER:

COMMENTS: _____

```

*****
** SIMULATION : CHI_04hr_010yr **
*****
  
```

```

-----
| CHICAGO STORM |
| Ptotal= 62.84 mm |
-----
IDF curve parameters: A=2169.985
                      B= 15.048
                      C= 0.889
used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 15.00 min
Time to peak ratio = 0.33
  
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	3.80	1.00	105.36	2.00	7.91	3.00	3.51
0.25	5.48	1.25	36.61	2.25	6.08	3.25	3.07
0.50	9.49	1.50	17.69	2.50	4.90	3.50	2.72
0.75	27.13	1.75	11.10	2.75	4.10	3.75	2.45

```

-----
| CALIB |
| NASHYD ( 0101) |
-----
Area (ha) = 26.05 Curve Number (CN) = 81.0
  
```

ID= 1 DT= 5.0 min | Ia (mm)= 7.40 # of Linear Res.(N)= 3.00
 ----- U.H. Tp(hrs)= 0.78

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	3.80	1.083	105.36	2.083	7.91	3.08	3.51
0.167	3.80	1.167	105.36	2.167	7.91	3.17	3.51
0.250	3.80	1.250	105.36	2.250	7.91	3.25	3.51
0.333	5.48	1.333	36.61	2.333	6.08	3.33	3.07
0.417	5.48	1.417	36.61	2.417	6.08	3.42	3.07
0.500	5.48	1.500	36.61	2.500	6.08	3.50	3.07
0.583	9.49	1.583	17.69	2.583	4.90	3.58	2.72
0.667	9.49	1.667	17.69	2.667	4.90	3.67	2.72
0.750	9.49	1.750	17.69	2.750	4.90	3.75	2.72
0.833	27.13	1.833	11.10	2.833	4.10	3.83	2.45
0.917	27.13	1.917	11.10	2.917	4.10	3.92	2.45
1.000	27.13	2.000	11.10	3.000	4.10	4.00	2.45

Unit Hyd Qpeak (cms) = 1.276

PEAK FLOW (cms) = 0.928 (i)
 TIME TO PEAK (hrs) = 2.167
 RUNOFF VOLUME (mm) = 26.725
 TOTAL RAINFALL (mm) = 62.844
 RUNOFF COEFFICIENT = 0.425

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

CALIB
 NASHYD (0204) | Area (ha)= 6.27 Curve Number (CN)= 67.0
 ID= 1 DT= 5.0 min | Ia (mm)= 6.00 # of Linear Res.(N)= 3.00
 ----- U.H. Tp(hrs)= 0.63

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	3.80	1.083	105.36	2.083	7.91	3.08	3.51
0.167	3.80	1.167	105.36	2.167	7.91	3.17	3.51
0.250	3.80	1.250	105.36	2.250	7.91	3.25	3.51
0.333	5.48	1.333	36.61	2.333	6.08	3.33	3.07
0.417	5.48	1.417	36.61	2.417	6.08	3.42	3.07
0.500	5.48	1.500	36.61	2.500	6.08	3.50	3.07
0.583	9.49	1.583	17.69	2.583	4.90	3.58	2.72
0.667	9.49	1.667	17.69	2.667	4.90	3.67	2.72
0.750	9.49	1.750	17.69	2.750	4.90	3.75	2.72
0.833	27.13	1.833	11.10	2.833	4.10	3.83	2.45
0.917	27.13	1.917	11.10	2.917	4.10	3.92	2.45
1.000	27.13	2.000	11.10	3.000	4.10	4.00	2.45

Unit Hyd Qpeak (cms) = 0.380

PEAK FLOW (cms) = 0.168 (i)
 TIME TO PEAK (hrs) = 2.000
 RUNOFF VOLUME (mm) = 17.758
 TOTAL RAINFALL (mm) = 62.844
 RUNOFF COEFFICIENT = 0.283

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

CALIB
 STANDHYD (0201) | Area (ha)= 7.34
 ID= 1 DT= 5.0 min | Total Imp(%)= 50.00 Dir. Conn.(%)= 35.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)	3.67	3.67
Dep. Storage (mm)	1.00	5.00
Average Slope (%)	0.50	2.00
Length (m)	221.21	70.00
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	3.80	1.083	105.36	2.083	7.91	3.08	3.51
0.167	3.80	1.167	105.36	2.167	7.91	3.17	3.51
0.250	3.80	1.250	105.36	2.250	7.91	3.25	3.51
0.333	5.48	1.333	36.61	2.333	6.08	3.33	3.07
0.417	5.48	1.417	36.61	2.417	6.08	3.42	3.07
0.500	5.48	1.500	36.61	2.500	6.08	3.50	3.07
0.583	9.49	1.583	17.69	2.583	4.90	3.58	2.72
0.667	9.49	1.667	17.69	2.667	4.90	3.67	2.72
0.750	9.49	1.750	17.69	2.750	4.90	3.75	2.72
0.833	27.13	1.833	11.10	2.833	4.10	3.83	2.45
0.917	27.13	1.917	11.10	2.917	4.10	3.92	2.45
1.000	27.13	2.000	11.10	3.000	4.10	4.00	2.45

Max.Eff.Inten.(mm/hr)= 105.36 44.61
 over (min) 5.00 20.00
 Storage Coeff. (min)= 4.96 (ii) 18.60 (iii)
 Unit Hyd. Tpeak (min)= 5.00 20.00
 Unit Hyd. peak (cms)= 0.22 0.06

PEAK FLOW (cms) = 0.72 0.27 0.844 (iii)
 TIME TO PEAK (hrs) = 1.25 1.50 1.25
 RUNOFF VOLUME (mm) = 61.84 23.06 36.63
 TOTAL RAINFALL (mm) = 62.84 62.84 62.84
 RUNOFF COEFFICIENT = 0.98 0.37 0.58

***** 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.

CALIB
 STANDHYD (0203) | Area (ha)= 1.09
 ID= 1 DT= 5.0 min | Total Imp(%)= 50.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)	0.55	0.55
Dep. Storage (mm)	1.00	5.00
Average Slope (%)	0.50	2.00
Length (m)	85.24	70.00
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	3.80	1.083	105.36	2.083	7.91	3.08	3.51

0.167	3.80	1.167	105.36	2.167	7.91	3.17	3.51
0.250	3.80	1.250	105.36	2.250	7.91	3.25	3.51
0.333	5.48	1.333	36.61	2.333	6.08	3.33	3.07
0.417	5.48	1.417	36.61	2.417	6.08	3.42	3.07
0.500	5.48	1.500	36.61	2.500	6.08	3.50	3.07
0.583	9.49	1.583	17.69	2.583	4.90	3.58	2.72
0.667	9.49	1.667	17.69	2.667	4.90	3.67	2.72
0.750	9.49	1.750	17.69	2.750	4.90	3.75	2.72
0.833	27.13	1.833	11.10	2.833	4.10	3.83	2.45
0.917	27.13	1.917	11.10	2.917	4.10	3.92	2.45
1.000	27.13	2.000	11.10	3.000	4.10	4.00	2.45
Max.Eff.Inten. (mm/hr)= 105.36 23.83							
over (min) 5.00 25.00							
Storage Coeff. (min)= 2.80 (ii) 20.32 (ii)							
Unit Hyd. Tpeak (min)= 5.00 25.00							
Unit Hyd. peak (cms)= 0.28 0.05							
TOTALS							
PEAK FLOW (cms)=	0.16	0.02	0.166 (iii)				
TIME TO PEAK (hrs)=	1.25	1.58	1.25				
RUNOFF VOLUME (mm)=	61.84	18.86	40.34				
TOTAL RAINFALL (mm)=	62.84	62.84	62.84				
RUNOFF COEFFICIENT =	0.98	0.30	0.64				

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

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

CALIB			
STANDHYD (0202)			
ID= 1 DT= 5.0 min			
Area (ha)= 11.35			
Total Imp(%)= 50.00 Dir. Conn.(%)= 35.00			
IMPERVIOUS PVIOUS (i)			
Surface Area (ha)= 5.68 5.68			
Dep. Storage (mm)= 1.00 5.00			
Average Slope (%)= 0.50 2.00			
Length (m)= 275.08 70.00			
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	3.80	1.083	105.36	2.083	7.91	3.08	3.51
0.167	3.80	1.167	105.36	2.167	7.91	3.17	3.51
0.250	3.80	1.250	105.36	2.250	7.91	3.25	3.51
0.333	5.48	1.333	36.61	2.333	6.08	3.33	3.07
0.417	5.48	1.417	36.61	2.417	6.08	3.42	3.07
0.500	5.48	1.500	36.61	2.500	6.08	3.50	3.07
0.583	9.49	1.583	17.69	2.583	4.90	3.58	2.72
0.667	9.49	1.667	17.69	2.667	4.90	3.67	2.72
0.750	9.49	1.750	17.69	2.750	4.90	3.75	2.72
0.833	27.13	1.833	11.10	2.833	4.10	3.83	2.45
0.917	27.13	1.917	11.10	2.917	4.10	3.92	2.45
1.000	27.13	2.000	11.10	3.000	4.10	4.00	2.45
Max.Eff.Inten. (mm/hr)= 105.36 44.61							
over (min) 5.00 20.00							
Storage Coeff. (min)= 5.65 (ii) 19.29 (ii)							
Unit Hyd. Tpeak (min)= 5.00 20.00							
Unit Hyd. peak (cms)= 0.20 0.06							
TOTALS							

PEAK FLOW (cms)=	1.10	0.40	1.282 (iii)
TIME TO PEAK (hrs)=	1.25	1.50	1.25
RUNOFF VOLUME (mm)=	61.84	23.06	36.63
TOTAL RAINFALL (mm)=	62.84	62.84	62.84
RUNOFF COEFFICIENT =	0.98	0.37	0.58

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

ADD HYD (0001)				
1 + 2 = 3				
AREA QPEAK TPEAK R.V.				
(ha) (cms) (hrs) (mm)				
ID1= 1 (0201):	7.34	0.844	1.25	36.63
+ ID2= 2 (0202):	11.35	1.282	1.25	36.63
=====				
ID = 3 (0001):	18.69	2.126	1.25	36.63

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0001)				
3 + 2 = 1				
AREA QPEAK TPEAK R.V.				
(ha) (cms) (hrs) (mm)				
ID1= 3 (0001):	18.69	2.126	1.25	36.63
+ ID2= 2 (0203):	1.09	0.166	1.25	40.34
=====				
ID = 1 (0001):	19.78	2.292	1.25	36.84

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0002)				
IN= 2---> OUT= 1				
DT= 5.0 min				
OVERFLOW IS OFF				
OUTFLOW STORAGE OUTFLOW STORAGE				
(cms) (ha.m.) (cms) (ha.m.)				
0.0000	0.0000	0.4415	0.4502	
0.0090	0.0511	0.6651	0.5039	
0.0131	0.0876	0.9062	0.5593	
0.0162	0.1261	1.0427	0.6168	
0.0188	0.1666	1.1630	0.6766	
0.0210	0.2091	1.2719	0.7386	
0.0231	0.2535	1.3720	0.8030	
0.0250	0.3000	1.4653	0.8690	
0.1059	0.3483	2.6092	0.9380	
0.2524	0.3984	4.6233	1.0080	
AREA QPEAK TPEAK R.V.				
(ha) (cms) (hrs) (mm)				
INFLOW : ID= 2 (0001)	19.780	2.292	1.25	36.84
OUTFLOW: ID= 1 (0002)	19.780	0.510	2.17	36.76

PEAK FLOW REDUCTION [Qout/Qin](%)= 22.26
TIME SHIFT OF PEAK FLOW (min)= 55.00
MAXIMUM STORAGE USED (ha.m.)= 0.4668

ADD HYD (0020)				
1 + 2 = 3				
AREA QPEAK TPEAK R.V.				
(ha) (cms) (hrs) (mm)				
ID1= 1 (0002):	19.78	0.510	2.17	36.76

```

+ ID2= 2 ( 0204):      6.27   0.168   2.00   17.76
=====
ID = 3 ( 0020):      26.05   0.675   2.08   32.19

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

V   V   I   SSSSS   U   U   A   L           (v 6.2.2019)
V   V   I   SS      U   U   A A  L
V   V   I   SS      U   U   AAAA  L
V   V   I   SS      U   U   A   A  L
VV      I   SSSSS   UUUUU   A   A  LLLL

```

```

OOO   TTTT   TTTT   H   H   Y   Y   M   M   OOO   TM
O   O   T   T   H   H   Y   Y   MM   MM   O   O
O   O   T   T   H   H   Y   Y   M   M   O   O
OOO   T   T   H   H   Y   Y   M   M   OOO

```

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

```

Input  filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
Output filename: C:\Users\FPetkovski\AppData\Local\Civica\XH5\1d605a61-9146-4ab0-blab-
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Summary filename: C:\Users\FPetkovski\AppData\Local\Civica\XH5\1d605a61-9146-4ab0-blab-
422fd6022bab\85988317-d5fb-44e1-90c0-808f48db663e\s

```

DATE: 03-31-2026 TIME: 04:33:41

USER:

COMMENTS: _____

```

*****
** SIMULATION : CHI_04hr_025yr **
*****

```

```

CHICAGO STORM      IDF curve parameters: A=3123.820
Ptotal= 76.63 mm   B= 18.098
                   C= 0.917
used in:  INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step   = 15.00 min
Time to peak ratio = 0.33

```

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr		hrs	mm/hr	hrs	mm/hr
0.00	4.34	1.00	126.19	2.00	9.63	3.00	3.98	
0.25	6.49	1.25	46.59	2.25	7.25	3.25	3.43	
0.50	11.70	1.50	22.44	2.50	5.74	3.50	3.01	
0.75	34.49	1.75	13.81	2.75	4.72	3.75	2.67	

CALIB

```

NASHYD ( 0101) | Area (ha)= 26.05 Curve Number (CN)= 81.0
ID= 1 DT= 5.0 min | Ia (mm)= 7.40 # of Linear Res.(N)= 3.00
                  | U.H. Tp(hrs)= 0.78

```

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

TIME		RAIN		TIME		RAIN		TIME		RAIN	
hrs	mm/hr	hrs	mm/hr	'	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	
0.083	4.34	1.083	126.19	2.083	9.63	3.08	3.98				
0.167	4.34	1.167	126.19	2.167	9.63	3.17	3.98				
0.250	4.34	1.250	126.19	2.250	9.63	3.25	3.98				
0.333	6.49	1.333	46.59	2.333	7.25	3.33	3.43				
0.417	6.49	1.417	46.59	2.417	7.25	3.42	3.43				
0.500	6.49	1.500	46.59	2.500	7.25	3.50	3.43				
0.583	11.70	1.583	22.44	2.583	5.74	3.58	3.01				
0.667	11.70	1.667	22.44	2.667	5.74	3.67	3.01				
0.750	11.70	1.750	22.44	2.750	5.74	3.75	3.01				
0.833	34.49	1.833	13.81	2.833	4.72	3.83	2.67				
0.917	34.49	1.917	13.81	2.917	4.72	3.92	2.67				
1.000	34.49	2.000	13.81	3.000	4.72	4.00	2.67				

Unit Hyd Qpeak (cms) = 1.276

```

PEAK FLOW (cms) = 1.325 (i)
TIME TO PEAK (hrs) = 2.167
RUNOFF VOLUME (mm) = 37.204
TOTAL RAINFALL (mm) = 76.625
RUNOFF COEFFICIENT = 0.486

```

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

```

CALIB
NASHYD ( 0204) | Area (ha)= 6.27 Curve Number (CN)= 67.0
ID= 1 DT= 5.0 min | Ia (mm)= 6.00 # of Linear Res.(N)= 3.00
                  | U.H. Tp(hrs)= 0.63

```

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

TIME		RAIN		TIME		RAIN		TIME		RAIN	
hrs	mm/hr	hrs	mm/hr	'	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	
0.083	4.34	1.083	126.19	2.083	9.63	3.08	3.98				
0.167	4.34	1.167	126.19	2.167	9.63	3.17	3.98				
0.250	4.34	1.250	126.19	2.250	9.63	3.25	3.98				
0.333	6.49	1.333	46.59	2.333	7.25	3.33	3.43				
0.417	6.49	1.417	46.59	2.417	7.25	3.42	3.43				
0.500	6.49	1.500	46.59	2.500	7.25	3.50	3.43				
0.583	11.70	1.583	22.44	2.583	5.74	3.58	3.01				
0.667	11.70	1.667	22.44	2.667	5.74	3.67	3.01				
0.750	11.70	1.750	22.44	2.750	5.74	3.75	3.01				
0.833	34.49	1.833	13.81	2.833	4.72	3.83	2.67				
0.917	34.49	1.917	13.81	2.917	4.72	3.92	2.67				
1.000	34.49	2.000	13.81	3.000	4.72	4.00	2.67				

Unit Hyd Qpeak (cms) = 0.380

```

PEAK FLOW (cms) = 0.247 (i)
TIME TO PEAK (hrs) = 2.000
RUNOFF VOLUME (mm) = 25.483
TOTAL RAINFALL (mm) = 76.625
RUNOFF COEFFICIENT = 0.333

```

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

CALIB STANDHYD (0201) ID= 1 DT= 5.0 min	Area (ha)= 7.34 Total Imp(%)= 50.00 Dir. Conn.(%)= 35.00
--	---

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	3.67	3.67
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	0.50	2.00
Length (m)=	221.21	70.00
Mannings n =	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	4.34	1.083	126.19	2.083	9.63	3.08	3.98
0.167	4.34	1.167	126.19	2.167	9.63	3.17	3.98
0.250	4.34	1.250	126.19	2.250	9.63	3.25	3.98
0.333	6.49	1.333	46.59	2.333	7.25	3.33	3.43
0.417	6.49	1.417	46.59	2.417	7.25	3.42	3.43
0.500	6.49	1.500	46.59	2.500	7.25	3.50	3.43
0.583	11.70	1.583	22.44	2.583	5.74	3.58	3.01
0.667	11.70	1.667	22.44	2.667	5.74	3.67	3.01
0.750	11.70	1.750	22.44	2.750	5.74	3.75	3.01
0.833	34.49	1.833	13.81	2.833	4.72	3.83	2.67
0.917	34.49	1.917	13.81	2.917	4.72	3.92	2.67
1.000	34.49	2.000	13.81	3.000	4.72	4.00	2.67

Max.Eff.Inten.(mm/hr)=	126.19	62.86
over (min)	5.00	20.00
Storage Coeff. (min)=	4.61 (ii)	16.50 (ii)
Unit Hyd. Tpeak (min)=	5.00	20.00
Unit Hyd. peak (cms)=	0.22	0.06

PEAK FLOW (cms)=	0.87	0.40	*TOTALS*
TIME TO PEAK (hrs)=	1.25	1.50	1.064 (iii)
RUNOFF VOLUME (mm)=	75.63	32.16	1.25
TOTAL RAINFALL (mm)=	76.63	76.63	47.37
RUNOFF COEFFICIENT =	0.99	0.42	76.63
			0.62

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

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

CALIB STANDHYD (0203) ID= 1 DT= 5.0 min	Area (ha)= 1.09 Total Imp(%)= 50.00 Dir. Conn.(%)= 50.00
--	---

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.55	0.55
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	0.50	2.00
Length (m)=	85.24	70.00
Mannings n =	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr

0.083	4.34	1.083	126.19	2.083	9.63	3.08	3.98
0.167	4.34	1.167	126.19	2.167	9.63	3.17	3.98
0.250	4.34	1.250	126.19	2.250	9.63	3.25	3.98
0.333	6.49	1.333	46.59	2.333	7.25	3.33	3.43
0.417	6.49	1.417	46.59	2.417	7.25	3.42	3.43
0.500	6.49	1.500	46.59	2.500	7.25	3.50	3.43
0.583	11.70	1.583	22.44	2.583	5.74	3.58	3.01
0.667	11.70	1.667	22.44	2.667	5.74	3.67	3.01
0.750	11.70	1.750	22.44	2.750	5.74	3.75	3.01
0.833	34.49	1.833	13.81	2.833	4.72	3.83	2.67
0.917	34.49	1.917	13.81	2.917	4.72	3.92	2.67
1.000	34.49	2.000	13.81	3.000	4.72	4.00	2.67

Max.Eff.Inten.(mm/hr)=	126.19	38.88	
over (min)	5.00	20.00	
Storage Coeff..(min)=	2.60 (ii)	17.01 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	0.29	0.06	
			TOTALS
PEAK FLOW (cms)=	0.19	0.04	0.207 (iii)
TIME TO PEAK (hrs)=	1.25	1.50	1.25
RUNOFF VOLUME (mm)=	75.63	26.84	51.22
TOTAL RAINFALL (mm)=	76.63	76.63	76.63
RUNOFF COEFFICIENT =	0.99	0.35	0.67

***** 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.

CALIB STANDHYD (0202) ID= 1 DT= 5.0 min	Area (ha)= 11.35 Total Imp(%)= 50.00 Dir. Conn.(%)= 35.00
--	--

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	5.68	5.68
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	0.50	2.00
Length (m)=	275.08	70.00
Mannings n =	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	4.34	1.083	126.19	2.083	9.63	3.08	3.98
0.167	4.34	1.167	126.19	2.167	9.63	3.17	3.98
0.250	4.34	1.250	126.19	2.250	9.63	3.25	3.98
0.333	6.49	1.333	46.59	2.333	7.25	3.33	3.43
0.417	6.49	1.417	46.59	2.417	7.25	3.42	3.43
0.500	6.49	1.500	46.59	2.500	7.25	3.50	3.43
0.583	11.70	1.583	22.44	2.583	5.74	3.58	3.01
0.667	11.70	1.667	22.44	2.667	5.74	3.67	3.01
0.750	11.70	1.750	22.44	2.750	5.74	3.75	3.01
0.833	34.49	1.833	13.81	2.833	4.72	3.83	2.67
0.917	34.49	1.917	13.81	2.917	4.72	3.92	2.67
1.000	34.49	2.000	13.81	3.000	4.72	4.00	2.67

Max.Eff.Inten.(mm/hr)=	126.19	62.86
over (min)	5.00	20.00
Storage Coeff. (min)=	5.26 (ii)	17.15 (ii)
Unit Hyd. Tpeak (min)=	5.00	20.00
Unit Hyd. peak (cms)=	0.21	0.06

```

*TOTALS*
PEAK FLOW      (cms)=      1.33      0.60      1.619 (iii)
TIME TO PEAK   (hrs)=      1.25      1.50      1.25
RUNOFF VOLUME  (mm)=     75.63     32.16     47.37
TOTAL RAINFALL (mm)=     76.63     76.63     76.63
RUNOFF COEFFICIENT =      0.99      0.42      0.62

```

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

```

-----
| ADD HYD ( 0001) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0201):    7.34    1.064    1.25    47.37
+ ID2= 2 ( 0202):   11.35    1.619    1.25    47.37
-----
ID = 3 ( 0001):   18.69    2.683    1.25    47.37

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0001) |
| 3 + 2 = 1 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 3 ( 0001):   18.69    2.683    1.25    47.37
+ ID2= 2 ( 0203):    1.09    0.207    1.25    51.22
-----
ID = 1 ( 0001):   19.78    2.890    1.25    47.58

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| RESERVOIR( 0002) |
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
-----
          OVERFLOW IS OFF
          OUTFLOW      STORAGE      OUTFLOW      STORAGE
          (cms)      (ha.m.)      (cms)      (ha.m.)
0.0000    0.0000    0.4415    0.4502
0.0090    0.0511    0.6651    0.5039
0.0131    0.0876    0.9062    0.5593
0.0162    0.1261    1.0427    0.6168
0.0188    0.1666    1.1630    0.6766
0.0210    0.2091    1.2719    0.7386
0.0231    0.2535    1.3720    0.8030
0.0250    0.3000    1.4653    0.8690
0.1059    0.3483    2.6092    0.9380
0.2524    0.3984    4.6233    1.0080

```

```

          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
INFLOW : ID= 2 ( 0001)  19.780    2.890    1.25    47.58
OUTFLOW: ID= 1 ( 0002)  19.780    0.862    2.00    47.51

```

```

          PEAK FLOW REDUCTION [Qout/Qin] (%) = 29.83
          TIME SHIFT OF PEAK FLOW (min) = 45.00
          MAXIMUM STORAGE USED (ha.m.) = 0.5492

```

```

-----
| ADD HYD ( 0020) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)

```

```

ID1= 1 ( 0002):    19.78    0.862    2.00    47.51
+ ID2= 2 ( 0204):    6.27    0.247    2.00    25.48
=====
ID = 3 ( 0020):    26.05    1.109    2.00    42.21

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
V   V   I   SSSSS   U   U   A   L   (v 6.2.2019)
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   LLLL

```

```

OOO   TTTT   TTTT   H   H   Y   Y   M   M   OOO   TM
O   O   T   T   H   H   Y   Y   MM MM   O   O
O   O   T   T   H   H   Y   M   M   O   O
OOO   T   T   H   H   Y   M   M   OOO
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```

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

```

Input  filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
Output filename: C:\Users\FPetkovski\AppData\Local\Civica\XH5\ld605a61-9146-4ab0-blab-
422fd6022bab\b625bc46-6a9e-420d-a045-fd88fd888ce6\s
Summary filename: C:\Users\FPetkovski\AppData\Local\Civica\XH5\ld605a61-9146-4ab0-blab-
422fd6022bab\b625bc46-6a9e-420d-a045-fd88fd888ce6\s

```

DATE: 03-31-2026

TIME: 04:33:41

USER:

COMMENTS: _____

```

*****
** SIMULATION : CHI_04hr_050yr **
*****

```

```

-----
| CHICAGO STORM |
| Ptotal= 86.83 mm |
-----
IDF curve parameters: A=4205.472
                      B= 21.188
                      C= 0.946
used in: INTENSITY = A / (t + B)^C
Duration of storm = 4.00 hrs
Storm time step = 15.00 min
Time to peak ratio = 0.33

```

```

TIME  RAIN  TIME  RAIN  TIME  RAIN  TIME  RAIN
hrs   mm/hr  hrs   mm/hr  hrs   mm/hr  hrs   mm/hr
0.00  4.58   1.00  141.06  2.00  10.89  3.00  4.16
0.25  7.11   1.25  54.77  2.25  8.02  3.25  3.53
0.50  13.39  1.50  26.35  2.50  6.23  3.50  3.05
0.75  40.53  1.75  15.94  2.75  5.02  3.75  2.67

```

CALIB			
NASHYD (0101)	Area (ha)= 26.05	Curve Number (CN)= 81.0	
ID= 1 DT= 5.0 min	Ia (mm)= 7.40	# of Linear Res. (N)= 3.00	
	U.H. Tp(hrs)= 0.78		

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

----- TRANSFORMED HYETOGRAPH -----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	4.58	1.083	141.06	2.083	10.89	3.08	4.16
0.167	4.58	1.167	141.06	2.167	10.89	3.17	4.16
0.250	4.58	1.250	141.06	2.250	10.89	3.25	4.16
0.333	7.11	1.333	54.77	2.333	8.02	3.33	3.53
0.417	7.11	1.417	54.77	2.417	8.02	3.42	3.53
0.500	7.11	1.500	54.77	2.500	8.02	3.50	3.53
0.583	13.39	1.583	26.35	2.583	6.23	3.58	3.05
0.667	13.39	1.667	26.35	2.667	6.23	3.67	3.05
0.750	13.39	1.750	26.35	2.750	6.23	3.75	3.05
0.833	40.53	1.833	15.94	2.833	5.02	3.83	2.67
0.917	40.53	1.917	15.94	2.917	5.02	3.92	2.67
1.000	40.53	2.000	15.94	3.000	5.02	4.00	2.67

Unit Hyd Qpeak (cms) = 1.276

PEAK FLOW (cms) = 1.647 (i)
 TIME TO PEAK (hrs) = 2.167
 RUNOFF VOLUME (mm) = 45.386
 TOTAL RAINFALL (mm) = 86.830
 RUNOFF COEFFICIENT = 0.523

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

CALIB			
NASHYD (0204)	Area (ha)= 6.27	Curve Number (CN)= 67.0	
ID= 1 DT= 5.0 min	Ia (mm)= 6.00	# of Linear Res. (N)= 3.00	
	U.H. Tp(hrs)= 0.63		

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

----- TRANSFORMED HYETOGRAPH -----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	4.58	1.083	141.06	2.083	10.89	3.08	4.16
0.167	4.58	1.167	141.06	2.167	10.89	3.17	4.16
0.250	4.58	1.250	141.06	2.250	10.89	3.25	4.16
0.333	7.11	1.333	54.77	2.333	8.02	3.33	3.53
0.417	7.11	1.417	54.77	2.417	8.02	3.42	3.53
0.500	7.11	1.500	54.77	2.500	8.02	3.50	3.53
0.583	13.39	1.583	26.35	2.583	6.23	3.58	3.05
0.667	13.39	1.667	26.35	2.667	6.23	3.67	3.05
0.750	13.39	1.750	26.35	2.750	6.23	3.75	3.05
0.833	40.53	1.833	15.94	2.833	5.02	3.83	2.67
0.917	40.53	1.917	15.94	2.917	5.02	3.92	2.67
1.000	40.53	2.000	15.94	3.000	5.02	4.00	2.67

Unit Hyd Qpeak (cms) = 0.380

PEAK FLOW (cms) = 0.314 (i)
 TIME TO PEAK (hrs) = 2.000
 RUNOFF VOLUME (mm) = 31.725
 TOTAL RAINFALL (mm) = 86.830
 RUNOFF COEFFICIENT = 0.365

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

CALIB			
STANDHYD (0201)	Area (ha)= 7.34		
ID= 1 DT= 5.0 min	Total Imp(%)= 50.00	Dir. Conn.(%)= 35.00	

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	3.67	3.67
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	0.50	2.00
Length (m)=	221.21	70.00
Mannings n =	0.013	0.250

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

----- TRANSFORMED HYETOGRAPH -----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	4.58	1.083	141.06	2.083	10.89	3.08	4.16
0.167	4.58	1.167	141.06	2.167	10.89	3.17	4.16
0.250	4.58	1.250	141.06	2.250	10.89	3.25	4.16
0.333	7.11	1.333	54.77	2.333	8.02	3.33	3.53
0.417	7.11	1.417	54.77	2.417	8.02	3.42	3.53
0.500	7.11	1.500	54.77	2.500	8.02	3.50	3.53
0.583	13.39	1.583	26.35	2.583	6.23	3.58	3.05
0.667	13.39	1.667	26.35	2.667	6.23	3.67	3.05
0.750	13.39	1.750	26.35	2.750	6.23	3.75	3.05
0.833	40.53	1.833	15.94	2.833	5.02	3.83	2.67
0.917	40.53	1.917	15.94	2.917	5.02	3.92	2.67
1.000	40.53	2.000	15.94	3.000	5.02	4.00	2.67

Max.Eff.Inten.(mm/hr)= 141.06 77.24
 over (min) 5.00 20.00
 Storage Coeff. (min)= 4.41 (ii) 15.36 (ii)
 Unit Hyd. Tpeak (min)= 5.00 20.00
 Unit Hyd. peak (cms)= 0.23 0.07

TOTALS
 PEAK FLOW (cms)= 0.98 0.51 1.231 (iii)
 TIME TO PEAK (hrs)= 1.25 1.50 1.25
 RUNOFF VOLUME (mm)= 85.83 39.37 55.63
 TOTAL RAINFALL (mm)= 86.83 86.83 86.83
 RUNOFF COEFFICIENT = 0.99 0.45 0.64

***** 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.

CALIB			
STANDHYD (0203)	Area (ha)= 1.09		
ID= 1 DT= 5.0 min	Total Imp(%)= 50.00	Dir. Conn.(%)= 50.00	

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.55	0.55
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	0.50	2.00
Length (m)=	85.24	70.00
Mannings n =	0.013	0.250

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

----- TRANSFORMED HYETOGRAPH -----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN

hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	4.58	1.083	141.06	2.083	10.89	3.08	4.16
0.167	4.58	1.167	141.06	2.167	10.89	3.17	4.16
0.250	4.58	1.250	141.06	2.250	10.89	3.25	4.16
0.333	7.11	1.333	54.77	2.333	8.02	3.33	3.53
0.417	7.11	1.417	54.77	2.417	8.02	3.42	3.53
0.500	7.11	1.500	54.77	2.500	8.02	3.50	3.53
0.583	13.39	1.583	26.35	2.583	6.23	3.58	3.05
0.667	13.39	1.667	26.35	2.667	6.23	3.67	3.05
0.750	13.39	1.750	26.35	2.750	6.23	3.75	3.05
0.833	40.53	1.833	15.94	2.833	5.02	3.83	2.67
0.917	40.53	1.917	15.94	2.917	5.02	3.92	2.67
1.000	40.53	2.000	15.94	3.000	5.02	4.00	2.67

Max.Eff.Inten.(mm/hr)= 141.06 48.45
over (min) 5.00 20.00
Storage Coeff. (min)= 2.49 (ii) 15.68 (ii)
Unit Hyd. Tpeak (min)= 5.00 20.00
Unit Hyd. peak (cms)= 0.29 0.07

TOTALS
PEAK FLOW (cms)= 0.21 0.05 0.235 (iii)
TIME TO PEAK (hrs)= 1.25 1.50 1.25
RUNOFF VOLUME (mm)= 85.83 33.25 59.53
TOTAL RAINFALL (mm)= 86.83 86.83 86.83
RUNOFF COEFFICIENT = 0.99 0.38 0.69

***** 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.

CALIB
STANDHYD (0202)
ID= 1 DT= 5.0 min
Area (ha)= 11.35
Total Imp(%)= 50.00 Dir. Conn.(%)= 35.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 5.68 5.68
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 0.50 2.00
Length (m)= 275.08 70.00
Mannings n = 0.013 0.250

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	4.58	1.083	141.06	2.083	10.89	3.08	4.16
0.167	4.58	1.167	141.06	2.167	10.89	3.17	4.16
0.250	4.58	1.250	141.06	2.250	10.89	3.25	4.16
0.333	7.11	1.333	54.77	2.333	8.02	3.33	3.53
0.417	7.11	1.417	54.77	2.417	8.02	3.42	3.53
0.500	7.11	1.500	54.77	2.500	8.02	3.50	3.53
0.583	13.39	1.583	26.35	2.583	6.23	3.58	3.05
0.667	13.39	1.667	26.35	2.667	6.23	3.67	3.05
0.750	13.39	1.750	26.35	2.750	6.23	3.75	3.05
0.833	40.53	1.833	15.94	2.833	5.02	3.83	2.67
0.917	40.53	1.917	15.94	2.917	5.02	3.92	2.67
1.000	40.53	2.000	15.94	3.000	5.02	4.00	2.67

Max.Eff.Inten.(mm/hr)= 141.06 77.24
over (min) 5.00 20.00
Storage Coeff. (min)= 5.03 (ii) 15.98 (ii)
Unit Hyd. Tpeak (min)= 5.00 20.00

Unit Hyd. peak (cms)= 0.21 0.07
TOTALS
PEAK FLOW (cms)= 1.50 0.77 1.875 (iii)
TIME TO PEAK (hrs)= 1.25 1.50 1.25
RUNOFF VOLUME (mm)= 85.83 39.37 55.63
TOTAL RAINFALL (mm)= 86.83 86.83 86.83
RUNOFF COEFFICIENT = 0.99 0.45 0.64

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

ADD HYD (0001)
1 + 2 = 3
AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
ID1= 1 (0201): 7.34 1.231 1.25 55.63
+ ID2= 2 (0202): 11.35 1.875 1.25 55.63
=====

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0001)
3 + 2 = 1
AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
ID1= 3 (0001): 18.69 3.106 1.25 55.63
+ ID2= 2 (0203): 1.09 0.235 1.25 59.53
=====

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0002)
IN= 2--> OUT= 1
DT= 5.0 min
OVERFLOW IS OFF
OUTFLOW STORAGE OUTFLOW STORAGE
(cms) (ha.m.) (cms) (ha.m.)
0.0000 0.0000 0.4415 0.4502
0.0090 0.0511 0.6651 0.5039
0.0131 0.0876 0.9062 0.5593
0.0162 0.1261 1.0427 0.6168
0.0188 0.1666 1.1630 0.6766
0.0210 0.2091 1.2719 0.7386
0.0231 0.2535 1.3720 0.8030
0.0250 0.3000 1.4653 0.8690
0.1059 0.3483 2.6092 0.9380
0.2524 0.3984 4.6233 1.0080
=====

AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
INFLOW : ID= 2 (0001) 19.780 3.342 1.25 55.84
OUTFLOW: ID= 1 (0002) 19.780 1.056 2.00 55.77
=====

PEAK FLOW REDUCTION [Qout/Qin] (%)= 31.61
TIME SHIFT OF PEAK FLOW (min)= 45.00
MAXIMUM STORAGE USED (ha.m.)= 0.6238

ADD HYD (0020)
1 + 2 = 3
AREA QPEAK TPEAK R.V.

```

-----
              (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0002):  19.78   1.056    2.00   55.77
+ ID2= 2 ( 0204):   6.27   0.314    2.00   31.73
=====
ID = 3 ( 0020):  26.05   1.370    2.00   49.98

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

=====
V  V  I  SSSSS  U  U  A  L              (v 6.2.2019)
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  TTTT  TTTT  H  H  Y  Y  M  M  OOO  TM
O  O  T  T  H  H  Y  Y  MM  MM  O  O
O  O  T  T  H  H  Y  Y  M  M  O  O
OOO  T  T  H  H  Y  Y  M  M  OOO

```

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

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
Output filename: C:\Users\FPetkovski\AppData\Local\Civica\XH5\ld605a61-9146-4ab0-blab-422fd6022bab\8aec26e5-0474-4ffe-9691-9909d17a3da4\s
Summary filename: C:\Users\FPetkovski\AppData\Local\Civica\XH5\ld605a61-9146-4ab0-blab-422fd6022bab\8aec26e5-0474-4ffe-9691-9909d17a3da4\s

DATE: 03-31-2026 TIME: 04:33:41

USER:

COMMENTS: _____

```

*****
** SIMULATION : CHI_04hr_100yr          **
*****

```

```

-----
| CHICAGO STORM |   IDF curve parameters: A=4764.902
| Ptotal= 97.09 mm |   B= 21.750
|                   |   C= 0.948
-----
used in:  INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step   = 15.00 min
Time to peak ratio = 0.33

```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	' hrs	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	5.15	1.00	156.38	2.00	12.28	3.00	4.67	
0.25	8.01	1.25	61.48	2.25	9.04	3.25	3.96	
0.50	15.10	1.50	29.71	2.50	7.01	3.50	3.41	
0.75	45.56	1.75	17.98	2.75	5.64	3.75	2.99	

```

-----
| CALIB |
| NASHYD ( 0101) |
| ID= 1 DT= 5.0 min |
-----
Area (ha)= 26.05   Curve Number (CN)= 81.0
Ia (mm)= 7.40     # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.78

```

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

----- TRANSFORMED HYETOGRAPH -----								
TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	' hrs	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	5.15	1.083	156.38	2.083	12.28	3.08	4.67	
0.167	5.15	1.167	156.38	2.167	12.28	3.17	4.67	
0.250	5.15	1.250	156.38	2.250	12.28	3.25	4.67	
0.333	8.01	1.333	61.48	2.333	9.04	3.33	3.96	
0.417	8.01	1.417	61.48	2.417	9.04	3.42	3.96	
0.500	8.01	1.500	61.48	2.500	9.04	3.50	3.96	
0.583	15.10	1.583	29.71	2.583	7.01	3.58	3.41	
0.667	15.10	1.667	29.71	2.667	7.01	3.67	3.41	
0.750	15.10	1.750	29.71	2.750	7.01	3.75	3.41	
0.833	45.56	1.833	17.98	2.833	5.64	3.83	2.99	
0.917	45.56	1.917	17.98	2.917	5.64	3.92	2.99	
1.000	45.56	2.000	17.98	3.000	5.64	4.00	2.99	

Unit Hyd Qpeak (cms) = 1.276

PEAK FLOW (cms) = 1.963 (i)
TIME TO PEAK (hrs) = 2.167
RUNOFF VOLUME (mm) = 53.892
TOTAL RAINFALL (mm) = 97.092
RUNOFF COEFFICIENT = 0.555

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

```

-----
| CALIB |
| NASHYD ( 0204) |
| ID= 1 DT= 5.0 min |
-----
Area (ha)= 6.27   Curve Number (CN)= 67.0
Ia (mm)= 6.00     # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.63

```

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

----- TRANSFORMED HYETOGRAPH -----								
TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	' hrs	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	5.15	1.083	156.38	2.083	12.28	3.08	4.67	
0.167	5.15	1.167	156.38	2.167	12.28	3.17	4.67	
0.250	5.15	1.250	156.38	2.250	12.28	3.25	4.67	
0.333	8.01	1.333	61.48	2.333	9.04	3.33	3.96	
0.417	8.01	1.417	61.48	2.417	9.04	3.42	3.96	
0.500	8.01	1.500	61.48	2.500	9.04	3.50	3.96	
0.583	15.10	1.583	29.71	2.583	7.01	3.58	3.41	
0.667	15.10	1.667	29.71	2.667	7.01	3.67	3.41	
0.750	15.10	1.750	29.71	2.750	7.01	3.75	3.41	
0.833	45.56	1.833	17.98	2.833	5.64	3.83	2.99	
0.917	45.56	1.917	17.98	2.917	5.64	3.92	2.99	
1.000	45.56	2.000	17.98	3.000	5.64	4.00	2.99	

Unit Hyd Qpeak (cms) = 0.380

PEAK FLOW (cms) = 0.381 (i)
TIME TO PEAK (hrs) = 2.000
RUNOFF VOLUME (mm) = 38.380
TOTAL RAINFALL (mm) = 97.092
RUNOFF COEFFICIENT = 0.395

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

CALIB			
STANDHYD (0201)			
ID= 1 DT= 5.0 min			
Area (ha)=	7.34		
Total Imp(%)=	50.00	Dir. Conn.(%)=	35.00
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	3.67	3.67	
Dep. Storage (mm)=	1.00	5.00	
Average Slope (%)=	0.50	2.00	
Length (m)=	221.21	70.00	
Mannings n =	0.013	0.250	

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

----- TRANSFORMED HYETOGRAPH -----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	5.15	1.083	156.38	2.083	12.28	3.08	4.67
0.167	5.15	1.167	156.38	2.167	12.28	3.17	4.67
0.250	5.15	1.250	156.38	2.250	12.28	3.25	4.67
0.333	8.01	1.333	61.48	2.333	9.04	3.33	3.96
0.417	8.01	1.417	61.48	2.417	9.04	3.42	3.96
0.500	8.01	1.500	61.48	2.500	9.04	3.50	3.96
0.583	15.10	1.583	29.71	2.583	7.01	3.58	3.41
0.667	15.10	1.667	29.71	2.667	7.01	3.67	3.41
0.750	15.10	1.750	29.71	2.750	7.01	3.75	3.41
0.833	45.56	1.833	17.98	2.833	5.64	3.83	2.99
0.917	45.56	1.917	17.98	2.917	5.64	3.92	2.99
1.000	45.56	2.000	17.98	3.000	5.64	4.00	2.99
Max.Eff.Inten.(mm/hr)=	156.38		104.62				
over (min)	5.00		15.00				
Storage Coeff. (min)=	4.24 (ii)		13.93 (ii)				
Unit Hyd. Tpeak (min)=	5.00		15.00				
Unit Hyd. peak (cms)=	0.24		0.08				
PEAK FLOW (cms)=	1.09		0.64		*TOTALS*		
TIME TO PEAK (hrs)=	1.25		1.42		1.533 (iii)		
RUNOFF VOLUME (mm)=	96.09		46.95		64.15		
TOTAL RAINFALL (mm)=	97.09		97.09		97.09		
RUNOFF COEFFICIENT =	0.99		0.48		0.66		

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

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

CALIB			
STANDHYD (0203)			
ID= 1 DT= 5.0 min			
Area (ha)=	1.09		
Total Imp(%)=	50.00	Dir. Conn.(%)=	50.00
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.55	0.55	
Dep. Storage (mm)=	1.00	5.00	
Average Slope (%)=	0.50	2.00	
Length (m)=	85.24	70.00	
Mannings n =	0.013	0.250	

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	5.15	1.083	156.38	2.083	12.28	3.08	4.67
0.167	5.15	1.167	156.38	2.167	12.28	3.17	4.67
0.250	5.15	1.250	156.38	2.250	12.28	3.25	4.67
0.333	8.01	1.333	61.48	2.333	9.04	3.33	3.96
0.417	8.01	1.417	61.48	2.417	9.04	3.42	3.96
0.500	8.01	1.500	61.48	2.500	9.04	3.50	3.96
0.583	15.10	1.583	29.71	2.583	7.01	3.58	3.41
0.667	15.10	1.667	29.71	2.667	7.01	3.67	3.41
0.750	15.10	1.750	29.71	2.750	7.01	3.75	3.41
0.833	45.56	1.833	17.98	2.833	5.64	3.83	2.99
0.917	45.56	1.917	17.98	2.917	5.64	3.92	2.99
1.000	45.56	2.000	17.98	3.000	5.64	4.00	2.99

Max.Eff.Inten.(mm/hr)=	156.38	58.75
over (min)	5.00	15.00
Storage Coeff. (min)=	2.39 (ii)	14.60 (ii)
Unit Hyd. Tpeak (min)=	5.00	15.00
Unit Hyd. peak (cms)=	0.30	0.08

PEAK FLOW (cms)=	0.24	0.06	*TOTALS*
TIME TO PEAK (hrs)=	1.25	1.42	0.276 (iii)
RUNOFF VOLUME (mm)=	96.09	40.08	68.08
TOTAL RAINFALL (mm)=	97.09	97.09	97.09
RUNOFF COEFFICIENT =	0.99	0.41	0.70

***** 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.

CALIB			
STANDHYD (0202)			
ID= 1 DT= 5.0 min			
Area (ha)=	11.35		
Total Imp(%)=	50.00	Dir. Conn.(%)=	35.00
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	5.68	5.68	
Dep. Storage (mm)=	1.00	5.00	
Average Slope (%)=	0.50	2.00	
Length (m)=	275.08	70.00	
Mannings n =	0.013	0.250	

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

----- TRANSFORMED HYETOGRAPH -----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	5.15	1.083	156.38	2.083	12.28	3.08	4.67
0.167	5.15	1.167	156.38	2.167	12.28	3.17	4.67
0.250	5.15	1.250	156.38	2.250	12.28	3.25	4.67
0.333	8.01	1.333	61.48	2.333	9.04	3.33	3.96
0.417	8.01	1.417	61.48	2.417	9.04	3.42	3.96
0.500	8.01	1.500	61.48	2.500	9.04	3.50	3.96
0.583	15.10	1.583	29.71	2.583	7.01	3.58	3.41
0.667	15.10	1.667	29.71	2.667	7.01	3.67	3.41
0.750	15.10	1.750	29.71	2.750	7.01	3.75	3.41
0.833	45.56	1.833	17.98	2.833	5.64	3.83	2.99
0.917	45.56	1.917	17.98	2.917	5.64	3.92	2.99
1.000	45.56	2.000	17.98	3.000	5.64	4.00	2.99

Max.Eff.Inten.(mm/hr)=	156.38	104.62
over (min)	5.00	15.00
Storage Coeff. (min)=	4.83 (ii)	14.52 (ii)


```

Unit Hyd. Tpeak (min)=      5.00      15.00
Unit Hyd. peak  (cms)=      0.22      0.08

*TOTALS*
PEAK FLOW      (cms)=      1.67      0.98      2.335 (iii)
TIME TO PEAK   (hrs)=      1.25      1.42      1.25
RUNOFF VOLUME  (mm)=      96.09     46.95     64.15
TOTAL RAINFALL (mm)=      97.09     97.09     97.09
RUNOFF COEFFICIENT =      0.99      0.48      0.66

```

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

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

```

-----
| ADD HYD ( 0001) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0201):    7.34    1.533    1.25    64.15
+ ID2= 2 ( 0202):   11.35    2.335    1.25    64.15
=====
ID = 3 ( 0001):   18.69    3.868    1.25    64.15

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0001) |
| 3 + 2 = 1 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 3 ( 0001):   18.69    3.868    1.25    64.15
+ ID2= 2 ( 0203):    1.09    0.276    1.25    68.08
=====
ID = 1 ( 0001):   19.78    4.144    1.25    64.37

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| RESERVOIR( 0002) |
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
-----
OVERFLOW IS OFF

          OUTFLOW      STORAGE      OUTFLOW      STORAGE
          (cms)      (ha.m.)      (cms)      (ha.m.)
0.0000    0.0000      0.4415    0.4502
0.0090    0.0511      0.6651    0.5039
0.0131    0.0876      0.9062    0.5593
0.0162    0.1261      1.0427    0.6168
0.0188    0.1666      1.1630    0.6766
0.0210    0.2091      1.2719    0.7386
0.0231    0.2535      1.3720    0.8030
0.0250    0.3000      1.4653    0.8690
0.1059    0.3483      2.6092    0.9380
0.2524    0.3984      4.6233    1.0080

          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
INFLOW : ID= 2 ( 0001)    19.780    4.144    1.25    64.37
OUTFLOW: ID= 1 ( 0002)    19.780    1.225    1.92    64.29

```

PEAK FLOW REDUCTION [Qout/Qin](%)= 29.55
 TIME SHIFT OF PEAK FLOW (min)= 40.00
 MAXIMUM STORAGE USED (ha.m.)= 0.7122

```

| ADD HYD ( 0020) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0002):    19.78    1.225    1.92    64.29
+ ID2= 2 ( 0204):    6.27    0.381    2.00    38.38
=====
ID = 3 ( 0020):    26.05    1.604    2.00    58.06

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
V V I SSSS U U A L (v 6.2.2019)
V V I SS U U A A L
V V I SS U U A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLL

```

```

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y MM MM O O O
O O T T H H Y M M O O O
OOO T T H H Y M M OOO

```

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

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
 Output filename: C:\Users\FPetkovski\AppData\Local\Civica\XH5\ld605a61-9146-4ab0-blab-422fd6022bab\dc3545e6-73b1-49cd-963c-55bb64d9286a\s
 Summary filename: C:\Users\FPetkovski\AppData\Local\Civica\XH5\ld605a61-9146-4ab0-blab-422fd6022bab\dc3545e6-73b1-49cd-963c-55bb64d9286a\s

DATE: 03-31-2026

TIME: 04:33:41

USER:

COMMENTS:

```

*****
** SIMULATION : SCS_06hr_002yr **
*****

```

```

-----
| READ STORM |
| Ptotal= 38.80 mm |
-----
Filename: C:\Users\FPetkovski\AppData\Local\Temp\
          eacd415e-8ceb-438b-a348-aa4b2932daf2\dbe2bb62
Comments: SCS_06hr_002yr

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	0.00	1.75	3.88	3.50	8.54	5.25	1.55
0.25	1.55	2.00	3.88	3.75	3.88	5.50	1.55
0.50	1.55	2.25	4.66	4.00	3.88	5.75	1.55
0.75	2.33	2.50	4.66	4.25	3.10	6.00	1.55
1.00	2.33	2.75	23.28	4.50	3.10		
1.25	2.33	3.00	60.53	4.75	2.33		
1.50	2.33	3.25	8.54	5.00	2.33		

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

CALIB
STANDHYD (0203)
ID= 1 DT= 5.0 min

Area (ha)= 1.09
Total Imp(%)= 50.00 Dir. Conn.(%)= 50.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 0.55 0.55
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 0.50 2.00
Length (m)= 85.24 70.00
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	0.00	1.667	2.33	3.250	60.53	4.83	2.33
0.167	0.00	1.750	2.33	3.333	8.54	4.92	2.33
0.250	0.00	1.833	3.88	3.417	8.54	5.00	2.33
0.333	1.55	1.917	3.88	3.500	8.54	5.08	2.33
0.417	1.55	2.000	3.88	3.583	8.54	5.17	2.33
0.500	1.55	2.083	3.88	3.667	8.54	5.25	2.33
0.583	1.55	2.167	3.88	3.750	8.54	5.33	1.55
0.667	1.55	2.250	3.88	3.833	3.88	5.42	1.55
0.750	1.55	2.333	4.66	3.917	3.88	5.50	1.55
0.833	2.33	2.417	4.66	4.000	3.88	5.58	1.55
0.917	2.33	2.500	4.66	4.083	3.88	5.67	1.55
1.000	2.33	2.583	4.66	4.167	3.88	5.75	1.55
1.083	2.33	2.667	4.66	4.250	3.88	5.83	1.55
1.167	2.33	2.750	4.66	4.333	3.10	5.92	1.55
1.250	2.33	2.833	23.28	4.417	3.10	6.00	1.55
1.333	2.33	2.917	23.28	4.500	3.10	6.08	1.55
1.417	2.33	3.000	23.28	4.583	3.10	6.17	1.55
1.500	2.33	3.083	60.53	4.667	3.10	6.25	1.55
1.583	2.33	3.167	60.53	4.750	3.10		

Max.Eff.Inten.(mm/hr)= 60.53 7.89
over (min) 5.00 35.00
Storage Coeff. (min)= 3.49 (ii) 30.76 (ii)
Unit Hyd. Tpeak (min)= 5.00 35.00
Unit Hyd. peak (cms)= 0.26 0.04

TOTALS
PEAK FLOW (cms)= 0.09 0.01 0.093 (iii)
TIME TO PEAK (hrs)= 3.25 3.75 3.25
RUNOFF VOLUME (mm)= 37.80 7.45 22.61
TOTAL RAINFALL (mm)= 38.80 38.80 38.80
RUNOFF COEFFICIENT = 0.97 0.19 0.58

***** 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.

CALIB
STANDHYD (0202)
ID= 1 DT= 5.0 min

Area (ha)= 11.35
Total Imp(%)= 50.00 Dir. Conn.(%)= 35.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 5.68 5.68
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 0.50 2.00
Length (m)= 275.08 70.00
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	0.00	1.667	2.33	3.250	60.53	4.83	2.33
0.167	0.00	1.750	2.33	3.333	8.54	4.92	2.33
0.250	0.00	1.833	3.88	3.417	8.54	5.00	2.33
0.333	1.55	1.917	3.88	3.500	8.54	5.08	2.33
0.417	1.55	2.000	3.88	3.583	8.54	5.17	2.33
0.500	1.55	2.083	3.88	3.667	8.54	5.25	2.33
0.583	1.55	2.167	3.88	3.750	8.54	5.33	1.55
0.667	1.55	2.250	3.88	3.833	3.88	5.42	1.55
0.750	1.55	2.333	4.66	3.917	3.88	5.50	1.55
0.833	2.33	2.417	4.66	4.000	3.88	5.58	1.55
0.917	2.33	2.500	4.66	4.083	3.88	5.67	1.55
1.000	2.33	2.583	4.66	4.167	3.88	5.75	1.55
1.083	2.33	2.667	4.66	4.250	3.88	5.83	1.55
1.167	2.33	2.750	4.66	4.333	3.10	5.92	1.55
1.250	2.33	2.833	23.28	4.417	3.10	6.00	1.55
1.333	2.33	2.917	23.28	4.500	3.10	6.08	1.55
1.417	2.33	3.000	23.28	4.583	3.10	6.17	1.55
1.500	2.33	3.083	60.53	4.667	3.10	6.25	1.55
1.583	2.33	3.167	60.53	4.750	3.10		

Max.Eff.Inten.(mm/hr)= 60.53 17.92
over (min) 5.00 30.00
Storage Coeff. (min)= 7.06 (ii) 26.70 (ii)
Unit Hyd. Tpeak (min)= 5.00 30.00
Unit Hyd. peak (cms)= 0.17 0.04
TOTALS
PEAK FLOW (cms)= 0.62 0.14 0.674 (iii)
TIME TO PEAK (hrs)= 3.25 3.67 3.25
RUNOFF VOLUME (mm)= 37.80 9.63 19.49
TOTAL RAINFALL (mm)= 38.80 38.80 38.80
RUNOFF COEFFICIENT = 0.97 0.25 0.50

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

ADD HYD (0001)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0201):	7.34	0.446	3.25	19.49
+ ID2= 2 (0202):	11.35	0.674	3.25	19.49
=====				
ID = 3 (0001):	18.69	1.120	3.25	19.49

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0001)				
3 + 2 = 1	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)

```

ID1= 3 ( 0001):  18.69  1.120  3.25  19.49
+ ID2= 2 ( 0203):  1.09  0.093  3.25  22.61
=====
ID = 1 ( 0001):  19.78  1.213  3.25  19.66

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
RESERVOIR( 0002)
IN= 2--> OUT= 1
DT= 5.0 min
-----
OVERFLOW IS OFF
-----
OUTFLOW STORAGE      OUTFLOW STORAGE
(cms)      (ha.m.)      (cms)      (ha.m.)
0.0000      0.0000      0.4415      0.4502
0.0090      0.0511      0.6651      0.5039
0.0131      0.0876      0.9062      0.5593
0.0162      0.1261      1.0427      0.6168
0.0188      0.1666      1.1630      0.6766
0.0210      0.2091      1.2719      0.7386
0.0231      0.2535      1.3720      0.8030
0.0250      0.3000      1.4653      0.8690
0.1059      0.3483      2.6092      0.9380
0.2524      0.3984      4.6233      1.0080
-----
AREA      QPEAK      TPEAK      R.V.
(ha)      (cms)      (hrs)      (mm)
INFLOW : ID= 2 ( 0001)  19.780  1.213  3.25  19.66
OUTFLOW: ID= 1 ( 0002)  19.780  0.071  5.67  19.59
-----
PEAK FLOW REDUCTION [Qout/Qin](%)= 5.81
TIME SHIFT OF PEAK FLOW (min)=145.00
MAXIMUM STORAGE USED (ha.m.)= 0.3272
-----

```

```

-----
ADD HYD ( 0020)
1 + 2 = 3
-----
AREA      QPEAK      TPEAK      R.V.
(ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0002):  19.78  0.071  5.67  19.59
+ ID2= 2 ( 0204):  6.27  0.062  3.92  6.81
=====
ID = 3 ( 0020):  26.05  0.092  5.25  16.51
-----

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

=====
V V I SSSS U U A L (v 6.2.2019)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLL
OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y MM MM O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

```

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

```

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
Output filename: C:\Users\FPetkovski\AppData\Local\Civica\XH5\ld605a61-9146-4ab0-blab-
422fd6022bab\fd3dce1e2-4edb-47d5-a8fb-803b7e546bac\s

```

Summary filename: C:\Users\FPetkovski\AppData\Local\Civica\XH5\ld605a61-9146-4ab0-blab-422fd6022bab\fd3dce1e2-4edb-47d5-a8fb-803b7e546bac\s

DATE: 03-31-2026

TIME: 04:33:41

USER:

COMMENTS:

```

*****
** SIMULATION : SCS_06hr_005yr
*****

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```

-----
READ STORM      Filename: C:\Users\FPetkovski\AppData\
                  ata\Local\Temp\
                  eacd415e-8ceb-438b-a348-aa4b2932daf2\04ae4d25
Ptotal= 55.10 mm      Comments: SCS_06hr_005yr
-----

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	0.00	1.75	5.51	3.50	12.12	5.25	2.20
0.25	2.20	2.00	5.51	3.75	5.51	5.50	2.20
0.50	2.20	2.25	6.61	4.00	5.51	5.75	2.20
0.75	3.31	2.50	6.61	4.25	4.41	6.00	2.20
1.00	3.31	2.75	33.06	4.50	4.41		
1.25	3.31	3.00	85.96	4.75	3.31		
1.50	3.31	3.25	12.12	5.00	3.31		

```

-----
CALIB
NASHYD ( 0101)      Area (ha)= 26.05      Curve Number (CN)= 81.0
ID= 1 DT= 5.0 min      Ia (mm)= 7.40      # of Linear Res. (N)= 3.00
U.H. Tp(hrs)= 0.78
-----

```

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      1.667 3.31      3.250 85.96      4.83 3.31
0.167 0.00      1.750 3.31      3.333 12.12      4.92 3.31
0.250 0.00      1.833 5.51      3.417 12.12      5.00 3.31
0.333 2.20      1.917 5.51      3.500 12.12      5.08 3.31
0.417 2.20      2.000 5.51      3.583 12.12      5.17 3.31
0.500 2.20      2.083 5.51      3.667 12.12      5.25 3.31
0.583 2.20      2.167 5.51      3.750 12.12      5.33 2.20
0.667 2.20      2.250 5.51      3.833 5.51      5.42 2.20
0.750 2.20      2.333 6.61      3.917 5.51      5.50 2.20
0.833 3.31      2.417 6.61      4.000 5.51      5.58 2.20
0.917 3.31      2.500 6.61      4.083 5.51      5.67 2.20
1.000 3.31      2.583 6.61      4.167 5.51      5.75 2.20
1.083 3.31      2.667 6.61      4.250 5.51      5.83 2.20
1.167 3.31      2.750 6.61      4.333 4.41      5.92 2.20
1.250 3.31      2.833 33.06      4.417 4.41      6.00 2.20
1.333 3.31      2.917 33.06      4.500 4.41      6.08 2.20
1.417 3.31      3.000 33.06      4.583 4.41      6.17 2.20
1.500 3.31      3.083 85.96      4.667 4.41      6.25 2.20
1.583 3.31      3.167 85.96      4.750 4.41

```

Unit Hyd Qpeak (cms) = 1.276

PEAK FLOW (cms) = 0.721 (i)
 TIME TO PEAK (hrs) = 4.000
 RUNOFF VOLUME (mm) = 21.209
 TOTAL RAINFALL (mm) = 55.100
 RUNOFF COEFFICIENT = 0.385

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

CALIB NASHYD (0204) ID= 1 DT= 5.0 min	Area (ha)= 6.27 Ia (mm)= 6.00 U.H. Tp(hrs)= 0.63	Curve Number (CN)= 67.0 # of Linear Res. (N)= 3.00
--	--	---

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	1.667	3.31	3.250	85.96	4.83	3.31
0.167	0.00	1.750	3.31	3.333	12.12	4.92	3.31
0.250	0.00	1.833	5.51	3.417	12.12	5.00	3.31
0.333	2.20	1.917	5.51	3.500	12.12	5.08	3.31
0.417	2.20	2.000	5.51	3.583	12.12	5.17	3.31
0.500	2.20	2.083	5.51	3.667	12.12	5.25	3.31
0.583	2.20	2.167	5.51	3.750	12.12	5.33	2.20
0.667	2.20	2.250	5.51	3.833	5.51	5.42	2.20
0.750	2.20	2.333	6.61	3.917	5.51	5.50	2.20
0.833	3.31	2.417	6.61	4.000	5.51	5.58	2.20
0.917	3.31	2.500	6.61	4.083	5.51	5.67	2.20
1.000	3.31	2.583	6.61	4.167	5.51	5.75	2.20
1.083	3.31	2.667	6.61	4.250	5.51	5.83	2.20
1.167	3.31	2.750	6.61	4.333	4.41	5.92	2.20
1.250	3.31	2.833	33.06	4.417	4.41	6.00	2.20
1.333	3.31	2.917	33.06	4.500	4.41	6.08	2.20
1.417	3.31	3.000	33.06	4.583	4.41	6.17	2.20
1.500	3.31	3.083	85.96	4.667	4.41	6.25	2.20
1.583	3.31	3.167	85.96	4.750	4.41		

Unit Hyd Qpeak (cms) = 0.380

PEAK FLOW (cms) = 0.129 (i)
 TIME TO PEAK (hrs) = 3.833
 RUNOFF VOLUME (mm) = 13.838
 TOTAL RAINFALL (mm) = 55.100
 RUNOFF COEFFICIENT = 0.251

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

CALIB STANDHYD (0201) ID= 1 DT= 5.0 min	Area (ha)= 7.34 Total Imp(%)= 50.00 Dir. Conn.(%)= 35.00
--	--

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	3.67	3.67
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	0.50	2.00
Length (m)=	221.21	70.00
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	0.00	1.667	3.31	3.250	85.96	4.83	3.31
0.167	0.00	1.750	3.31	3.333	12.12	4.92	3.31
0.250	0.00	1.833	5.51	3.417	12.12	5.00	3.31
0.333	2.20	1.917	5.51	3.500	12.12	5.08	3.31
0.417	2.20	2.000	5.51	3.583	12.12	5.17	3.31
0.500	2.20	2.083	5.51	3.667	12.12	5.25	3.31
0.583	2.20	2.167	5.51	3.750	12.12	5.33	2.20
0.667	2.20	2.250	5.51	3.833	5.51	5.42	2.20
0.750	2.20	2.333	6.61	3.917	5.51	5.50	2.20
0.833	3.31	2.417	6.61	4.000	5.51	5.58	2.20
0.917	3.31	2.500	6.61	4.083	5.51	5.67	2.20
1.000	3.31	2.583	6.61	4.167	5.51	5.75	2.20
1.083	3.31	2.667	6.61	4.250	5.51	5.83	2.20
1.167	3.31	2.750	6.61	4.333	4.41	5.92	2.20
1.250	3.31	2.833	33.06	4.417	4.41	6.00	2.20
1.333	3.31	2.917	33.06	4.500	4.41	6.08	2.20
1.417	3.31	3.000	33.06	4.583	4.41	6.17	2.20
1.500	3.31	3.083	85.96	4.667	4.41	6.25	2.20
1.583	3.31	3.167	85.96	4.750	4.41		

Max.Eff.Inten.(mm/hr)= 85.96 42.84
 over (min) 5.00 20.00
 Storage Coeff. (min)= 5.38 (ii) 19.24 (ii)
 Unit Hyd. Tpeak (min)= 5.00 20.00
 Unit Hyd. peak (cms)= 0.21 0.06

TOTALS
 PEAK FLOW (cms)= 0.59 0.22 0.733 (iii)
 TIME TO PEAK (hrs)= 3.25 3.42 3.25
 RUNOFF VOLUME (mm)= 54.10 18.34 30.86
 TOTAL RAINFALL (mm)= 55.10 55.10 55.10
 RUNOFF COEFFICIENT = 0.98 0.33 0.56

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

CALIB STANDHYD (0203) ID= 1 DT= 5.0 min	Area (ha)= 1.09 Total Imp(%)= 50.00 Dir. Conn.(%)= 50.00
--	--

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.55	0.55
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	0.50	2.00
Length (m)=	85.24	70.00
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	0.00	1.667	3.31	3.250	85.96	4.83	3.31
0.167	0.00	1.750	3.31	3.333	12.12	4.92	3.31
0.250	0.00	1.833	5.51	3.417	12.12	5.00	3.31
0.333	2.20	1.917	5.51	3.500	12.12	5.08	3.31
0.417	2.20	2.000	5.51	3.583	12.12	5.17	3.31
0.500	2.20	2.083	5.51	3.667	12.12	5.25	3.31
0.583	2.20	2.167	5.51	3.750	12.12	5.33	2.20
0.667	2.20	2.250	5.51	3.833	5.51	5.42	2.20
0.750	2.20	2.333	6.61	3.917	5.51	5.50	2.20
0.833	3.31	2.417	6.61	4.000	5.51	5.58	2.20

0.917	3.31	2.500	6.61	4.083	5.51	5.67	2.20
1.000	3.31	2.583	6.61	4.167	5.51	5.75	2.20
1.083	3.31	2.667	6.61	4.250	5.51	5.83	2.20
1.167	3.31	2.750	6.61	4.333	4.41	5.92	2.20
1.250	3.31	2.833	33.06	4.417	4.41	6.00	2.20
1.333	3.31	2.917	33.06	4.500	4.41	6.08	2.20
1.417	3.31	3.000	33.06	4.583	4.41	6.17	2.20
1.500	3.31	3.083	85.96	4.667	4.41	6.25	2.20
1.583	3.31	3.167	85.96	4.750	4.41		
Max.Eff.Inten.(mm/hr)= 85.96 21.28							
over (min) 5.00 25.00							
Storage Coeff. (min)= 3.04 (ii) 21.37 (ii)							
Unit Hyd. Tpeak (min)= 5.00 25.00							
Unit Hyd. peak (cms)= 0.27 0.05							
TOTALS							
PEAK FLOW (cms)= 0.13 0.02 0.139 (iii)							
TIME TO PEAK (hrs)= 3.25 3.50 3.25							
RUNOFF VOLUME (mm)= 54.10 14.80 34.44							
TOTAL RAINFALL (mm)= 55.10 55.10 55.10							
RUNOFF COEFFICIENT = 0.98 0.27 0.62							

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

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

CALIB			
STANDHYD (0202)			
ID= 1 DT= 5.0 min			
Area (ha)= 11.35			
Total Imp(%)= 50.00 Dir. Conn.(%)= 35.00			
IMPERVIOUS PVIOUS (i)			
Surface Area (ha)=	5.68	5.68	
Dep. Storage (mm)=	1.00	5.00	
Average Slope (%)=	0.50	2.00	
Length (m)=	275.08	70.00	
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	0.00	1.667	3.31	3.250	85.96	4.83	3.31
0.167	0.00	1.750	3.31	3.333	12.12	4.92	3.31
0.250	0.00	1.833	5.51	3.417	12.12	5.00	3.31
0.333	2.20	1.917	5.51	3.500	12.12	5.08	3.31
0.417	2.20	2.000	5.51	3.583	12.12	5.17	3.31
0.500	2.20	2.083	5.51	3.667	12.12	5.25	3.31
0.583	2.20	2.167	5.51	3.750	12.12	5.33	2.20
0.667	2.20	2.250	5.51	3.833	5.51	5.42	2.20
0.750	2.20	2.333	6.61	3.917	5.51	5.50	2.20
0.833	3.31	2.417	6.61	4.000	5.51	5.58	2.20
0.917	3.31	2.500	6.61	4.083	5.51	5.67	2.20
1.000	3.31	2.583	6.61	4.167	5.51	5.75	2.20
1.083	3.31	2.667	6.61	4.250	5.51	5.83	2.20
1.167	3.31	2.750	6.61	4.333	4.41	5.92	2.20
1.250	3.31	2.833	33.06	4.417	4.41	6.00	2.20
1.333	3.31	2.917	33.06	4.500	4.41	6.08	2.20
1.417	3.31	3.000	33.06	4.583	4.41	6.17	2.20
1.500	3.31	3.083	85.96	4.667	4.41	6.25	2.20
1.583	3.31	3.167	85.96	4.750	4.41		

Max.Eff.Inten. (mm/hr)= 85.96 42.84

over (min)	5.00	20.00	
Storage Coeff. (min)=	6.13 (ii)	19.99 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	0.19	0.06	
TOTALS			
PEAK FLOW (cms)=	0.90	0.33	1.112 (iii)
TIME TO PEAK (hrs)=	3.25	3.50	3.25
RUNOFF VOLUME (mm)=	54.10	18.34	30.86
TOTAL RAINFALL (mm)=	55.10	55.10	55.10
RUNOFF COEFFICIENT =	0.98	0.33	0.56

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

ADD HYD (0001)					
1 + 2 = 3					
	AREA	QPEAK	TPEAK	R.V.	
	(ha)	(cms)	(hrs)	(mm)	
ID1= 1 (0201):	7.34	0.733	3.25	30.86	
+ ID2= 2 (0202):	11.35	1.112	3.25	30.86	
=====					
ID = 3 (0001):	18.69	1.845	3.25	30.86	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0001)					
3 + 2 = 1					
	AREA	QPEAK	TPEAK	R.V.	
	(ha)	(cms)	(hrs)	(mm)	
ID1= 3 (0001):	18.69	1.845	3.25	30.86	
+ ID2= 2 (0203):	1.09	0.139	3.25	34.44	
=====					
ID = 1 (0001):	19.78	1.984	3.25	31.06	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0002)					
IN= 2---> OUT= 1					
DI= 5.0 min					
OVERFLOW IS OFF					
	OUTFLOW	STORAGE	OUTFLOW	STORAGE	
	(cms)	(ha.m.)	(cms)	(ha.m.)	
	0.0000	0.0000	0.4415	0.4502	
	0.0090	0.0511	0.6651	0.5039	
	0.0131	0.0876	0.9062	0.5593	
	0.0162	0.1261	1.0427	0.6168	
	0.0188	0.1666	1.1630	0.6766	
	0.0210	0.2091	1.2719	0.7386	
	0.0231	0.2535	1.3720	0.8030	
	0.0250	0.3000	1.4653	0.8690	
	0.1059	0.3483	2.6092	0.9380	
	0.2524	0.3984	4.6233	1.0080	

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0001)	19.780	1.984	3.25	31.06
OUTFLOW: ID= 1 (0002)	19.780	0.318	4.17	30.98

PEAK FLOW REDUCTION [Qout/Qin](%)= 16.04
TIME SHIFT OF PEAK FLOW (min)= 55.00
MAXIMUM STORAGE USED (ha.m.)= 0.4165

CALIB			
NASHVD (0101)	Area (ha)=	26.05	Curve Number (CN)= 81.0
ID= 1 DT= 5.0 min	Ia (mm)=	7.40	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.78	

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

--- TRANSFORMED HYPOTHEGRAPH ---							
TIME	RAIN	TIME	RAIN	TIME	RAIN		
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr		
0.083	0.00	1.667	3.96	3.250	102.96	4.83	3.96
0.167	0.00	1.750	3.96	3.333	14.52	4.92	3.96
0.250	0.00	1.833	6.60	3.417	14.52	5.00	3.96
0.333	2.64	1.917	6.60	3.500	14.52	5.08	3.96
0.417	2.64	2.000	6.60	3.583	14.52	5.17	3.96
0.500	2.64	2.083	6.60	3.667	14.52	5.25	3.96
0.583	2.64	2.167	6.60	3.750	14.52	5.33	2.64
0.667	2.64	2.250	6.60	3.833	6.60	5.42	2.64
0.750	2.64	2.333	7.92	3.917	6.60	5.50	2.64
0.833	3.96	2.417	7.92	4.000	6.60	5.58	2.64
0.917	3.96	2.500	7.92	4.083	6.60	5.67	2.64
1.000	3.96	2.583	7.92	4.167	6.60	5.75	2.64
1.083	3.96	2.667	7.92	4.250	6.60	5.83	2.64
1.167	3.96	2.750	7.92	4.333	5.28	5.92	2.64
1.250	3.96	2.833	39.60	4.417	5.28	6.00	2.64
1.333	3.96	2.917	39.60	4.500	5.28	6.08	2.64
1.417	3.96	3.000	39.60	4.583	5.28	6.17	2.64
1.500	3.96	3.083	102.96	4.667	5.28	6.25	2.64
1.583	3.96	3.167	102.96	4.750	5.28		

```

Unit Hyd Qpeak      (cms)=      1.276
PEAK FLOW           (cms)=      1.001 (i)
TIME TO PEAK        (hrs)=      4.000
RUNOFF VOLUME       (mm)=      29.057
TOTAL RAINFALL      (mm)=      66.000
RUNOFF COEFFICIENT  =      0.440

```

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

DATE: 03-31-2026 TIME: 04:33:41

USER:

COMMENTS:

```
*****
** SIMULATION : SCS_06hr_010yr          **
*****
```

READ STORM	Filename: C:\Users\FPetkovski\AppData Local\Temp\
Ptotal= 66.00 mm	Comments: SCS 06hr 010yr

CALIB			
NASHYD (0204)	Area (ha)=	6.27	Curve Number (CN)= 67.0
ID= 1 DT= 5.0 min	Ia (mm)=	6.00	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.63	

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	1.667	3.96	3.250	102.96	4.83	3.96
0.167	0.00	1.750	3.96	3.333	14.52	4.92	3.96
0.250	0.00	1.833	6.60	3.417	14.52	5.00	3.96
0.333	2.64	1.917	6.60	3.500	14.52	5.08	3.96
0.417	2.64	2.000	6.60	3.583	14.52	5.17	3.96
0.500	2.64	2.083	6.60	3.667	14.52	5.25	3.96
0.583	2.64	2.167	6.60	3.750	14.52	5.33	2.64
0.667	2.64	2.250	6.60	3.833	6.60	5.42	2.64
0.750	2.64	2.333	7.92	3.917	6.60	5.50	2.64
0.833	3.96	2.417	7.92	4.000	6.60	5.58	2.64
0.917	3.96	2.500	7.92	4.083	6.60	5.67	2.64
1.000	3.96	2.583	7.92	4.167	6.60	5.75	2.64

1.083	3.96	2.667	7.92	4.250	6.60	5.83	2.64
1.167	3.96	2.750	7.92	4.333	5.28	5.92	2.64
1.250	3.96	2.833	39.60	4.417	5.28	6.00	2.64
1.333	3.96	2.917	39.60	4.500	5.28	6.08	2.64
1.417	3.96	3.000	39.60	4.583	5.28	6.17	2.64
1.500	3.96	3.083	102.96	4.667	5.28	6.25	2.64
1.583	3.96	3.167	102.96	4.750	5.28		

Unit Hyd Qpeak (cms)= 0.380

PEAK FLOW (cms)= 0.184 (i)

TIME TO PEAK (hrs)= 3.833

RUNOFF VOLUME (mm)= 19.448

TOTAL RAINFALL (mm)= 66.000

RUNOFF COEFFICIENT = 0.295

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

CALIB							
STANDHYD (0201)	Area (ha)=	7.34					
ID= 1 DT= 5.0 min	Total Imp(%)=	50.00	Dir. Conn.(%)=	35.00			

		IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	3.67	3.67	
Dep. Storage (mm)=	1.00	5.00	
Average Slope (%)=	0.50	2.00	
Length (m)=	221.21	70.00	
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	0.00	1.667	3.96	3.250	102.96	4.83	3.96
0.167	0.00	1.750	3.96	3.333	14.52	4.92	3.96
0.250	0.00	1.833	6.60	3.417	14.52	5.00	3.96
0.333	2.64	1.917	6.60	3.500	14.52	5.08	3.96
0.417	2.64	2.000	6.60	3.583	14.52	5.17	3.96
0.500	2.64	2.083	6.60	3.667	14.52	5.25	3.96
0.583	2.64	2.167	6.60	3.750	14.52	5.33	2.64
0.667	2.64	2.250	6.60	3.833	6.60	5.42	2.64
0.750	2.64	2.333	7.92	3.917	6.60	5.50	2.64
0.833	3.96	2.417	7.92	4.000	6.60	5.58	2.64
0.917	3.96	2.500	7.92	4.083	6.60	5.67	2.64
1.000	3.96	2.583	7.92	4.167	6.60	5.75	2.64
1.083	3.96	2.667	7.92	4.250	6.60	5.83	2.64
1.167	3.96	2.750	7.92	4.333	5.28	5.92	2.64
1.250	3.96	2.833	39.60	4.417	5.28	6.00	2.64
1.333	3.96	2.917	39.60	4.500	5.28	6.08	2.64
1.417	3.96	3.000	39.60	4.583	5.28	6.17	2.64
1.500	3.96	3.083	102.96	4.667	5.28	6.25	2.64
1.583	3.96	3.167	102.96	4.750	5.28		

Max.Eff.Inten.(mm/hr)=	102.96	58.73
over (min)	5.00	20.00
Storage Coeff. (min)=	5.01 (ii)	17.22 (ii)
Unit Hyd. Tpeak (min)=	5.00	20.00
Unit Hyd. peak (cms)=	0.21	0.06

PEAK FLOW (cms)=	0.71	0.32	*TOTALS*
TIME TO PEAK (hrs)=	3.25	3.42	0.925 (iii)
RUNOFF VOLUME (mm)=	65.00	25.07	39.04
TOTAL RAINFALL (mm)=	66.00	66.00	66.00
RUNOFF COEFFICIENT =	0.98	0.38	0.59

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

CALIB							
STANDHYD (0203)	Area (ha)=	1.09					
ID= 1 DT= 5.0 min	Total Imp(%)=	50.00	Dir. Conn.(%)=	50.00			

		IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.55	0.55	
Dep. Storage (mm)=	1.00	5.00	
Average Slope (%)=	0.50	2.00	
Length (m)=	85.24	70.00	
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	0.00	1.667	3.96	3.250	102.96	4.83	3.96
0.167	0.00	1.750	3.96	3.333	14.52	4.92	3.96
0.250	0.00	1.833	6.60	3.417	14.52	5.00	3.96
0.333	2.64	1.917	6.60	3.500	14.52	5.08	3.96
0.417	2.64	2.000	6.60	3.583	14.52	5.17	3.96
0.500	2.64	2.083	6.60	3.667	14.52	5.25	3.96
0.583	2.64	2.167	6.60	3.750	14.52	5.33	2.64
0.667	2.64	2.250	6.60	3.833	6.60	5.42	2.64
0.750	2.64	2.333	7.92	3.917	6.60	5.50	2.64
0.833	3.96	2.417	7.92	4.000	6.60	5.58	2.64
0.917	3.96	2.500	7.92	4.083	6.60	5.67	2.64
1.000	3.96	2.583	7.92	4.167	6.60	5.75	2.64
1.083	3.96	2.667	7.92	4.250	6.60	5.83	2.64
1.167	3.96	2.750	7.92	4.333	5.28	5.92	2.64
1.250	3.96	2.833	39.60	4.417	5.28	6.00	2.64
1.333	3.96	2.917	39.60	4.500	5.28	6.08	2.64
1.417	3.96	3.000	39.60	4.583	5.28	6.17	2.64
1.500	3.96	3.083	102.96	4.667	5.28	6.25	2.64
1.583	3.96	3.167	102.96	4.750	5.28		

Max.Eff.Inten.(mm/hr)=	102.96	36.95
over (min)	5.00	20.00
Storage Coeff. (min)=	2.82 (ii)	17.53 (ii)
Unit Hyd. Tpeak (min)=	5.00	20.00
Unit Hyd. peak (cms)=	0.28	0.06

PEAK FLOW (cms)=	0.16	0.03	*TOTALS*
TIME TO PEAK (hrs)=	3.25	3.42	0.175 (iii)
RUNOFF VOLUME (mm)=	65.00	20.61	42.80
TOTAL RAINFALL (mm)=	66.00	66.00	66.00
RUNOFF COEFFICIENT =	0.98	0.31	0.65

***** 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.

CALIB							
STANDHYD (0202)	Area (ha)=	11.35					
ID= 1 DT= 5.0 min	Total Imp(%)=	50.00	Dir. Conn.(%)=	35.00			

```

-----
Surface Area      (ha)=      5.68      5.68
Dep. Storage      (mm)=      1.00      5.00
Average Slope      (%)=      0.50      2.00
Length            (m)=     275.08     70.00
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 0.00    1.667 3.96    3.250 102.96    4.83 3.96
0.167 0.00    1.750 3.96    3.333 14.52    4.92 3.96
0.250 0.00    1.833 6.60    3.417 14.52    5.00 3.96
0.333 2.64    1.917 6.60    3.500 14.52    5.08 3.96
0.417 2.64    2.000 6.60    3.583 14.52    5.17 3.96
0.500 2.64    2.083 6.60    3.667 14.52    5.25 3.96
0.583 2.64    2.167 6.60    3.750 14.52    5.33 2.64
0.667 2.64    2.250 6.60    3.833 6.60    5.42 2.64
0.750 2.64    2.333 7.92    3.917 6.60    5.50 2.64
0.833 3.96    2.417 7.92    4.000 6.60    5.58 2.64
0.917 3.96    2.500 7.92    4.083 6.60    5.67 2.64
1.000 3.96    2.583 7.92    4.167 6.60    5.75 2.64
1.083 3.96    2.667 7.92    4.250 6.60    5.83 2.64
1.167 3.96    2.750 7.92    4.333 5.28    5.92 2.64
1.250 3.96    2.833 39.60    4.417 5.28    6.00 2.64
1.333 3.96    2.917 39.60    4.500 5.28    6.08 2.64
1.417 3.96    3.000 39.60    4.583 5.28    6.17 2.64
1.500 3.96    3.083 102.96    4.667 5.28    6.25 2.64
1.583 3.96    3.167 102.96    4.750 5.28

```

```

Max.Eff.Inten.(mm/hr)= 102.96      58.73
over (min)            = 5.00      20.00
Storage Coeff. (min)= 5.71 (ii) 17.92 (ii)
Unit Hyd. Tpeak (min)= 5.00      20.00
Unit Hyd. peak (cms)= 0.20      0.06

```

```

*TOTALS*
PEAK FLOW (cms)= 1.08      0.49      1.407 (iii)
TIME TO PEAK (hrs)= 3.25      3.42      3.25
RUNOFF VOLUME (mm)= 65.00      25.07      39.04
TOTAL RAINFALL (mm)= 66.00      66.00      66.00
RUNOFF COEFFICIENT = 0.98      0.38      0.59

```

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

```

-----
ADD HYD ( 0001)
1 + 2 = 3
AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
ID1= 1 ( 0201): 7.34 0.925 3.25 39.04
+ ID2= 2 ( 0202): 11.35 1.407 3.25 39.04
=====
ID = 3 ( 0001): 18.69 2.332 3.25 39.04

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
ADD HYD ( 0001)
3 + 2 = 1
AREA QPEAK TPEAK R.V.

```

```

-----
(ha) (cms) (hrs) (mm)
ID1= 3 ( 0001): 18.69 2.332 3.25 39.04
+ ID2= 2 ( 0203): 1.09 0.175 3.25 42.80
=====
ID = 1 ( 0001): 19.78 2.507 3.25 39.25

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
RESERVOIR( 0002)
IN= 2---> OUT= 1
DT= 5.0 min
OVERFLOW IS OFF
OUTFLOW STORAGE | OUTFLOW STORAGE
(cms) (ha.m.) | (cms) (ha.m.)
0.0000 0.0000 | 0.4415 0.4502
0.0090 0.0511 | 0.6651 0.5039
0.0131 0.0876 | 0.9062 0.5593
0.0162 0.1261 | 1.0427 0.6168
0.0188 0.1666 | 1.1630 0.6766
0.0210 0.2091 | 1.2719 0.7386
0.0231 0.2535 | 1.3720 0.8030
0.0250 0.3000 | 1.4653 0.8690
0.1059 0.3483 | 2.6092 0.9380
0.2524 0.3984 | 4.6233 1.0080
AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
INFLOW : ID= 2 ( 0001) 19.780 2.507 3.25 39.25
OUTFLOW: ID= 1 ( 0002) 19.780 0.565 3.92 39.18
PEAK FLOW REDUCTION [Qout/Qin] (%) = 22.53
TIME SHIFT OF PEAK FLOW (min) = 40.00
MAXIMUM STORAGE USED (ha.m.) = 0.4800

```

```

-----
ADD HYD ( 0020)
1 + 2 = 3
AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
ID1= 1 ( 0002): 19.78 0.565 3.92 39.18
+ ID2= 2 ( 0204): 6.27 0.184 3.83 19.45
=====
ID = 3 ( 0020): 26.05 0.748 3.92 34.43

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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V V I SSSS U U A L (v 6.2.2019)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLL

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OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y MM MM O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

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

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
Output filename: C:\Users\FPetkovski\AppData\Local\Civica\VH5\ld605a61-9146-4ab0-blab-422fd6022bab\b35dfdb1-e5c4-4f95-a1e8-6c2d1ce02dc9\s

Summary filename: C:\Users\FPetkovski\AppData\Local\Civica\XH5\1d605a61-9146-4ab0-b1ab-422fd6022bab\b35dfdb1-e5c4-4f95-a1e8-6c2d1ce02dc9\s

DATE: 03-31-2026

TIME: 04:33:41

USER:

COMMENTS: _____

** SIMULATION : SCS_06hr_025yr

READ STORM		Filename: C:\Users\FPetkovski\AppData\Local\Temp\	
Ptotal= 79.60 mm		eacd415e-8ceb-438b-a348-aa4b2932daf2\93ebd4b6	
		Comments: SCS_06hr_025yr	
TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr
0.00	0.00	1.75	7.96
0.25	3.18	2.00	7.96
0.50	3.18	2.25	9.55
0.75	4.78	2.50	9.55
1.00	4.78	2.75	47.76
1.25	4.78	3.00	124.18
1.50	4.78	3.25	17.51

CALIB		Area (ha)= 26.05	
NASHYD (0101)		Curve Number (CN)= 81.0	
ID= 1 DT= 5.0 min		# of Linear Res. (N)= 3.00	
		U.H. Tp(hrs)= 0.78	

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

--- TRANSFORMED HYETOGRAPH ---			
TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	4.78
0.167	0.00	1.750	4.78
0.250	0.00	1.833	7.96
0.333	3.18	1.917	7.96
0.417	3.18	2.000	7.96
0.500	3.18	2.083	7.96
0.583	3.18	2.167	7.96
0.667	3.18	2.250	7.96
0.750	3.18	2.333	9.55
0.833	4.78	2.417	9.55
0.917	4.78	2.500	9.55
1.000	4.78	2.583	9.55
1.083	4.78	2.667	9.55
1.167	4.78	2.750	9.55
1.250	4.78	2.833	47.76
1.333	4.78	2.917	47.76
1.417	4.78	3.000	47.76
1.500	4.78	3.083	124.18
1.583	4.78	3.167	124.18

Unit Hyd Qpeak (cms) = 1.276

PEAK FLOW (cms) = 1.377 (i)
TIME TO PEAK (hrs) = 4.000
RUNOFF VOLUME (mm) = 39.557
TOTAL RAINFALL (mm) = 79.600
RUNOFF COEFFICIENT = 0.497

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

CALIB		Area (ha)= 6.27	
NASHYD (0204)		Curve Number (CN)= 67.0	
ID= 1 DT= 5.0 min		# of Linear Res. (N)= 3.00	
		U.H. Tp(hrs)= 0.63	

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

--- TRANSFORMED HYETOGRAPH ---			
TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	4.78
0.167	0.00	1.750	4.78
0.250	0.00	1.833	7.96
0.333	3.18	1.917	7.96
0.417	3.18	2.000	7.96
0.500	3.18	2.083	7.96
0.583	3.18	2.167	7.96
0.667	3.18	2.250	7.96
0.750	3.18	2.333	9.55
0.833	4.78	2.417	9.55
0.917	4.78	2.500	9.55
1.000	4.78	2.583	9.55
1.083	4.78	2.667	9.55
1.167	4.78	2.750	9.55
1.250	4.78	2.833	47.76
1.333	4.78	2.917	47.76
1.417	4.78	3.000	47.76
1.500	4.78	3.083	124.18
1.583	4.78	3.167	124.18

Unit Hyd Qpeak (cms) = 0.380

PEAK FLOW (cms) = 0.260 (i)
TIME TO PEAK (hrs) = 3.833
RUNOFF VOLUME (mm) = 27.261
TOTAL RAINFALL (mm) = 79.600
RUNOFF COEFFICIENT = 0.342

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

CALIB		Area (ha)= 7.34	
STANDHYD (0201)		Dir. Conn. (%) = 35.00	
ID= 1 DT= 5.0 min			

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	3.67	3.67
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	0.50	2.00
Length	(m)=	221.21	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	1.667	4.78	3.250	124.18	4.83	4.78
0.167	0.00	1.750	4.78	3.333	17.51	4.92	4.78
0.250	0.00	1.833	7.96	3.417	17.51	5.00	4.78
0.333	3.18	1.917	7.96	3.500	17.51	5.08	4.78
0.417	3.18	2.000	7.96	3.583	17.51	5.17	4.78
0.500	3.18	2.083	7.96	3.667	17.51	5.25	4.78
0.583	3.18	2.167	7.96	3.750	17.51	5.33	3.18
0.667	3.18	2.250	7.96	3.833	7.96	5.42	3.18
0.750	3.18	2.333	9.55	3.917	7.96	5.50	3.18
0.833	4.78	2.417	9.55	4.000	7.96	5.58	3.18
0.917	4.78	2.500	9.55	4.083	7.96	5.67	3.18
1.000	4.78	2.583	9.55	4.167	7.96	5.75	3.18
1.083	4.78	2.667	9.55	4.250	7.96	5.83	3.18
1.167	4.78	2.750	9.55	4.333	6.37	5.92	3.18
1.250	4.78	2.833	47.76	4.417	6.37	6.00	3.18
1.333	4.78	2.917	47.76	4.500	6.37	6.08	3.18
1.417	4.78	3.000	47.76	4.583	6.37	6.17	3.18
1.500	4.78	3.083	124.18	4.667	6.37	6.25	3.18
1.583	4.78	3.167	124.18	4.750	6.37	6.25	3.18

Max.Eff.Inten.(mm/hr)=	124.18	80.38
over (min)	5.00	20.00
Storage Coeff. (min)=	4.64 (ii)	15.42 (ii)
Unit Hyd. Tpeak (min)=	5.00	20.00
Unit Hyd. peak (cms)=	0.22	0.07

PEAK FLOW (cms)=	0.86	0.47	1.181 (iii)
TIME TO PEAK (hrs)=	3.25	3.42	3.25
RUNOFF VOLUME (mm)=	78.60	34.22	49.75
TOTAL RAINFALL (mm)=	79.60	79.60	79.60
RUNOFF COEFFICIENT =	0.99	0.43	0.63

***** 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.

CALIB STANDHYD (0203) ID= 1 DT= 5.0 min	Area (ha)= 1.09 Total Imp(%)= 50.00 Dir. Conn.(%)= 50.00
--	--

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.55	0.55
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	0.50	2.00
Length (m)=	85.24	70.00
Mannings n	0.013	0.250

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

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.667	4.78	3.250	124.18	4.83	4.78
0.167	0.00	1.750	4.78	3.333	17.51	4.92	4.78
0.250	0.00	1.833	7.96	3.417	17.51	5.00	4.78
0.333	3.18	1.917	7.96	3.500	17.51	5.08	4.78
0.417	3.18	2.000	7.96	3.583	17.51	5.17	4.78
0.500	3.18	2.083	7.96	3.667	17.51	5.25	4.78
0.583	3.18	2.167	7.96	3.750	17.51	5.33	3.18
0.667	3.18	2.250	7.96	3.833	7.96	5.42	3.18
0.750	3.18	2.333	9.55	3.917	7.96	5.50	3.18

0.833	4.78	2.417	9.55	4.000	7.96	5.58	3.18
0.917	4.78	2.500	9.55	4.083	7.96	5.67	3.18
1.000	4.78	2.583	9.55	4.167	7.96	5.75	3.18
1.083	4.78	2.667	9.55	4.250	7.96	5.83	3.18
1.167	4.78	2.750	9.55	4.333	6.37	5.92	3.18
1.250	4.78	2.833	47.76	4.417	6.37	6.00	3.18
1.333	4.78	2.917	47.76	4.500	6.37	6.08	3.18
1.417	4.78	3.000	47.76	4.583	6.37	6.17	3.18
1.500	4.78	3.083	124.18	4.667	6.37	6.25	3.18
1.583	4.78	3.167	124.18	4.750	6.37	6.25	3.18

Max.Eff.Inten.(mm/hr)=	124.18	51.60
over (min)	5.00	20.00
Storage Coeff. (min)=	2.62 (ii)	15.49 (ii)
Unit Hyd. Tpeak (min)=	5.00	20.00
Unit Hyd. peak (cms)=	0.29	0.07

PEAK FLOW (cms)=	0.19	0.04	0.217 (iii)
TIME TO PEAK (hrs)=	3.25	3.42	3.25
RUNOFF VOLUME (mm)=	78.60	28.67	53.63
TOTAL RAINFALL (mm)=	79.60	79.60	79.60
RUNOFF COEFFICIENT =	0.99	0.36	0.67

***** 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.

CALIB STANDHYD (0202) ID= 1 DT= 5.0 min	Area (ha)= 11.35 Total Imp(%)= 50.00 Dir. Conn.(%)= 35.00
--	---

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	5.68	5.68
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	0.50	2.00
Length (m)=	275.08	70.00
Mannings n	0.013	0.250

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

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.667	4.78	3.250	124.18	4.83	4.78
0.167	0.00	1.750	4.78	3.333	17.51	4.92	4.78
0.250	0.00	1.833	7.96	3.417	17.51	5.00	4.78
0.333	3.18	1.917	7.96	3.500	17.51	5.08	4.78
0.417	3.18	2.000	7.96	3.583	17.51	5.17	4.78
0.500	3.18	2.083	7.96	3.667	17.51	5.25	4.78
0.583	3.18	2.167	7.96	3.750	17.51	5.33	3.18
0.667	3.18	2.250	7.96	3.833	7.96	5.42	3.18
0.750	3.18	2.333	9.55	3.917	7.96	5.50	3.18
0.833	4.78	2.417	9.55	4.000	7.96	5.58	3.18
0.917	4.78	2.500	9.55	4.083	7.96	5.67	3.18
1.000	4.78	2.583	9.55	4.167	7.96	5.75	3.18
1.083	4.78	2.667	9.55	4.250	7.96	5.83	3.18
1.167	4.78	2.750	9.55	4.333	6.37	5.92	3.18
1.250	4.78	2.833	47.76	4.417	6.37	6.00	3.18
1.333	4.78	2.917	47.76	4.500	6.37	6.08	3.18
1.417	4.78	3.000	47.76	4.583	6.37	6.17	3.18
1.500	4.78	3.083	124.18	4.667	6.37	6.25	3.18
1.583	4.78	3.167	124.18	4.750	6.37	6.25	3.18

```

Max.Eff.Inten.(mm/hr)= 124.18      80.38
                    over (min)      5.00      20.00
Storage Coeff. (min)= 5.29 (ii)    16.07 (ii)
Unit Hyd. Tpeak (min)= 5.00      20.00
Unit Hyd. peak (cms)= 0.21      0.06

*TOTALS*
PEAK FLOW (cms)= 1.32      0.71      1.799 (iii)
TIME TO PEAK (hrs)= 3.25      3.42      3.25
RUNOFF VOLUME (mm)= 78.60      34.22      49.75
TOTAL RAINFALL (mm)= 79.60      79.60      79.60
RUNOFF COEFFICIENT = 0.99      0.43      0.63

```

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

```

-----
| ADD HYD ( 0001) |
| 1 + 2 = 3 |
-----
          AREA   QPEAK   TPEAK   R.V.
          (ha)   (cms)   (hrs)   (mm)
ID1= 1 ( 0201):  7.34  1.181  3.25  49.75
+ ID2= 2 ( 0202): 11.35  1.799  3.25  49.75
=====
ID = 3 ( 0001):  18.69  2.979  3.25  49.75

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0001) |
| 3 + 2 = 1 |
-----
          AREA   QPEAK   TPEAK   R.V.
          (ha)   (cms)   (hrs)   (mm)
ID1= 3 ( 0001):  18.69  2.979  3.25  49.75
+ ID2= 2 ( 0203):  1.09  0.217  3.25  53.63
=====
ID = 1 ( 0001):  19.78  3.196  3.25  49.97

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| RESERVOIR( 0002) |
| IN= 2----> OUT= 1 |
| DT= 5.0 min |
-----
OVERFLOW IS OFF

          OUTFLOW   STORAGE   OUTFLOW   STORAGE
          (cms)     (ha.m.)   (cms)     (ha.m.)
0.0000    0.0000    0.4415    0.4502
0.0090    0.0511    0.6651    0.5039
0.0131    0.0876    0.9062    0.5593
0.0162    0.1261    1.0427    0.6168
0.0188    0.1666    1.1630    0.6766
0.0210    0.2091    1.2719    0.7386
0.0231    0.2535    1.3720    0.8030
0.0250    0.3000    1.4653    0.8690
0.1059    0.3483    2.6092    0.9380
0.2524    0.3984    4.6233    1.0080

          AREA   QPEAK   TPEAK   R.V.
          (ha)   (cms)   (hrs)   (mm)
INFLOW : ID= 2 ( 0001) 19.780  3.196  3.25  49.97
OUTFLOW: ID= 1 ( 0002) 19.780  0.910  3.83  49.89

```

```

PEAK FLOW REDUCTION [Qout/Qin](%) = 28.47
TIME SHIFT OF PEAK FLOW (min) = 35.00
MAXIMUM STORAGE USED (ha.m.) = 0.5621

```

```

-----
| ADD HYD ( 0020) |
| 1 + 2 = 3 |
-----
          AREA   QPEAK   TPEAK   R.V.
          (ha)   (cms)   (hrs)   (mm)
ID1= 1 ( 0002):  19.78  0.910  3.83  49.89
+ ID2= 2 ( 0204):  6.27  0.260  3.83  27.26
=====
ID = 3 ( 0020):  26.05  1.170  3.83  44.45

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
V V I SSSS U U A L (v 6.2.2019)
V V I SS U U A A L
V V I SS U U A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLL

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y MM MM O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

```

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

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
 Output filename: C:\Users\FPetkovski\AppData\Local\Civica\XH5\ld605a61-9146-4ab0-blab-422fd6022bab\2622415c-ff12-4555-8704-26d49478add9\s
 Summary filename: C:\Users\FPetkovski\AppData\Local\Civica\XH5\ld605a61-9146-4ab0-blab-422fd6022bab\2622415c-ff12-4555-8704-26d49478add9\s

DATE: 03-31-2026

TIME: 04:33:41

USER:

COMMENTS:

```

*****
** SIMULATION : SCS_06hr_050yr **
*****

```

```

-----
| READ STORM |
| Ptotal= 89.80 mm |
-----
Filename: C:\Users\FPetkovski\AppData\Local\Temp\
          eacd415e-8ceb-438b-a348-aa4b2932daf2\72512e71
Comments: SCS_06hr_050yr

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	0.00	1.75	8.98	3.50	19.76	5.25	3.59
0.25	3.59	2.00	8.98	3.75	8.98	5.50	3.59
0.50	3.59	2.25	10.78	4.00	8.98	5.75	3.59
0.75	5.39	2.50	10.78	4.25	7.18	6.00	3.59
1.00	5.39	2.75	53.88	4.50	7.18		
1.25	5.39	3.00	140.09	4.75	5.39		

1.50 5.39 | 3.25 19.76 | 5.00 5.39 |

```

-----
CALIB
NASHYD ( 0101)
ID= 1 DT= 5.0 min
Area (ha)= 26.05 Curve Number (CN)= 81.0
Ia (mm)= 7.40 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.78

```

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 1.667 5.39 3.250 140.09 4.83 5.39
0.167 0.00 1.750 5.39 3.333 19.76 4.92 5.39
0.250 0.00 1.833 8.98 3.417 19.76 5.00 5.39
0.333 3.59 1.917 8.98 3.500 19.76 5.08 5.39
0.417 3.59 2.000 8.98 3.583 19.76 5.17 5.39
0.500 3.59 2.083 8.98 3.667 19.76 5.25 5.39
0.583 3.59 2.167 8.98 3.750 19.76 5.33 3.59
0.667 3.59 2.250 8.98 3.833 8.98 5.42 3.59
0.750 3.59 2.333 10.78 3.917 8.98 5.50 3.59
0.833 5.39 2.417 10.78 4.000 8.98 5.58 3.59
0.917 5.39 2.500 10.78 4.083 8.98 5.67 3.59
1.000 5.39 2.583 10.78 4.167 8.98 5.75 3.59
1.083 5.39 2.667 10.78 4.250 8.98 5.83 3.59
1.167 5.39 2.750 10.78 4.333 7.18 5.92 3.59
1.250 5.39 2.833 53.88 4.417 7.18 6.00 3.59
1.333 5.39 2.917 53.88 4.500 7.18 6.08 3.59
1.417 5.39 3.000 53.88 4.583 7.18 6.17 3.59
1.500 5.39 3.083 140.09 4.667 7.18 6.25 3.59
1.583 5.39 3.167 140.09 4.750 7.18

```

Unit Hyd Qpeak (cms)= 1.276

```

PEAK FLOW (cms)= 1.673 (i)
TIME TO PEAK (hrs)= 4.000
RUNOFF VOLUME (mm)= 47.823
TOTAL RAINFALL (mm)= 89.803
RUNOFF COEFFICIENT = 0.533

```

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

```

-----
CALIB
NASHYD ( 0204)
ID= 1 DT= 5.0 min
Area (ha)= 6.27 Curve Number (CN)= 67.0
Ia (mm)= 6.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.63

```

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 1.667 5.39 3.250 140.09 4.83 5.39
0.167 0.00 1.750 5.39 3.333 19.76 4.92 5.39
0.250 0.00 1.833 8.98 3.417 19.76 5.00 5.39
0.333 3.59 1.917 8.98 3.500 19.76 5.08 5.39
0.417 3.59 2.000 8.98 3.583 19.76 5.17 5.39
0.500 3.59 2.083 8.98 3.667 19.76 5.25 5.39
0.583 3.59 2.167 8.98 3.750 19.76 5.33 3.59
0.667 3.59 2.250 8.98 3.833 8.98 5.42 3.59
0.750 3.59 2.333 10.78 3.917 8.98 5.50 3.59
0.833 5.39 2.417 10.78 4.000 8.98 5.58 3.59
0.917 5.39 2.500 10.78 4.083 8.98 5.67 3.59

```

```

1.000 5.39 2.583 10.78 4.167 8.98 5.75 3.59
1.083 5.39 2.667 10.78 4.250 8.98 5.83 3.59
1.167 5.39 2.750 10.78 4.333 7.18 5.92 3.59
1.250 5.39 2.833 53.88 4.417 7.18 6.00 3.59
1.333 5.39 2.917 53.88 4.500 7.18 6.08 3.59
1.417 5.39 3.000 53.88 4.583 7.18 6.17 3.59
1.500 5.39 3.083 140.09 4.667 7.18 6.25 3.59
1.583 5.39 3.167 140.09 4.750 7.18

```

Unit Hyd Qpeak (cms)= 0.380

```

PEAK FLOW (cms)= 0.322 (i)
TIME TO PEAK (hrs)= 3.833
RUNOFF VOLUME (mm)= 33.616
TOTAL RAINFALL (mm)= 89.803
RUNOFF COEFFICIENT = 0.374

```

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

```

-----
CALIB
STANDHYD ( 0201)
ID= 1 DT= 5.0 min
Area (ha)= 7.34
Total Imp(%)= 50.00 Dir. Conn.(%)= 35.00

```

```

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 3.67 3.67
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 0.50 2.00
Length (m)= 221.21 70.00
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 0.00 1.667 5.39 3.250 140.09 4.83 5.39
0.167 0.00 1.750 5.39 3.333 19.76 4.92 5.39
0.250 0.00 1.833 8.98 3.417 19.76 5.00 5.39
0.333 3.59 1.917 8.98 3.500 19.76 5.08 5.39
0.417 3.59 2.000 8.98 3.583 19.76 5.17 5.39
0.500 3.59 2.083 8.98 3.667 19.76 5.25 5.39
0.583 3.59 2.167 8.98 3.750 19.76 5.33 3.59
0.667 3.59 2.250 8.98 3.833 8.98 5.42 3.59
0.750 3.59 2.333 10.78 3.917 8.98 5.50 3.59
0.833 5.39 2.417 10.78 4.000 8.98 5.58 3.59
0.917 5.39 2.500 10.78 4.083 8.98 5.67 3.59
1.000 5.39 2.583 10.78 4.167 8.98 5.75 3.59
1.083 5.39 2.667 10.78 4.250 8.98 5.83 3.59
1.167 5.39 2.750 10.78 4.333 7.18 5.92 3.59
1.250 5.39 2.833 53.88 4.417 7.18 6.00 3.59
1.333 5.39 2.917 53.88 4.500 7.18 6.08 3.59
1.417 5.39 3.000 53.88 4.583 7.18 6.17 3.59
1.500 5.39 3.083 140.09 4.667 7.18 6.25 3.59
1.583 5.39 3.167 140.09 4.750 7.18

```

```

Max.Eff.Inten.(mm/hr)= 140.09 105.22
over (min)= 5.00 15.00
Storage Coeff. (min)= 4.43 (ii) 14.10 (ii)
Unit Hyd. Tpeak (min)= 5.00 15.00
Unit Hyd. peak (cms)= 0.23 0.08

```

```

*TOTALS*
PEAK FLOW (cms)= 0.98 0.62 1.503 (iii)
TIME TO PEAK (hrs)= 3.25 3.33 3.25
RUNOFF VOLUME (mm)= 88.80 41.53 58.07
TOTAL RAINFALL (mm)= 89.80 89.80 89.80
RUNOFF COEFFICIENT = 0.99 0.46 0.65

```

***** 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.

CALIB
STANDHYD (0203)
ID= 1 DT= 5.0 min

Area (ha)= 1.09
Total Imp(%)= 50.00 Dir. Conn.(%)= 50.00

IMPERVIOUS PVIOUS (i)

Surface Area (ha)= 0.55 0.55
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 0.50 2.00
Length (m)= 85.24 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	1.667	5.39	3.250	140.09	4.83	5.39
0.167	0.00	1.750	5.39	3.333	19.76	4.92	5.39
0.250	0.00	1.833	8.98	3.417	19.76	5.00	5.39
0.333	3.59	1.917	8.98	3.500	19.76	5.08	5.39
0.417	3.59	2.000	8.98	3.583	19.76	5.17	5.39
0.500	3.59	2.083	8.98	3.667	19.76	5.25	5.39
0.583	3.59	2.167	8.98	3.750	19.76	5.33	3.59
0.667	3.59	2.250	8.98	3.833	8.98	5.42	3.59
0.750	3.59	2.333	10.78	3.917	8.98	5.50	3.59
0.833	5.39	2.417	10.78	4.000	8.98	5.58	3.59
0.917	5.39	2.500	10.78	4.083	8.98	5.67	3.59
1.000	5.39	2.583	10.78	4.167	8.98	5.75	3.59
1.083	5.39	2.667	10.78	4.250	8.98	5.83	3.59
1.167	5.39	2.750	10.78	4.333	7.18	5.92	3.59
1.250	5.39	2.833	53.88	4.417	7.18	6.00	3.59
1.333	5.39	2.917	53.88	4.500	7.18	6.08	3.59
1.417	5.39	3.000	53.88	4.583	7.18	6.17	3.59
1.500	5.39	3.083	140.09	4.667	7.18	6.25	3.59
1.583	5.39	3.167	140.09	4.750	7.18		

Max.Eff.Inten.(mm/hr)= 140.09 63.47
over (min) 5.00 15.00
Storage Coeff. (min)= 2.50 (ii) 14.34 (ii)
Unit Hyd. Tpeak (min)= 5.00 15.00
Unit Hyd. peak (cms)= 0.29 0.08

TOTALS

PEAK FLOW (cms)= 0.21 0.06 0.261 (iii)
TIME TO PEAK (hrs)= 3.25 3.33 3.25
RUNOFF VOLUME (mm)= 88.80 35.20 61.99
TOTAL RAINFALL (mm)= 89.80 89.80 89.80
RUNOFF COEFFICIENT = 0.99 0.39 0.69

***** 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.

CALIB

STANDHYD (0202)
ID= 1 DT= 5.0 min

Area (ha)= 11.35
Total Imp(%)= 50.00 Dir. Conn.(%)= 35.00

IMPERVIOUS PVIOUS (i)

Surface Area (ha)= 5.68 5.68
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 0.50 2.00
Length (m)= 275.08 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	1.667	5.39	3.250	140.09	4.83	5.39
0.167	0.00	1.750	5.39	3.333	19.76	4.92	5.39
0.250	0.00	1.833	8.98	3.417	19.76	5.00	5.39
0.333	3.59	1.917	8.98	3.500	19.76	5.08	5.39
0.417	3.59	2.000	8.98	3.583	19.76	5.17	5.39
0.500	3.59	2.083	8.98	3.667	19.76	5.25	5.39
0.583	3.59	2.167	8.98	3.750	19.76	5.33	3.59
0.667	3.59	2.250	8.98	3.833	8.98	5.42	3.59
0.750	3.59	2.333	10.78	3.917	8.98	5.50	3.59
0.833	5.39	2.417	10.78	4.000	8.98	5.58	3.59
0.917	5.39	2.500	10.78	4.083	8.98	5.67	3.59
1.000	5.39	2.583	10.78	4.167	8.98	5.75	3.59
1.083	5.39	2.667	10.78	4.250	8.98	5.83	3.59
1.167	5.39	2.750	10.78	4.333	7.18	5.92	3.59
1.250	5.39	2.833	53.88	4.417	7.18	6.00	3.59
1.333	5.39	2.917	53.88	4.500	7.18	6.08	3.59
1.417	5.39	3.000	53.88	4.583	7.18	6.17	3.59
1.500	5.39	3.083	140.09	4.667	7.18	6.25	3.59
1.583	5.39	3.167	140.09	4.750	7.18		

Max.Eff.Inten.(mm/hr)= 140.09 105.22
over (min) 5.00 15.00
Storage Coeff. (min)= 5.04 (ii) 14.72 (ii)
Unit Hyd. Tpeak (min)= 5.00 15.00
Unit Hyd. peak (cms)= 0.21 0.08

TOTALS

PEAK FLOW (cms)= 1.50 0.94 2.289 (iii)
TIME TO PEAK (hrs)= 3.25 3.33 3.25
RUNOFF VOLUME (mm)= 88.80 41.53 58.08
TOTAL RAINFALL (mm)= 89.80 89.80 89.80
RUNOFF COEFFICIENT = 0.99 0.46 0.65

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

ADD HYD (0001)
1 + 2 = 3

AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)

ID1= 1 (0201): 7.34 1.503 3.25 58.07
+ ID2= 2 (0202): 11.35 2.289 3.25 58.08
=====

ID = 3 (0001): 18.69 3.793 3.25 58.08

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

ADD HYD ( 0001 )
3 + 2 = 1
-----
ID1= 3 ( 0001):  18.69  3.793  3.25  58.08
+ ID2= 2 ( 0203):   1.09  0.261  3.25  61.99
=====
ID = 1 ( 0001):  19.78  4.054  3.25  58.29

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

RESERVOIR( 0002 )
IN= 2----> OUT= 1
DT= 5.0 min
-----
OVERFLOW IS OFF
OUTFLOW STORAGE | OUTFLOW STORAGE
(cms) (ha.m.) | (cms) (ha.m.)
0.0000 0.0000 | 0.4415 0.4502
0.0090 0.0511 | 0.6651 0.5039
0.0131 0.0876 | 0.9062 0.5593
0.0162 0.1261 | 1.0427 0.6168
0.0188 0.1666 | 1.1630 0.6766
0.0210 0.2091 | 1.2719 0.7386
0.0231 0.2535 | 1.3720 0.8030
0.0250 0.3000 | 1.4653 0.8690
0.1059 0.3483 | 2.6092 0.9380
0.2524 0.3984 | 4.6233 1.0080
-----
AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
INFLOW : ID= 2 ( 0001) 19.780 4.054 3.25 58.29
OUTFLOW: ID= 1 ( 0002) 19.780 1.090 3.75 58.22
-----
PEAK FLOW REDUCTION [Qout/Qin](%)= 26.88
TIME SHIFT OF PEAK FLOW (min)= 30.00
MAXIMUM STORAGE USED (ha.m.)= 0.6409

```

```

ADD HYD ( 0020 )
1 + 2 = 3
-----
ID1= 1 ( 0002):  19.78  1.090  3.75  58.22
+ ID2= 2 ( 0204):   6.27  0.322  3.83  33.62
=====
ID = 3 ( 0020):  26.05  1.408  3.75  52.30

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

=====
V V I SSSS U U A L (v 6.2.2019)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLL
OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y M M O O
O O T T H H Y Y M M O O
OOO T T H H Y Y M M OOO
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```

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

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

Output filename: C:\Users\FPetkovski\AppData\Local\Civica\XH5\ld605a61-9146-4ab0-blab-422fd6022bab\eff34418-86fc-41b6-8501-c6593c489531\s
Summary filename: C:\Users\FPetkovski\AppData\Local\Civica\XH5\ld605a61-9146-4ab0-blab-422fd6022bab\eff34418-86fc-41b6-8501-c6593c489531\s

DATE: 03-31-2026

TIME: 04:33:41

USER:

COMMENTS: _____

** SIMULATION : SCS_06hr_100yr **

```

READ STORM
-----
Ptotal= 99.90 mm
Filename: C:\Users\FPetkovski\AppData\Local\Temp\
eacd415e-8ceb-438b-a348-aa4b2932daf2\6bf5a9e3
Comments: SCS_06hr_100yr

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	0.00	1.75	9.99	3.50	21.98	5.25	4.00
0.25	4.00	2.00	9.99	3.75	9.99	5.50	4.00
0.50	4.00	2.25	11.99	4.00	9.99	5.75	4.00
0.75	5.99	2.50	11.99	4.25	7.99	6.00	4.00
1.00	5.99	2.75	59.94	4.50	7.99		
1.25	5.99	3.00	155.84	4.75	5.99		
1.50	5.99	3.25	21.98	5.00	5.99		

```

CALIB
NASHYD ( 0101 )
ID= 1 DT= 5.0 min
-----
Area (ha)= 26.05 Curve Number (CN)= 81.0
Ia (mm)= 7.40 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.78

```

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 1.667 5.99 3.250 155.84 4.83 5.99
0.167 0.00 1.750 5.99 3.333 21.98 4.92 5.99
0.250 0.00 1.833 9.99 3.417 21.98 5.00 5.99
0.333 4.00 1.917 9.99 3.500 21.98 5.08 5.99
0.417 4.00 2.000 9.99 3.583 21.98 5.17 5.99
0.500 4.00 2.083 9.99 3.667 21.98 5.25 5.99
0.583 4.00 2.167 9.99 3.750 21.98 5.33 4.00
0.667 4.00 2.250 9.99 3.833 9.99 5.42 4.00
0.750 4.00 2.333 11.99 3.917 9.99 5.50 4.00
0.833 5.99 2.417 11.99 4.000 9.99 5.58 4.00
0.917 5.99 2.500 11.99 4.083 9.99 5.67 4.00
1.000 5.99 2.583 11.99 4.167 9.99 5.75 4.00
1.083 5.99 2.667 11.99 4.250 9.99 5.83 4.00
1.167 5.99 2.750 11.99 4.333 7.99 5.92 4.00
1.250 5.99 2.833 59.94 4.417 7.99 6.00 4.00
1.333 5.99 2.917 59.94 4.500 7.99 6.08 4.00
1.417 5.99 3.000 59.94 4.583 7.99 6.17 4.00
1.500 5.99 3.083 155.84 4.667 7.99 6.25 4.00

```

1.583 5.99 | 3.167 155.84 | 4.750 7.99 |

Unit Hyd Qpeak (cms) = 1.276

PEAK FLOW (cms) = 1.975 (i)
TIME TO PEAK (hrs) = 4.000
RUNOFF VOLUME (mm) = 56.261
TOTAL RAINFALL (mm) = 99.900
RUNOFF COEFFICIENT = 0.563

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

CALIB			
NASHYD (0204)	Area (ha) = 6.27	Curve Number (CN) = 67.0	
ID= 1 DT= 5.0 min	Ia (mm) = 6.00	# of Linear Res. (N) = 3.00	
	U.H. Tp(hrs) = 0.63		

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

TIME		RAIN		TIME		RAIN		TIME		RAIN	
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	5.99	3.250	155.84	4.83	5.99				
0.167	0.00	1.750	5.99	3.333	21.98	4.92	5.99				
0.250	0.00	1.833	9.99	3.417	21.98	5.00	5.99				
0.333	4.00	1.917	9.99	3.500	21.98	5.08	5.99				
0.417	4.00	2.000	9.99	3.583	21.98	5.17	5.99				
0.500	4.00	2.083	9.99	3.667	21.98	5.25	5.99				
0.583	4.00	2.167	9.99	3.750	21.98	5.33	4.00				
0.667	4.00	2.250	9.99	3.833	9.99	5.42	4.00				
0.750	4.00	2.333	11.99	3.917	9.99	5.50	4.00				
0.833	5.99	2.417	11.99	4.000	9.99	5.58	4.00				
0.917	5.99	2.500	11.99	4.083	9.99	5.67	4.00				
1.000	5.99	2.583	11.99	4.167	9.99	5.75	4.00				
1.083	5.99	2.667	11.99	4.250	9.99	5.83	4.00				
1.167	5.99	2.750	11.99	4.333	7.99	5.92	4.00				
1.250	5.99	2.833	59.94	4.417	7.99	6.00	4.00				
1.333	5.99	2.917	59.94	4.500	7.99	6.08	4.00				
1.417	5.99	3.000	59.94	4.583	7.99	6.17	4.00				
1.500	5.99	3.083	155.84	4.667	7.99	6.25	4.00				
1.583	5.99	3.167	155.84	4.750	7.99						

Unit Hyd Qpeak (cms) = 0.380

PEAK FLOW (cms) = 0.388 (i)
TIME TO PEAK (hrs) = 3.833
RUNOFF VOLUME (mm) = 40.259
TOTAL RAINFALL (mm) = 99.900
RUNOFF COEFFICIENT = 0.403

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

CALIB			
STANDHYD (0201)	Area (ha) = 7.34	Dir. Conn.(%) = 35.00	
ID= 1 DT= 5.0 min	Total Imp(%) = 50.00		

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)	3.67	3.67
Dep. Storage (mm)	1.00	5.00
Average Slope (%)	0.50	2.00
Length (m)	221.21	70.00
Mannings n	0.013	0.250

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

TIME		RAIN		TIME		RAIN		TIME		RAIN	
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	5.99	3.250	155.84	4.83	5.99				
0.167	0.00	1.750	5.99	3.333	21.98	4.92	5.99				
0.250	0.00	1.833	9.99	3.417	21.98	5.00	5.99				
0.333	4.00	1.917	9.99	3.500	21.98	5.08	5.99				
0.417	4.00	2.000	9.99	3.583	21.98	5.17	5.99				
0.500	4.00	2.083	9.99	3.667	21.98	5.25	5.99				
0.583	4.00	2.167	9.99	3.750	21.98	5.33	4.00				
0.667	4.00	2.250	9.99	3.833	9.99	5.42	4.00				
0.750	4.00	2.333	11.99	3.917	9.99	5.50	4.00				
0.833	5.99	2.417	11.99	4.000	9.99	5.58	4.00				
0.917	5.99	2.500	11.99	4.083	9.99	5.67	4.00				
1.000	5.99	2.583	11.99	4.167	9.99	5.75	4.00				
1.083	5.99	2.667	11.99	4.250	9.99	5.83	4.00				
1.167	5.99	2.750	11.99	4.333	7.99	5.92	4.00				
1.250	5.99	2.833	59.94	4.417	7.99	6.00	4.00				
1.333	5.99	2.917	59.94	4.500	7.99	6.08	4.00				
1.417	5.99	3.000	59.94	4.583	7.99	6.17	4.00				
1.500	5.99	3.083	155.84	4.667	7.99	6.25	4.00				
1.583	5.99	3.167	155.84	4.750	7.99						

Max.Eff.Inten.(mm/hr) = 155.84 123.83
over (min) = 5.00 15.00
Storage Coeff. (min) = 4.24 (ii) 13.31 (ii)
Unit Hyd. Tpeak (min) = 5.00 15.00
Unit Hyd. peak (cms) = 0.24 0.08

TOTALS
PEAK FLOW (cms) = 1.09 0.75 1.736 (iii)
TIME TO PEAK (hrs) = 3.25 3.33 3.25
RUNOFF VOLUME (mm) = 98.90 49.08 66.51
TOTAL RAINFALL (mm) = 99.90 99.90 99.90
RUNOFF COEFFICIENT = 0.99 0.49 0.67

***** 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.

CALIB			
STANDHYD (0203)	Area (ha) = 1.09	Dir. Conn.(%) = 50.00	
ID= 1 DT= 5.0 min	Total Imp(%) = 50.00		

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)	0.55	0.55
Dep. Storage (mm)	1.00	5.00
Average Slope (%)	0.50	2.00
Length (m)	85.24	70.00
Mannings n	0.013	0.250

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

TIME		RAIN		TIME		RAIN		TIME		RAIN	
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	5.99	3.250	155.84	4.83	5.99				
0.167	0.00	1.750	5.99	3.333	21.98	4.92	5.99				
0.250	0.00	1.833	9.99	3.417	21.98	5.00	5.99				
0.333	4.00	1.917	9.99	3.500	21.98	5.08	5.99				
0.417	4.00	2.000	9.99	3.583	21.98	5.17	5.99				
0.500	4.00	2.083	9.99	3.667	21.98	5.25	5.99				
0.583	4.00	2.167	9.99	3.750	21.98	5.33	4.00				

0.667	4.00	2.250	9.99	3.833	9.99	5.42	4.00
0.750	4.00	2.333	11.99	3.917	9.99	5.50	4.00
0.833	5.99	2.417	11.99	4.000	9.99	5.58	4.00
0.917	5.99	2.500	11.99	4.083	9.99	5.67	4.00
1.000	5.99	2.583	11.99	4.167	9.99	5.75	4.00
1.083	5.99	2.667	11.99	4.250	9.99	5.83	4.00
1.167	5.99	2.750	11.99	4.333	7.99	5.92	4.00
1.250	5.99	2.833	59.94	4.417	7.99	6.00	4.00
1.333	5.99	2.917	59.94	4.500	7.99	6.08	4.00
1.417	5.99	3.000	59.94	4.583	7.99	6.17	4.00
1.500	5.99	3.083	155.84	4.667	7.99	6.25	4.00
1.583	5.99	3.167	155.84	4.750	7.99		

Max.Eff.Inten.(mm/hr)=	155.84	75.85
over (min)	5.00	15.00
Storage Coeff. (min)=	2.39 (ii)	13.42 (ii)
Unit Hyd. Tpeak (min)=	5.00	15.00
Unit Hyd. peak (cms)=	0.30	0.08

PEAK FLOW (cms)=	0.24	0.07	0.297 (iii)
TIME TO PEAK (hrs)=	3.25	3.33	3.25
RUNOFF VOLUME (mm)=	98.90	42.00	70.44
TOTAL RAINFALL (mm)=	99.90	99.90	99.90
RUNOFF COEFFICIENT =	0.99	0.42	0.71

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

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

CALIB	
STANDHYD (0202)	
ID= 1 DT= 5.0 min	

Area (ha)=	11.35
Total Imp(%)=	50.00
Dir. Conn.(%)=	35.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	5.68	5.68
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	0.50	2.00
Length (m)=	275.08	70.00
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	0.00	1.667	5.99	3.250	155.84	4.83	5.99
0.167	0.00	1.750	5.99	3.333	21.98	4.92	5.99
0.250	0.00	1.833	9.99	3.417	21.98	5.00	5.99
0.333	4.00	1.917	9.99	3.500	21.98	5.08	5.99
0.417	4.00	2.000	9.99	3.583	21.98	5.17	5.99
0.500	4.00	2.083	9.99	3.667	21.98	5.25	5.99
0.583	4.00	2.167	9.99	3.750	21.98	5.33	4.00
0.667	4.00	2.250	9.99	3.833	9.99	5.42	4.00
0.750	4.00	2.333	11.99	3.917	9.99	5.50	4.00
0.833	5.99	2.417	11.99	4.000	9.99	5.58	4.00
0.917	5.99	2.500	11.99	4.083	9.99	5.67	4.00
1.000	5.99	2.583	11.99	4.167	9.99	5.75	4.00
1.083	5.99	2.667	11.99	4.250	9.99	5.83	4.00
1.167	5.99	2.750	11.99	4.333	7.99	5.92	4.00
1.250	5.99	2.833	59.94	4.417	7.99	6.00	4.00
1.333	5.99	2.917	59.94	4.500	7.99	6.08	4.00
1.417	5.99	3.000	59.94	4.583	7.99	6.17	4.00
1.500	5.99	3.083	155.84	4.667	7.99	6.25	4.00

1.583	5.99	3.167	155.84	4.750	7.99
-------	------	-------	--------	-------	------

Max.Eff.Inten.(mm/hr)=	155.84	123.83
over (min)	5.00	15.00
Storage Coeff. (min)=	4.83 (ii)	13.90 (ii)
Unit Hyd. Tpeak (min)=	5.00	15.00
Unit Hyd. peak (cms)=	0.22	0.08

PEAK FLOW (cms)=	1.67	1.14	*TOTALS*
TIME TO PEAK (hrs)=	3.25	3.33	2.646 (iii)
RUNOFF VOLUME (mm)=	98.90	49.08	3.25
TOTAL RAINFALL (mm)=	99.90	99.90	66.51
RUNOFF COEFFICIENT =	0.99	0.49	99.90
			0.67

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

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

ADD HYD (0001)	AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0201):	7.34	1.736	3.25	66.51
+ ID2= 2 (0202):	11.35	2.646	3.25	66.51
ID = 3 (0001):	18.69	4.382	3.25	66.51

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0001)	AREA	QPEAK	TPEAK	R.V.
3 + 2 = 1	(ha)	(cms)	(hrs)	(mm)
ID1= 3 (0001):	18.69	4.382	3.25	66.51
+ ID2= 2 (0203):	1.09	0.297	3.25	70.44
ID = 1 (0001):	19.78	4.679	3.25	66.73

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0002)	OVERFLOW IS OFF			
IN= 2---> OUT= 1	OUTFLOW	STORAGE	OUTFLOW	STORAGE
DT= 5.0 min	(cms)	(ha.m.)	(cms)	(ha.m.)
	0.0000	0.0000	0.4415	0.4502
	0.0090	0.0511	0.6651	0.5039
	0.0131	0.0876	0.9062	0.5593
	0.0162	0.1261	1.0427	0.6168
	0.0188	0.1666	1.1630	0.6766
	0.0210	0.2091	1.2719	0.7386
	0.0231	0.2535	1.3720	0.8030
	0.0250	0.3000	1.4653	0.8690
	0.1059	0.3483	2.6092	0.9380
	0.2524	0.3984	4.6233	1.0080

AREA	QPEAK	TPEAK	R.V.
(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0001)	19.780	4.679	3.25
OUTFLOW: ID= 1 (0002)	19.780	1.248	3.75
			66.66

PEAK FLOW REDUCTION [Qout/Qin] (%) =	26.68
TIME SHIFT OF PEAK FLOW (min) =	30.00

MAXIMUM STORAGE USED (ha.m.) = 0.7257

```
-----  
| ADD HYD ( 0020) |  
| 1 + 2 = 3 |  
-----  
ID1= 1 ( 0002): 19.78 1.248 3.75 66.66  
+ ID2= 2 ( 0204): 6.27 0.388 3.83 40.26  
-----  
ID = 3 ( 0020): 26.05 1.632 3.75 60.30  
-----
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

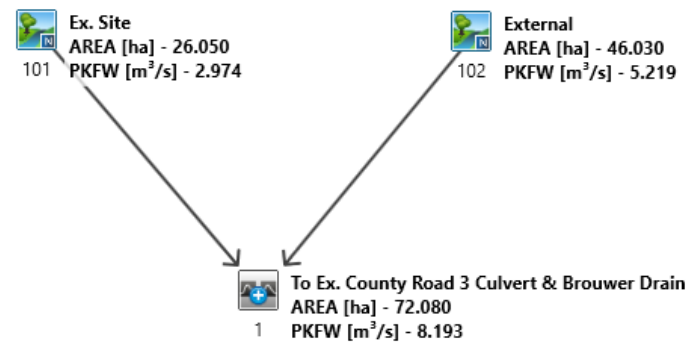


Figure F.2: VO Model Schematic – Floodplain – Pre-Development

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

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	1.667	5.99	3.250	155.84	4.83	5.99
0.167	0.00	1.750	5.99	3.333	21.98	4.92	5.99
0.250	0.00	1.833	9.99	3.417	21.98	5.00	5.99
0.333	4.00	1.917	9.99	3.500	21.98	5.08	5.99

0.417	4.00	2.000	9.99	3.583	21.98	5.17	5.99
0.500	4.00	2.083	9.99	3.667	21.98	5.25	5.99
0.583	4.00	2.167	9.99	3.750	21.98	5.33	4.00
0.667	4.00	2.250	9.99	3.833	9.99	5.42	4.00
0.750	4.00	2.333	11.99	3.917	9.99	5.50	4.00
0.833	5.99	2.417	11.99	4.000	9.99	5.58	4.00
0.917	5.99	2.500	11.99	4.083	9.99	5.67	4.00
1.000	5.99	2.583	11.99	4.167	9.99	5.75	4.00
1.083	5.99	2.667	11.99	4.250	9.99	5.83	4.00
1.167	5.99	2.750	11.99	4.333	7.99	5.92	4.00
1.250	5.99	2.833	59.94	4.417	7.99	6.00	4.00
1.333	5.99	2.917	59.94	4.500	7.99	6.08	4.00
1.417	5.99	3.000	59.94	4.583	7.99	6.17	4.00
1.500	5.99	3.083	155.84	4.667	7.99	6.25	4.00
1.583	5.99	3.167	155.84	4.750	7.99		

Unit Hyd Qpeak (cms) = 1.276

PEAK FLOW (cms) = 1.975 (i)
 TIME TO PEAK (hrs) = 4.000
 RUNOFF VOLUME (mm) = 56.261
 TOTAL RAINFALL (mm) = 99.900
 RUNOFF COEFFICIENT = 0.563

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

ADD HYD (0001)	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3				
ID1= 1 (0101):	26.05	1.975	4.00	56.26
+ ID2= 2 (0102):	46.03	3.253	4.00	52.29
ID = 3 (0001):	72.08	5.229	4.00	53.72

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

V V I SSSS U U A L (v 5.1.2000)
 V V I SS U U A A L
 V V I SS U U A A A A L
 V V I SS U U A A L
 V V I SSSS UUUU A A LLLL

OOO TTTT TTTT H H Y Y M M OOO TM
 O O T T H H Y Y MM MM O O
 O O T T H H Y M M O O
 OOO T T H H Y M M OOO

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

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voin.dat
 Output filename: C:\Users\Valdor\AppData\Local\Civica\XH5\ld605a61-9146-4ab0-blab-422fd6022bab\d239831c-1a14-4f5b-ba42-5dce8f20262d\scena

Summary filename: C:\Users\Valdor\AppData\Local\Civica\XH5\ld605a61-9146-4ab0-blab-422fd6022bab\d239831c-1a14-4f5b-ba42-5dce8f20262d\scena

DATE: 04-02-2020

TIME: 04:14:32

USER:

COMMENTS:

 ** SIMULATION : Hurricane Hazel

READ STORM	Filename: C:\Users\Valdor\AppData\Local\Temp\090cf2ca-7d11-44ad-ac85-d8e7f8b47f5d\37b34bef
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
0.50	4.00	3.50	12.00	6.50	22.00	9.50	50.00
1.00	8.00	4.00	12.00	7.00	26.00	10.00	56.00
1.50	4.00	4.50	16.00	7.50	12.00	10.50	38.00
2.00	4.00	5.00	18.00	8.00	12.00	11.00	38.00
2.50	6.00	5.50	12.00	8.50	12.00	11.50	14.00
3.00	8.00	6.00	14.00	9.00	14.00	12.00	12.00

CALIB NASHYD (0102)	Area (ha)	Curve Number (CN)
ID= 1 DT= 5.0 min	46.03	90.0
U.H. Tp(hrs)= 0.77	7.20	# of Linear Res. (N)= 3.00

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

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	4.00	3.083	12.00	6.083	22.00	9.08	50.00
0.167	4.00	3.167	12.00	6.167	22.00	9.17	50.00
0.250	4.00	3.250	12.00	6.250	22.00	9.25	50.00
0.333	4.00	3.333	12.00	6.333	22.00	9.33	50.00
0.417	4.00	3.417	12.00	6.417	22.00	9.42	50.00
0.500	4.00	3.500	12.00	6.500	22.00	9.50	50.00
0.583	8.00	3.583	12.00	6.583	26.00	9.58	56.00
0.667	8.00	3.667	12.00	6.667	26.00	9.67	56.00
0.750	8.00	3.750	12.00	6.750	26.00	9.75	56.00
0.833	8.00	3.833	12.00	6.833	26.00	9.83	56.00
0.917	8.00	3.917	12.00	6.917	26.00	9.92	56.00
1.000	8.00	4.000	12.00	7.000	26.00	10.00	56.00
1.083	4.00	4.083	16.00	7.083	12.00	10.08	38.00
1.167	4.00	4.167	16.00	7.167	12.00	10.17	38.00
1.250	4.00	4.250	16.00	7.250	12.00	10.25	38.00
1.333	4.00	4.333	16.00	7.333	12.00	10.33	38.00
1.417	4.00	4.417	16.00	7.417	12.00	10.42	38.00
1.500	4.00	4.500	16.00	7.500	12.00	10.50	38.00
1.583	4.00	4.583	18.00	7.583	12.00	10.58	38.00
1.667	4.00	4.667	18.00	7.667	12.00	10.67	38.00
1.750	4.00	4.750	18.00	7.750	12.00	10.75	38.00

1.833	4.00	4.833	18.00	7.833	12.00	10.83	38.00
1.917	4.00	4.917	18.00	7.917	12.00	10.92	38.00
2.000	4.00	5.000	18.00	8.000	12.00	11.00	38.00
2.083	6.00	5.083	12.00	8.083	12.00	11.08	14.00
2.167	6.00	5.167	12.00	8.167	12.00	11.17	14.00
2.250	6.00	5.250	12.00	8.250	12.00	11.25	14.00
2.333	6.00	5.333	12.00	8.333	12.00	11.33	14.00
2.417	6.00	5.417	12.00	8.417	12.00	11.42	14.00
2.500	6.00	5.500	12.00	8.500	12.00	11.50	14.00
2.583	8.00	5.583	14.00	8.583	14.00	11.58	12.00
2.667	8.00	5.667	14.00	8.667	14.00	11.67	12.00
2.750	8.00	5.750	14.00	8.750	14.00	11.75	12.00
2.833	8.00	5.833	14.00	8.833	14.00	11.83	12.00
2.917	8.00	5.917	14.00	8.917	14.00	11.92	12.00
3.000	8.00	6.000	14.00	9.000	14.00	12.00	12.00

Unit Hyd Qpeak (cms) = 2.283

PEAK FLOW (cms) = 5.219 (i)
 TIME TO PEAK (hrs) = 10.833
 RUNOFF VOLUME (mm) = 179.995
 TOTAL RAINFALL (mm) = 212.000
 RUNOFF COEFFICIENT = 0.849

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

READ STORM	Filename: C:\Users\Valdor\AppData Local\Temp\090cf2ca-7d11-44ad-ac85-d8e7f8b47f5d\37b34bef
Ptotal=212.00 mm	Comments: Hurricane Hazel

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.50	4.00	3.50	12.00	6.50	22.00	9.50	50.00
1.00	8.00	4.00	12.00	7.00	26.00	10.00	56.00
1.50	4.00	4.50	16.00	7.50	12.00	10.50	38.00
2.00	4.00	5.00	18.00	8.00	12.00	11.00	38.00
2.50	6.00	5.50	12.00	8.50	12.00	11.50	14.00
3.00	8.00	6.00	14.00	9.00	14.00	12.00	12.00

CALIB	Area (ha)	Curve Number (CN)
NASHYD (0101)	26.05	92.0
ID= 1 DT= 5.0 min	Ia (mm)= 7.40	# of Linear Res. (N)= 3.00
	U.H. Tp (hrs)= 0.78	

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	4.00	3.083	12.00	6.083	22.00	9.08	50.00
0.167	4.00	3.167	12.00	6.167	22.00	9.17	50.00
0.250	4.00	3.250	12.00	6.250	22.00	9.25	50.00
0.333	4.00	3.333	12.00	6.333	22.00	9.33	50.00
0.417	4.00	3.417	12.00	6.417	22.00	9.42	50.00
0.500	4.00	3.500	12.00	6.500	22.00	9.50	50.00
0.583	8.00	3.583	12.00	6.583	26.00	9.58	56.00
0.667	8.00	3.667	12.00	6.667	26.00	9.67	56.00
0.750	8.00	3.750	12.00	6.750	26.00	9.75	56.00
0.833	8.00	3.833	12.00	6.833	26.00	9.83	56.00
0.917	8.00	3.917	12.00	6.917	26.00	9.92	56.00
1.000	8.00	4.000	12.00	7.000	26.00	10.00	56.00
1.083	4.00	4.083	16.00	7.083	12.00	10.08	38.00

1.167	4.00	4.167	16.00	7.167	12.00	10.17	38.00
1.250	4.00	4.250	16.00	7.250	12.00	10.25	38.00
1.333	4.00	4.333	16.00	7.333	12.00	10.33	38.00
1.417	4.00	4.417	16.00	7.417	12.00	10.42	38.00
1.500	4.00	4.500	16.00	7.500	12.00	10.50	38.00
1.583	4.00	4.583	18.00	7.583	12.00	10.58	38.00
1.667	4.00	4.667	18.00	7.667	12.00	10.67	38.00
1.750	4.00	4.750	18.00	7.750	12.00	10.75	38.00
1.833	4.00	4.833	18.00	7.833	12.00	10.83	38.00
1.917	4.00	4.917	18.00	7.917	12.00	10.92	38.00
2.000	4.00	5.000	18.00	8.000	12.00	11.00	38.00
2.083	6.00	5.083	12.00	8.083	12.00	11.08	14.00
2.167	6.00	5.167	12.00	8.167	12.00	11.17	14.00
2.250	6.00	5.250	12.00	8.250	12.00	11.25	14.00
2.333	6.00	5.333	12.00	8.333	12.00	11.33	14.00
2.417	6.00	5.417	12.00	8.417	12.00	11.42	14.00
2.500	6.00	5.500	12.00	8.500	12.00	11.50	14.00
2.583	8.00	5.583	14.00	8.583	14.00	11.58	12.00
2.667	8.00	5.667	14.00	8.667	14.00	11.67	12.00
2.750	8.00	5.750	14.00	8.750	14.00	11.75	12.00
2.833	8.00	5.833	14.00	8.833	14.00	11.83	12.00
2.917	8.00	5.917	14.00	8.917	14.00	11.92	12.00
3.000	8.00	6.000	14.00	9.000	14.00	12.00	12.00

Unit Hyd Qpeak (cms) = 1.276

PEAK FLOW (cms) = 2.974 (i)
 TIME TO PEAK (hrs) = 10.833
 RUNOFF VOLUME (mm) = 184.664
 TOTAL RAINFALL (mm) = 212.000
 RUNOFF COEFFICIENT = 0.871

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

ADD HYD (0001)	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0101):	26.05	2.974	10.83	184.66
+ ID2= 2 (0102):	46.03	5.219	10.83	179.99
ID = 3 (0001):	72.08	8.193	10.83	181.68

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

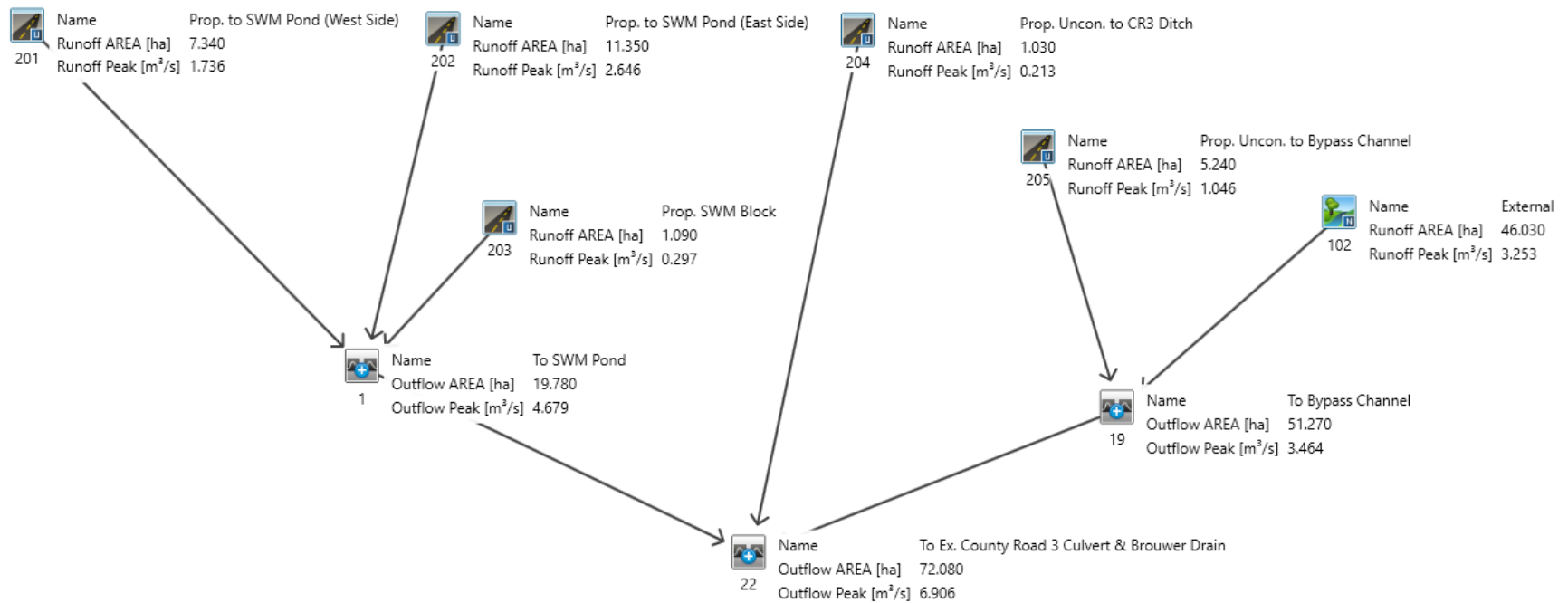


Figure F.3: VO Model Schematic – Floodplain – Post-Development

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=====
*****
V   V   I   SSSS   U   U   A   L   (v 6.2.2019)
V   V   I   SS     U   U   A A   L
V   V   I   SS     U   U   AAAAA L
V   V   I   SS     U   U   A   L
VV      I   SSSS   UUUUU   A   A   LLLLL

OOO   TTTT   TTTT   H   H   Y   Y   M   M   OOO   TM
O   O   T   T   H   H   Y   Y   MM MM   O   O
O   O   T   T   H   H   Y   M   M   O   O
OOO   T   T   H   H   Y   M   M   OOO

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```

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

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
Output filename: C:\Users\FPetkovski\AppData\Local\Civica\XH5\ld605a61-9146-4ab0-blab-422fd6022bab\99214b5f-0acb-461b-b590-1de6bfd274ab\s
Summary filename: C:\Users\FPetkovski\AppData\Local\Civica\XH5\ld605a61-9146-4ab0-blab-422fd6022bab\99214b5f-0acb-461b-b590-1de6bfd274ab\s

DATE: 04-02-2026 TIME: 03:31:14

USER:

COMMENTS: _____

```

*****
** SIMULATION : SCS_06hr_100yr **
*****

```

READ STORM	Filename: C:\Users\FPetkovski\AppData\Local\Temp\86ced78c-af80-4f1d-80cd-269ddf08e560\6bf5a9e3
Ptotal= 99.90 mm	Comments: SCS_06hr_100yr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.00	1.75	9.99	3.50	21.98	5.25	4.00
0.25	4.00	2.00	9.99	3.75	9.99	5.50	4.00
0.50	4.00	2.25	11.99	4.00	9.99	5.75	4.00
0.75	5.99	2.50	11.99	4.25	7.99	6.00	4.00
1.00	5.99	2.75	59.94	4.50	7.99		
1.25	5.99	3.00	155.84	4.75	5.99		
1.50	5.99	3.25	21.98	5.00	5.99		

CALIB	Area (ha)= 46.03	Curve Number (CN)= 78.0
NASHYD (0102)	Ia (mm)= 7.20	# of Linear Res. (N)= 3.00
ID= 1 DT= 5.0 min	U.H. Tp(hrs)= 0.77	

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

TIME		RAIN		TRANSFORMED		HYETOGRAPH		TIME		RAIN	
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	5.99	3.250	155.84	4.83	5.99				
0.167	0.00	1.750	5.99	3.333	21.98	4.92	5.99				
0.250	0.00	1.833	9.99	3.417	21.98	5.00	5.99				
0.333	4.00	1.917	9.99	3.500	21.98	5.08	5.99				
0.417	4.00	2.000	9.99	3.583	21.98	5.17	5.99				
0.500	4.00	2.083	9.99	3.667	21.98	5.25	5.99				
0.583	4.00	2.167	9.99	3.750	21.98	5.33	4.00				
0.667	4.00	2.250	9.99	3.833	9.99	5.42	4.00				
0.750	4.00	2.333	11.99	3.917	9.99	5.50	4.00				
0.833	5.99	2.417	11.99	4.000	9.99	5.58	4.00				
0.917	5.99	2.500	11.99	4.083	9.99	5.67	4.00				
1.000	5.99	2.583	11.99	4.167	9.99	5.75	4.00				
1.083	5.99	2.667	11.99	4.250	9.99	5.83	4.00				
1.167	5.99	2.750	11.99	4.333	7.99	5.92	4.00				
1.250	5.99	2.833	59.94	4.417	7.99	6.00	4.00				
1.333	5.99	2.917	59.94	4.500	7.99	6.08	4.00				
1.417	5.99	3.000	59.94	4.583	7.99	6.17	4.00				
1.500	5.99	3.083	155.84	4.667	7.99	6.25	4.00				
1.583	5.99	3.167	155.84	4.750	7.99						

Unit Hyd Qpeak (cms)= 2.283

PEAK FLOW (cms)= 3.253 (i)
TIME TO PEAK (hrs)= 4.000
RUNOFF VOLUME (mm)= 52.289
TOTAL RAINFALL (mm)= 99.900
RUNOFF COEFFICIENT = 0.523

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

CALIB	Area (ha)= 5.24
STANDHYD (0205)	Total Imp(%)= 35.00 Dir. Conn.(%)= 25.00
ID= 1 DT= 5.0 min	

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.83	3.41
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	0.50	2.00
Length (m)=	186.90	70.00
Mannings n	0.013	0.250

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

TIME		RAIN		TRANSFORMED		HYETOGRAPH		TIME		RAIN	
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	5.99	3.250	155.84	4.83	5.99				
0.167	0.00	1.750	5.99	3.333	21.98	4.92	5.99				
0.250	0.00	1.833	9.99	3.417	21.98	5.00	5.99				
0.333	4.00	1.917	9.99	3.500	21.98	5.08	5.99				
0.417	4.00	2.000	9.99	3.583	21.98	5.17	5.99				
0.500	4.00	2.083	9.99	3.667	21.98	5.25	5.99				
0.583	4.00	2.167	9.99	3.750	21.98	5.33	4.00				
0.667	4.00	2.250	9.99	3.833	9.99	5.42	4.00				
0.750	4.00	2.333	11.99	3.917	9.99	5.50	4.00				
0.833	5.99	2.417	11.99	4.000	9.99	5.58	4.00				
0.917	5.99	2.500	11.99	4.083	9.99	5.67	4.00				
1.000	5.99	2.583	11.99	4.167	9.99	5.75	4.00				
1.083	5.99	2.667	11.99	4.250	9.99	5.83	4.00				
1.167	5.99	2.750	11.99	4.333	7.99	5.92	4.00				
1.250	5.99	2.833	59.94	4.417	7.99	6.00	4.00				
1.333	5.99	2.917	59.94	4.500	7.99	6.08	4.00				
1.417	5.99	3.000	59.94	4.583	7.99	6.17	4.00				

1.500	5.99	3.083	155.84	4.667	7.99	6.25	4.00
1.583	5.99	3.167	155.84	4.750	7.99		

Max.Eff.Inten.(mm/hr)= 155.84 103.17
 over (min) 5.00 15.00
 Storage Coeff. (min)= 3.83 (ii) 13.58 (ii)
 Unit Hyd. Tpeak (min)= 5.00 15.00
 Unit Hyd. peak (cms)= 0.25 0.08

TOTALS

PEAK FLOW (cms)= 0.56 0.57 1.046 (iii)
 TIME TO PEAK (hrs)= 3.25 3.33 3.25
 RUNOFF VOLUME (mm)= 98.90 45.86 59.12
 TOTAL RAINFALL (mm)= 99.90 99.90 99.90
 RUNOFF COEFFICIENT = 0.99 0.46 0.59

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

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

ADD HYD (0019)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0102):	46.03	3.253	4.00	52.29
+ ID2= 2 (0205):	5.24	1.046	3.25	59.12
ID = 3 (0019):	51.27	3.464	3.92	52.99

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB			
STANDHYD (0201)	Area (ha)= 7.34		
ID= 1 DT= 5.0 min	Total Imp(%)= 50.00	Dir. Conn.(%)= 35.00	

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	3.67	3.67
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	0.50	2.00
Length (m)=	221.21	70.00
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	0.00	1.667	5.99	3.250	155.84	4.83	5.99
0.167	0.00	1.750	5.99	3.333	21.98	4.92	5.99
0.250	0.00	1.833	9.99	3.417	21.98	5.00	5.99
0.333	4.00	1.917	9.99	3.500	21.98	5.08	5.99
0.417	4.00	2.000	9.99	3.583	21.98	5.17	5.99
0.500	4.00	2.083	9.99	3.667	21.98	5.25	5.99
0.583	4.00	2.167	9.99	3.750	21.98	5.33	4.00
0.667	4.00	2.250	9.99	3.833	9.99	5.42	4.00
0.750	4.00	2.333	11.99	3.917	9.99	5.50	4.00
0.833	5.99	2.417	11.99	4.000	9.99	5.58	4.00
0.917	5.99	2.500	11.99	4.083	9.99	5.67	4.00
1.000	5.99	2.583	11.99	4.167	9.99	5.75	4.00
1.083	5.99	2.667	11.99	4.250	9.99	5.83	4.00
1.167	5.99	2.750	11.99	4.333	7.99	5.92	4.00
1.250	5.99	2.833	59.94	4.417	7.99	6.00	4.00
1.333	5.99	2.917	59.94	4.500	7.99	6.08	4.00

1.417	5.99	3.000	59.94	4.583	7.99	6.17	4.00
1.500	5.99	3.083	155.84	4.667	7.99	6.25	4.00
1.583	5.99	3.167	155.84	4.750	7.99		

Max.Eff.Inten.(mm/hr)= 155.84 123.83
 over (min) 5.00 15.00
 Storage Coeff. (min)= 4.24 (ii) 13.31 (ii)
 Unit Hyd. Tpeak (min)= 5.00 15.00
 Unit Hyd. peak (cms)= 0.24 0.08

TOTALS

PEAK FLOW (cms)= 1.09 0.75 1.736 (iii)
 TIME TO PEAK (hrs)= 3.25 3.33 3.25
 RUNOFF VOLUME (mm)= 98.90 49.08 66.51
 TOTAL RAINFALL (mm)= 99.90 99.90 99.90
 RUNOFF COEFFICIENT = 0.99 0.49 0.67

***** 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.

CALIB			
STANDHYD (0203)	Area (ha)= 1.09		
ID= 1 DT= 5.0 min	Total Imp(%)= 50.00	Dir. Conn.(%)= 50.00	

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.55	0.55
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	0.50	2.00
Length (m)=	85.24	70.00
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	0.00	1.667	5.99	3.250	155.84	4.83	5.99
0.167	0.00	1.750	5.99	3.333	21.98	4.92	5.99
0.250	0.00	1.833	9.99	3.417	21.98	5.00	5.99
0.333	4.00	1.917	9.99	3.500	21.98	5.08	5.99
0.417	4.00	2.000	9.99	3.583	21.98	5.17	5.99
0.500	4.00	2.083	9.99	3.667	21.98	5.25	5.99
0.583	4.00	2.167	9.99	3.750	21.98	5.33	4.00
0.667	4.00	2.250	9.99	3.833	9.99	5.42	4.00
0.750	4.00	2.333	11.99	3.917	9.99	5.50	4.00
0.833	5.99	2.417	11.99	4.000	9.99	5.58	4.00
0.917	5.99	2.500	11.99	4.083	9.99	5.67	4.00
1.000	5.99	2.583	11.99	4.167	9.99	5.75	4.00
1.083	5.99	2.667	11.99	4.250	9.99	5.83	4.00
1.167	5.99	2.750	11.99	4.333	7.99	5.92	4.00
1.250	5.99	2.833	59.94	4.417	7.99	6.00	4.00
1.333	5.99	2.917	59.94	4.500	7.99	6.08	4.00
1.417	5.99	3.000	59.94	4.583	7.99	6.17	4.00
1.500	5.99	3.083	155.84	4.667	7.99	6.25	4.00
1.583	5.99	3.167	155.84	4.750	7.99		

Max.Eff.Inten.(mm/hr)= 155.84 75.85
 over (min) 5.00 15.00
 Storage Coeff. (min)= 2.39 (ii) 13.42 (ii)
 Unit Hyd. Tpeak (min)= 5.00 15.00
 Unit Hyd. peak (cms)= 0.30 0.08

TOTALS

PEAK FLOW (cms)= 0.24 0.07 0.297 (iii)

TIME TO PEAK (hrs) = 3.25 3.33 3.25
 RUNOFF VOLUME (mm) = 98.90 42.00 70.44
 TOTAL RAINFALL (mm) = 99.90 99.90 99.90
 RUNOFF COEFFICIENT = 0.99 0.42 0.71

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

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

CALIB STANDHYD (0202) ID= 1 DT= 5.0 min		Area (ha) = 11.35 Total Imp(%) = 50.00	Dir. Conn.(%) = 35.00
		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha) = 5.68	5.68	
Dep. Storage	(mm) = 1.00	5.00	
Average Slope	(%) = 0.50	2.00	
Length	(m) = 275.08	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	1.667	5.99	3.250	155.84	4.83	5.99
0.167	0.00	1.750	5.99	3.333	21.98	4.92	5.99
0.250	0.00	1.833	9.99	3.417	21.98	5.00	5.99
0.333	4.00	1.917	9.99	3.500	21.98	5.08	5.99
0.417	4.00	2.000	9.99	3.583	21.98	5.17	5.99
0.500	4.00	2.083	9.99	3.667	21.98	5.25	5.99
0.583	4.00	2.167	9.99	3.750	21.98	5.33	4.00
0.667	4.00	2.250	9.99	3.833	9.99	5.42	4.00
0.750	4.00	2.333	11.99	3.917	9.99	5.50	4.00
0.833	5.99	2.417	11.99	4.000	9.99	5.58	4.00
0.917	5.99	2.500	11.99	4.083	9.99	5.67	4.00
1.000	5.99	2.583	11.99	4.167	9.99	5.75	4.00
1.083	5.99	2.667	11.99	4.250	9.99	5.83	4.00
1.167	5.99	2.750	11.99	4.333	7.99	5.92	4.00
1.250	5.99	2.833	59.94	4.417	7.99	6.00	4.00
1.333	5.99	2.917	59.94	4.500	7.99	6.08	4.00
1.417	5.99	3.000	59.94	4.583	7.99	6.17	4.00
1.500	5.99	3.083	155.84	4.667	7.99	6.25	4.00
1.583	5.99	3.167	155.84	4.750	7.99		
Max.Eff.Inten.(mm/hr)=	155.84	123.83					
over (min)	5.00	15.00					
Storage Coeff. (min)=	4.83 (ii)	13.90 (ii)					
Unit Hyd. Tpeak (min)=	5.00	15.00					
Unit Hyd. peak (cms)=	0.22	0.08					
			TOTALS				
PEAK FLOW (cms)=	1.67	1.14	2.646 (iii)				
TIME TO PEAK (hrs)=	3.25	3.33	3.25				
RUNOFF VOLUME (mm)=	98.90	49.08	66.51				
TOTAL RAINFALL (mm)=	99.90	99.90	99.90				
RUNOFF COEFFICIENT =	0.99	0.49	0.67				

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

- (i) CN PROCEDURE SELECTED FOR PVIOUS LOSSES:
 CN* = 68.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.

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

ADD HYD (0001) 1 + 2 = 3		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0201):	7.34	1.736	3.25	66.51	
+ ID2= 2 (0202):	11.35	2.646	3.25	66.51	
ID = 3 (0001):	18.69	4.382	3.25	66.51	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0001) 3 + 2 = 1		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (0001):	18.69	4.382	3.25	66.51	
+ ID2= 2 (0203):	1.09	0.297	3.25	70.44	
ID = 1 (0001):	19.78	4.679	3.25	66.73	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (0204) ID= 1 DT= 5.0 min		Area (ha) = 1.03 Total Imp(%) = 35.00	Dir. Conn.(%) = 25.00
		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha) = 0.36	0.67	
Dep. Storage	(mm) = 1.00	5.00	
Average Slope	(%) = 0.50	2.00	
Length	(m) = 82.87	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	1.667	5.99	3.250	155.84	4.83	5.99
0.167	0.00	1.750	5.99	3.333	21.98	4.92	5.99
0.250	0.00	1.833	9.99	3.417	21.98	5.00	5.99
0.333	4.00	1.917	9.99	3.500	21.98	5.08	5.99
0.417	4.00	2.000	9.99	3.583	21.98	5.17	5.99
0.500	4.00	2.083	9.99	3.667	21.98	5.25	5.99
0.583	4.00	2.167	9.99	3.750	21.98	5.33	4.00
0.667	4.00	2.250	9.99	3.833	9.99	5.42	4.00
0.750	4.00	2.333	11.99	3.917	9.99	5.50	4.00
0.833	5.99	2.417	11.99	4.000	9.99	5.58	4.00
0.917	5.99	2.500	11.99	4.083	9.99	5.67	4.00
1.000	5.99	2.583	11.99	4.167	9.99	5.75	4.00
1.083	5.99	2.667	11.99	4.250	9.99	5.83	4.00
1.167	5.99	2.750	11.99	4.333	7.99	5.92	4.00
1.250	5.99	2.833	59.94	4.417	7.99	6.00	4.00
1.333	5.99	2.917	59.94	4.500	7.99	6.08	4.00
1.417	5.99	3.000	59.94	4.583	7.99	6.17	4.00
1.500	5.99	3.083	155.84	4.667	7.99	6.25	4.00
1.583	5.99	3.167	155.84	4.750	7.99		
Max.Eff.Inten.(mm/hr)=	155.84	103.17					
over (min)	5.00	15.00					
Storage Coeff. (min)=	2.35 (ii)	12.10 (ii)					
Unit Hyd. Tpeak (min)=	5.00	15.00					
Unit Hyd. peak (cms)=	0.30	0.09					


```

*TOTALS*
PEAK FLOW      (cms)=      0.11      0.12      0.213 (iii)
TIME TO PEAK   (hrs)=      3.25      3.33      3.25
RUNOFF VOLUME  (mm)=     98.90     45.86     59.11
TOTAL RAINFALL (mm)=     99.90     99.90     99.90
RUNOFF COEFFICIENT =      0.99      0.46      0.59

```

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

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

```

-----
| ADD HYD ( 0022) |
| 1 + 2 = 3 |
-----
          AREA   QPEAK   TPEAK   R.V.
          (ha)   (cms)   (hrs)   (mm)
ID1= 1 ( 0001): 19.78  4.679  3.25  66.73
+ ID2= 2 ( 0019): 51.27  3.464  3.92  52.99
=====
ID = 3 ( 0022): 71.05  6.693  3.25  56.81

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0022) |
| 3 + 2 = 1 |
-----
          AREA   QPEAK   TPEAK   R.V.
          (ha)   (cms)   (hrs)   (mm)
ID1= 3 ( 0022): 71.05  6.693  3.25  56.81
+ ID2= 2 ( 0204): 1.03  0.213  3.25  59.11
=====
ID = 1 ( 0022): 72.08  6.906  3.25  56.85

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

```

=====
V  V  I  SSSS  U  U  A  L          (v 6.2.2019)
V  V  I  SS   U  U  A  A  L
V  V  I  SS   U  U  AAAAA L
V  V  I  SS   U  U  A  A  L
VV   I  SSSS  UUUUU A  A  LLLL

```

```

OOO  TTTT  TTTT  H  H  Y  Y  M  M  OOO  TM
O  O  T  T  H  H  Y  Y  MM  MM  O  O
O  O  T  T  H  H  Y  Y  M  M  O  O
OOO  T  T  H  H  Y  Y  M  M  OOO

```

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

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
Output filename: C:\Users\FPetkovski\AppData\Local\Civica\XH5\ld605a61-9146-4ab0-blab-422fd6022bab\ddad2efc-923d-45a9-91f1-12c0b2922c5e\s

Summary filename: C:\Users\FPetkovski\AppData\Local\Civica\XH5\ld605a61-9146-4ab0-blab-422fd6022bab\ddad2efc-923d-45a9-91f1-12c0b2922c5e\s

DATE: 04-02-2026

TIME: 03:29:42

USER:

COMMENTS: _____

```

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

```

```

-----
| READ STORM |
| Ptotal=212.00 mm |
-----
Filename: C:\Users\FPetkovski\AppData\Local\Temp\
b064e03b-9da2-4c22-b50e-ab021ca90150\37b34bef
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	4.00	3.00	12.00	6.00	22.00	9.00	50.00
0.50	8.00	3.50	12.00	6.50	26.00	9.50	56.00
1.00	4.00	4.00	16.00	7.00	12.00	10.00	38.00
1.50	4.00	4.50	18.00	7.50	12.00	10.50	38.00
2.00	6.00	5.00	12.00	8.00	12.00	11.00	14.00
2.50	8.00	5.50	14.00	8.50	14.00	11.50	12.00

```

-----
| CALIB |
| NASHYD ( 0102) |
| ID= 1 DT= 5.0 min |
-----
Area (ha)= 46.03 Curve Number (CN)= 90.0
Ia (mm)= 7.20 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.77

```

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

```

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN TIME RAIN TIME RAIN TIME RAIN
hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
0.083 4.00 3.083 12.00 6.083 22.00 9.08 50.00
0.167 4.00 3.167 12.00 6.167 22.00 9.17 50.00
0.250 4.00 3.250 12.00 6.250 22.00 9.25 50.00
0.333 4.00 3.333 12.00 6.333 22.00 9.33 50.00
0.417 4.00 3.417 12.00 6.417 22.00 9.42 50.00
0.500 4.00 3.500 12.00 6.500 22.00 9.50 50.00
0.583 8.00 3.583 12.00 6.583 26.00 9.58 56.00
0.667 8.00 3.667 12.00 6.667 26.00 9.67 56.00
0.750 8.00 3.750 12.00 6.750 26.00 9.75 56.00
0.833 8.00 3.833 12.00 6.833 26.00 9.83 56.00
0.917 8.00 3.917 12.00 6.917 26.00 9.92 56.00
1.000 8.00 4.000 12.00 7.000 26.00 10.00 56.00
1.083 4.00 4.083 16.00 7.083 12.00 10.08 38.00
1.167 4.00 4.167 16.00 7.167 12.00 10.17 38.00
1.250 4.00 4.250 16.00 7.250 12.00 10.25 38.00
1.333 4.00 4.333 16.00 7.333 12.00 10.33 38.00
1.417 4.00 4.417 16.00 7.417 12.00 10.42 38.00
1.500 4.00 4.500 16.00 7.500 12.00 10.50 38.00
1.583 4.00 4.583 18.00 7.583 12.00 10.58 38.00
1.667 4.00 4.667 18.00 7.667 12.00 10.67 38.00
1.750 4.00 4.750 18.00 7.750 12.00 10.75 38.00

```

1.833	4.00	4.833	18.00	7.833	12.00	10.83	38.00
1.917	4.00	4.917	18.00	7.917	12.00	10.92	38.00
2.000	4.00	5.000	18.00	8.000	12.00	11.00	38.00
2.083	6.00	5.083	12.00	8.083	12.00	11.08	14.00
2.167	6.00	5.167	12.00	8.167	12.00	11.17	14.00
2.250	6.00	5.250	12.00	8.250	12.00	11.25	14.00
2.333	6.00	5.333	12.00	8.333	12.00	11.33	14.00
2.417	6.00	5.417	12.00	8.417	12.00	11.42	14.00
2.500	6.00	5.500	12.00	8.500	12.00	11.50	14.00
2.583	8.00	5.583	14.00	8.583	14.00	11.58	12.00
2.667	8.00	5.667	14.00	8.667	14.00	11.67	12.00
2.750	8.00	5.750	14.00	8.750	14.00	11.75	12.00
2.833	8.00	5.833	14.00	8.833	14.00	11.83	12.00
2.917	8.00	5.917	14.00	8.917	14.00	11.92	12.00
3.000	8.00	6.000	14.00	9.000	14.00	12.00	12.00

Unit Hyd Qpeak (cms) = 2.283

PEAK FLOW (cms) = 5.219 (i)
 TIME TO PEAK (hrs) = 10.833
 RUNOFF VOLUME (mm) = 179.995
 TOTAL RAINFALL (mm) = 212.000
 RUNOFF COEFFICIENT = 0.849

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

CALIB	
STANDHYD (0205)	
ID= 1 DT= 5.0 min	

Area (ha) = 5.24
 Total Imp(%) = 35.00 Dir. Conn.(%) = 25.00

IMPERVIOUS		PERVIOUS (i)	
Surface Area (ha)	1.83		3.41
Dep. Storage (mm)	1.00		5.00
Average Slope (%)	0.50		2.00
Length (m)	186.90		70.00
Mannings n	0.013		0.250

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

--- TRANSFORMED HYETOGRAPH ---							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	4.00	3.083	12.00	6.083	22.00	9.08	50.00
0.167	4.00	3.167	12.00	6.167	22.00	9.17	50.00
0.250	4.00	3.250	12.00	6.250	22.00	9.25	50.00
0.333	4.00	3.333	12.00	6.333	22.00	9.33	50.00
0.417	4.00	3.417	12.00	6.417	22.00	9.42	50.00
0.500	4.00	3.500	12.00	6.500	22.00	9.50	50.00
0.583	8.00	3.583	12.00	6.583	26.00	9.58	56.00
0.667	8.00	3.667	12.00	6.667	26.00	9.67	56.00
0.750	8.00	3.750	12.00	6.750	26.00	9.75	56.00
0.833	8.00	3.833	12.00	6.833	26.00	9.83	56.00
0.917	8.00	3.917	12.00	6.917	26.00	9.92	56.00
1.000	8.00	4.000	12.00	7.000	26.00	10.00	56.00
1.083	4.00	4.083	16.00	7.083	12.00	10.08	38.00
1.167	4.00	4.167	16.00	7.167	12.00	10.17	38.00
1.250	4.00	4.250	16.00	7.250	12.00	10.25	38.00
1.333	4.00	4.333	16.00	7.333	12.00	10.33	38.00
1.417	4.00	4.417	16.00	7.417	12.00	10.42	38.00
1.500	4.00	4.500	16.00	7.500	12.00	10.50	38.00
1.583	4.00	4.583	18.00	7.583	12.00	10.58	38.00
1.667	4.00	4.667	18.00	7.667	12.00	10.67	38.00
1.750	4.00	4.750	18.00	7.750	12.00	10.75	38.00
1.833	4.00	4.833	18.00	7.833	12.00	10.83	38.00
1.917	4.00	4.917	18.00	7.917	12.00	10.92	38.00
2.000	4.00	5.000	18.00	8.000	12.00	11.00	38.00
2.083	6.00	5.083	12.00	8.083	12.00	11.08	14.00

2.167	6.00	5.167	12.00	8.167	12.00	11.17	14.00
2.250	6.00	5.250	12.00	8.250	12.00	11.25	14.00
2.333	6.00	5.333	12.00	8.333	12.00	11.33	14.00
2.417	6.00	5.417	12.00	8.417	12.00	11.42	14.00
2.500	6.00	5.500	12.00	8.500	12.00	11.50	14.00
2.583	8.00	5.583	14.00	8.583	14.00	11.58	12.00
2.667	8.00	5.667	14.00	8.667	14.00	11.67	12.00
2.750	8.00	5.750	14.00	8.750	14.00	11.75	12.00
2.833	8.00	5.833	14.00	8.833	14.00	11.83	12.00
2.917	8.00	5.917	14.00	8.917	14.00	11.92	12.00
3.000	8.00	6.000	14.00	9.000	14.00	12.00	12.00

Max.Eff.Inten.(mm/hr)= 56.00 61.52
 over (min) = 5.00 20.00
 Storage Coeff. (min)= 5.77 (ii) 17.76 (ii)
 Unit Hyd. Tpeak (min)= 5.00 20.00
 Unit Hyd. peak (cms)= 0.20 0.06

TOTALS
 PEAK FLOW (cms) = 0.20 0.54 0.739 (iii)
 TIME TO PEAK (hrs) = 10.00 10.08 10.00
 RUNOFF VOLUME (mm) = 211.00 172.78 182.33
 TOTAL RAINFALL (mm) = 212.00 212.00 212.00
 RUNOFF COEFFICIENT = 1.00 0.82 0.86

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 84.0 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 (0019)				
1	2	3		
ID1= 1 (0102):	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
	46.03	5.219	10.83	179.99
+ ID2= 2 (0205):	5.24	0.739	10.00	182.33
=====				
ID = 3 (0019):	51.27	5.777	10.75	180.23

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB	
STANDHYD (0201)	
ID= 1 DT= 5.0 min	

Area (ha) = 7.34
 Total Imp(%) = 50.00 Dir. Conn.(%) = 35.00

IMPERVIOUS		PERVIOUS (i)	
Surface Area (ha)	3.67		3.67
Dep. Storage (mm)	1.00		5.00
Average Slope (%)	0.50		2.00
Length (m)	221.21		70.00
Mannings n	0.013		0.250

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

--- TRANSFORMED HYETOGRAPH ---							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	4.00	3.083	12.00	6.083	22.00	9.08	50.00
0.167	4.00	3.167	12.00	6.167	22.00	9.17	50.00
0.250	4.00	3.250	12.00	6.250	22.00	9.25	50.00
0.333	4.00	3.333	12.00	6.333	22.00	9.33	50.00
0.417	4.00	3.417	12.00	6.417	22.00	9.42	50.00
0.500	4.00	3.500	12.00	6.500	22.00	9.50	50.00
0.583	8.00	3.583	12.00	6.583	26.00	9.58	56.00
0.667	8.00	3.667	12.00	6.667	26.00	9.67	56.00

0.750	8.00	3.750	12.00	6.750	26.00	9.75	56.00
0.833	8.00	3.833	12.00	6.833	26.00	9.83	56.00
0.917	8.00	3.917	12.00	6.917	26.00	9.92	56.00
1.000	8.00	4.000	12.00	7.000	26.00	10.00	56.00
1.083	4.00	4.083	16.00	7.083	12.00	10.08	38.00
1.167	4.00	4.167	16.00	7.167	12.00	10.17	38.00
1.250	4.00	4.250	16.00	7.250	12.00	10.25	38.00
1.333	4.00	4.333	16.00	7.333	12.00	10.33	38.00
1.417	4.00	4.417	16.00	7.417	12.00	10.42	38.00
1.500	4.00	4.500	16.00	7.500	12.00	10.50	38.00
1.583	4.00	4.583	18.00	7.583	12.00	10.58	38.00
1.667	4.00	4.667	18.00	7.667	12.00	10.67	38.00
1.750	4.00	4.750	18.00	7.750	12.00	10.75	38.00
1.833	4.00	4.833	18.00	7.833	12.00	10.83	38.00
1.917	4.00	4.917	18.00	7.917	12.00	10.92	38.00
2.000	4.00	5.000	18.00	8.000	12.00	11.00	38.00
2.083	6.00	5.083	12.00	8.083	12.00	11.08	14.00
2.167	6.00	5.167	12.00	8.167	12.00	11.17	14.00
2.250	6.00	5.250	12.00	8.250	12.00	11.25	14.00
2.333	6.00	5.333	12.00	8.333	12.00	11.33	14.00
2.417	6.00	5.417	12.00	8.417	12.00	11.42	14.00
2.500	6.00	5.500	12.00	8.500	12.00	11.50	14.00
2.583	8.00	5.583	14.00	8.583	14.00	11.58	12.00
2.667	8.00	5.667	14.00	8.667	14.00	11.67	12.00
2.750	8.00	5.750	14.00	8.750	14.00	11.75	12.00
2.833	8.00	5.833	14.00	8.833	14.00	11.83	12.00
2.917	8.00	5.917	14.00	8.917	14.00	11.92	12.00
3.000	8.00	6.000	14.00	9.000	14.00	12.00	12.00

Max.Eff.Inten.(mm/hr)= 56.00 69.92
over (min) 5.00 20.00
Storage Coeff. (min)= 6.39 (ii) 17.78 (ii)
Unit Hyd. Tpeak (min)= 5.00 20.00
Unit Hyd. peak (cms)= 0.18 0.06

TOTALS
PEAK FLOW (cms)= 0.40 0.66 1.056 (iii)
TIME TO PEAK (hrs)= 10.00 10.08 10.00
RUNOFF VOLUME (mm)= 211.00 176.58 188.63
TOTAL RAINFALL (mm)= 212.00 212.00 212.00
RUNOFF COEFFICIENT = 1.00 0.83 0.89

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 84.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0203)	Area (ha)= 1.09		
ID= 1 DT= 5.0 min	Total Imp(%)= 50.00	Dir. Conn.(%)= 50.00	

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.55	0.55
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	0.50	2.00
Length (m)=	85.24	70.00
Mannings n =	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----					
TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	4.00	3.083	12.00	6.083	22.00
0.167	4.00	3.167	12.00	6.167	22.00
0.250	4.00	3.250	12.00	6.250	22.00

0.333	4.00	3.333	12.00	6.333	22.00	9.33	50.00
0.417	4.00	3.417	12.00	6.417	22.00	9.42	50.00
0.500	4.00	3.500	12.00	6.500	22.00	9.50	50.00
0.583	8.00	3.583	12.00	6.583	26.00	9.58	56.00
0.667	8.00	3.667	12.00	6.667	26.00	9.67	56.00
0.750	8.00	3.750	12.00	6.750	26.00	9.75	56.00
0.833	8.00	3.833	12.00	6.833	26.00	9.83	56.00
0.917	8.00	3.917	12.00	6.917	26.00	9.92	56.00
1.000	8.00	4.000	12.00	7.000	26.00	10.00	56.00
1.083	4.00	4.083	16.00	7.083	12.00	10.08	38.00
1.167	4.00	4.167	16.00	7.167	12.00	10.17	38.00
1.250	4.00	4.250	16.00	7.250	12.00	10.25	38.00
1.333	4.00	4.333	16.00	7.333	12.00	10.33	38.00
1.417	4.00	4.417	16.00	7.417	12.00	10.42	38.00
1.500	4.00	4.500	16.00	7.500	12.00	10.50	38.00
1.583	4.00	4.583	18.00	7.583	12.00	10.58	38.00
1.667	4.00	4.667	18.00	7.667	12.00	10.67	38.00
1.750	4.00	4.750	18.00	7.750	12.00	10.75	38.00
1.833	4.00	4.833	18.00	7.833	12.00	10.83	38.00
1.917	4.00	4.917	18.00	7.917	12.00	10.92	38.00
2.000	4.00	5.000	18.00	8.000	12.00	11.00	38.00
2.083	6.00	5.083	12.00	8.083	12.00	11.08	14.00
2.167	6.00	5.167	12.00	8.167	12.00	11.17	14.00
2.250	6.00	5.250	12.00	8.250	12.00	11.25	14.00
2.333	6.00	5.333	12.00	8.333	12.00	11.33	14.00
2.417	6.00	5.417	12.00	8.417	12.00	11.42	14.00
2.500	6.00	5.500	12.00	8.500	12.00	11.50	14.00
2.583	8.00	5.583	14.00	8.583	14.00	11.58	12.00
2.667	8.00	5.667	14.00	8.667	14.00	11.67	12.00
2.750	8.00	5.750	14.00	8.750	14.00	11.75	12.00
2.833	8.00	5.833	14.00	8.833	14.00	11.83	12.00
2.917	8.00	5.917	14.00	8.917	14.00	11.92	12.00
3.000	8.00	6.000	14.00	9.000	14.00	12.00	12.00

Max.Eff.Inten.(mm/hr)= 56.00 52.63
over (min) 5.00 20.00
Storage Coeff. (min)= 3.60 (ii) 16.37 (ii)
Unit Hyd. Tpeak (min)= 5.00 20.00
Unit Hyd. peak (cms)= 0.25 0.06

TOTALS
PEAK FLOW (cms)= 0.08 0.07 0.159 (iii)
TIME TO PEAK (hrs)= 10.00 10.08 10.00
RUNOFF VOLUME (mm)= 211.00 167.78 189.38
TOTAL RAINFALL (mm)= 212.00 212.00 212.00
RUNOFF COEFFICIENT = 1.00 0.79 0.89

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 84.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0202)	Area (ha)= 11.35		
ID= 1 DT= 5.0 min	Total Imp(%)= 50.00	Dir. Conn.(%)= 35.00	

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	5.68	5.68
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	0.50	2.00
Length (m)=	275.08	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	4.00	3.083	12.00	6.083	22.00	9.08	50.00
0.167	4.00	3.167	12.00	6.167	22.00	9.17	50.00
0.250	4.00	3.250	12.00	6.250	22.00	9.25	50.00
0.333	4.00	3.333	12.00	6.333	22.00	9.33	50.00
0.417	4.00	3.417	12.00	6.417	22.00	9.42	50.00
0.500	4.00	3.500	12.00	6.500	22.00	9.50	50.00
0.583	8.00	3.583	12.00	6.583	26.00	9.58	56.00
0.667	8.00	3.667	12.00	6.667	26.00	9.67	56.00
0.750	8.00	3.750	12.00	6.750	26.00	9.75	56.00
0.833	8.00	3.833	12.00	6.833	26.00	9.83	56.00
0.917	8.00	3.917	12.00	6.917	26.00	9.92	56.00
1.000	8.00	4.000	12.00	7.000	26.00	10.00	56.00
1.083	4.00	4.083	16.00	7.083	12.00	10.08	38.00
1.167	4.00	4.167	16.00	7.167	12.00	10.17	38.00
1.250	4.00	4.250	16.00	7.250	12.00	10.25	38.00
1.333	4.00	4.333	16.00	7.333	12.00	10.33	38.00
1.417	4.00	4.417	16.00	7.417	12.00	10.42	38.00
1.500	4.00	4.500	16.00	7.500	12.00	10.50	38.00
1.583	4.00	4.583	18.00	7.583	12.00	10.58	38.00
1.667	4.00	4.667	18.00	7.667	12.00	10.67	38.00
1.750	4.00	4.750	18.00	7.750	12.00	10.75	38.00
1.833	4.00	4.833	18.00	7.833	12.00	10.83	38.00
1.917	4.00	4.917	18.00	7.917	12.00	10.92	38.00
2.000	4.00	5.000	18.00	8.000	12.00	11.00	38.00
2.083	6.00	5.083	12.00	8.083	12.00	11.08	14.00
2.167	6.00	5.167	12.00	8.167	12.00	11.17	14.00
2.250	6.00	5.250	12.00	8.250	12.00	11.25	14.00
2.333	6.00	5.333	12.00	8.333	12.00	11.33	14.00
2.417	6.00	5.417	12.00	8.417	12.00	11.42	14.00
2.500	6.00	5.500	12.00	8.500	12.00	11.50	14.00
2.583	8.00	5.583	14.00	8.583	14.00	11.58	12.00
2.667	8.00	5.667	14.00	8.667	14.00	11.67	12.00
2.750	8.00	5.750	14.00	8.750	14.00	11.75	12.00
2.833	8.00	5.833	14.00	8.833	14.00	11.83	12.00
2.917	8.00	5.917	14.00	8.917	14.00	11.92	12.00
3.000	8.00	6.000	14.00	9.000	14.00	12.00	12.00
Max.Eff.Inten. (mm/hr)=	56.00	69.92					
over (min)	5.00	20.00					
Storage Coeff. (min)=	7.28 (ii)	18.67 (ii)					
Unit Hyd. Tpeak (min)=	5.00	20.00					
Unit Hyd. peak (cms)=	0.17	0.06					
			TOTALS				
PEAK FLOW (cms)=	0.62	1.01	1.624 (iii)				
TIME TO PEAK (hrs)=	10.00	10.08	10.00				
RUNOFF VOLUME (mm)=	211.00	176.58	188.63				
TOTAL RAINFALL (mm)=	212.00	212.00	212.00				
RUNOFF COEFFICIENT =	1.00	0.83	0.89				

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 84.0 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.

----- TRANSFORMED HYETOGRAPH -----				
ADD HYD (0001)	AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0201):	7.34	1.056	10.00	188.63
+ ID2= 2 (0202):	11.35	1.624	10.00	188.63
ID = 3 (0001):	18.69	2.680	10.00	188.63

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

----- TRANSFORMED HYETOGRAPH -----				
ADD HYD (0001)	AREA	QPEAK	TPEAK	R.V.
3 + 2 = 1	(ha)	(cms)	(hrs)	(mm)
ID1= 3 (0001):	18.69	2.680	10.00	188.63
+ ID2= 2 (0203):	1.09	0.159	10.00	189.38
ID = 1 (0001):	19.78	2.839	10.00	188.67

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

----- TRANSFORMED HYETOGRAPH -----			
CALIB	Area	(ha)=	1.03
STANDHYD (0204)	Total Imp(%)=	35.00	Dir. Conn.(%)= 25.00
ID= 1 DT= 5.0 min			

	IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)= 0.36	0.67
Dep. Storage	(mm)= 1.00	5.00
Average Slope	(%)= 0.50	2.00
Length	(m)= 82.87	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	4.00	3.083	12.00	6.083	22.00	9.08	50.00
0.167	4.00	3.167	12.00	6.167	22.00	9.17	50.00
0.250	4.00	3.250	12.00	6.250	22.00	9.25	50.00
0.333	4.00	3.333	12.00	6.333	22.00	9.33	50.00
0.417	4.00	3.417	12.00	6.417	22.00	9.42	50.00
0.500	4.00	3.500	12.00	6.500	22.00	9.50	50.00
0.583	8.00	3.583	12.00	6.583	26.00	9.58	56.00
0.667	8.00	3.667	12.00	6.667	26.00	9.67	56.00
0.750	8.00	3.750	12.00	6.750	26.00	9.75	56.00
0.833	8.00	3.833	12.00	6.833	26.00	9.83	56.00
0.917	8.00	3.917	12.00	6.917	26.00	9.92	56.00
1.000	8.00	4.000	12.00	7.000	26.00	10.00	56.00
1.083	4.00	4.083	16.00	7.083	12.00	10.08	38.00
1.167	4.00	4.167	16.00	7.167	12.00	10.17	38.00
1.250	4.00	4.250	16.00	7.250	12.00	10.25	38.00
1.333	4.00	4.333	16.00	7.333	12.00	10.33	38.00
1.417	4.00	4.417	16.00	7.417	12.00	10.42	38.00
1.500	4.00	4.500	16.00	7.500	12.00	10.50	38.00
1.583	4.00	4.583	18.00	7.583	12.00	10.58	38.00
1.667	4.00	4.667	18.00	7.667	12.00	10.67	38.00
1.750	4.00	4.750	18.00	7.750	12.00	10.75	38.00
1.833	4.00	4.833	18.00	7.833	12.00	10.83	38.00
1.917	4.00	4.917	18.00	7.917	12.00	10.92	38.00
2.000	4.00	5.000	18.00	8.000	12.00	11.00	38.00
2.083	6.00	5.083	12.00	8.083	12.00	11.08	14.00
2.167	6.00	5.167	12.00	8.167	12.00	11.17	14.00
2.250	6.00	5.250	12.00	8.250	12.00	11.25	14.00
2.333	6.00	5.333	12.00	8.333	12.00	11.33	14.00
2.417	6.00	5.417	12.00	8.417	12.00	11.42	14.00
2.500	6.00	5.500	12.00	8.500	12.00	11.50	14.00
2.583	8.00	5.583	14.00	8.583	14.00	11.58	12.00
2.667	8.00	5.667	14.00	8.667	14.00	11.67	12.00
2.750	8.00	5.750	14.00	8.750	14.00	11.75	12.00
2.833	8.00	5.833	14.00	8.833	14.00	11.83	12.00
2.917	8.00	5.917	14.00	8.917	14.00	11.92	12.00
3.000	8.00	6.000	14.00	9.000	14.00	12.00	12.00

Max.Eff.Inten. (mm/hr) = 56.00 61.52

over (min)	5.00	20.00	
Storage Coeff. (min)=	3.54 (ii)	15.54 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	0.26	0.07	
TOTALS			
PEAK FLOW (cms)=	0.04	0.11	0.147 (iii)
TIME TO PEAK (hrs)=	10.00	10.08	10.00
RUNOFF VOLUME (mm)=	211.00	172.78	182.33
TOTAL RAINFALL (mm)=	212.00	212.00	212.00
RUNOFF COEFFICIENT =	1.00	0.82	0.86

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

- (i) CN PROCEDURE SELECTED FOR PVIOUS LOSSES:
 CN* = 84.0 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 ( 0022) |
| 1 + 2 = 3      |
-----
      AREA   QPEAK   TPEAK   R.V.
      (ha)   (cms)   (hrs)   (mm)
ID1= 1 ( 0001): 19.78  2.839  10.00 188.67
+ ID2= 2 ( 0019): 51.27  5.777  10.75 180.23
=====
ID = 3 ( 0022): 71.05  7.912  10.58 182.58

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0022) |
| 3 + 2 = 1      |
-----
      AREA   QPEAK   TPEAK   R.V.
      (ha)   (cms)   (hrs)   (mm)
ID1= 3 ( 0022): 71.05  7.912  10.58 182.58
+ ID2= 2 ( 0204): 1.03  0.147  10.00 182.33
=====
ID = 1 ( 0022): 72.08  8.024  10.58 182.58

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

APPENDIX “G”

Water Balance Calculations



VALDOR ENGINEERING INC.
 741 Rowntree Dairy Road, Suite 2, Woodbridge, Ontario L4L 5T9
 Tel: 905-264-0054 Fax: 905-264-0069
 info@valdor-engineering.com www.valdor-engineering.com

Project No: 20102
 Date: January 2021

Table G.1: Infiltration Trench Calculation - Stormwater Management Pond Quality Control Outlet to Infiltration Trench

<i>Total Req'd Annual Infiltration Volume to Achieve Target (m³)</i>	<i>Total Actual Annual Infiltration Volume per Design (m³)</i>	<i>Soil Infiltration Rate (mm/h)</i>	<i>Equivalent Drainage Area (ha)</i>	<i>Maximum Trench Length per Site Plan (m)</i>	<i>Initial Abstraction (Trench Drainage Area) (mm)</i>	<i>Retention Time (hr)</i>	<i>Total Annual Rainfall Depth (Per 1981-2010 Climate Normals for Peterborough Airport) (mm)</i>	<i>Total Rainfall Depth Available for Infiltration Per Rainfall Analysis Assuming Ia=5.0mm (mm)</i>	<i>Annual Rainfall Depth Needed to Achieve Target Infiltration (mm)</i>	<i>¹ Req'd Design Storm Depth to Achieve Annual Infiltration Requirements (Assuming Ia=0.0 mm) (mm)</i>	<i>Req'd Event-Based Runoff Volume to be Infiltrated (Based on Req'd Design Storm Depth) (m³)</i>
12,438	12,558	21.8	1.48	-	0.0	48	750.1	850.96	842.8	25.0	368.9

Maximum Allowable Depth	
Soil Infiltration Rate (mm/hr):	21.8
Safety Factor:	2.5
P, Design Soil Infiltration Rate (mm/hr):	8.7
T, Drawdown Time (hr):	48
d, Maximum Allowable Depth (m):	0.42

Minimum Bottom Area	
V, Runoff Volume to Infiltrated (m ³):	369
P, Design Soil Infiltration Rate (mm/hr):	8.7
n, Void Ratio (clear stone):	0.40
Δt, Drawdown Time (hr):	48
A, Minimum Bottom Area (m ²):	2,204

$$d = \frac{P \cdot T}{1000} \quad \text{Equation 4.2, Stormwater Management Planning and Design Manual, MOE, 2003}$$

$$A = \frac{1000 \cdot V}{P \cdot n \cdot \Delta t} \quad \text{Equation 4.3, Stormwater Management Planning and Design Manual, MOE, 2003}$$

Infiltration Trench Design									
Infiltration Trench Location	Drainage Area (ha)	Available Infiltration Volume (m ³)	Length (m)	Width (m)	³ Design Depth (m)	Bottom Area (m ²)	Void Ratio	Storage Volume Provided (m ³)	Lesser of Available Infiltration Volume or Storage Volume Provided (m ³)
SWM Pond Outlet	20.61	-	122.0	18.0	0.42	2,196	0.40	368.9	368.9
Total Drainage Area (ha): 20.61 Total Bottom Area Provided (m²): 2,196 Total Infiltration Volume Used (m³): 368.9									Total: 368.93

Notes:

Infiltration facilities are sized based on the following criteria (SWMPDM, MOE, 2003) and/or assumptions:

- (1) Infiltration trench volume should be sized based on the runoff generated by a 4-hr 15-mm event or smaller.
- (2) The drainage area to each infiltration trench should be sufficient to provide required runoff quantity.
- (3) The maximum allowable depth of the infiltration facility is based on the soil infiltrate rate and the retention time.
- (4) It is feasible to convey the runoff to the infiltration facility.
- (5) The seasonal high water table should be at least 1 m below the infiltration trench.

Date: January 2021

Number of Days $\geq$ Rainfall Depth (days)

Rainfall Depth (mm)

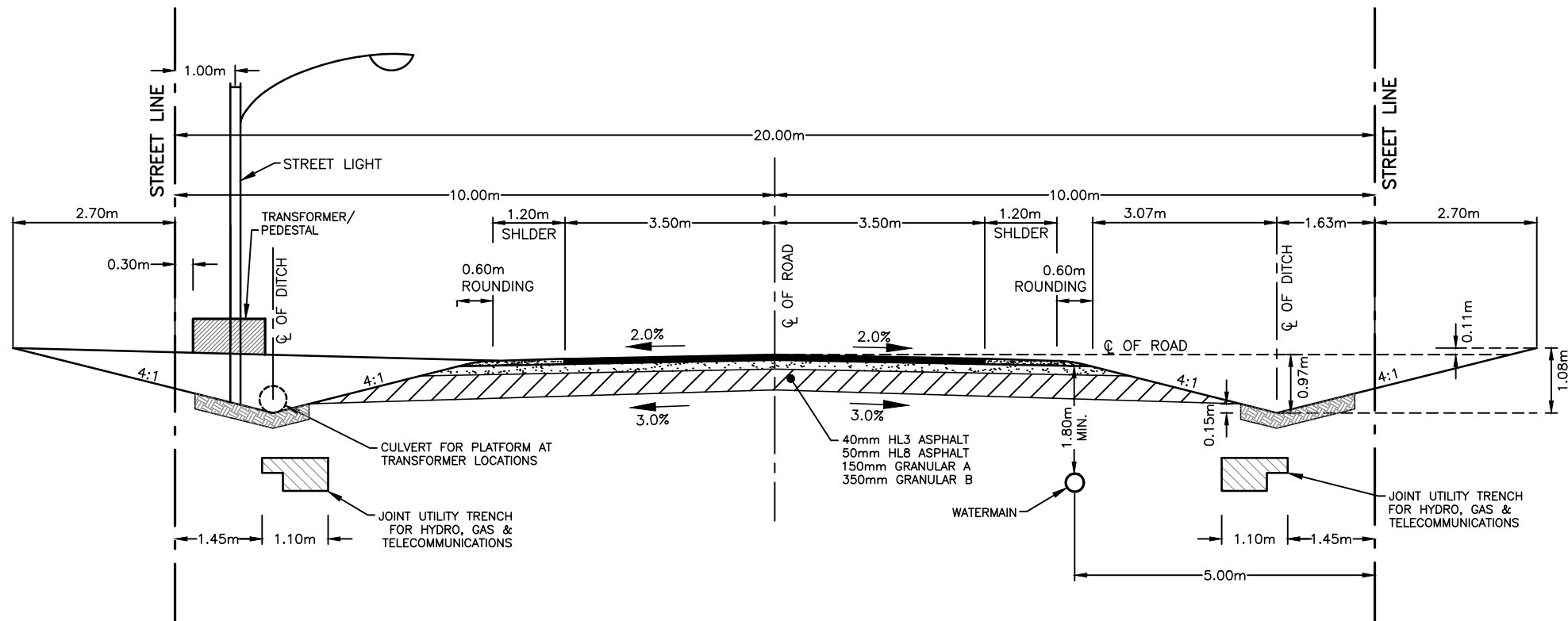
$y = -30.466834132624\ln(x) + 102.555358488569$
 $R^2 = 0.998252687050$

Series1 Log. (Series1)

Rainfall Depth (mm)	Number of Days $\geq$ Rainfall Depth (days)
5.0	57
10.0	30
20.0	5

APPENDIX “H”

Road Details



MARSVILLE ESTATES

**RURAL ROAD - 7.0m
ON 20.0m RIGHT-OF-WAY**

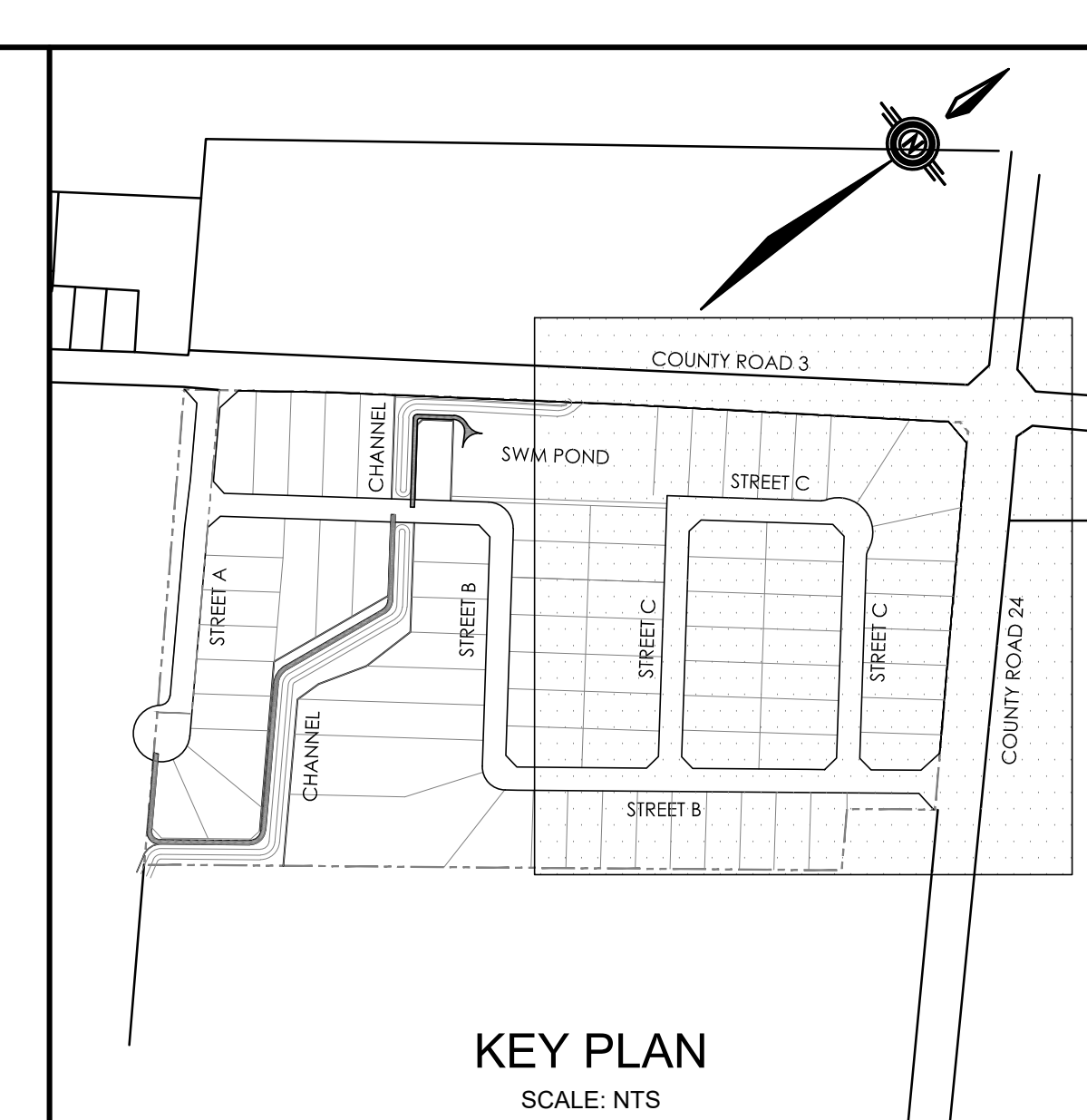
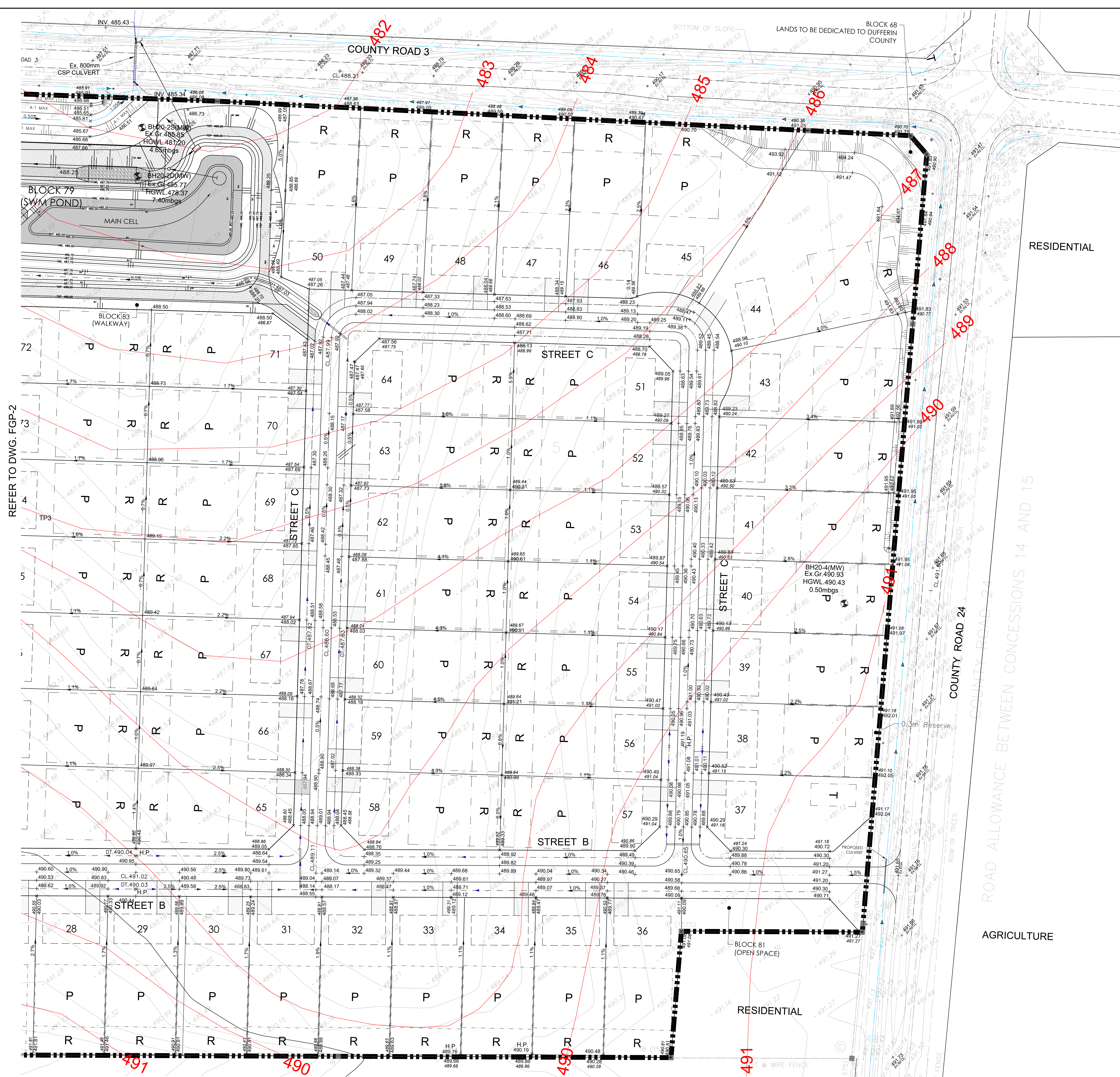
NO.	REVISIONS	DATE	APR'D

SCALE: 1:100

DATE: JAN. 2021

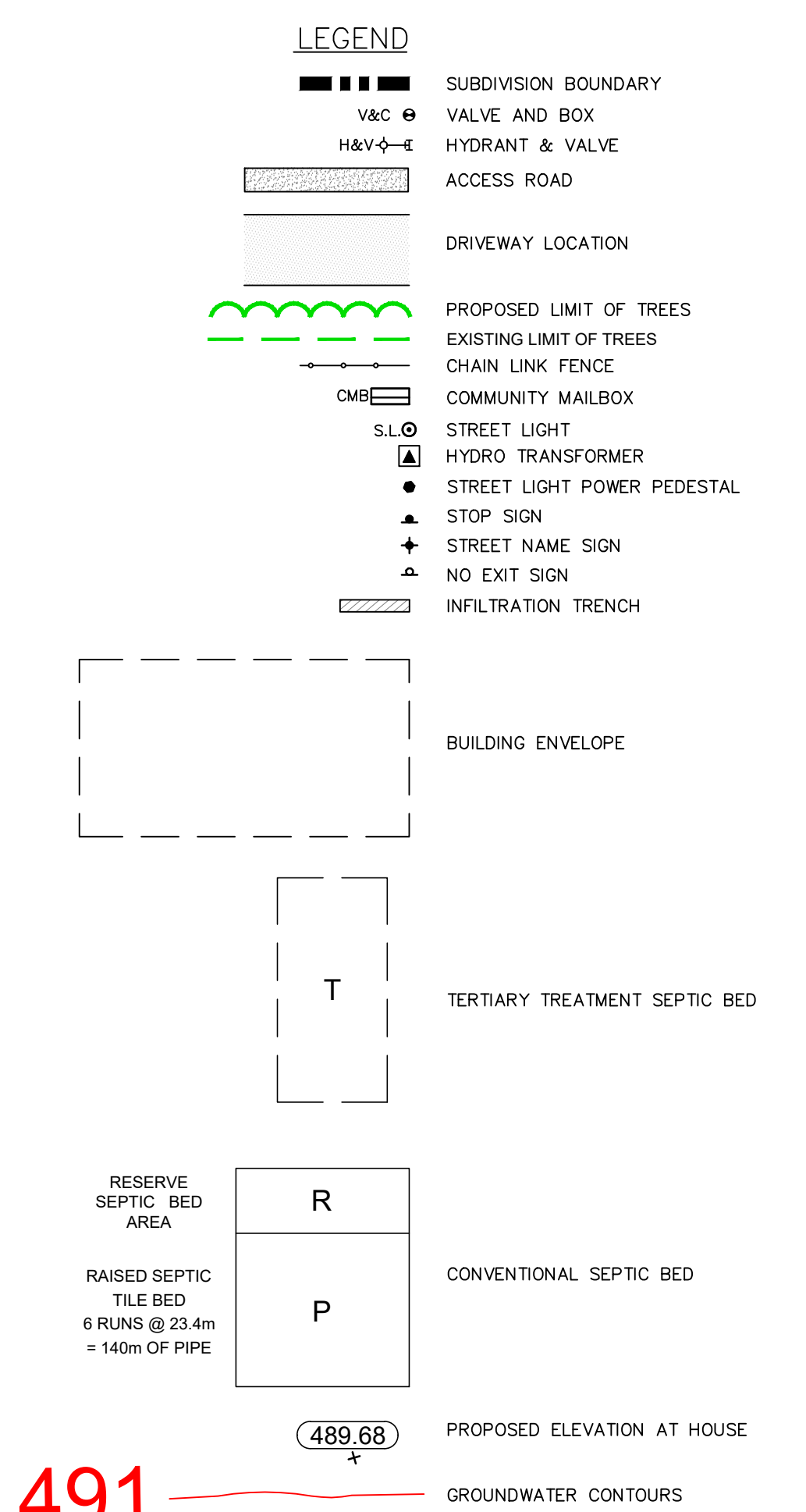
APPENDIX “I”

Functional Grading Plans



NOTE:

THIS PLAN HAS BEEN PREPARED TO DEMONSTRATE FEASIBILITY OF THE PROPOSED DEVELOPMENT WITH RESPECT TO GRADING IN CONJUNCTION WITH THE DRAFT PLAN APPLICATION. DETAILED GRADING DESIGN WILL BE PREPARED AT THE SUBDIVISION ENGINEERING STAGE.



JOB STATUS:				
05.	MAR 31 2026		ISSUED FOR CO-ORDINATION	DG
04.	MAY 12 2022		AS PER REVISED DRAFT PLAN	DG
03.	FEB 17 2022		BLRM ACC'D	DG
02.	JAN 26 2021		UPDATED FOR JAN 2021 FSR	DG
01.	MAR 16 2020		ISSUED FOR COORDINATION	DG
No.	BY	DATE	REVISION	CHECKED

ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM
AND ARE DERIVED FROM STATION No 00819698229 HAVING A PUBLISHED
ELEVATION OF 449.775 METRES.



PRELIMINARY

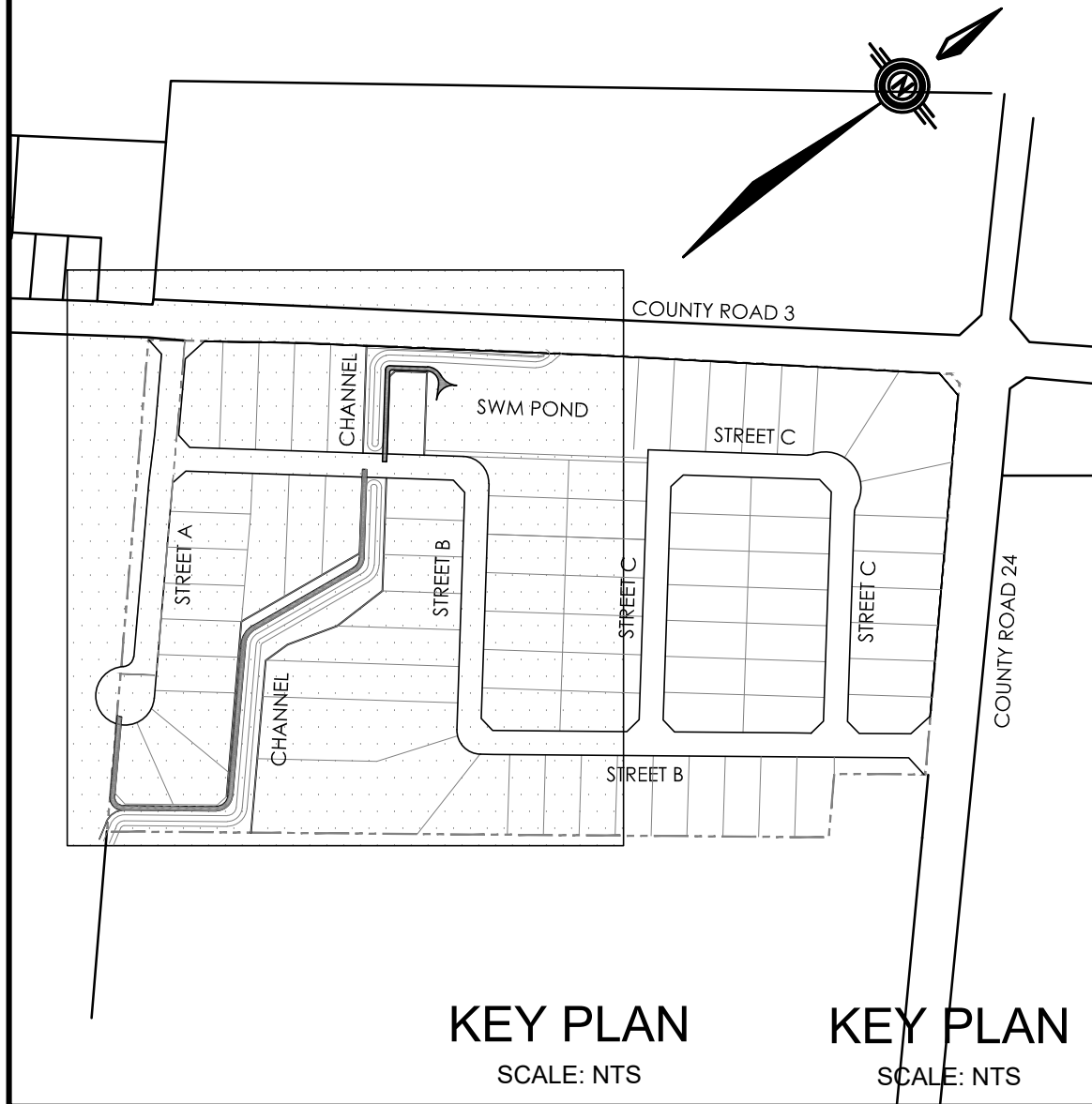
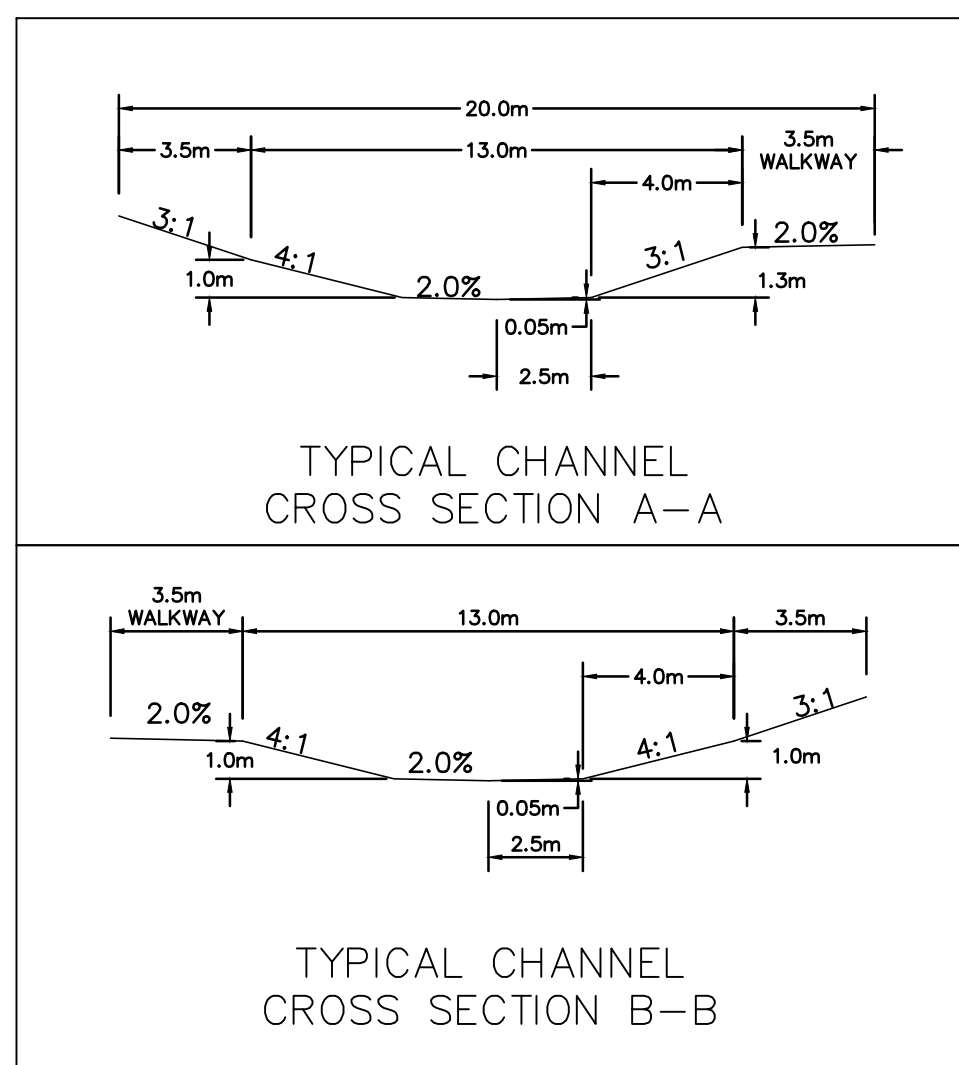
PROJECT No. 20102



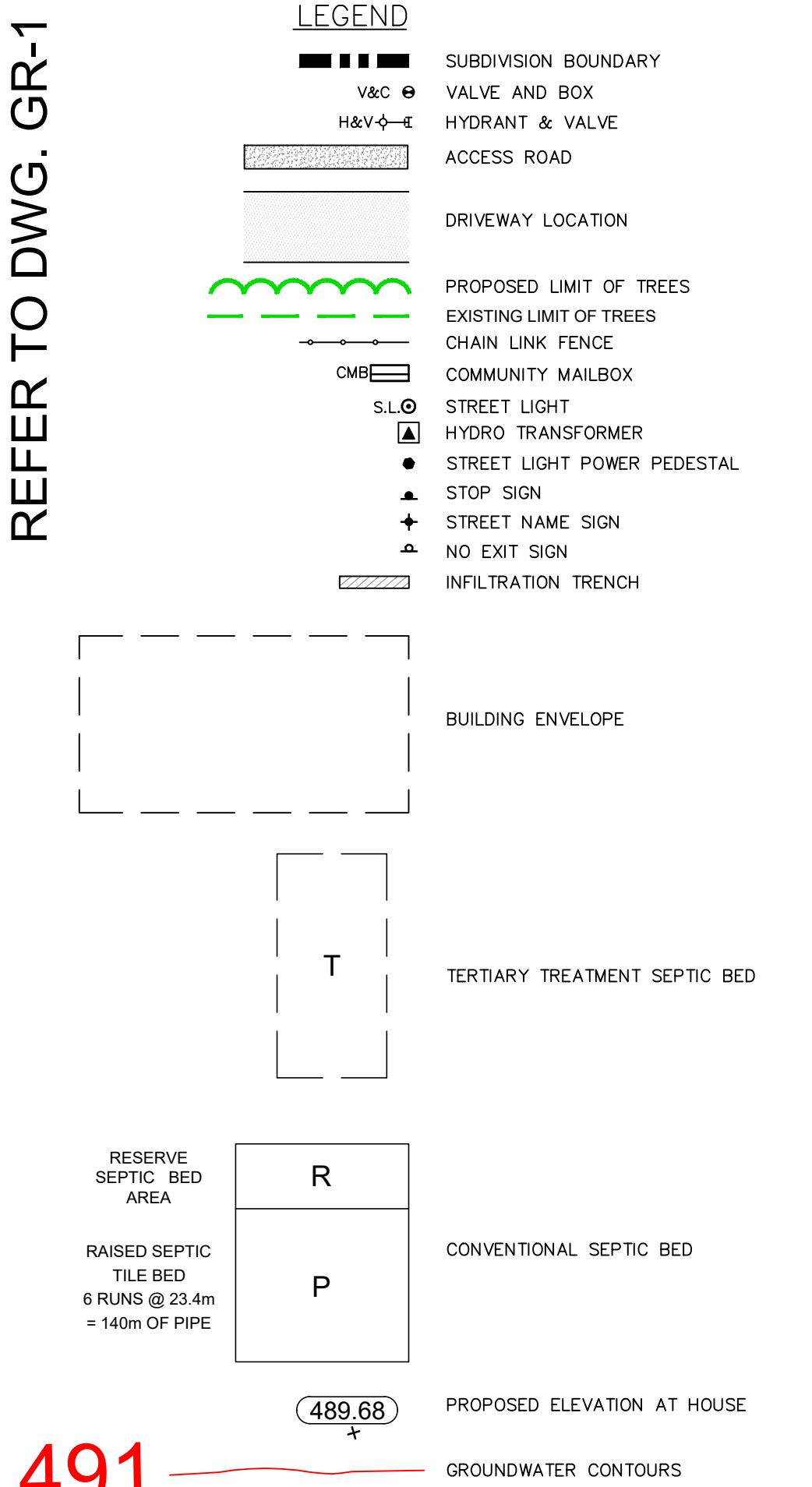
PROJECT: MARSVILLE ESTATES DUBDIVISION
063076 COUNTY ROAD 3
COMMUNITY OF MARSVILLE TOWN OF EAST GARAFRAXA

FUNCTIONAL GRADING PLAN

Surveyed By:		Date:	Contract No.:	
Drawn By: D.N.Z.		Checked By: D.A.G.		Drawing No.: FGP-1
Designed By: D.N.Z.		Checked By: D.A.G.		
Scale: 1:500		Date: 2020.03.05		



NOTE:
THIS PLAN HAS BEEN PREPARED TO DEMONSTRATE FEASIBILITY OF THE PROPOSED DEVELOPMENT WITH RESPECT TO GRADING IN CONJUNCTION WITH THE DRAFT PLAN APPLICATION. DETAILED GRADING DESIGN WILL BE PREPARED AT THE SUBDIVISION ENGINEERING STAGE.



JOB STATUS:			
DATE	ISSUED FOR CO-ORDINATION	DATE	CHECKED
01 MAR 21 2020	AS PER PREPARED DRAFT PLAN	01 MAR 21 2020	01
02 FEB 17 2020	REVIEW ADDED	02 FEB 17 2020	02
03 JAN 30 2021	UPDATED FOR JAN 30 2021 FSR	03 JAN 30 2021	03
04 MAR 19 2020	ISSUED FOR CO-ORDINATION	04 MAR 19 2020	04
DATE	REVISION	DATE	CHECKED

BENCHMARK NOTE:
ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM AND ARE DERIVED FROM STATION NO. D081968229 HAVING A PUBLISHED ELEVATION OF 444.75 METRES.



PRELIMINARY

PROJECT No. 20102

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
571 Chival Road, Unit 4, 2nd Floor, Woodbridge, Ontario, L4L 8A2
TEL: (905) 884-5584, FAX: (905) 884-5585 E-MAIL: info@valdorengineering.com
www.valdorengineering.com

CLIENT: MARSVILLE ESTATES INC.

PROJECT: MARSVILLE ESTATES SUBDIVISION
063076 COUNTY ROAD 3
COMMUNITY OF MARSVILLE TOWN OF EAST GARAFRAXA

FUNCTIONAL GRADING PLAN

Drawn By: D.N.Z.	Checked By: D.A.G.	Contract No.:	Drawing No.: FGP-2
Scale: 1:500	Date: 2020 03 05		

