2509 Cedar Creek Road, Ayr, ON
Township of North Dumfries
Functional Servicing and Stormwater Management Report

May 3, 2024

Prepared for:

Cedar Creek Road Holdings Inc.
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Project No.: 161414214

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Water Resources Engineer

Prepared by _____
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Amy Kyle, B.Eng

Water Resources Specialist

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1.0 INTRODUCTION

1.1 SITE LOCATION

The subject property is located at 2509 Cedar Creek Road in the Township of North Dumfries, Regional Municipality of Waterloo, Ontario as shown on Figure 1. The proposed Draft Plan includes the creation of a new private condo street, seven industrial zoned lots and stormwater management facility. The study area for the project comprises approximately 18.03 hectares, and is a mix of agricultural field, manicured lawns, scrubland, laneways, and buildings. The above described are illustrated in the proposed Draft Plan included in Appendix A.

1.2 BACKGROUND / OVERVIEW

The subject property is located within the Highway 401/97 Employment Area and currently zoned as zone Z.11 (industrial) with a north and south pocket zoned as zone Z.12 (open space). The subject property is bounded by industrial zoned lands to the west, Regional Road 97 (Cedar Creek Road) to the north, agriculturally zoned lands to the south and east. The closest noise sensitive land use (residence) is located approximately 235m east of the proposed Site. The proposed development meets the Class I (light industry). However, it is within the area of influence for Class II and recommended minimum separation distance of 300m from the closest existing residential land use for Class II (heavy industry). The industries in the proposed Site are expected to have MECP approval through the Environmental Compliance Approval (ECA).

1.3 PURPOSE OF THE REPORT

The purpose of this Functional Servicing and Stormwater Management Report (FSR) is to outline how the proposed subdivision can be supplied with adequate services, including sanitary, domestic water, storm drainage, stormwater management (SWM), and utilities to the requirements of the various approval agencies. The servicing strategies presented in this Report are conceptual. Detailed engineering drawings (for construction) and a Final SWM Report will be submitted as part of the final engineering design process once the proposed subdivision has received Draft Plan approval.

Stantec has conducted several onsite investigations to review the existing site conditions (see Existing Conditions Drawings, C-050 in Appendix B). Supplementary reports that should be read in conjunction with this report include:

- Documentation and Commemoration Report—2509 Cedar Creek Road, Township of North Dumfries - prepared by Stantec Consulting dated February 2024.
- Geotechnical Investigation – Preliminary Geotechnical Investigation for proposed industrial development, 2509 Cedar Creek Road, Ayr, ON - prepared by Stantec Consulting dated January 2024.

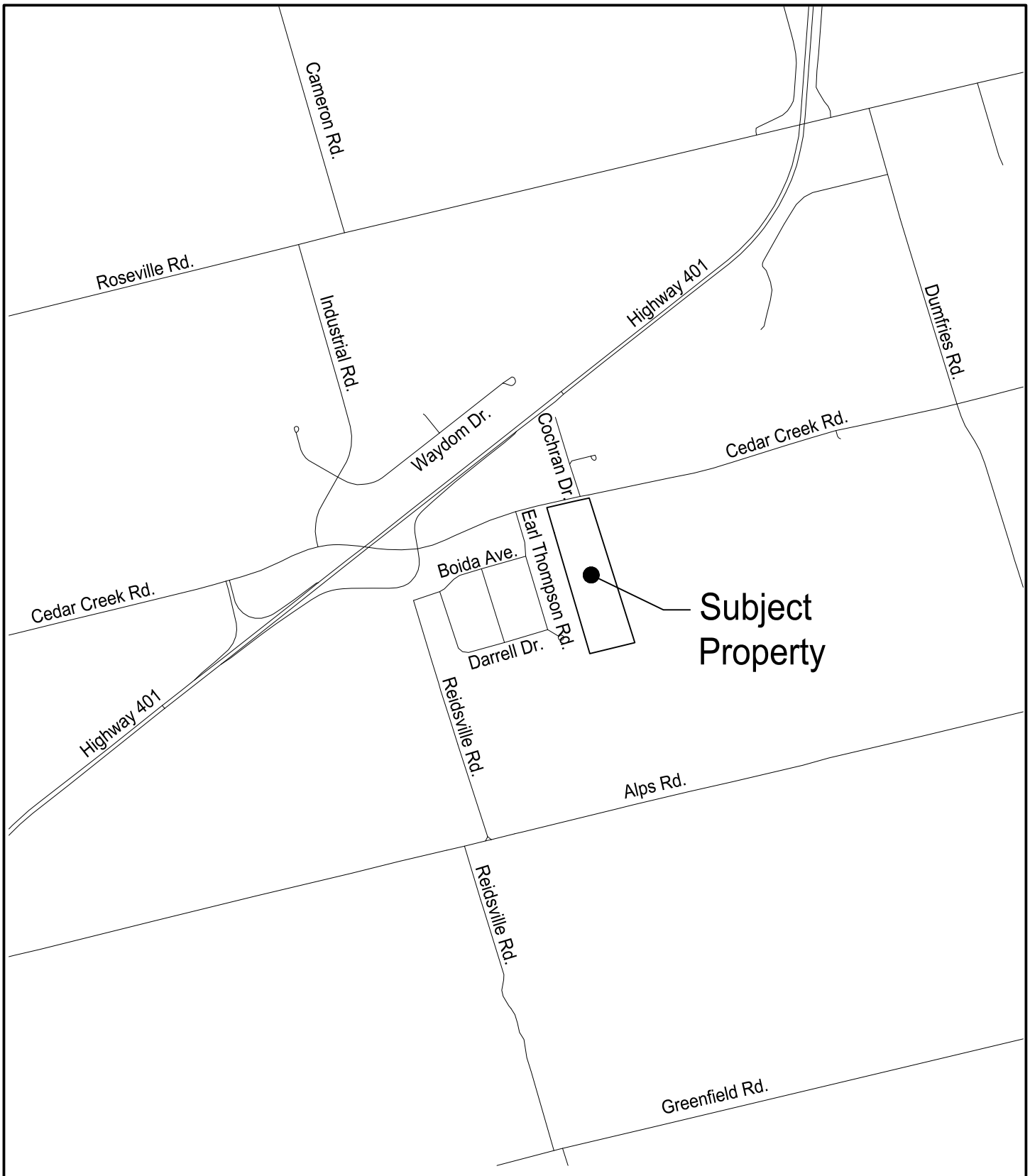
- Hydrogeological Assessment, 2509 Cedar Creek Road, Township of North Dumfries, ON - prepared by Stantec Consulting dated May 2024.
- Land Use Noise Compatibility Study for the proposed industrial development at 2509 Cedar Creek Road, Township of North Dumfries Ontario, prepared by Stantec Consulting dated January 2024.
- Planning Justification Report, 2509 Cedar Creek Road, Ayr, Township of North Dumfries, ON - prepared by Stantec Consulting dated May 2024.
- 2509 Cedar Creek Road, Ayr, ON Township of North Dumfries Scoped Environmental Impact Study - prepared by Stantec Consulting dated May 2024.
- 2509 Cedar Creek Road Industrial Development, Chloride Impact Assessment- prepared by Stantec Consulting dated May 2024.
- 2509 Cedar Creek Road - Traffic Impact Study, prepared by Stantec Consulting dated February 2024.

1.4 ENVIRONMENTAL ASSESSMENT REQUIREMENTS

The subject lands are located within the Regional Municipality of Waterloo (Region), Township of North Dumfries and within the administrative jurisdiction of the GRCA. The GRCA Regulation Limit associated with the Roseville Swamp Cedar Creek Provincially Significant Wetland Complex is on private property to the east and will be encroached upon by the SWM outlet channel. The subject lands lie within the Cedar Creek Sub Watershed of the Grand River Watershed.

Plans and policies relating to natural heritage that will be considered are detailed in the Scoped Environmental Impact Study.

All of the works required for the Cedar Creek lands are described in the subsequent sections of this Report. The plans, included in this Report, show the location of the proposed septic field, wells and SWM Facility, as well as grading, and utilities. The intent of this Report and, the supplementary Reports, is to ensure that the commenting agencies and the public are made aware of the servicing strategies for the proposed development.



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TOWNSHIP OF NORTH DUMFRIES, ON

Project No.
161414214

Title
SITE LOCATION PLAN

Revision	Date

Reference Sheet	Figure No.
	1.0

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2.0 OVERALL GRADING

2.1 EXISTING LAND USE AND SITE TOPOGRAPHY

Most of the subject lands is currently vacant and used for agricultural purposes with remnants of a residential dwelling, associated driveways and ancillary structures along the northwest portion of the Site. Generally, the site slopes down in a southerly direction with an overall grade change of approximately +/-13m.

The topography of the subject lands slopes from west to east with a number of localized high and low points throughout the Site, elevations ranging from approximately 316 m along the northeast property line along Cedar Creek Road to approximately 301.0 m at the southern edge of the Site. There are localized hills and valleys within the Site with slopes ranging from 0.8% to 5%. There are two major existing drainage patterns within the Site; the first and largest catchment conveying external drainage from lands north of Cedar Creek Road via an existing culvert towards the Site and external lands directly west of the Site via the south Cedar Creek roadside ditch. These external areas enter the Site along the north edge of the property, crossing the lands and drains to a low area along the eastern property line to the neighboring lands (2407 Cedar Creek Road). The second includes external drainage from the Existing Municipal Infiltration based SWM Facility directly west of the subject lands that spill during large rain events to the remaining lands, south of the above noted catchment, that drain via sheet flow uncontrolled offsite through the southern property line of the Site to Con 10 PT Lots 28 & 29 Alps Road.

The shallow soil conditions at the Site typically comprised 0.8m to 1.4m of surficial silty sand topsoil overlying predominantly sand as well as sand and gravel/ gravel deposits. Localized, silt and/ or clay deposits were observed. Cobbles and boulders were noted withing the sand and gravelly deposits.

2.2 SITE AND ROAD PROFILE DESIGN CONSTRAINTS

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

- Match existing grades, where possible, to minimize grading and cut/fill quantities and minimize changes to the surface hydrology and hydrogeology of the area.
- Match existing road elevations, with consideration given to forecasted road redevelopments (i.e., Cedar Creek Road).
- Satisfy the Town of North Dumfries's requirements for minimum and maximum road grades.
- Where possible, provide a major overland flow route.

- Respect existing environmental feature configurations, elevations that are to be retained, and prescribed wetland buffer limits.

- Provide a spill point and conveyance for the Existing Municipal Infiltration based Stormwater Management Facility west of the subject lands.

- Provide a drainage conveyance for external lands north and west of the subject lands.

2.3 PROPOSED ROAD PROFILES AND OVERAL SITE GRADING

A preliminary road profile has been established for Street A, based on the proposed street alignment, to satisfy the constraints outlined in the previous section 2.2 - Design Constraints and Procedures (see Preliminary Road Profile Drawing C-200 included in Appendix B). The road profile is relatively smooth with grades ranging from a minimum of 0.5% to a maximum of 5.0%. The design strategy for the Street A grades was to match existing elevations at Cedar Creek Road and to maintain an overland flow drainage route to the proposed SWM Facility, while attempting to match the existing topography. The proposed centerline road elevations are illustrated on the enclosed Preliminary Road Profile C-200 referenced above and the Preliminary Servicing and Grading Plan C-400 to C-402 also included in Appendix B.

The proposed Street A road cross section for the private road within the subject development is shown on Figure 2. The cross section has been designed to be superelevated draining to the east and include for roadside ditches that have been sized to accommodate the conveyance for the various storm events. The east road ditch is proposed to collect the drainage from the proposed road and lots fronting onto the road such to convey the drainage to the proposed SWM Facility. The proposed ditch along the west side of the proposed road has been sized to provide conveyance for the major flows expected to spill from the existing Infiltration based SWM Facility west of the development such to drain south, by-pass the proposed SWM Facility and directed to the outlet channel that crosses the neighboring property known as 2407 Cedar Creek Road to the existing wetland located at Con. 10 PT Lot 27 on Cedar Creek Road.

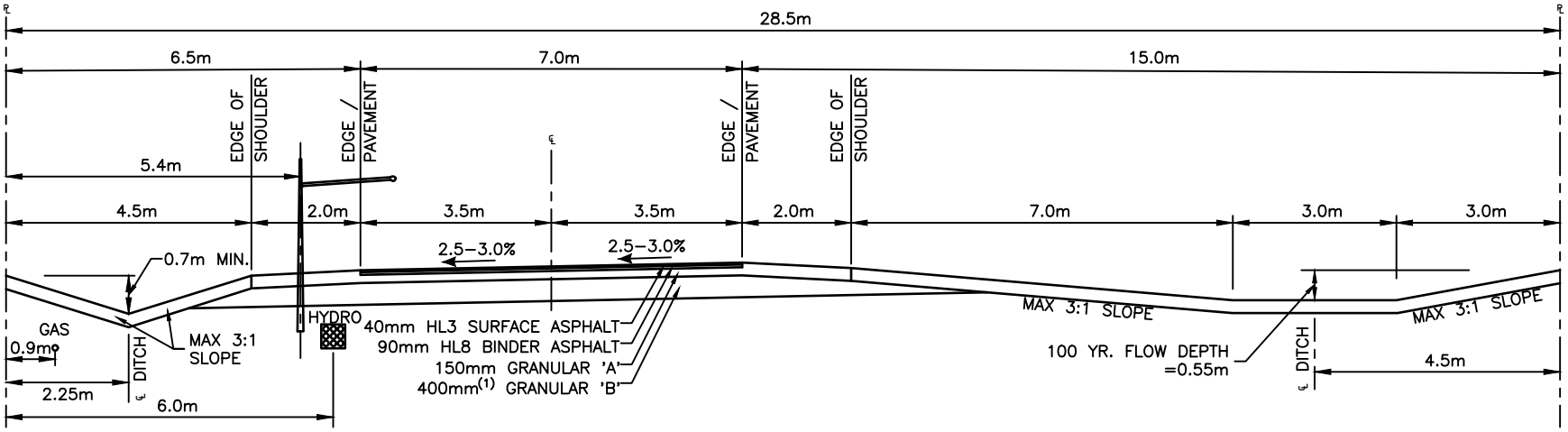
The proposed lot grading within the Site will range between a minimum of 2.5% and a maximum of 6%, including 3:1 transition slope to accommodate the various grade changes within the proposed development (i.e., adjacent to the proposed SWM Facility) and at various perimeter locations surrounding the Site. The lot grading is designed to split drainage such to minimize raising the Site. The lot grading is designed to be split drainage with the front of the lot draining to the east road ditch and the rear draining to a rear lot ditch. Both the east ditch and rear lot ditch convey lot drainage to the proposed SWM Facility for treatment prior to discharging to the outlet channel. Profiles of the east road ditch, rear lot ditch and outlet channel are illustrated in the Preliminary Road Profiles referenced above and the proposed grading is illustrated on the Concept Grading Plans also noted above and included in Appendix B.

Overall Grading

The stormwater management (SWM) Block is proposed at the southern edge of the Site. The SWM outlet is proposed to discharge to an outlet channel that will be established with an easement in favour of the proposed development, that will traverse the southern and eastern portions of the adjacent lands known as 2407 Cedar Creek Road, to the existing wetland located at Con. 10 PT Lot 27 on Cedar Creek Road and eventually discharging to the southern edge of the Roseville Swamp Cedar Creek Provincially Significant Wetland Complex on the west side of the CP rail line.

Preliminary earthwork calculations have been performed based on the preliminary road profiles and lot grades. The calculations indicate that there is an earth fill shortage with a surplus of existing topsoil. Surplus topsoil is to be reused onsite as fill where feasible, to minimize the fill shortage and import requirement. Please refer to Conceptual Cut/Fill Plan and earth quantities on Drawings C-900 also included in Appendix B.

At detailed design, profiles and grading will be refined to minimize the required earth fill shortage.



NOTE(1) – THICKER SUBBASE WILL BE REQUIRED WHERE SUBGRADE CONSISTS OF SILT.

MINIMUM DEPTH OF COVER (UNLESS OTHERWISE SPECIFIED)	
GAS MAIN	0.60m
HYDRO	0.90m
TELEPHONE	0.75m
CABLE T.V.	0.75m

3.0% FOR ROADS < 1.0% GRADE
2.5% FOR ROADS > 1.0% GRADE

TYPICAL ROAD CROSS–SECTION "STREET_A"

NTS

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Project No.
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Title
CROSS-SECTION

Revision | Date

Reference Sheet | Figure No.
2.0

3.0 SITE SERVICING

3.1 SANITARY AND WATER SERVICING

Individual onsite sewage systems utilizing conventional septic system and tertiary treatment with subsurface discharge of treated effluent will provide sanitary servicing for each lot in the development. The individual onsite sewage systems will be located entirely within each property boundary. It is intended that these services would be privately owned and operated.

The conventional septic system consists of a two-compartment septic system, followed by a septic bed, fed either by gravity (where site topography allows it) or with an effluent pump. The gravity system, being the most economical where soils in place consist of sand, being the case at most of the proposed lots, will require the largest septic field footprint. The tertiary system is an advanced treatment system with a modified septic tank, used as a digester, followed by a biofilter tank, a recirculation pump, and an effluent pump feeding a modified septic field. As the treatment process normally occurring within the septic field, with a tertiary system, this treatment would be completed within these aforementioned tanks and respective septic field footprint could be reduced by one third compared to the conventional system.

This would allow an increase in the number of employees at a given lot, for the same septic field footprint.

Additional details regarding the water and sewage system feasibility is outlined in a Study included in Appendix C.

The Provincial Policy Statement (2005) section 1.6.4.4 does allow for individual onsite services as follows: Individual onsite sewage services and individual onsite water services shall be used for a new development of five or less lots or private residences where municipal sewage services and municipal water services or private communal sewage services and private communal water services are not provided and where site conditions are suitable for the long-term provision of such services. Despite this, individual onsite sewage services and individual onsite water services may be used to service more than five lots or private residences in rural areas provided these services are solely for those uses permitted by policy 1.1.4.1(a) and site conditions are suitable for the long-term provision of such services. In rural areas located in municipalities: a) permitted uses and activities shall relate to the management or use of resources, resource-based recreational activities, limited residential development and other rural land uses. Based on the above, the proposed development complies with the Provincial Policy Statement.

3.2 STORM SERVICING

No traditional storm sewers are proposed for the subject development as the majority of the proposed Lots and road will drain to the proposed roadside ditches or rear yard ditch that conveys site drainage to the proposed SWM Facility. This drainage pattern is further described in Section 4.0 below. A by-pass storm sewer is proposed such to convey external drainage from the north and west of the Site to the adjacent lands mimicking the existing drainage conditions. Further details regarding this by-pass storm sewer described below in section 4.0 and demonstrated on the engineering plans included in Appendix B.

4.0 PRELIMINARY STORMWATER MANAGEMENT

The Preliminary Stormwater Management (PSWM) design has been completed in support of the Draft Plan for the proposed 2509 Cedar Creek Rd Industrial Development, North Dumfries, Ontario. This section discusses the PSWM strategy for the Site that has been developed in order to mitigate potential impacts of the proposed development on adjacent water features.

4.1 STUDY APPROACH

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

The SWM design involved the following study components:

- Complete a hydrologic study to determine the existing site conditions (pre-development conditions) with respect to topography, soils information, and existing land uses.
- Prepare an existing (pre-development) and proposed (post-development) condition hydrologic model using SWMHYMO to determine runoff volumes and peak flow rates to downstream areas.
- Complete the preliminary design of the SWM Facility to provide sufficient water quality and water quantity control to achieve target rates to downstream receivers.
- Summarize the Study through preliminary design and recommendations.

4.2 BACKGROUND

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

- *Preliminary Geotechnical Investigation for Proposed Industrial Development, 2509 Cedar Creek Road, Ayr, Ontario*, Stantec Consulting Ltd., January 16th, 2024.
- *Erosion and Sediment Control Guide for Urban Construction*, Toronto and Region Conservation Authority, 2019.
- *City of Kitchener Development Manual*, City of Kitchener, 2021.
- *Stormwater Management Planning and Design (SWMPD) Manual*, Ministry of the Environment, Conservation and Parks (MECP), March 2003.
- *Low Impact Development Stormwater Management Planning and Design Guide (LID Manual),* Credit Valley Conservation Authority and Toronto and Region Conservation Authority, 2010.

4.3 STORMWATER MANAGEMENT DESIGN CRITERIA

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

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

4.4 EXISTING CONDITIONS

4.4.1 Topography and Surface Drainage

As noted in the *Preliminary Geotechnical Investigation Report* (Stantec, 2024), the Site generally slopes down toward the south with an overall grade change of approximately 13 m. Based on topographic information, the ground surface is highest in the north of the subject site near elevation 314 m above mean sea level (AMSL) and slopes down toward the south border of the property near elevation 301 m AMSL. There is a high point in the northeast of the Site, with an elevation of approximately 316 m AMSL.

The Site is generally split by a drainage divide running east to west near the centre of the property. The drainage divide creates two predominant drainage zones (flows to the east and flows to the south), with flows from both directions draining overland to neighboring properties, and ultimately discharging to Cedar Creek. Additionally, several external catchment areas drain onto and are conveyed through the Site. These include a small agricultural area to the east of the site draining overland onto the site and a large mostly industrial area to the north that is conveyed to the Site through an existing culvert under Cedar Creek Road. These external areas are conveyed through the Site, eventually discharging east to the neighboring property. Additional industrial catchment areas to the west of the Site, including the outflow from an existing SWM feature, enter the Site from the west and discharge east or south.

Existing conditions drainage information is presented on Figure 3 and Figure 3.1, which present the Pre-Development Drainage Plans.

4.4.2 Geotechnical Information

As identified in the *Preliminary Geotechnical Investigation Report* (Stantec, 2024), the subsurface soils for the Site are predominantly sand overlain by a silty sand topsoil. Some sand and gravel/gravel deposits and occasional silt and/or clay deposits were also found in some locations. Cobbles and bounders were also noted within the sand and gravel deposits. Bedrock was not encountered at the boreholes advanced for this Site.

Based on results from the *Preliminary Geotechnical Investigation*, groundwater levels in the north third of the Site ranged between 2.8 m below ground surface (BGS) to 10.3 m BGS (elevations ranging from 304.6 m to 305.3 m AMSL) in spring 2022 and were approximately 0.5 - 1 m lower in fall 2022 (Stantec, 2024). The monitoring wells in the south two-thirds of the Site were dry during testing, so the depth of the water table in this region is unknown. However, well depths in this area ranged from 5.02 m BGS to 6.03 m BGS (296.77 m AMSL to 305.89 m AMSL), suggesting that the water table is located further BGS than this in these areas. There is a potential for localized perched groundwater at shallower depths following heavy rain or snow melt in the spring (Stantec, 2024).

Thus, the predominant soil conditions (sand with trace silt and gravel) will generally be suitable for at-source infiltration of precipitation. In areas with higher silt content, lower infiltration rates should be expected.

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Notes

1:4000 0 40 120 200m

MAJOR OVERLAND FLOW ROUTE

Legend

- 103 / A=4.52 — EXISTING SUBCATCHMENT ID AREA (ha)
- DRAINAGE BOUNDARY
- 320.0 — EXISTING CONTOURS
- 320.0 — LiDAR CONTOURS (2018 DATA)
- GRCA FLOODPLAIN
- GRCA REGULATION LIMIT
- GRCA WATERBODY
- GRCA WATERCOURSE
- GRCA WETLAND

Client/Project

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Project No.
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Title

PRE-DEVELOPMENT DRAINAGE PLAN

Revision

Date
2024.01.11

Reference Sheet

Figure No.
3.0

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Notes

1:6000 0 60 180 300m

MAJOR OVERLAND FLOW ROUTE

Legend

Legend

103 / A=4.52 — EXISTING SUBCATCHMENT ID AREA (ha)

DRAINAGE BOUNDARY

320.0 — EXISTING CONTOURS

320.0 — LiDAR CONTOURS (2018 DATA)

GRCA FLOODPLAIN

GRCA REGULATION LIMIT

GRCA WATERBODY

GRCA WATERCOURSE

GRCA WETLAND

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Project No.
161414214

Title

EXTERNAL PRE-DEVELOPMENT DRAINAGE PLAN

Revision

Date
2024.01.11

Reference Sheet

Figure No.
3.1

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5.0 STORMWATER MANAGEMENT DESIGN

5.1 HYDROLOGIC MODELING

A hydrologic model was prepared using SWMHYMO to simulate drainage conditions for the subject development under existing and proposed development conditions. The model was employed to predict flows and design SWM systems to ensure the criteria are achieved.

In the absence of IDF parameters for Township of North Dumfries, City of Kitchener's IDF parameters were used. Model results were obtained for the existing and proposed conditions for the following events:

- The 25 mm, 4-hour Chicago Storm derived using the parameters as provided in Table 1
- The 2-, 5-, 10-, 25-, 50-, and 100-year, 3-hour Chicago distributions derived using the parameters provided in Table 1
- The 48-hour Regional Rainfall Event (i.e., Hurricane Hazel)

Table 1: Rainfall Events - City of Kitchener IDF Parameters

Return Period	IDF Parameters			
	A	B	C	Depth (mm)
25 mm, 4-hr	509	6	0.7989	25.0
2-year, 3-hr	743	6	0.7989	34.3
5-year, 3-hr	1593	11	0.8789	47.3
10-year, 3-hr	2221	12	0.9080	56.3
25-year, 3-hr	3158	15	0.9355	68.3
50-year, 3-hr	3886	16	0.9495	77.2
100-year, 3-hr	4688	17	0.9624	87.1
Hurricane Hazel	-	-	-	285

5.2 EXISTING CONDITIONS HYDROLOGIC MODEL

An existing conditions hydrologic model was prepared to simulate existing conditions for the Site. Input and output files for the SWMHYMO model are provided in Appendix D. Soil Conservation Service (SCS) Curve Numbers (CN) and catchment parameters were calculated for each existing catchment based on land use and soil type and are provided in Appendix D. Delineation of existing drainage catchments is provided on Figure 3 and Figure 3.1 which present the Pre-Development Drainage Area Plans, and are summarized below:

- Catchment 100: 55.94 ha of industrial property northwest of the Site and part of Highway 401, draining south through a culvert under Cedar Creek Road into the Site and flowing south/east through the Site.
- Catchment 101: 14.55 ha of external catchment containing a portion of Cedar Creek Road, a portion of industrial property, and a grassed area near Highway 401 off-ramp, entering the Site in the north and draining overland to the south/east.
- Catchment 102: 12.64 ha of external industrial area west of the Site, draining to private external SWM feature overflowing into the subject Site, ultimately flowing east through the Site.
- Catchment 103: 4.52 ha of external industrial area west of the Site, draining east into the Site and ultimately flowing south.
- Catchment 104: 0.73 ha of external agricultural area northeast of the Site, draining west into the Site and ultimately flowing south/east through the Site.
- Catchment 105: 7.06 ha of agricultural area in the north portion of the Site including a small house and driveway, draining to agricultural land to the east and eventually to Cedar Creek.
- Catchment 106: 11.00 ha of agricultural area in the southern portion of the Site draining south and eventually to Cedar Creek.

5.3 PROPOSED CONDITIONS HYDROLOGIC MODEL

The proposed development incorporates seven industrial lots and a SWM Facility Block, along with one new road. The proposed SWM Facility will be located in the southern portion of the Site and discharge mostly via infiltration, with a constructed conveyance channel (called the outlet channel) provided to convey high flows to Cedar Creek in the east.

The SWM Facility is proposed to provide water quality and quantity control for the entire 2509 Cedar Creek Road development. The drainage from the external agricultural lands to the west of the Site is to be routed around the perimeter of the Site via a swale (called the west road ditch), which will connect to the outlet channel to Cedar

Creek. The drainage from the external lands to the northwest of the Site will enter a storm sewer upon entry into the Site (called the By-Pass Storm Sewer) and be released east of the Site, where the existing flows drain.

Catchment parameters including impervious percentage, slope, and SCS Curve Numbers were calculated for each of the proposed catchments based on land use and soil type and are provided in Appendix D. All input and output files are provided in Appendix D. The delineation of the proposed drainage catchments is provided on Figure 4, Post-Development Drainage Plan, and is summarized as follows:

- Catchment 100: 55.94 ha of industrial property northwest of the Site and part of Highway 401, draining south through a culvert under Cedar Creek Road into the By-Pass Storm Sewer and discharging to the agricultural lands to the east.
- Catchment 101: 14.55 ha of external catchment containing a portion of Cedar Creek Road, a portion of industrial property, and a grassed area near Highway 401 off-ramp, entering the By-Pass Storm Sewer and discharging to the agricultural lands to the east.
- Catchment 102: 12.64 ha of external industrial area west of the Site, draining to private external SWM feature and overflowing into the west road ditch, where flow is conveyed around the SWM Facility to the outlet channel.
- Catchment 103: 4.52 ha of external industrial area west of the Site, draining east into the west road ditch, where flow is conveyed around the SWM Facility to the outlet channel.
- Catchment 104: 0.73 ha of external agricultural area northeast of the Site, draining west into the rear lot ditch, where flow is conveyed to the east inlet of the SWM Facility.
- Catchment 200: 0.14 ha in northwest corner of property comprising a small portion of the west road ditch, draining to the By-Pass Storm Sewer and discharging uncontrolled to the east.
- Catchment 201: 0.64 ha in the northwest corner of property containing a portion of the east road ditch and developed land, draining to the By-Pass Storm Sewer and discharging uncontrolled to the east.
- Catchment 202: 8.82 ha of developed area covering the east portion of the Site, draining to the rear lot ditch and entering the SWM Facility through the east forebay.
- Catchment 203: 0.55 ha catchment on the east side of the Site containing the By-Pass Storm Sewer outlet and plunge pool, draining offsite to the east.
- Catchment 204: 4.92 ha of developed area, draining to the west into the east road ditch, entering the SWM Facility through the west forebay.
- Catchment 205: 1.63 ha SWM Facility Block.

N

100
A=55.94

101
A=14.55

102
A=12.64

103
A=4.52

104
A=0.73

200
A=0.14

201
A=0.64

202
A=8.82

203
A=0.55

204
A=4.92

205
A=1.63

206
A=1.22

207
A=0.14

208
A=1.13

CEDAR CREEK ROAD

COCHRAN DRIVE

BOIDA AVENUE

REIDSVILLE ROAD

DARRELL DRIVE

HARMONY ROAD

EARL THOMPSON ROAD

EARL THOMPSON PLACE

STREET 'A'

EAST ROAD DITCH

WEST ROAD DITCH

BY-PASS STORM SEWER

REAR LOT DITCH

OUTLET CHANNEL

- FLOWS (ALL) ENTER BY-PASS STORM SEWER, THEN OUTLET TO PLUNGE POOL, DISCHARGING TO AGRICULTURAL LANDS TO THE EAST VIA SPREADER SWALE
- FLOWS (ALL) DRAIN DIRECTLY OFFSITE TO THE EAST, UNCONTROLLED
- FLOWS (ALL) CONVEYED THROUGH REAR LOT DITCH TO EAST INLET OF SWM FACILITY
- FLOWS (ALL) CONVEYED THROUGH EAST ROAD DITCH TO WEST INLET OF SWM FACILITY
- FLOWS (ALL) ENTER SWM FACILITY DIRECTLY
- FLOWS (ALL) CONVEYED THROUGH WEST ROAD DITCH, ROUTING FLOWS AROUND SWM FACILITY, THEN DISCHARGE TO OUTLET CHANNEL
- FLOWS (ALL) DRAIN DIRECTLY OFFSITE TO THE SOUTH, UNCONTROLLED
- FLOWS (ALL) ENTER OUTLET CHANNEL DIRECTLY

EXTERNAL TOPO INFORMATION OBTAINED VIA ONTARIO GEOHUB. DATA SOURCE: ONTARIO DIGITAL TERRAIN MODEL (LiDAR-DERIVED) FROM THE MINISTRY OF NATURAL RESOURCES AND FORESTRY (CVGD 2013).

V:\01614\active\161414214\design\drawing\civil\sheet_files\SWM\FIGURES\161414214-C-FIG 4.0_POST CONDS.dwg
1/19/2024 8:54:53 AM By: Morinigh, Brian

Stantec

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Notes

1:4000 0 40 120 200m

DRAINAGE BOUNDARY
320.0 EXISTING CONTOURS
320.0 LiDAR CONTOURS (2018 DATA)
MAJOR OVERLAND FLOW ROUTE

Legend

103 A=4.52 EXISTING SUBCATCHMENT ID AREA (ha)
206 A=1.19 SUBCATCHMENT ID AREA (ha)
DIVERSION SWALE

GRCA FLOODPLAIN
GRCA REGULATION LIMIT
GRCA WATERBODY
GRCA WATERCOURSE
GRCA WETLAND

Client/Project
CEDAR CREEK ROAD HOLDINGS INC.

2509 CEDAR CREEK ROAD, AYR
TOWNSHIP OF NORTH DUMFRIES, ON

Project No.
161414214

Title
POST DEVELOPMENT DRAINAGE PLAN

Revision

Date
2024.01.11

Reference Sheet

Figure No.
4.0

- Catchment 206: 0.76 ha grassed swale (west road ditch), located on the far west side of the property, directing flows around the SWM Facility to the outlet channel at the southeast corner of the property.
- Catchment 207: 0.14 ha south of the SWM Facility, draining offsite to the south.
- Catchment 208: 1.13 ha of constructed conveyance channel (outlet channel), directing flows to Cedar Creek in the northeast.

Note that the private SWM feature in Catchment 102 has been modelled according to assumptions made based on LiDAR data and the surrounding soil characteristics.

5.4 PROPOSED SWM STRATEGY

The proposed SWM strategy for the 2509 Cedar Creek Road development incorporates minor and major system conveyance via grassed swales (east road ditch and rear lot ditch) to the proposed SWM Facility for water quality and quantity control. Infiltration has been incorporated on a lot-level basis where possible, as well as within the end of pipe SWM Facility. The SWM strategy has been developed in accordance with the objectives and criteria previously listed.

5.4.1 Stormwater Management Facility Design

Runoff from the majority of the proposed development drains into an infiltration facility complete with two forebays located in each inlet to the facility. The location of this proposed SWM Facility was selected for a variety of reasons including the following:

- This is an existing low point on the Site where water naturally drains overland offsite.
- This location is the most efficient use of land for the future development of the Site and minimizes the cut/fill impacts of development.

The proposed SWM Facility is designed to provide water quantity and quality control for 16.10 ha of land (including 0.73 ha of external agricultural land) as well as infiltration to simulate natural conditions of the Site and aid in groundwater recharge. As outlined in the preliminary criteria, the SWM Facility is required to provide 'enhanced' water quality treatment prior to discharging downstream.

The SWM Facility is designed to infiltrate all minor storms including the 10-year event, while major storm events greater than the 10-year storm will be attenuated in the infiltration cell, eventually discharging to Cedar Creek through the outlet channel at rates below existing conditions. The SWM Facility forebays will provide initial water quality treatment and isolation of sediment deposition for ease of cleanout as well as to minimize transport of fines from entering and clogging the infiltration cell. The infiltration cell will provide further water quality treatment through infiltration of most runoff events. Since the basin will be sized to infiltrate up to the 10-year storm event, it can be assumed it will also provide over 80% TSS removal prior to discharge downstream. Additionally, the MECP infiltration basin volume requirement for quality control based on an enhanced level of treatment is 608 m^3, whereas this facility contains over 7000 m^3 of infiltration volume.

In addition to the water quality benefit described above, the SWM Facility (including forebays and infiltration cell) will provide water quantity storage as well as enhance groundwater recharge. To provide a conservative estimate during the design of water quantity control infrastructure in the SWM Facility, any infiltration that will occur in the conveyance swales (east road ditch and rear lot ditch) was ignored in the modelling, leading to more runoff entering the SWM Facility. The preliminary design of the SWM Facility has maximum ponding elevations of 302.69 m above sea level (ASL) and 302.85 m ASL during the 100-year and Regional Storm Events, respectively. This leads to a depth of 0.19 m and 0.35 m above the maximum infiltration depth during the 100-year and Regional Storm Event, respectively. Thus, ponding height from the bottom of the infiltration cell is

1.19 m for the 100-year event and 1.35 m for the Regional Storm Event. Although the height of water in the SWM Facility exceeds the recommended maximum of 0.6 m for infiltration facilities for these storm events, the more frequent storm events (25 mm and 2-year) remain under this height and thus compaction that would limit the functionality of the infiltration basin is not expected. The freeboard to the top of pond for 100-year storm event is 0.31 m. For all events greater than the 10-year (25-year, 50-year, 100-year, and the Regional Storm), the flows are conveyed though the overflow weir and enter the outlet channel to Cedar Creek. The weir elevation has been set to provide sufficient infiltration volumes while ensuring infiltration drawdown times do not exceed 48 hours. The 1.2 m deep forebays have a sediment storage capacity of 129 m^3 and 190 m^3 for the west forebay and east forebay respectively, at a maximum depth of sediment at 0.5 m, providing an expected cleanout frequency of approximately once every 9 years for the west forebay and 7 years for the east forebay. The forebay length required to provide appropriate dispersion and settling length for the 5-year inlet flow is 30 m and 52 m and the length provided is approximately 44 m and 54 m, for the west forebay and east forebay respectively. Detailed design calculations are provided in Appendix D.

The SWM Facility is proposed to be drained by a single outflow weir once the infiltration volume is exceeded. Flows that pond to an elevation higher than the infiltration depth will discharge over the weir into the outlet channel to Cedar Creek. This will occur for events greater than the 10-year storm event. Details on the SWM Facility design and operating characteristics are summarized in Table 2 and Table 3 respectively, and the detailed stage-storage-discharge analysis for the proposed SWM Facility is provided in Appendix D. Additionally, a detailed drawing of the SWM Facility is included on Drawing C-410 (Appendix B).

Overall, the SWM Facility will provide an ‘enhanced’ level of water quality control through inlet forebays and the subsequent infiltration cell. The SWM Facility will enhance infiltration across the Site to maintain groundwater recharge while providing a total drawdown of <48 hours for all storm events. Design characteristics for the proposed SWM Facility are summarized in Table 2, with calculations provided in Appendix D.

Stormwater Management Design

Table 2: SWM Facility Design Characteristics

Parameter	Basin Characteristics
Total Contributing Area (quality and quantity)	16.10 ha
Total Percent Impervious to SWM Facility (includes external agricultural area – catchment 104)	78%
Forebay Parameters:	
West forebay	
Required Forebay Length/Provided Forebay Length	30 m / 44 m
Forebay Depth	1.2 m
Sediment Storage Volume Provided	129 m^3
Cleanout Frequency	9.0 years
East forebay	
Required Forebay Length/Provided Forebay Length	52 m / 54 m
Forebay Depth	1.2 m
Sediment Storage Volume Provided	190 m^3
Cleanout Frequency	7.1 years
Infiltration Cell Details:	
Infiltration Cell Top of Ponding Elevation	302.5 m
Infiltration Cell Bottom Elevation	301.5 m
Infiltration Depth	1 m
Infiltration Footprint	5,524 m^2
Maximum Infiltration Drawdown	43.9 hours
Total Depth of SWM Facility	1.5 m
Outlet Structure Details:	
Overflow Weir Crest Invert/ Length / Side Slopes (H:V)	302.50 m / 3 m / 10:1

The operating characteristics of the SWM Facility are summarized in Table 3**.** Detailed modelling files are found in Appendix D.

Stormwater Management Design

Table 3: SWM Facility Operating Characteristics

Storm Event	25 mm	2-year	5-year	10-year	25-year	50-year	100-year	Regional
Proposed Peak Flow Rate to SWM Facility (m^3/s)	1.725	2.661	3.587	4.502	5.227	5.952	6.807	2.235
Proposed Peak Flow Rate from the SWM Facility (m^3/s)	0.000	0.000	0.000	0.000	0.115	0.322	0.631	2.145
Maximum Total Storage Volume (m^3)	2,158	3,378	5,054	6,250	7,479	8,016	8,524	9,857
Maximum Ponding elevation (m)	301.83	302.01	302.24	302.40	302.56	302.62	302.69	302.85
Infiltration Drawdown Time (hrs.)	13.5	21.1	31.5	39.0	43.9	43.9	43.9	43.9

Target peak flow rates to the east and south as well as peak flow rates for proposed conditions are summarized in Table 4 while detailed modelling files are included in Appendix D. Note that in the models, catchment 104 is modelled as an “internal” catchment because the flows are being directed to the SWM Facility, even though it is not within the Site boundary. As observed in Table 4, water quantity targets from the Site have been met as the proposed peak flow rates from the Site to the east and south are at or below target levels. However, when considering the flows from external catchments that flow through the Site as well as internal catchments (collectively referred to as the “Study Area”), proposed flows to the east are slightly higher (≤3% increase for all storms up to and including the 100-year storm event). This is because flows from a large external catchment (Catchment 103) are being redirected around the Site to discharge to the east in the proposed conditions, whereas in existing conditions, the flows exit the Site to the agricultural lands to the south. However, these flows are all discharging to the same Cedar Creek system, with more of the flow now discharging further upstream, into the wetland area around Cedar Creek. Since flows from only a small area (Catchment 207) from the study area are being discharged south of the Site in the proposed conditions, the total flows to the Cedar Creek system will be much lower than existing conditions. Infiltration through the west road ditch and through the outlet channel to the east has also not been considered, so the actual increase in peak flow will be lower than what is shown in the model. Additionally, there is a larger external area east of the Site draining to the discharge point to the Cedar Creek system, which will further minimize the overall effect of the small increase from the Site flowing east.

Stormwater Management Design

Table 4: Existing and Proposed Flow Rates

Storm Event	25 mm	2-year	5-year	10-year	25-year	50-year	100-year	Regional
Existing Peak Flow Rate (PFR) from Site Towards East (m^3/s)	0.081	0.148	0.283	0.399	0.553	0.684	0.836	0.989
Existing PFR from Site Towards South (m^3/s)	0.078	0.146	0.278	0.389	0.544	0.673	0.823	1.242
Existing PFR from Study Area Towards East (m^3/s)	2.284	3.920	6.604	8.840	12.689	16.169	19.26	11.995
Existing PFR from Study Area Towards South (m^3/s)	0.435	0.662	0.895	1.133	1.350	1.554	1.819	1.755
Proposed PFR from Site Towards East (m^3/s)	0.071	0.109	0.155	0.202	0.242	0.374	0.705	2.375
Proposed PFR from Site Towards South (m^3/s)	0.001	0.003	0.005	0.007	0.010	0.013	0.016	0.015
Proposed PFR from Study Area Towards East (m^3/s)	2.311	4.001	6.766	9.079	12.737	16.538	19.839	14.011
Proposed PFR from Study Area Towards South (m^3/s)	0.001	0.003	0.005	0.007	0.010	0.013	0.016	0.015

5.5 OTHER SWM FEATURES

There are four grassed swales (ditches) on the Site (west road ditch, east road ditch, rear lot ditch, and the outlet channel). These swales are designed to convey flow around the perimeter of the Site and to Cedar Creek. Grassed swales are known to provide infiltration and water quality benefits as the water travels over the pervious area. However, the amount of infiltration and sediment removal efficiency the swale can achieve is hard to predict, thus these additional benefits have not been accounted for, providing a conservative SWM Facility design. All grassed swales have been sized to convey the largest peak flows from the modelled events (100-year or Regional Storm Event). Details on the swale design can be found in Appendix D.

Additionally, a plunge pool and spreader swale has been provided following the outlet from the By-Pass Storm Sewer on the east border of the Site (Catchment 203). The plunge pool will help dissipate the energy from the pipe and provide more infiltration potential while the spreader swale will help to release the flows over a greater surface area, reducing the erosion potential to the neighbouring external lands. Details of the plunge pool and spreader swale will be designed at a future design stage. The use of a perforated pipe system in the By-Pass Storm Sewer also will be investigated in future design stages to provide the potential for infiltration into the surrounding soils before daylighting into the plunge pool.

5.6 ADDITIONAL DESIGN CONSIDERATIONS

5.6.1 Infiltration

The geotechnical work performed by Stantec identifies a predominant soil of sands across the Site with smaller areas of gravel and silts. Based on the results of the *Preliminary Geotechnical Investigation* (Stantec, 2024), it can be concluded that the soils are generally suitable for infiltration. Additionally, infiltration testing conducted as a part of the *Hydrogeological Assessment* confirms this conclusion (Stantec, 2024). Locations with higher silt content have lower infiltration rates, as expected, whereas locations with higher amounts of non-cohesive sand and gravel (such as the south portion of the Site) have higher infiltration rates, presenting favorable conditions for on-site infiltration.

In general, the sandy soils onsite have coefficients of permeability of about 2.0×10^{-3} cm/sec. The infiltration rates for these soils are estimated to have an unfactored infiltration rate of approximately 100 mm/hr, which is representative of the soils in the location of the proposed infiltration facility. Applying a safety factor of 3.5 (LID Manual, 2010) leads to a preliminary infiltration rate of approximately 29 mm/hr. The suitability of existing soils should be assessed at the proposed elevation of any infiltration facility on a lot-by-lot basis following completion of site grading.

To promote infiltration, it is proposed that all rooftops throughout the development be directed to soak-away pits sized to retain runoff from the 25 mm event. Additionally, flows from the Site will be conveyed to the SWM Facility through swales, promoting infiltration, especially during smaller rainfall events.

5.6.2 End-Of-Pipe Infiltration

As mentioned previously, the proposed SWM Facility will be designed as an infiltration facility comprising of two dry forebays to provide initial water quality treatment and isolation of sediment at each inlet, followed by the main infiltration cell. The proposed SWM Facility provides additional retention volume to increase the groundwater recharge and decrease the excess runoff volume to the surrounding lands. The proposed system will be operational all year round. As this Site is outside of any Well Head Protection Areas (WHPAs), infiltration of winter runoff is assumed to not pose a significant risk to any drinking water sources. Additionally, infiltration of the winter runoff as opposed to directing this downstream via surface flow will help reduce the impact of salt on the aquatic vegetation. However, a chloride impact assessment has been conducted and will be provided under separate cover.

The infiltration cell functions by setting the SWM Facility outlet to the outlet channel to Cedar Creek above the base of the infiltration cell to provide a 'dead' ponding depth/volume that will then infiltrate through the amended soil and existing sandy soil layer. To determine this outlet elevation, the SWM Facility was modelled in SWMHYMO with infiltration as the only outflow value. The infiltration cell in the SWM Facility has a footprint of 5,524 m², which leads to an outflow rate of 0.044 m³/s using the factored infiltration rate of 29 mm/hr. Above the infiltration volumes or 'dead' storage volumes, water will be attenuated and released to the outlet channel to Cedar Creek via the outflow weir. This volume provides active storage to attenuate the large storm events.

The facility infiltrates all frequent storms (the 25 mm rainfall event alone represents approximately 80% of the annual precipitation volume), therefore, infiltration of this volume will make a significant contribution to the Site infiltration, leading to an overall infiltration surplus and aiding in groundwater recharge. A water balance analysis was completed as part of the *Hydrogeological Investigation*, documented under separate cover (Stantec, 2024). Further investigation/analysis will be necessary at the detailed design and site plan stages to confirm site water balance, infiltration rates, and depth to high groundwater levels at the base of the proposed infiltration facilities; however, it is assumed that as most of the Site is being infiltrated, the water balance targets will be maintained.

5.7 SWM FACILITY LINER

As discussed in the *Preliminary Geotechnical Investigation Report* (Stantec, 2024), the soils within the proposed SWM Facility Block include mainly sandy soils with the high groundwater level measured to be >5 m below the existing ground surface. Thus, due to the favorable soil conditions and resulting proposed infiltration measures, no liner is recommended for any portion of the SWM Facility. This will also allow the forebays to provide additional infiltration that has not been accounted for.

6.0 EROSION AND SEDIMENT CONTROL

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

6.1 EROSION POTENTIAL

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

- Site Slopes: Generally gentle (< 2%) to moderate (2-10%) – average slope is approximately 2%.
- Slope Lengths: Long (generally greater than 30 m).
- Erodibility Classification: High erodibility rate for silty sand and low erodibility rate for sandy soils.

Therefore, based on this classification the Site has moderate to high erosion potential, depending on the specific location within the Site.

6.2 PRELIMINARY EROSION AND SEDIMENTATION CONTROL PLAN

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

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

- Steep slopes (>3:1) shall have erosion blankets.
- Light and/or heavy-duty silt fencing will be erected on all site boundaries where there is potential for runoff to be discharged offsite, to protect adjacent downstream lands from migration of sediment in overland flow. The location of this fencing will be adjacent to the limit of grading. Silt fence attached to paige wire fencing will be installed periodically throughout the Site adjacent to sensitive areas. Silt fencing should be erected before grading begins to protect adjacent and downstream areas from migration of sediment in overland flow.
- Storm service outlets will be installed during servicing and roadworks construction to provide lot level dead and live storage where appropriate.

Erosion and Sediment Control

- Erosion control berms/swales will be located in appropriate (critical) areas to divert flows to temporary sediment basins.
- A construction entrance feature ("mud-mat") will be provided at all site entrances to minimize the offsite transport of sediment via construction vehicles.
- Runoff will be directed to a temporary sedimentation facility via swales to minimize untreated runoff discharged from the Site.
- The temporary sedimentation facility should not be sited in the location of the proposed permanent SWM Facility as it may inhibit the function of the final SWM Facility as an infiltration basin.
- Swales constructed onsite will have temporary rock check dams to help attenuate flows and encourage deposition of suspended sediment where appropriate.
- All disturbed areas where construction is not expected for 30 days shall be re-vegetated with 50 mm of topsoil and hydro-seeding according to OPSS 572.
- During construction, all catchbasins are to be sealed until roads are paved to prevent sediment deposition in the catchbasins' sumps and conveyance of silt to the SWM Facility.
- An Erosion Control Implementation Schedule will be included with the Detailed Erosion and Sedimentation Control Plan, prepared in conjunction with the pre-grading application and/or final engineering design.
- Following completion of construction and site stabilization, all erosion and sediment control measures and accumulated sediment are to be removed.

Infiltration facilities are particularly vulnerable to failure during the construction phase for two reasons. First, if the construction sequence is not followed correctly, construction sediment can clog the facility. In addition, heavy construction can result in compaction of the soil which can then reduce the soil's infiltration rate. For this reason, adequate erosion and sediment controls upstream of the infiltration facility and soak-away pits as well as a careful construction sequence will need to be implemented. This will be developed at detail design prior to construction.

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

Erosion and Sediment Control

6.3 MONITORING, MAINTENANCE AND MITIGATION

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

7.0 UTILITIES

7.1 GRANDBRIDGE ENERGY

Grandbridge Energy stated that they have 3-phase power that runs along Cedar Creek Road. These services will be extended to service the subject lands, therefore, there are no constraints for providing hydro service to the proposed development.

7.2 BELL CANADA

Bell has an existing fibre ped on the opposite side of Earl Thompson with conduit crossing that goes down Earl Thompson. These services will be extended to service the subject lands, therefore, there are no constraints for providing Bell service to the proposed development.

7.3 ROGERS CABLE

Rogers has aerial fiber along Earl Thompson Road as well as having aerial fiber on the South side of HWY 97/Cedar Creek Road. Service for the subject lands would be provided off Earl Thompson Road; therefore, there are no constraints for providing Bell service to the proposed development.

7.4 ENBRIDGE

Enbridge has indicated that gas is currently located within the neighborhood. Once a demand for the future industrial lots is determined, a capacity review will need to be undertaken.

7.5 UTILITY SUMMARY

Internal hydro services, Bell, Rogers cable lines and gas mains for the development would be buried in a joint trench within the Subject Plan.

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1 CONCLUSIONS

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

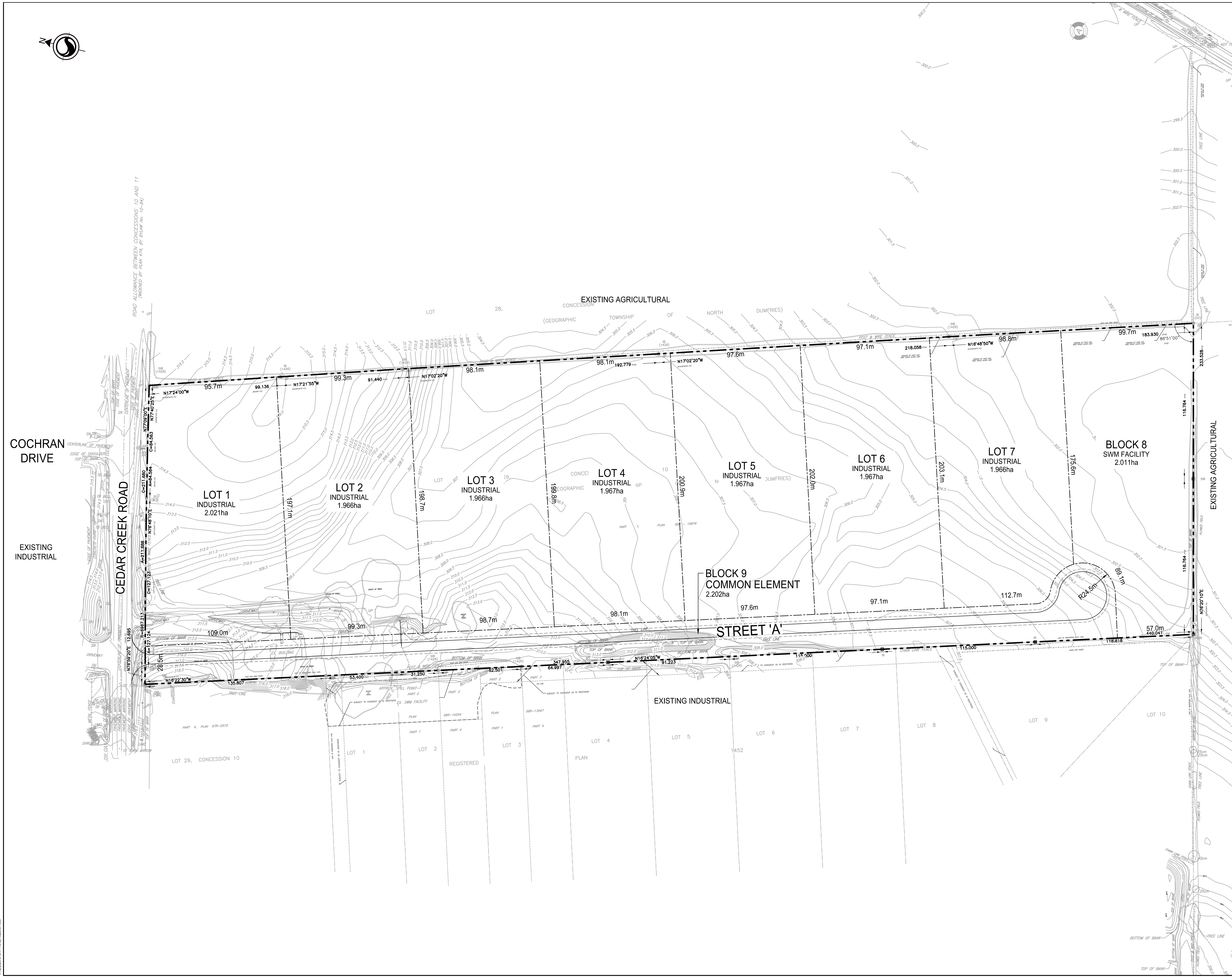
- The proposed 2509 Cedar Creek Road can be adequately serviced by municipal sewage, storm drainage, water services and utilities.
- The proposed SWM features provides water quantity and water quality control for the proposed 2509 Cedar Creek Road industrial development.
- The proposed SWM Facility provides sufficient storage to attenuate post-development discharge to maintain existing target flow rates.
- Along with the end-of-pipe infiltration facility, lot level soak-away pits should be incorporated to infiltrate the first 25 mm of clean roof runoff where possible to help promote at-source infiltration across the Site and aid in groundwater recharge.

8.2 RECOMMENDATIONS

- This Report be circulated to the Municipalities and various approval agencies in support of Draft Plan of Subdivision Approval.
- Detailed grading and servicing design drawings be prepared, a Final Stormwater Management Report and Erosion Settlement Control Plan be completed once the Draft Plan of development for 2509 Cedar Creek Road has been approved to support construction.

APPENDIX A

Conceptual Draft Plan of Vacant Land Condominium DP-1



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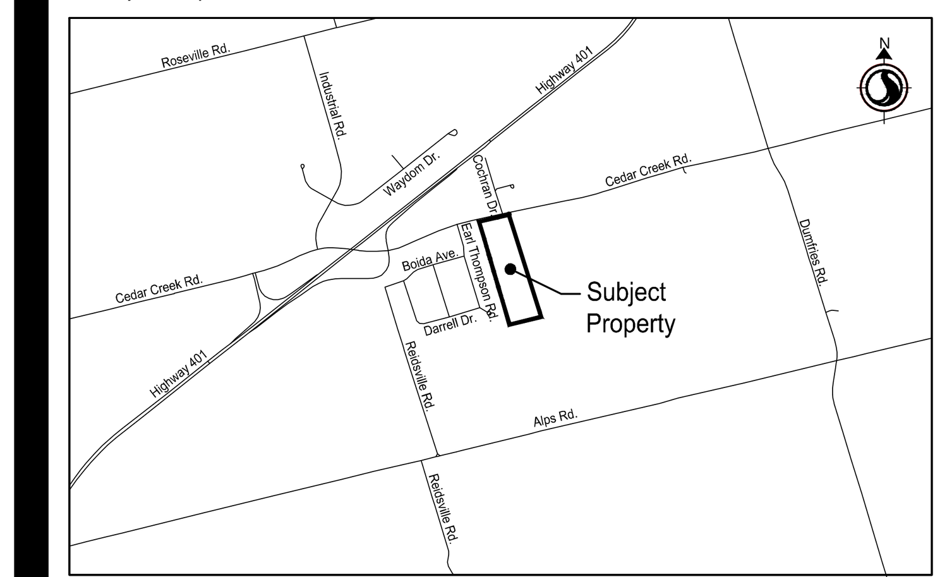
Key Map NTS.



Legal Description

Part of Lot 29,
Concession 10,
Township of North Dumfries,
Regional Municipality of Waterloo

Information Required

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

Surveyor's Certificate

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

Signed ______
O.L.S Name
Stantec Consulting Ltd.
Date ______

Owner's Certificate

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

Signed ______
Owner Name
Company Name
Date ______

Land Use Schedule

Lots/Blocks	Land Use	Area (ha)
Lot 1	Industrial	2.021
Lot 2	Industrial	1.966
Lot 3	Industrial	1.966
Lot 4	Industrial	1.967
Lot 5	Industrial	1.967
Lot 6	Industrial	1.967
Lot 7	Industrial	1.966
Block 8	Stormwater Management Facility	2.011
Block 9	Street A	2.202
TOTAL		18.033ha

Revision	By	Appd	YYYY.MM.DD
1st Submission for Draft Plan	TR	MD	2024.01.12

File Name: 161414214_R-DP_CONDO	JJ	JJ	MD	2022.08.16
	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD

Permit-Seal

APPROVED: ______ DATE: ______

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

Client/Project

CEDAR CREEK ROAD HOLDINGS INC.

2509 CEDAR CREEK ROAD, AYR

TOWNSHIP OF NORTH DUMFRIES, ON

Title

CONCEPTUAL DRAFT PLAN OF VACANT LAND CONDOMINIUM

Project No. 161414214

Scale 1:1250 (0 12.5 37.5 62.5m)

Revision 0

Sheet 1 of 1

Drawing No. **DP-1**

ORIGINAL SHEET - ARCH D

APPENDIX B

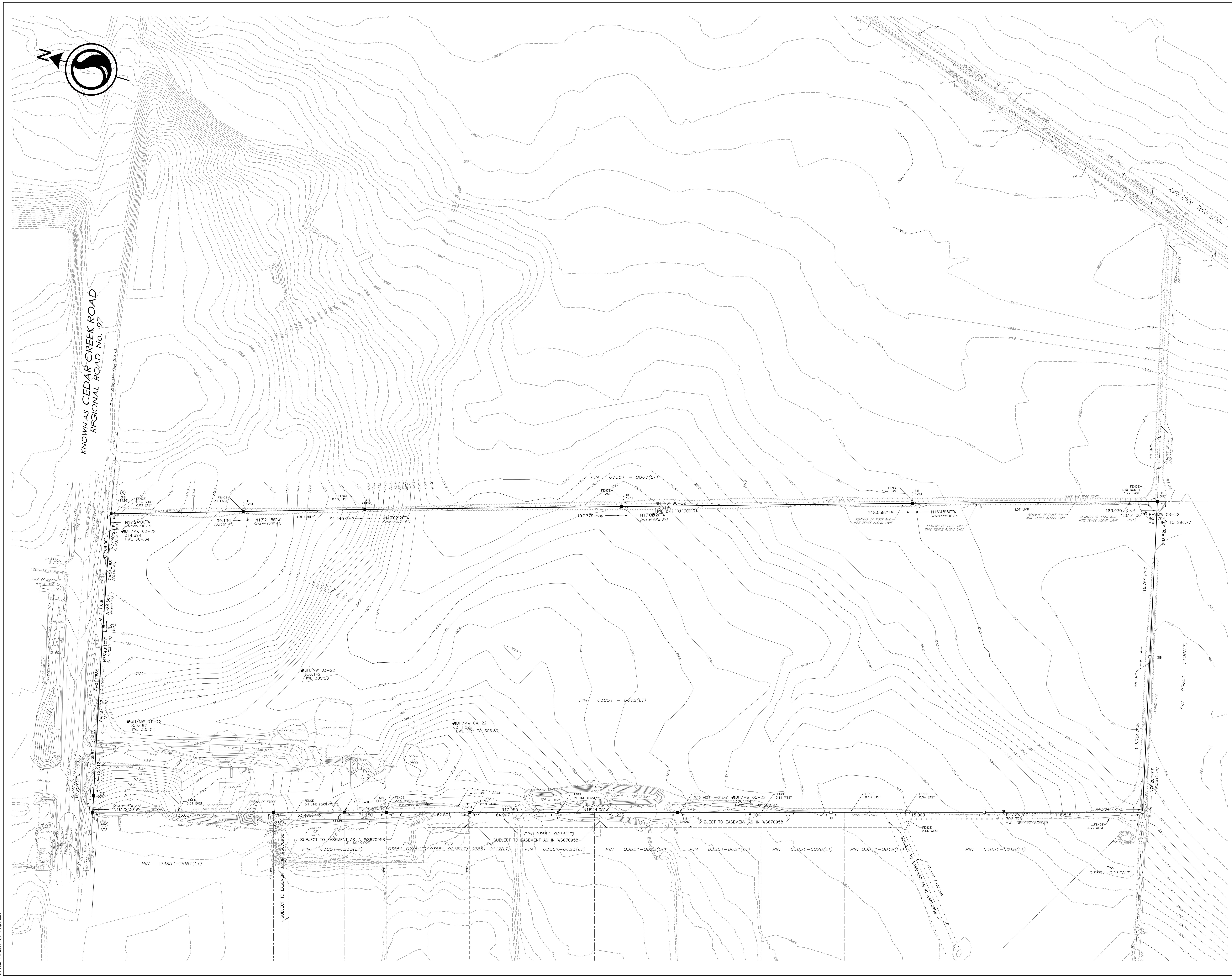
Existing Conditions Plan C-050

Preliminary Profiles Plan C-200, C-201 & C-202
Preliminary Servicing and Grading Plan C-400, C-401 & C-402

Prelim. Grading Plan Outlet Ditch Sta 0+000 To 0+320, C-403

Prelim. Grading Plan Outlet Ditch Sta 0+320 To End, C-404
Stormwater Management Facility Plan C-410

Preliminary Cut/Fill Plan C-900



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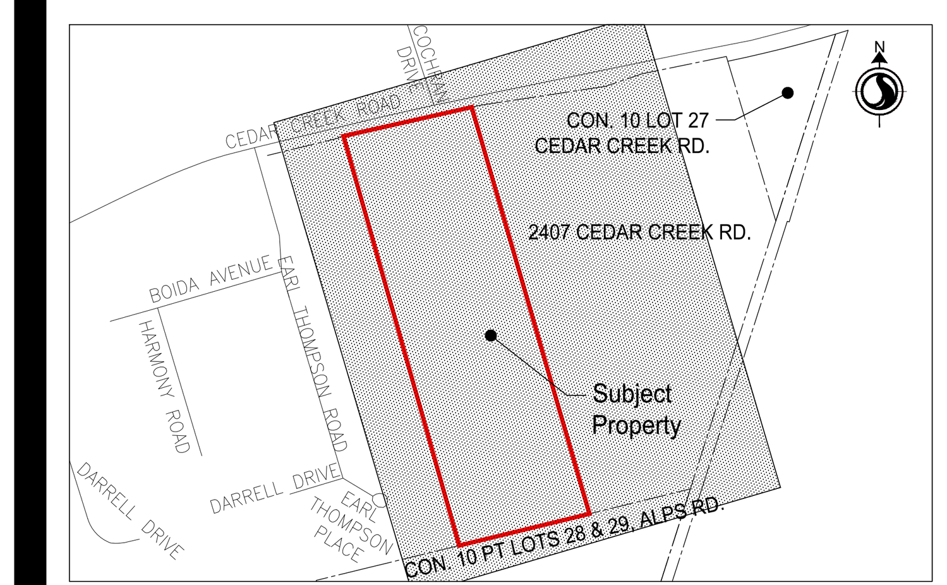
Key Map NTS.



Notes

1. ELEV'S ARE REFERRED TO THE CANADIAN GEODETIC VERTICAL DATUM (CGVD-1928:1978)
   BM1: PNT:102 N:4797898.320 E:546236.366 ELEV: 312.205 (SIB)
   BM2: PNT:115 N:4798062.046 E:546096.888 ELEV: 314.320 (CONCRETE MONUMENT)
2. DRAFT PLAN PREPARED BY STANTEC CONSULTING LTD., DATED JANUARY 2024.
3. CALCULATED PLAN PREPARED BY STANTEC CONSULTING LTD., DATED JANUARY 2024.
4. TOPOGRAPHICAL SURVEY PREPARED BY STANTEC CONSULTING LTD., DATED APRIL 2022. ADDITIONAL TOPOGRAPHICAL INFORMATION BY STANTEC CONSULTING LTD., DATED MAY 2022 AND JUNE 2022.

Legend

PROPOSED | EXISTING

- PROPERTY LINE
- EXISTING CONTOUR (305.0)
- CONTOUR (M.N.R.F LiDAR 2018) (305.0)
- BOREHOLE/MONITORING WELL (WITH GROUND ELEVATION, AND HIGH WATER LEVEL) (BH/MW 02-22 314.894 HWL 304.64; IDENTIFICATION NUMBER; INSTALL YEAR)
- TREES
- EASEMENT
- UTILITY POLE
- FENCE
- EXISTING DRIPLINE
- EXISTING DITCH
- EXISTING STORM/CULVERT
- EXISTING SIGN
- EXISTING ANCHOR
- EXISTING GAS MARKER
- STANDARD IRON BAR
- IRON BAR

Revision/Issue	By	Appd	YYYY.MM.DD
0. DRAFT PLAN FIRST SUBMISSION	BWM	KRB	2024.01.18

File Name: 161414214_C-DP	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD
	BWM	BWM	KRB	2024.01.18

Permit-Seal

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CONSTRUCTION

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Client/Project

CEDAR CREEK ROAD HOLDINGS INC.

2509 CEDAR CREEK ROAD, AYR

TOWNSHIP OF NORTH DUMFRIES, ON

Title

EXISTING CONDITIONS PLAN

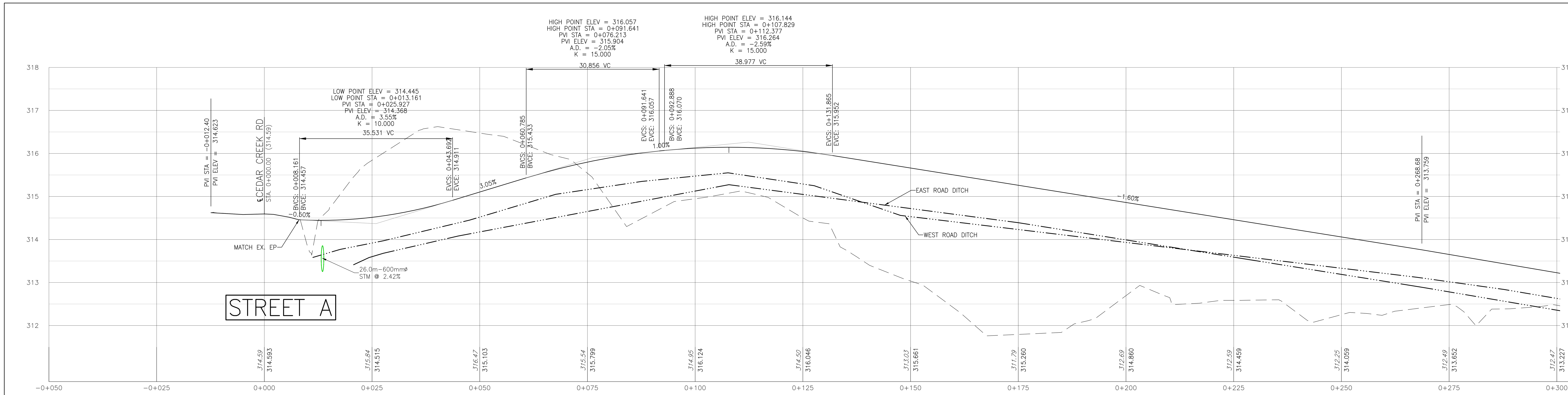
Project No. 161414214

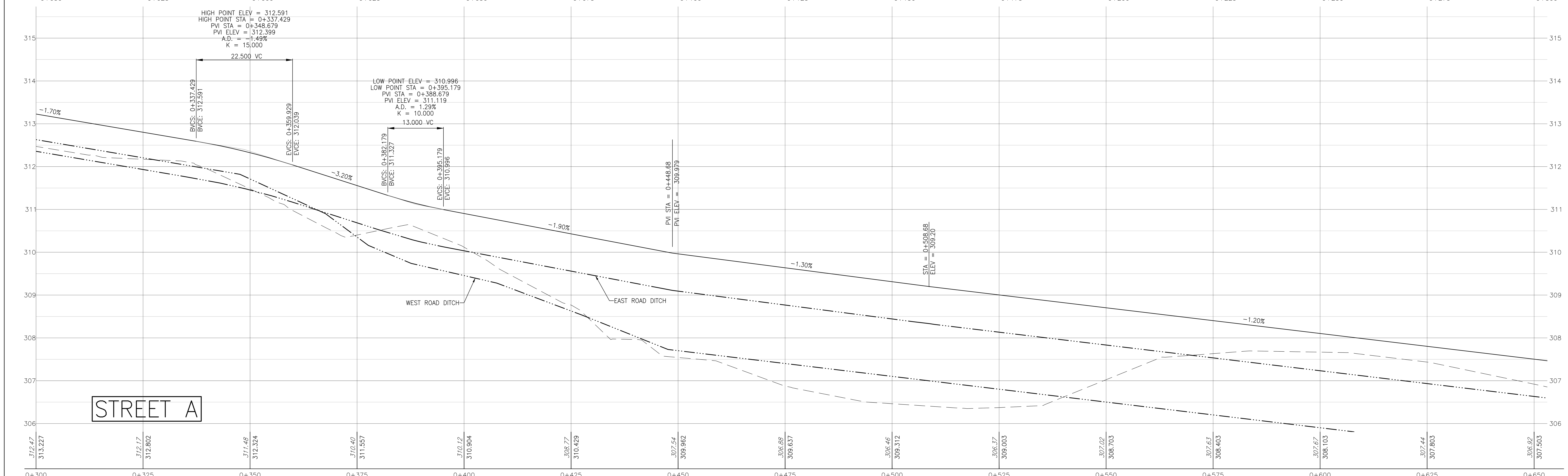
Scale 1:1250 (0, 12.5, 37.5, 62.5m)

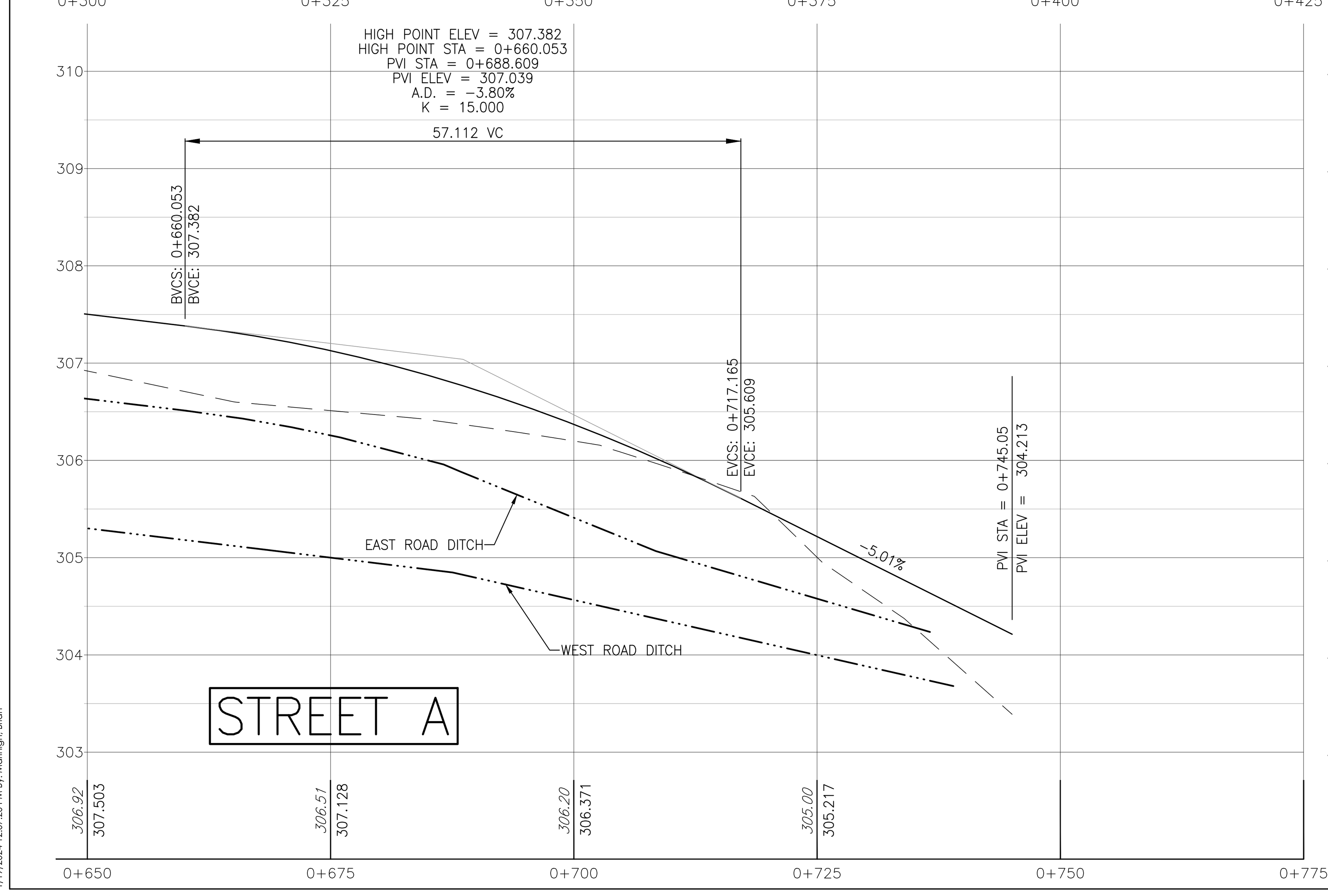
Revision 0

Sheet

Drawing No. **C-050**







ORIGINAL SHEET - ARCH D

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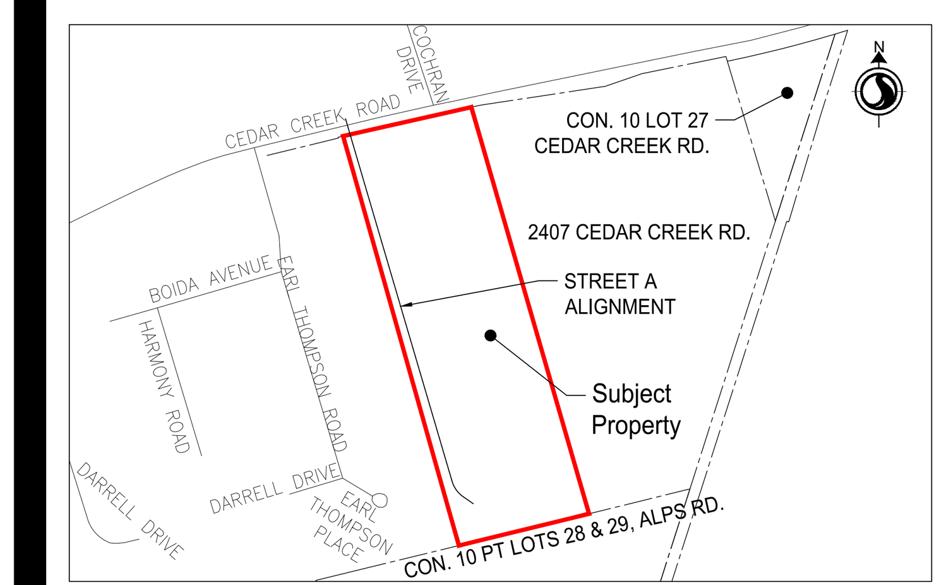
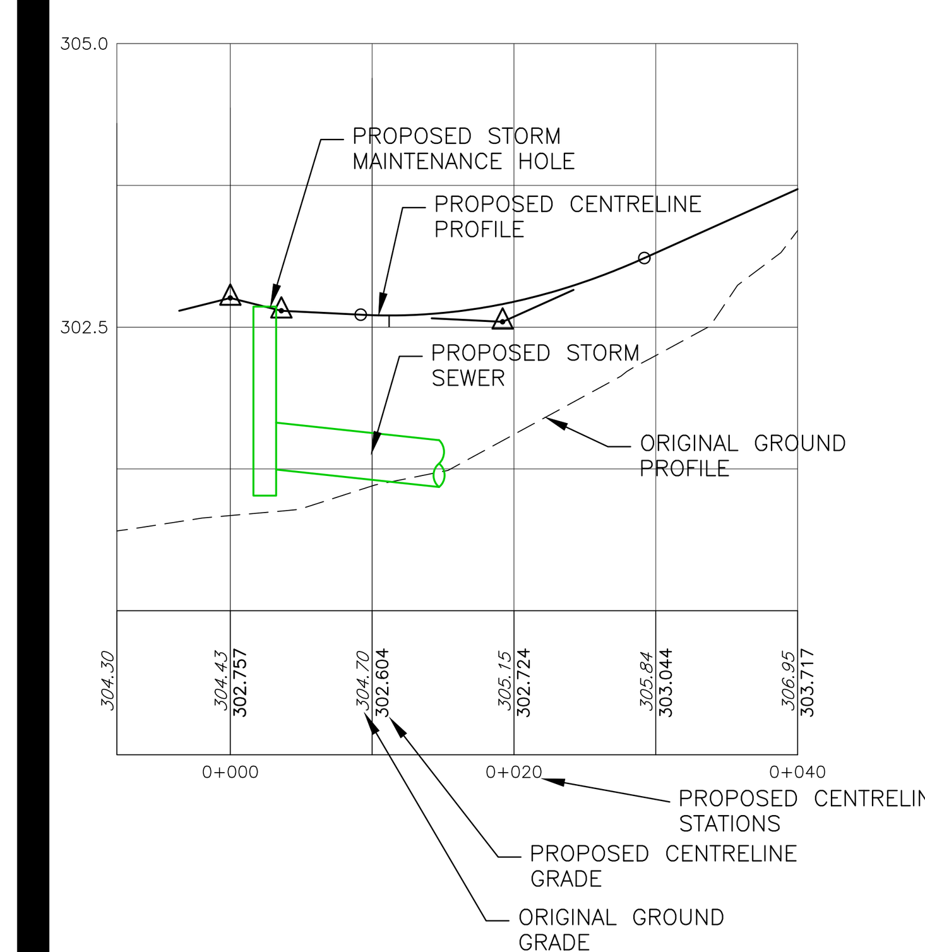
Key Map NTS.



Notes

1. ELEV'S ARE REFERRED TO THE CANADIAN GEODETIC VERTICAL DATUM (CGVD-1928:1978)
   BM1: PNT:102 N:4797898.320 E:546236.366 ELEV: 312.205 (SIB)
   BM2: PNT:115 N:4798062.046 E:546096.888 ELEV: 314.320 (CONCRETE MONUMENT)
2. DRAFT PLAN PREPARED BY STANTEC CONSULTING LTD., DATED JANUARY 2024.
3. CALCULATED PLAN PREPARED BY STANTEC CONSULTING LTD., DATED JANUARY 2024.
4. TOPOGRAPHICAL SURVEY PREPARED BY STANTEC CONSULTING LTD., DATED APRIL 2022. ADDITIONAL TOPOGRAPHICAL INFORMATION BY STANTEC CONSULTING LTD., DATED MAY 2022 AND JUNE 2022.

Legend



Revision/Issue	By	Appd	YYYY.MM.DD
0. DRAFT PLAN FIRST SUBMISSION	BWM	KRB	2024.01.18

File Name: 161414214_C-200ST-STREETA	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD
	BWM	BWM	KRB	2024.01.18

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Client/Project

CEDAR CREEK ROAD HOLDINGS INC.

2509 CEDAR CREEK ROAD, AYR

TOWNSHIP OF NORTH DUMFRIES, ON

Title

PRELIMINARY PROFILES PLAN

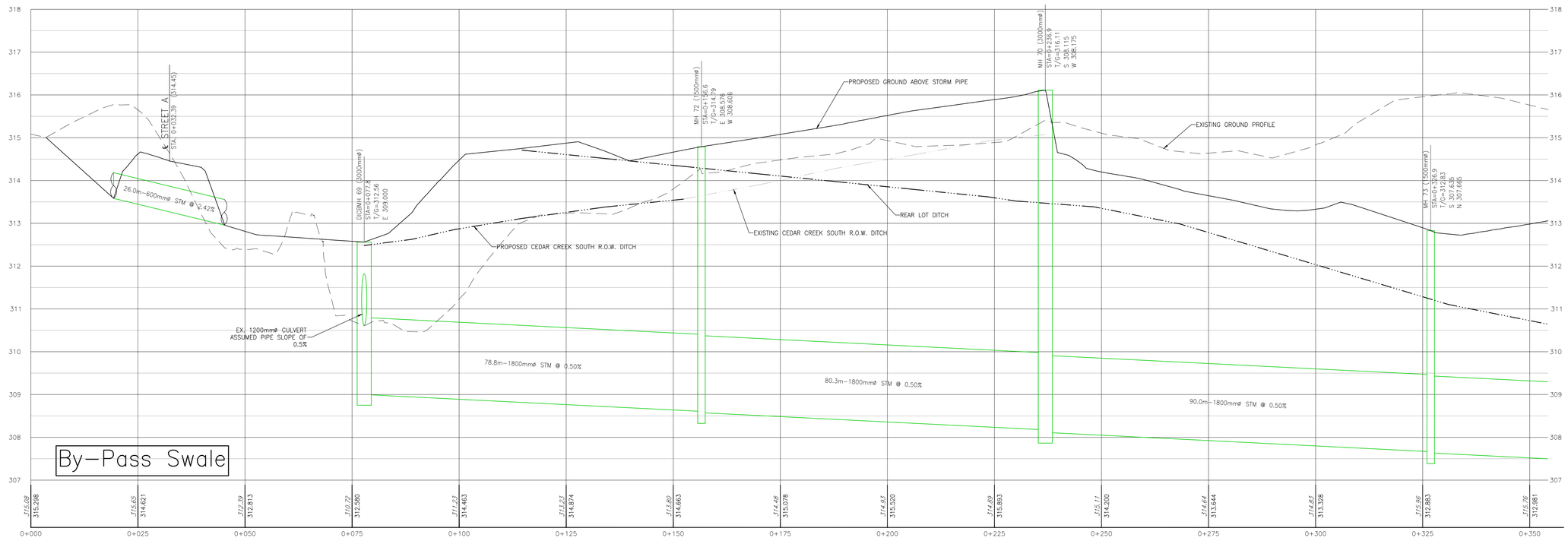
Project No. 161414214

Scale 1:500H 1:100V

Revision 0

Sheet

Drawing No. **C-200**



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Tel: (519) 579-4410
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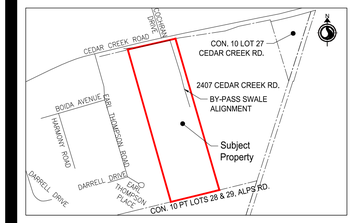
Key Map NTS.



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Legend

Revision/Issue	By	Appd	YYYY.MM.DD
0. DRAFT PLAN FIRST SUBMISSION	BWM	KRB	2024.01.18

File Name: 161414214_C-201ST-BYPASS-SWALE	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD
	BWM	BWM	KRB	2024.01.18

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Client/Project
CEDAR CREEK ROAD HOLDINGS INC.

2509 CEDAR CREEK ROAD, AYR

TOWNSHIP OF NORTH DUMFRIES, ON

Title
PRELIMINARY PROFILES PLAN

Project No. 161414214

Scale 1:500H 0 5 15 25m
1:100V 0 1 3 5m

Revision 0

Sheet

Drawing No. **C-201**

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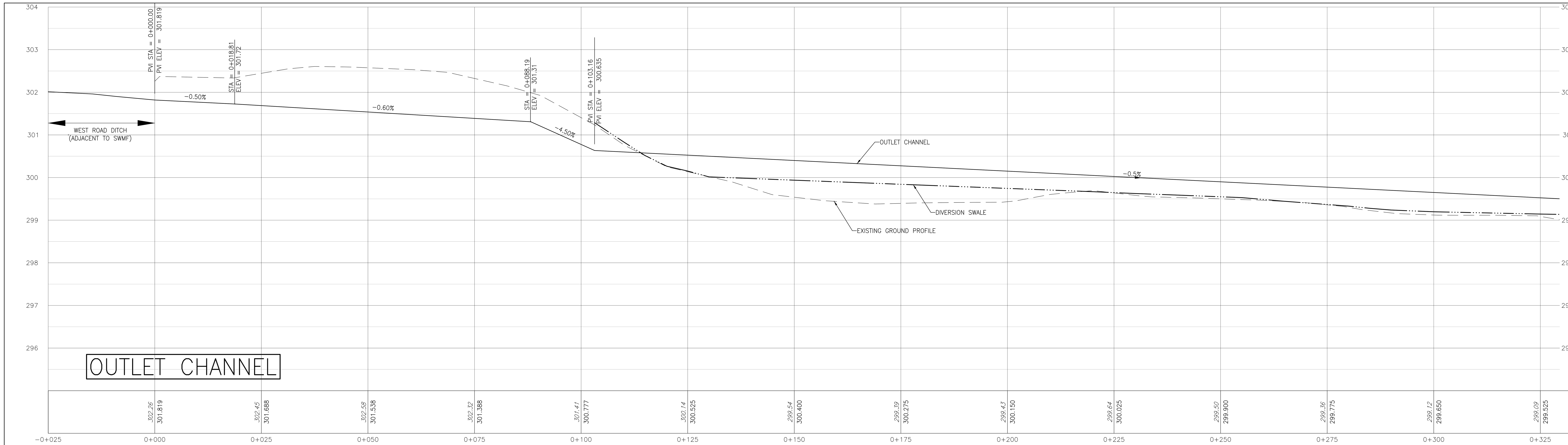
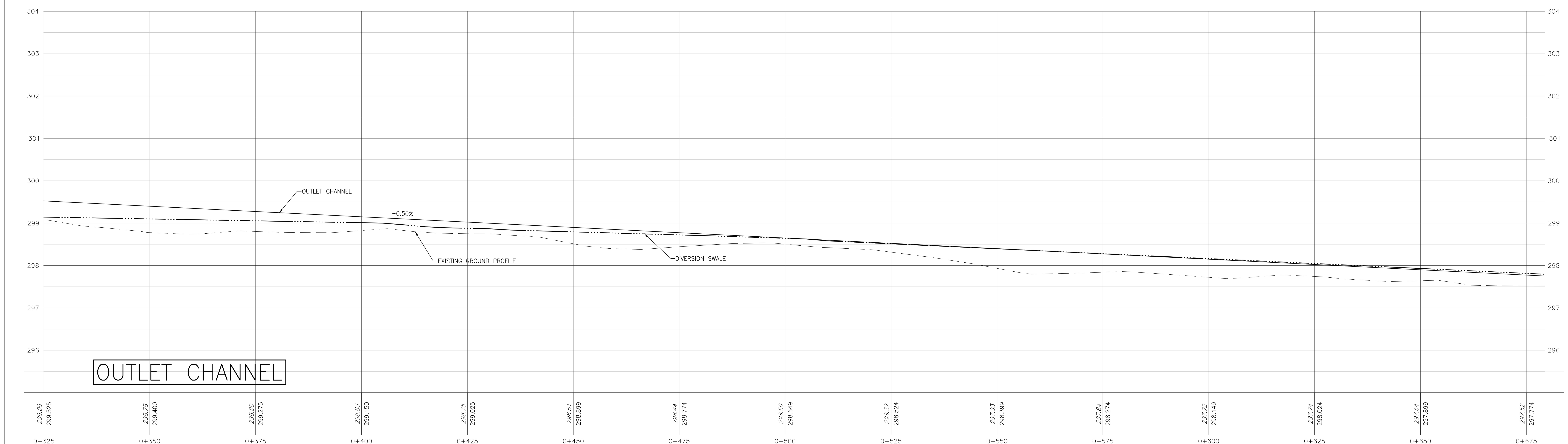
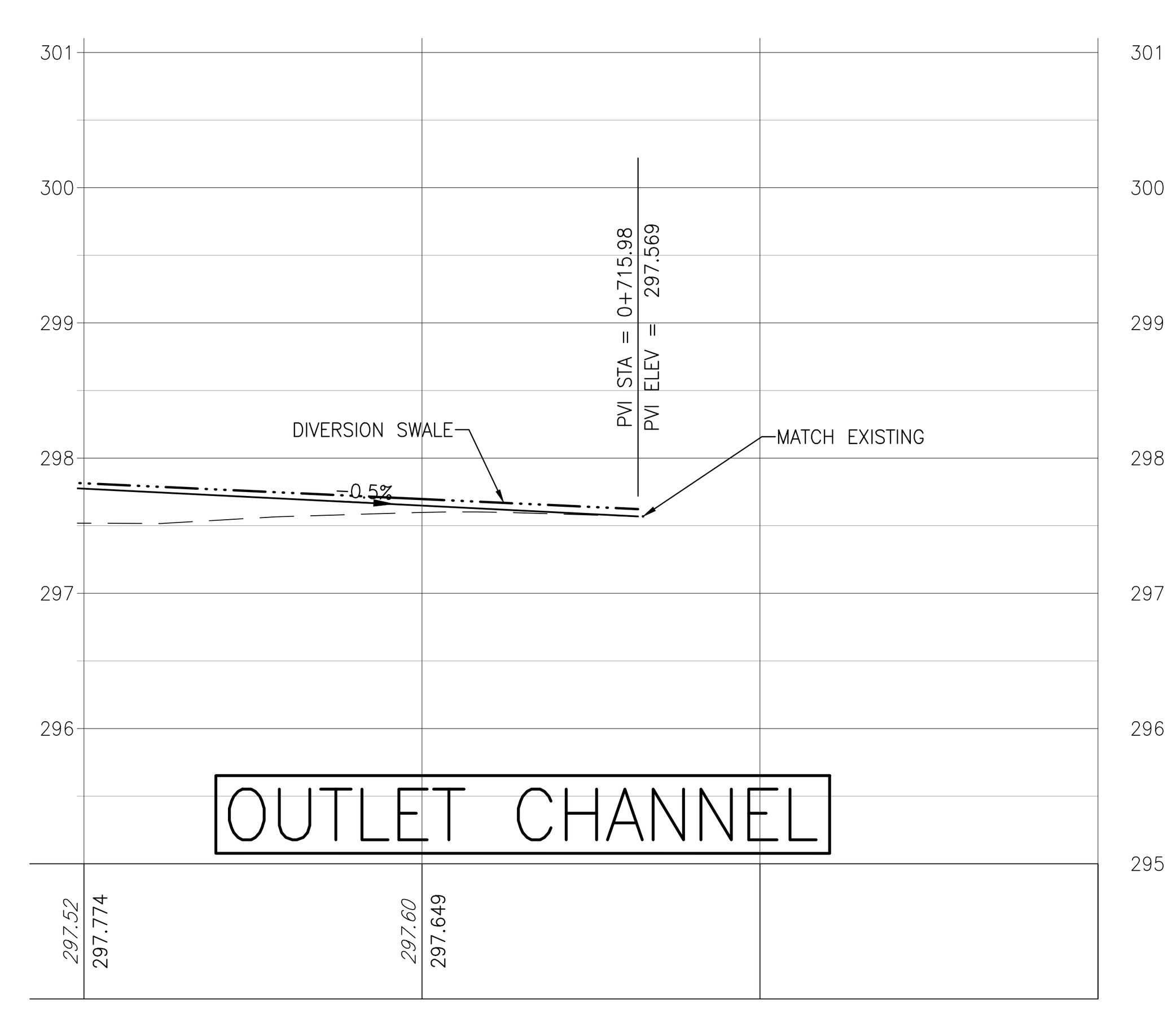
17/1/2024 2:39:17 PM by Mattingly, Brian

ORIGINAL SHEET - ARCH D







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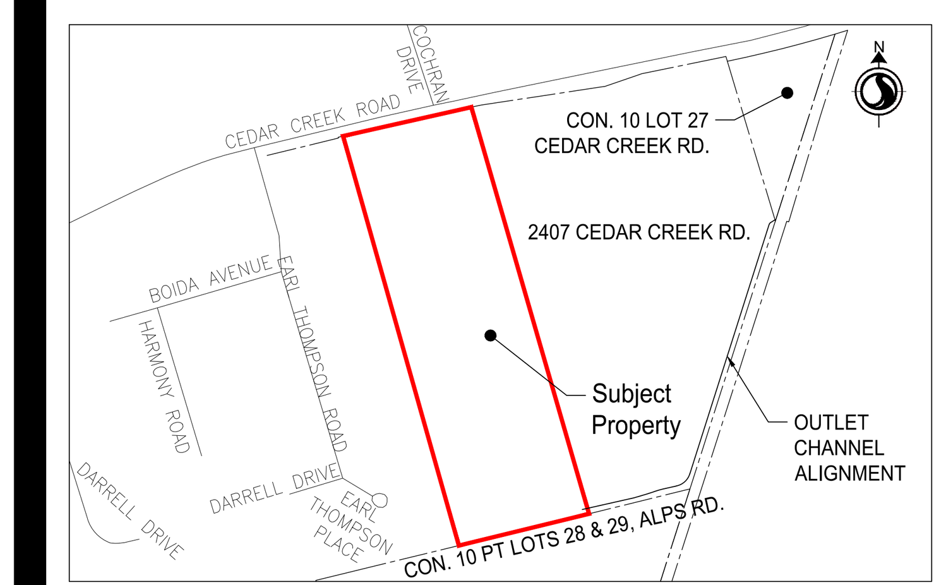
Key Map NTS.



Notes

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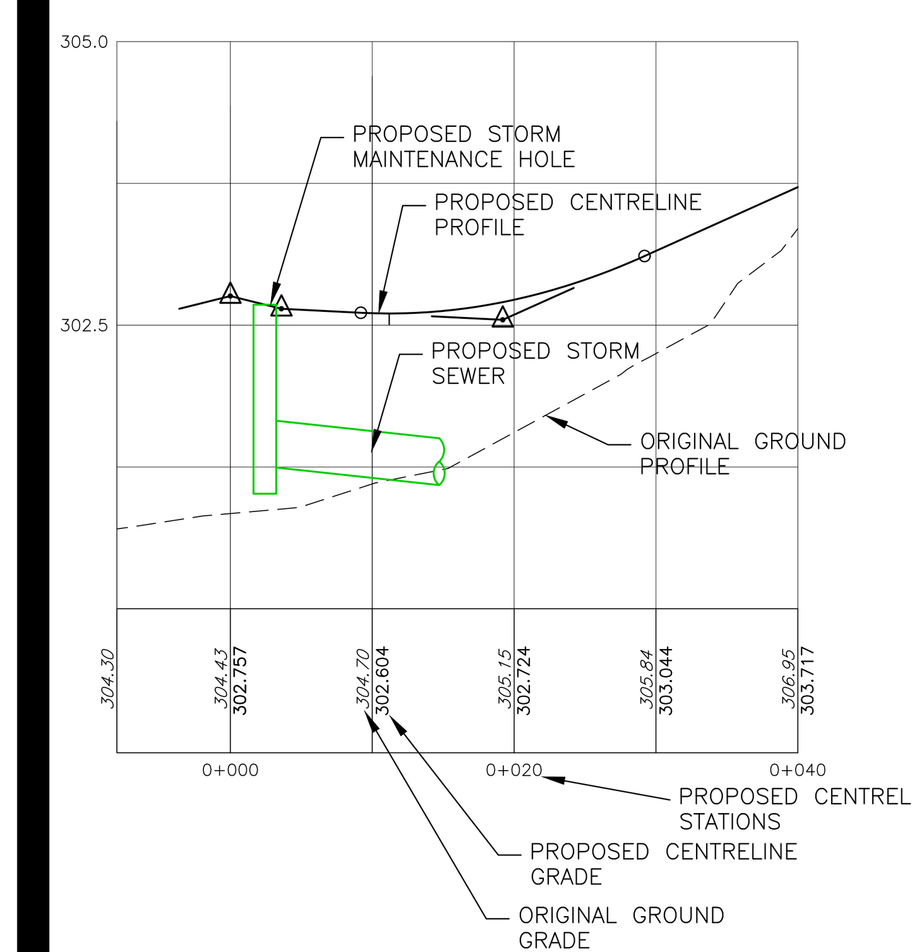
Legend



Revision/Issue	By	Appd	YYYY.MM.DD
0. DRAFT PLAN FIRST SUBMISSION	BWM	KRB	2024.01.18

File Name: 161414214_C-202ST-OUTLET-DITCH	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD
	BWM	BWM	KRB	2024.01.18

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Client/Project

CEDAR CREEK ROAD HOLDINGS INC.

2509 CEDAR CREEK ROAD, AYR

TOWNSHIP OF NORTH DUMFRIES, ON

Title

PRELIMINARY PROFILES PLAN

Project No. 161414214

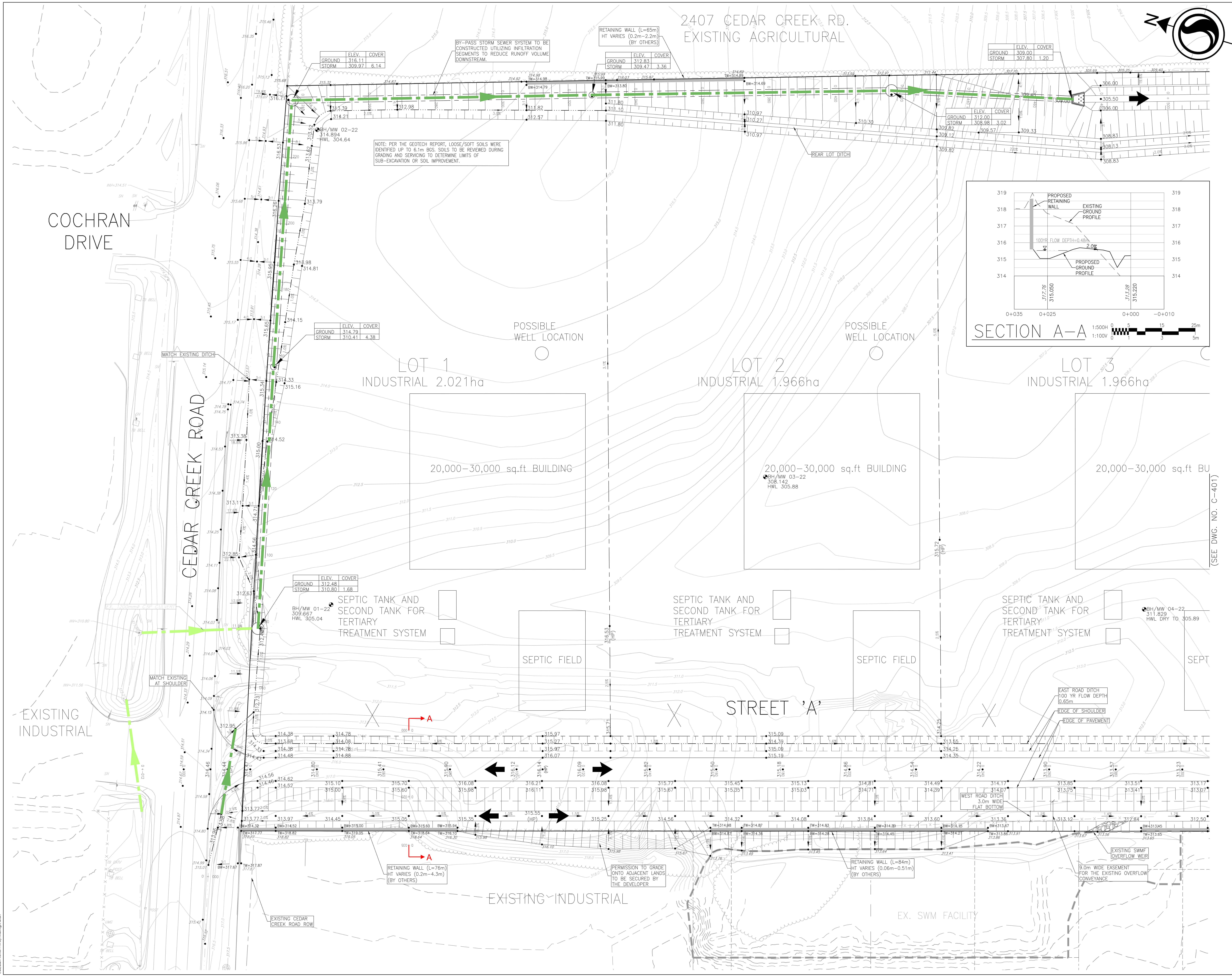
Scale 1:500H 1:100V

Revision 0

Sheet

Drawing No. **C-202**

ORIGINAL SHEET - ARCH D



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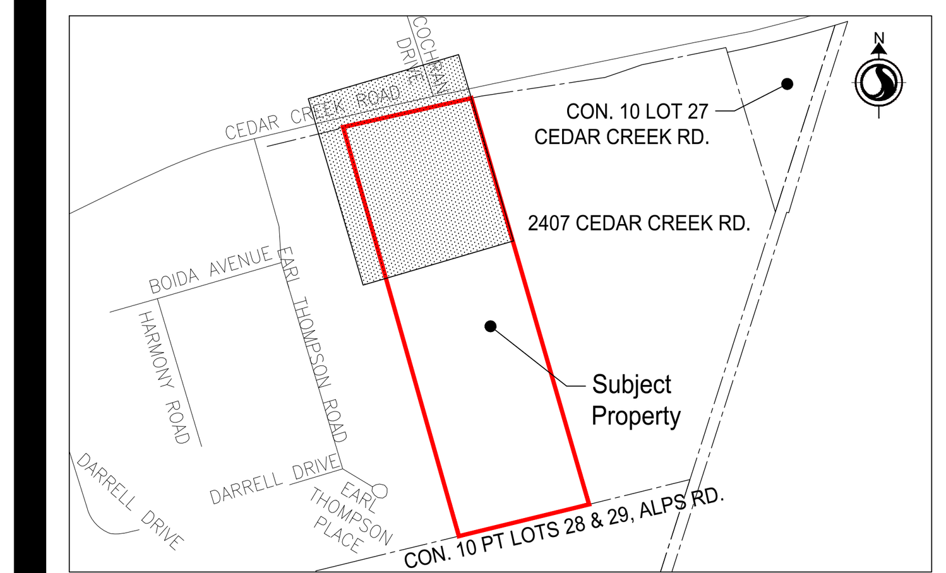
Key Map NTS.



Notes

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Legend

- 352.82 EXISTING ELEVATION
- 352.92 PROPOSED ELEVATION
- FLOW DIRECTION
- STRUCTURAL FILL (SEE DETAIL DWG C-500)
- PROPOSED DRIVEWAY/ACCESS RAMP
- PROPOSED DRAINAGE SWALE/DITCH
- EXISTING CONTOUR
- M.N.R.F. CONTOUR (LIDAR 2018 DATA)
- RETAINING WALL
- PROPOSED STORM MANHOLE
- PROPOSED STORM CATCHBASIN MANHOLE
- PROPOSED CATCHBASIN
- PROPOSED SLOPE (3:1 UNLESS NOTED OTHERWISE)
- OVERLAND FLOW DIRECTION
- BORE HOLE
- PROPOSED STORM SEWER
- EXISTING STORM SEWER
- EXISTING SWM FACILITY BOUNDARY

	ELEV.	COVER
GROUND	312.49	
STORM	308.83	3.66

GROUND ELEVATION — COVER OVER SEWER (TO OBVERT) — SEWER OBVERT ELEVATION

Revision/Issue	By	Appd	YYYY.MM.DD
0. DRAFT PLAN FIRST SUBMISSION	BWM	KRB	2024.01.18

File Name: 161414214_C-GP	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD
	BWM	BWM	KRB	2024.01.18

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Client/Project

CEDAR CREEK ROAD HOLDINGS INC.

2509 CEDAR CREEK ROAD, AYR

TOWNSHIP OF NORTH DUMFRIES, ON

Title

PRELIMINARY SERVICING AND GRADING PLAN

Project No. 161414214

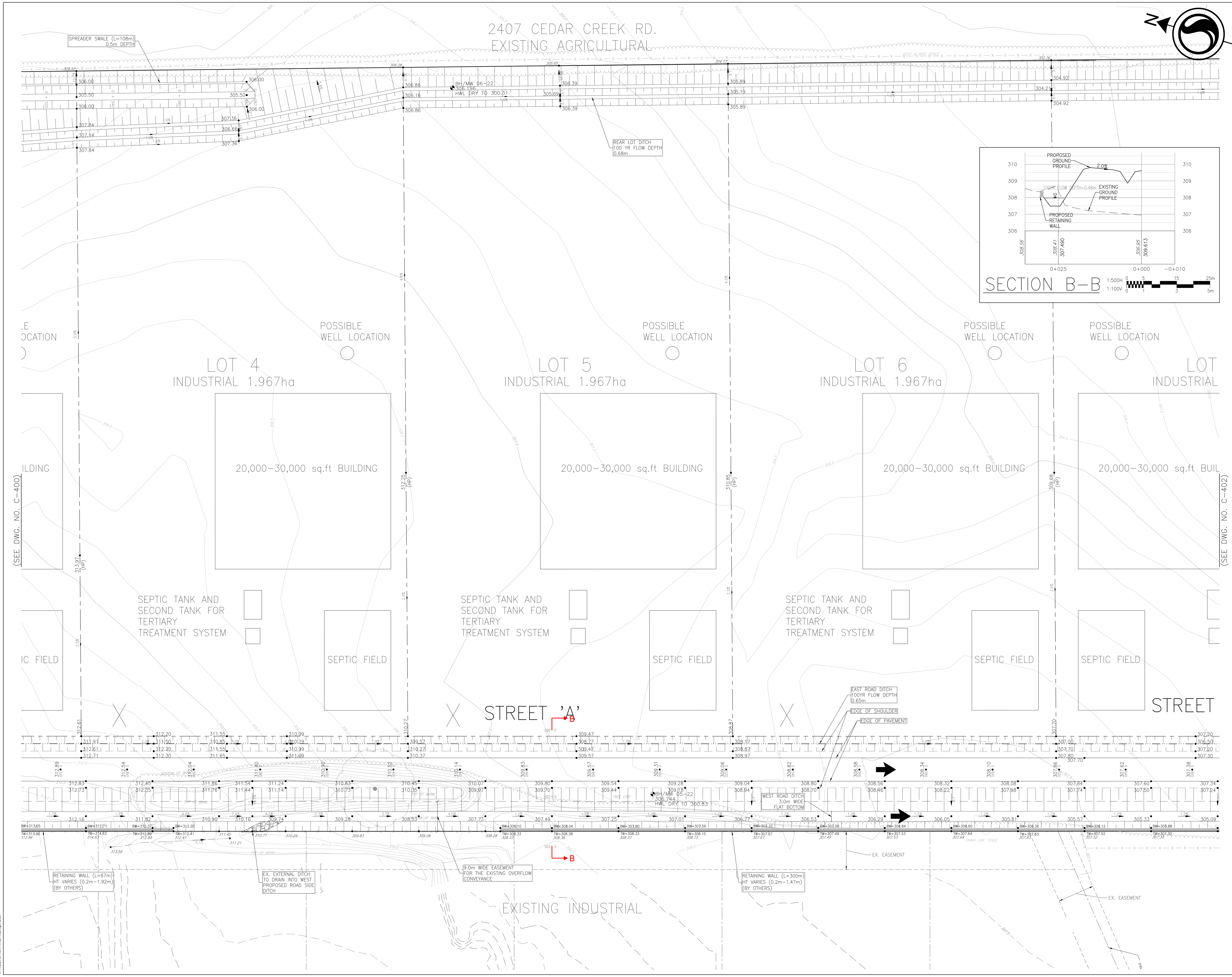
Scale 1:500

Revision 0

Sheet

Drawing No. **C-400**

ORIGINAL SHEET - ARCH D



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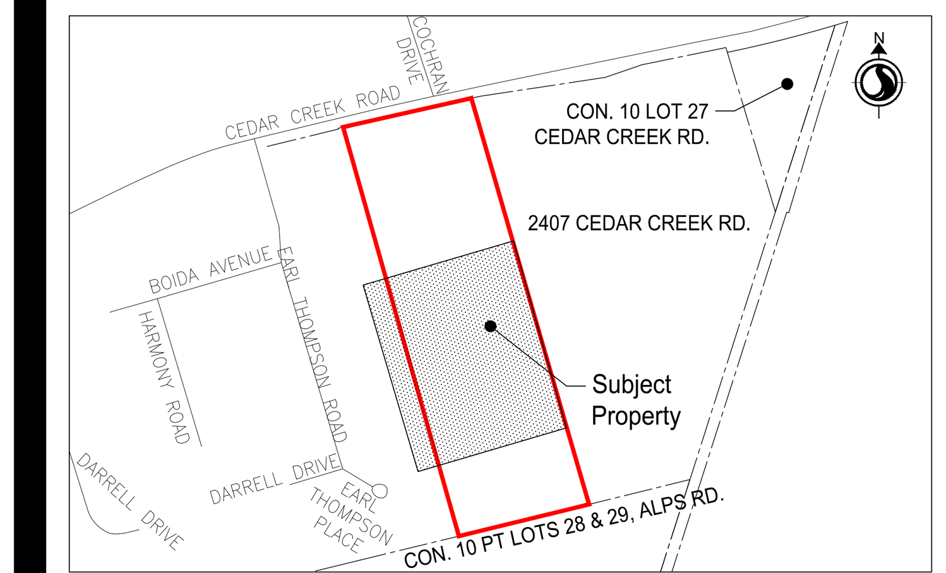
Key Map NTS.



Notes

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4. TOPOGRAPHICAL SURVEY PREPARED BY STANTEC CONSULTING LTD., DATED APRIL 2022. ADDITIONAL TOPOGRAPHICAL INFORMATION BY STANTEC CONSULTING LTD., DATED MAY 2022 AND JUNE 2022.

Legend

- 352.82 EXISTING ELEVATION
- 352.92 PROPOSED ELEVATION
- 5.0% 2.0% FLOW DIRECTION
- S.F. STRUCTURAL FILL (SEE DETAIL DWG C–500)
- PROPOSED DRIVEWAY/ACCESS RAMP
- PROPOSED DRAINAGE SWALE/DITCH
- 349.00 EXISTING CONTOUR
- 349.00 M.N.R.F. CONTOUR (LiDAR 2018 DATA)
- RETAINING WALL
- PROPOSED STORM MANHOLE
- PROPOSED STORM CATCHBASIN MANHOLE
- PROPOSED CATCHBASIN
- PROPOSED SLOPE (3:1 UNLESS NOTED OTHERWISE)
- OVERLAND FLOW DIRECTION
- BH/MW 02–22 314.894 HWL 304.64 BORE HOLE

Revision/Issue	By	Appd	YYYY.MM.DD
0. DRAFT PLAN FIRST SUBMISSION	BWM	KRB	2024.01.18

File Name: 161414214_C-GP	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD
	BWM	BWM	KRB	2024.01.18

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Client/Project

CEDAR CREEK ROAD HOLDINGS INC.

2509 CEDAR CREEK ROAD, AYR

TOWNSHIP OF NORTH DUMFRIES, ON

Title

PRELIMINARY SERVICING AND GRADING PLAN

Project No. 161414214

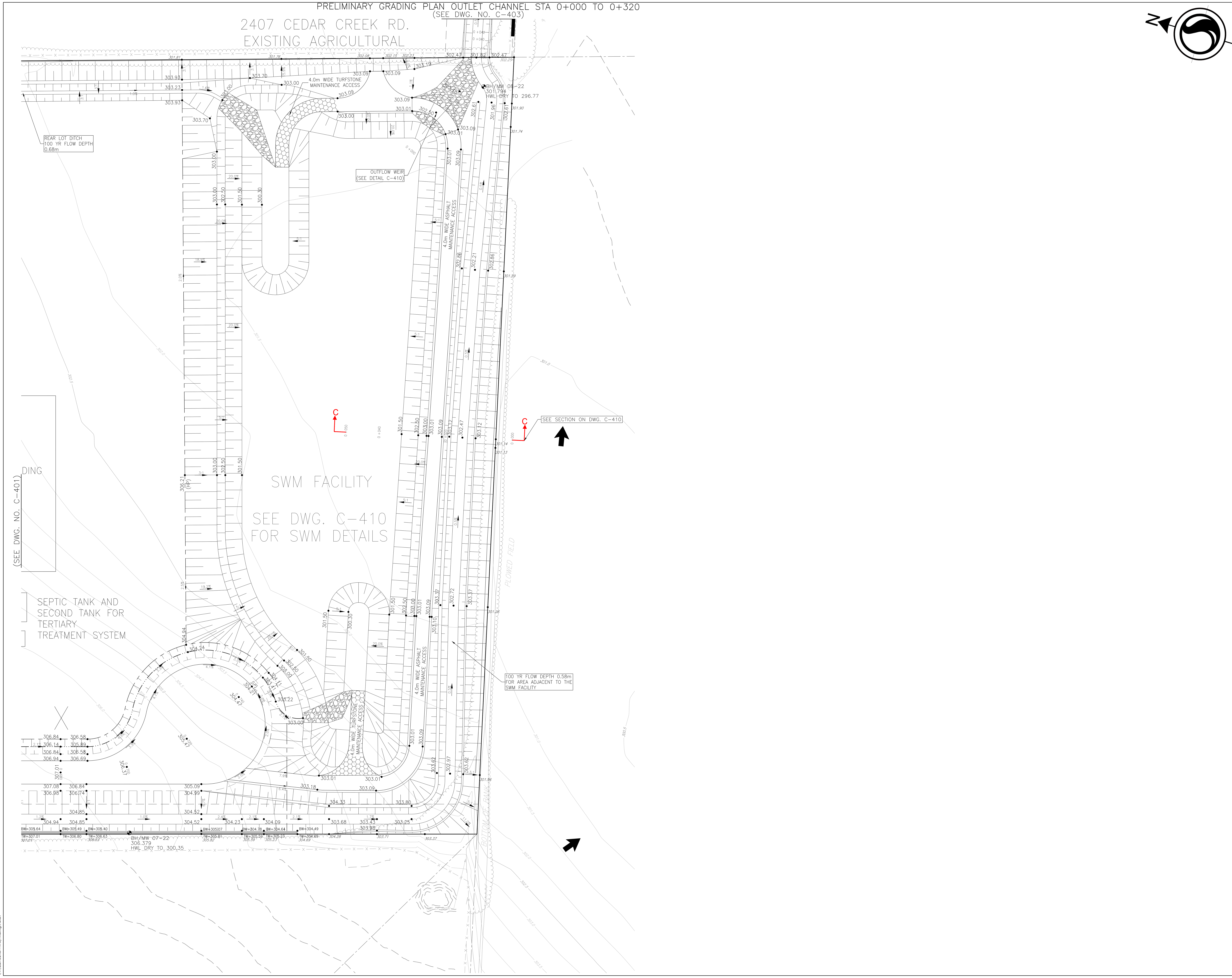
Scale 1:500 (0 5 15 25m)

Revision 0

Sheet

Drawing No. **C-401**

ORIGINAL SHEET - ARCH D



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Tel: (519) 579-4410
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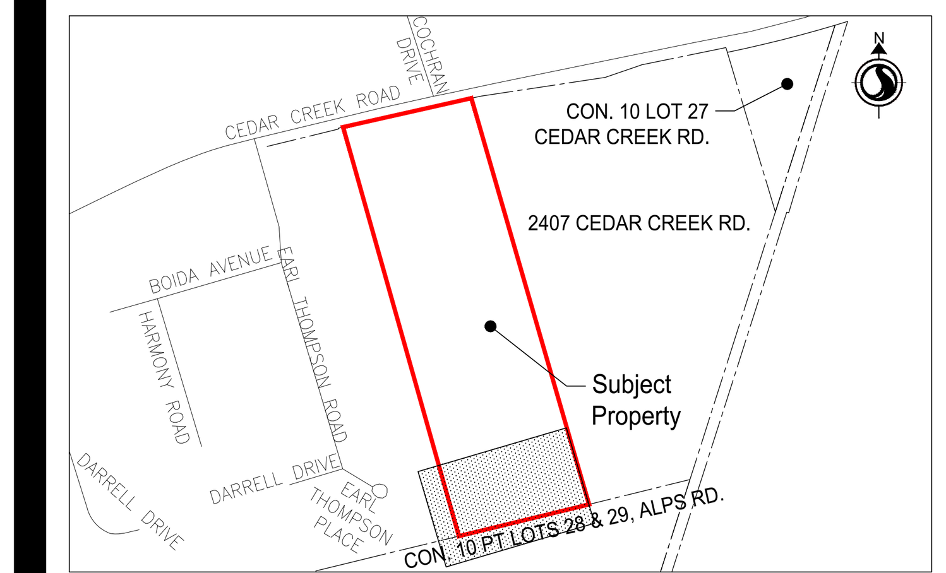
Key Map NTS.



Notes

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   BM1: PNT:102 N:4797898.320 E:546236.366 ELEV: 312.205 (SIB)
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Legend

- 352.82 EXISTING ELEVATION
- 352.92 PROPOSED ELEVATION
- FLOW DIRECTION
- STRUCTURAL FILL (SEE DETAIL DWG C-500)
- PROPOSED DRIVEWAY/ACCESS RAMP
- PROPOSED DRAINAGE SWALE/DITCH
- EXISTING CONTOUR
- M.N.R.F. CONTOUR (LiDAR 2018 DATA)
- RETAINING WALL
- PROPOSED STORM MANHOLE
- PROPOSED STORM CATCHBASIN MANHOLE
- PROPOSED CATCHBASIN
- PROPOSED SLOPE (3:1 UNLESS NOTED OTHERWISE)
- OVERLAND FLOW DIRECTION
- BORE HOLE

Revision/Issue	By	Appd	YYYY.MM.DD
0. DRAFT PLAN FIRST SUBMISSION	BWM	KRB	2024.01.18

File Name: 161414214_C-GP	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD
	BWM	BWM	KRB	2024.01.18

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Client/Project

CEDAR CREEK ROAD HOLDINGS INC.

2509 CEDAR CREEK ROAD, AYR

TOWNSHIP OF NORTH DUMFRIES, ON

Title

PRELIMINARY SERVICING AND GRADING PLAN

Project No. 161414214

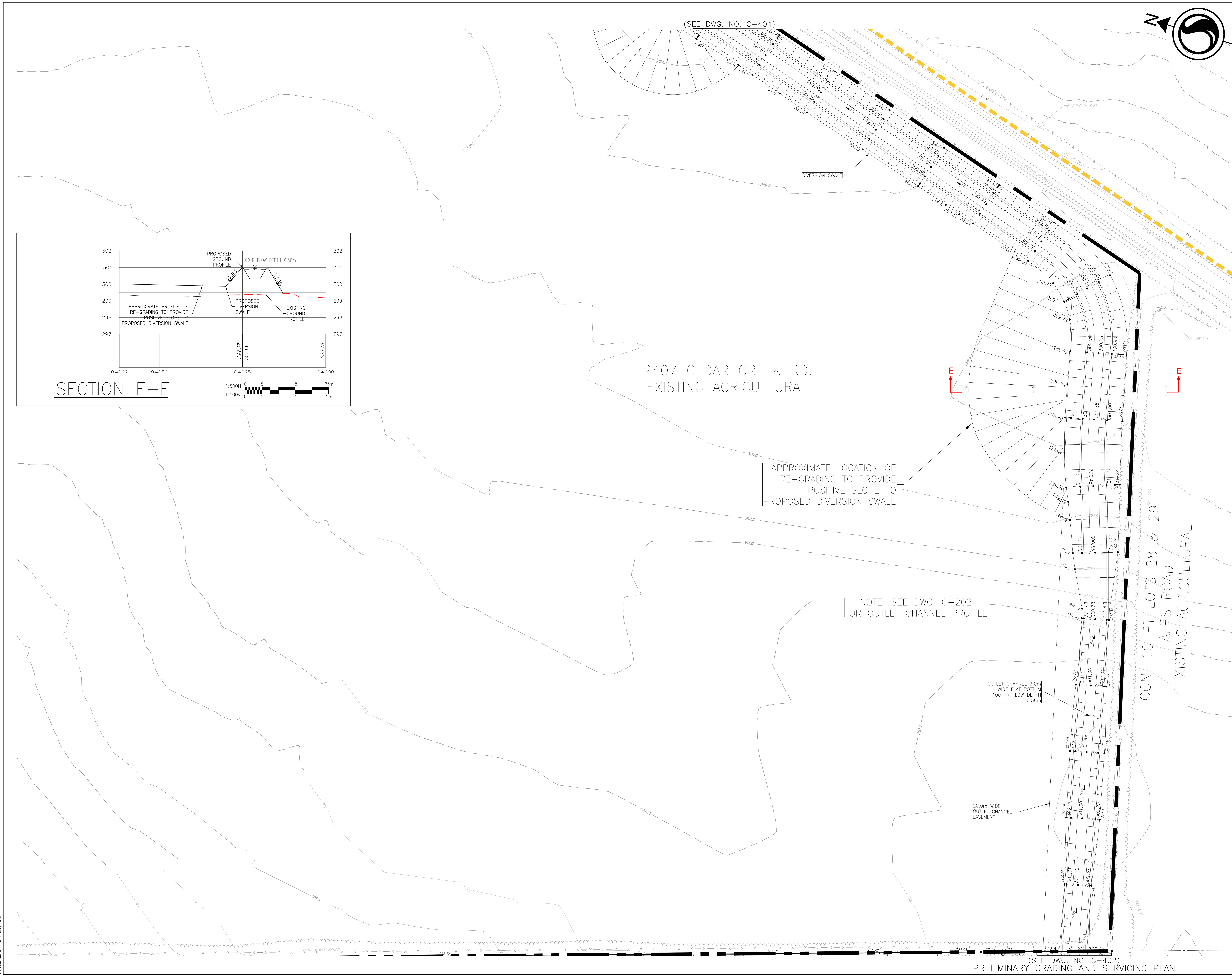
Scale 1:500

Revision 0

Sheet

Drawing No. C-402

ORIGINAL SHEET - ARCH D



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Tel: (519) 579-4410
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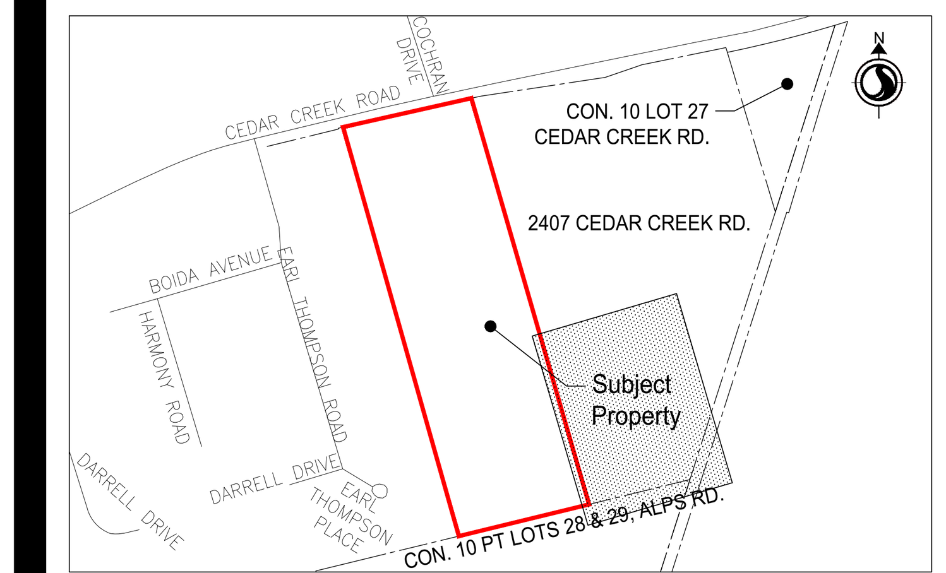
Key Map NTS.



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Legend

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- 352.92 PROPOSED ELEVATION
- 5.0% 2.0% FLOW DIRECTION
- S.F. STRUCTURAL FILL (SEE DETAIL DWG C-500)
- PROPOSED DRIVEWAY/ACCESS RAMP
- PROPOSED DRAINAGE SWALE/DITCH
- 349.00 EXISTING CONTOUR
- 349.00 M.N.R.F. CONTOUR (LIDAR 2018 DATA)
- RETAINING WALL
- PROPOSED STORM MANHOLE
- PROPOSED STORM CATCHBASIN MANHOLE
- PROPOSED CATCHBASIN
- PROPOSED SLOPE (3:1 UNLESS NOTED OTHERWISE)
- OVERLAND FLOW DIRECTION
- GRCA REGULATION LIMIT

Revision/Issue	By	Appd	YYYY.MM.DD
0. DRAFT PLAN FIRST SUBMISSION	BWM	KRB	2024.01.18

File Name: 161414214_C-GP	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD
	BWM	BWM	KRB	2024.01.18

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Client/Project

CEDAR CREEK ROAD HOLDINGS INC.

2509 CEDAR CREEK ROAD, AYR

TOWNSHIP OF NORTH DUMFRIES, ON

Title

PRELIMINARY GRADING PLAN OUTLET DITCH STA 0+000 TO 0+320

Project No. 161414214

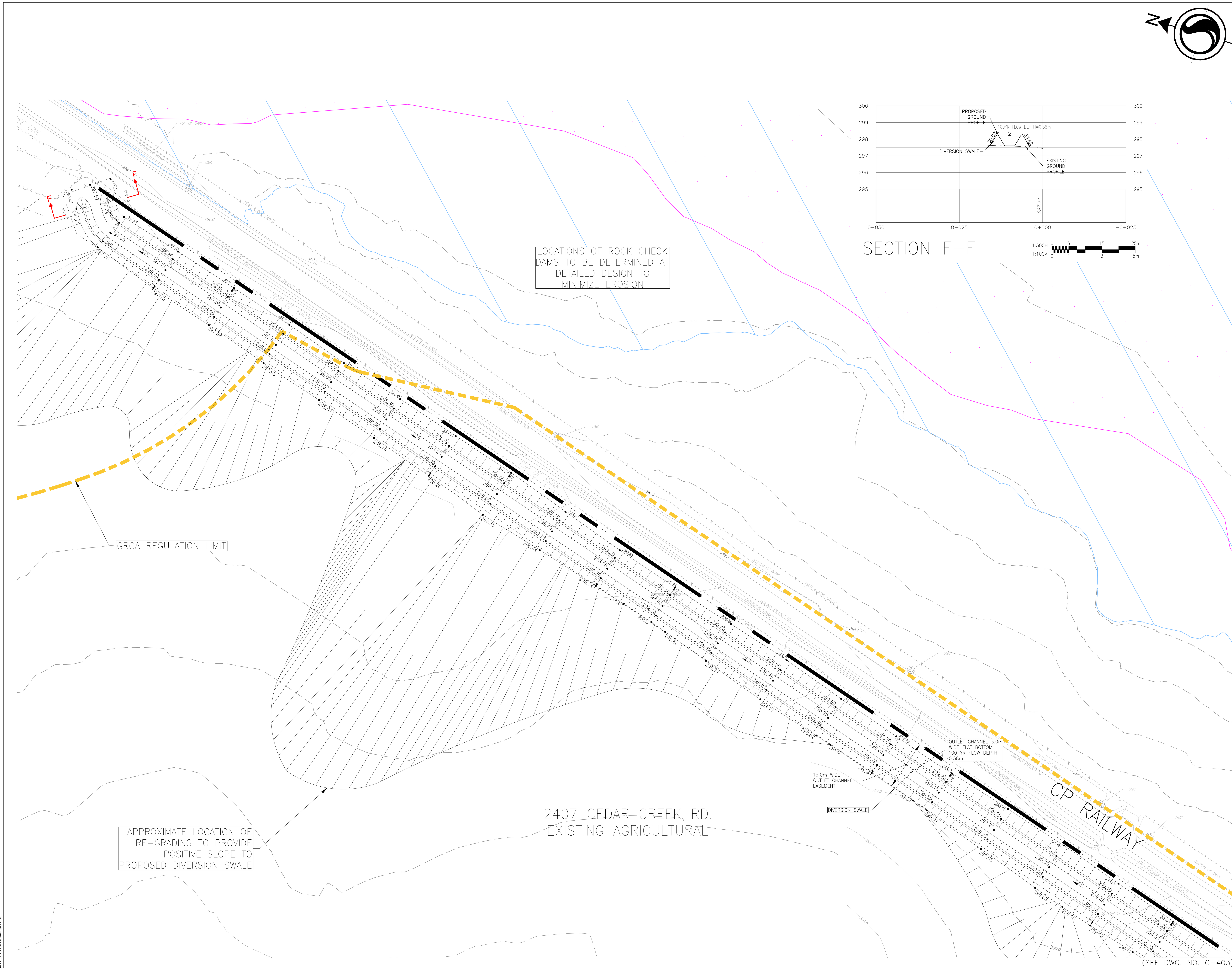
Scale 1:500

Revision 0

Sheet

Drawing No. **C-403**

ORIGINAL SHEET - ARCH D



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Tel: (519) 579-4410
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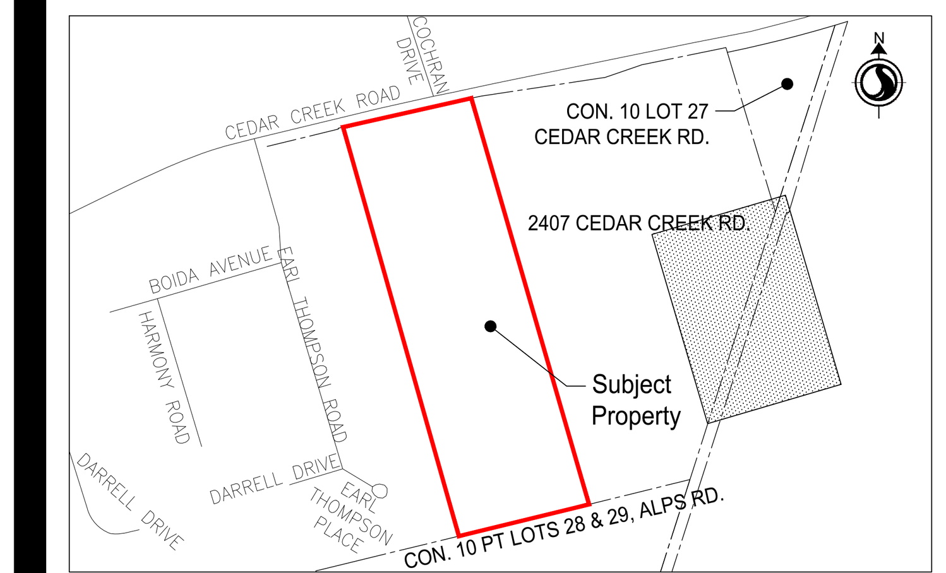
Key Map NTS.



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Legend

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- 352.92 PROPOSED ELEVATION
- 5.0% 2.0% FLOW DIRECTION
- S.F. STRUCTURAL FILL (SEE DETAIL DWG C-500)
- PROPOSED DRIVEWAY/ACCESS RAMP
- PROPOSED DRAINAGE SWALE/DITCH
- 349.00 EXISTING CONTOUR
- 349.00 M.N.R.F. CONTOUR (LiDAR 2018 DATA)
- RETAINING WALL
- PROPOSED STORM MANHOLE
- PROPOSED STORM CATCHBASIN MANHOLE
- PROPOSED CATCHBASIN
- PROPOSED SLOPE (3:1 UNLESS NOTED OTHERWISE)
- OVERLAND FLOW DIRECTION
- GRCA FLOODPLAIN
- GRCA REGULATION LIMIT
- GRCA WATERBODY
- GRCA WATERCOURSE
- GRCA WETLAND

Revision/Issue	By	Appd	YYYY.MM.DD
0. DRAFT PLAN FIRST SUBMISSION	BWM	KRB	2024.01.18

File Name: 161414214_C-GP	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD
	BWM	BWM	KRB	2024.01.18

Permit-Seal

PRELIMINARY
NOT FOR
CONSTRUCTION

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Client/Project

CEDAR CREEK ROAD HOLDINGS INC.

2509 CEDAR CREEK ROAD, AYR

TOWNSHIP OF NORTH DUMFRIES, ON

Title

PRELIMINARY GRADING PLAN
OUTLET DITCH STA 0+320 TO END

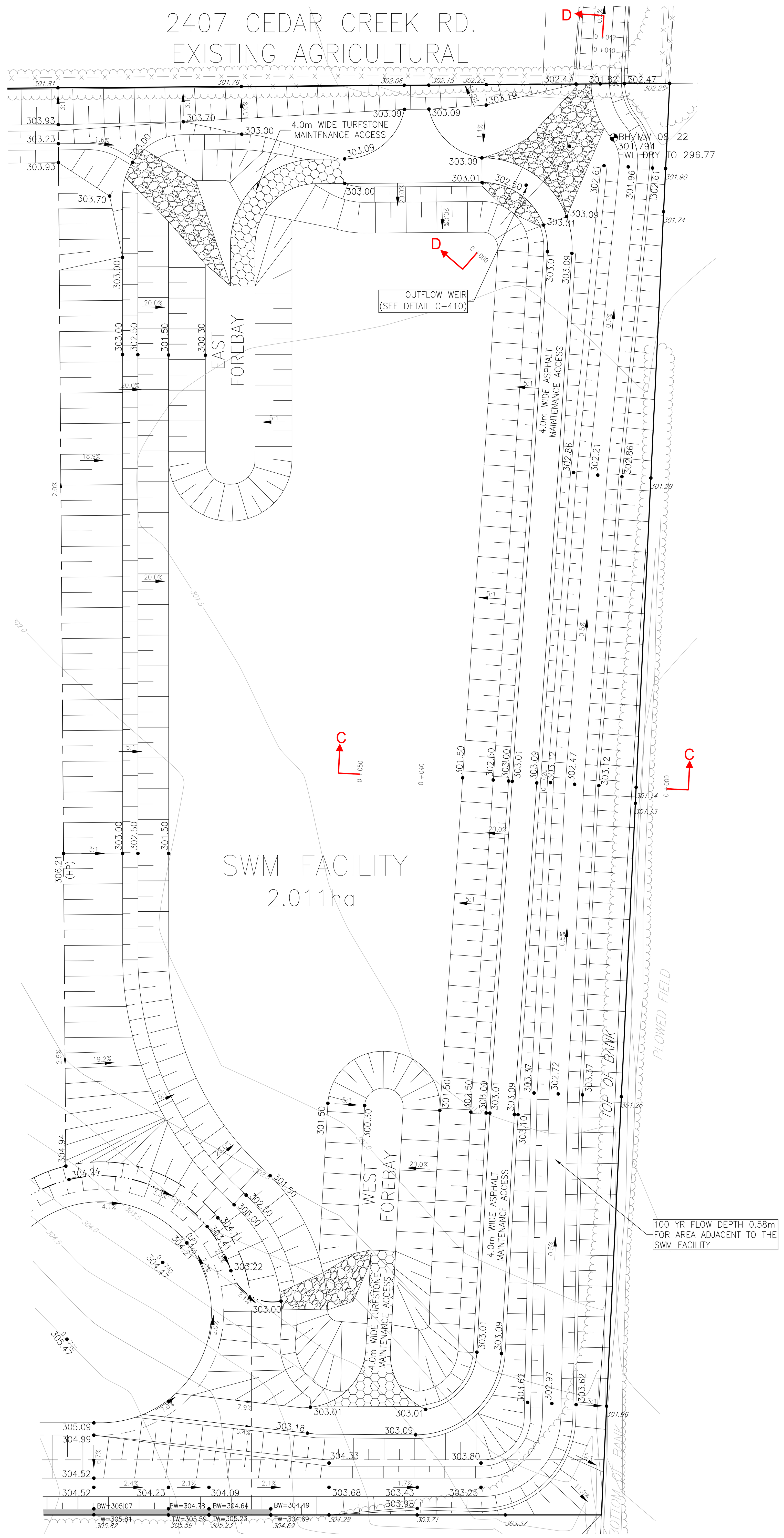
Project No. 161414214

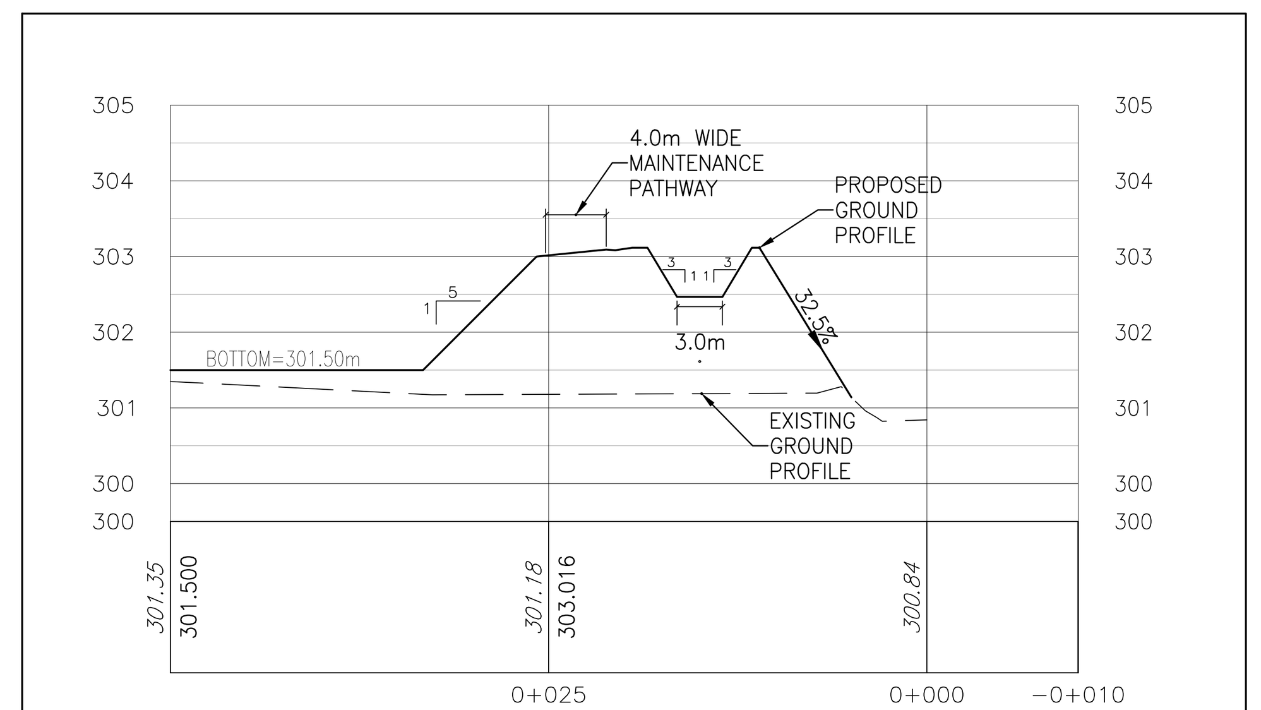
Scale 1:500 (0 5 15 25m)

Revision 0

Sheet

Drawing No. **C-404**

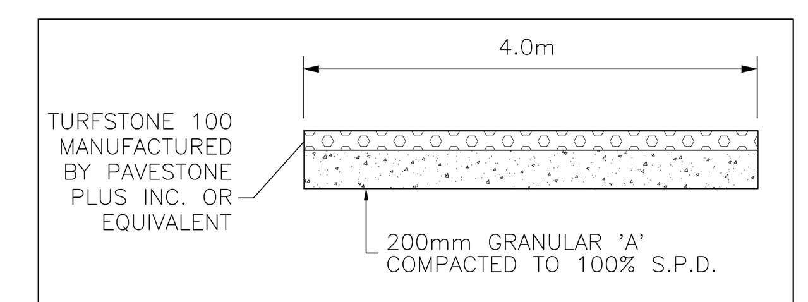




SECTION C-C

SWM POND STATISTICS

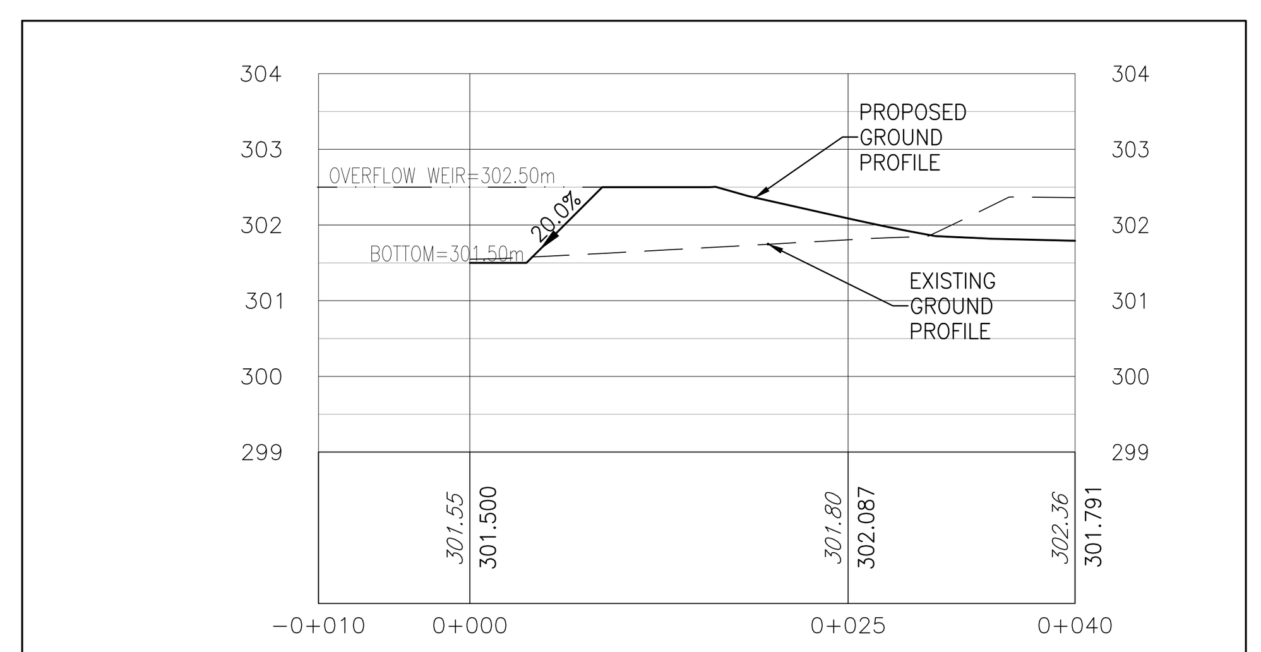
DESCRIPTION	ELEVATION
POND BOTTOM (FOREBAYS)	300.30
POND BOTTOM (INFILTRATION CELL)	301.50
QUALITY EXTENDED DETENTION (25mm)	301.83
2 YEAR WATER LEVEL	301.90
5 YEAR WATER LEVEL	302.24
100 YEAR WATER LEVEL	302.69
REGIONAL WATER LEVEL	302.85



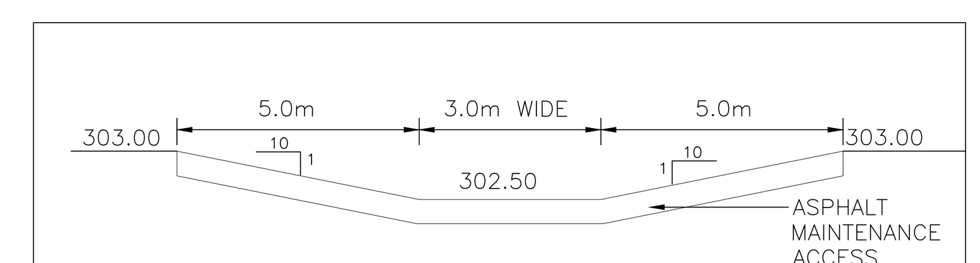
TURFSTONE MAINTENANCE ACCESS DETAIL

NTS

NOTE
- MIN. RADIUS TO BE 10.0m (11.5m CENTERLINE)
- MAX. SLOPE TO BE 10:1
- TURFSTONE AND PERMEABLE PAVER TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS

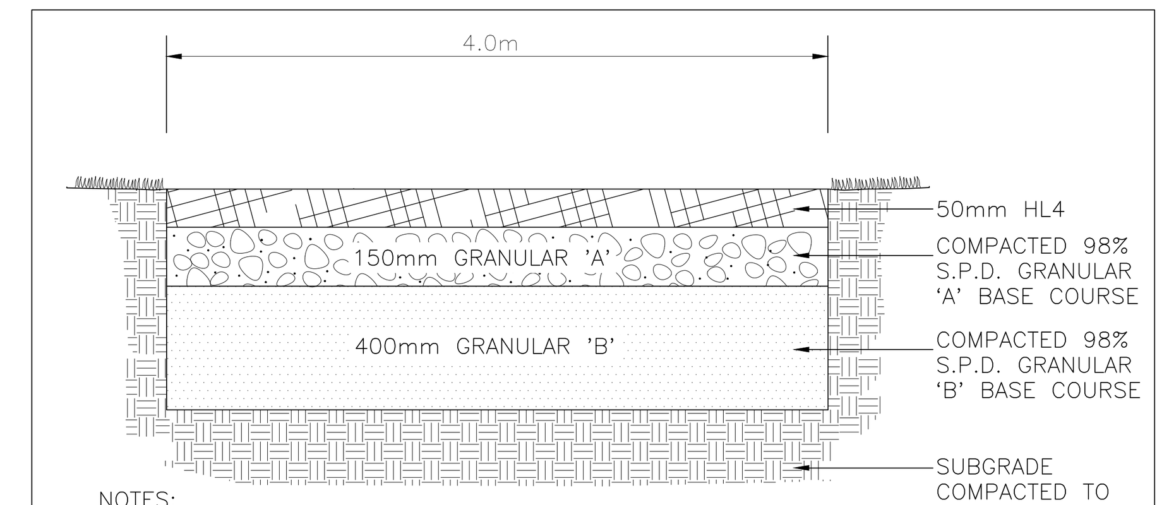


SWM OUTLET [SECTION D-D]



OUTFLOW WEIR DETAIL

NTS



NOTES:

1. COMPACT ASPHALT TO 97% MARSHALL MIX DESIGN BULK DENSITY.
2. TRAIL TO MATCH PROPOSED GRADES.
3. TRAIL SURFACE TO BE SMOOTH AND EVEN THROUGHOUT.
4. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.
5. DISTURBED AREAS ARE TO BE RESTORED C/W TOPSOIL AND SEED (AS SPECIFIED IN THE LANDSCAPE PLANS). TOPSOIL IS TO BE FINE GRADED AND BOX SCRAPPED WITH ALL AREAS HAVING POSITIVE DRAINAGE.
6. MINIMUM 10.0m RADIUS
7. MAX SLOPE 10:1

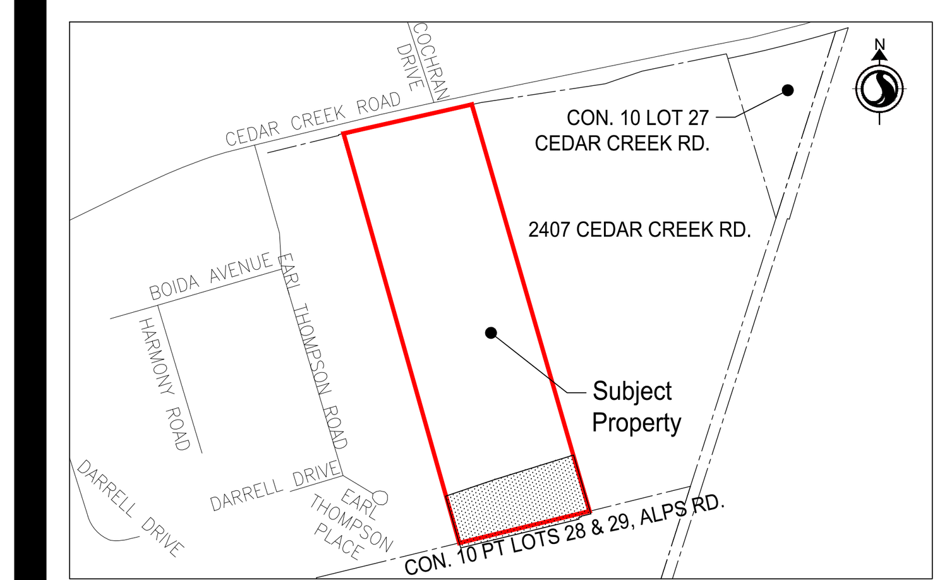
ASPHALT MAINTENANCE ACCESS/WALKWAY DETAIL

NTS

Stantec

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

Key Map NTS.



Notes

1. ELEV'S ARE REFERRED TO THE CANADIAN GEODETIC VERTICAL DATUM (CGVD-1928:1978)
   BM1: PNT:102 N:4797898.320 E:546236.366 ELEV: 312.205 (SIB)
   BM2: PNT:115 N:4798062.046 E:546096.888 ELEV: 314.320 (CONCRETE MONUMENT)
2. DRAFT PLAN PREPARED BY STANTEC CONSULTING LTD., DATED JANUARY 2024.
3. CALCULATED PLAN PREPARED BY STANTEC CONSULTING LTD., DATED JANUARY 2024.
4. TOPOGRAPHICAL SURVEY PREPARED BY STANTEC CONSULTING LTD., DATED APRIL 2022. ADDITIONAL TOPOGRAPHICAL INFORMATION BY STANTEC CONSULTING LTD., DATED MAY 2022 AND JUNE 2022.

Legend

- 352.82 EXISTING ELEVATION
- 352.92 PROPOSED ELEVATION
- 5.0% 2.0% FLOW DIRECTION
- S.F. STRUCTURAL FILL (SEE DETAIL DWG C-500)
- PROPOSED DRAINAGE SWALE (SEE DETAIL DWG C-500)
- 349.00 EXISTING CONTOUR
- RETAINING WALL
- PROPOSED SLOPE (3:1 UNLESS NOTED OTHERWISE)
- OVERLAND FLOW DIRECTION
- BORE HOLE

Revision/Issue	By	Appd	YYYY.MM.DD
0. DRAFT PLAN FIRST SUBMISSION	BWM	KRB	2024.01.18

File Name: 161414214_C-GP	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD
	BWM	BWM	KRB	2024.01.18

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Client/Project

CEDAR CREEK ROAD HOLDINGS INC.

2509 CEDAR CREEK ROAD, AYR

TOWNSHIP OF NORTH DUMFRIES, ON

Title

STORMWATER MANAGEMENT FACILITY PLAN

Project No. 161414214

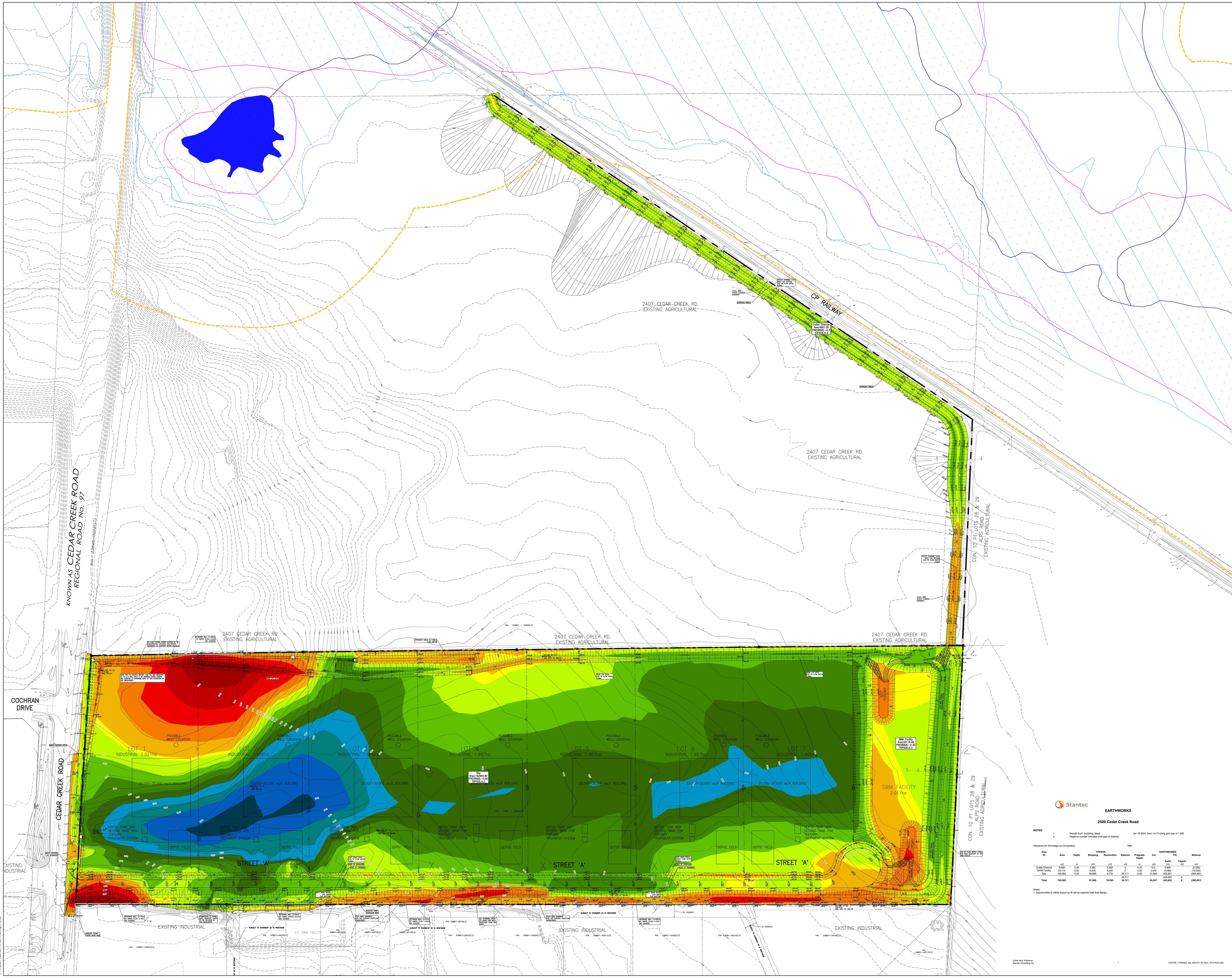
Scale 1:500

Revision 0

Sheet

Drawing No. **C-410**

ORIGINAL SHEET - ARCH D



EARTHWORKS

2509 Cedar Creek Road

NOTES

1 Results from modeling dated Jan 18 2024 time: 14.73 Using grid size of 1.000
2 Negative number indicates shortage of material.

Allowance for Shrinkage on Compaction **10%**

Area ID	Area	Depth	TOPSOIL Stripping	TOPSOIL Restoration	TOPSOIL Balance	Pregrade Depth	EARTHWORKS Cut	Fill Earth	Fill Topsoil	Balance
	m2	m	m3	m3	m3	m	m3	m3	m3	m3
Outlet Channel	9,608	0.30	2,882	2,882	0	0.30	512	5,906		(5,395)
SWM Facility	20,115	0.30	6,035	6,035	0	0.30	3,425	13,964		(10,539)
Site	162,962	0.30	48,889	9,778	39,111	0.60	41,884	405,951		(364,067)
					39,111			425,822	0	
Total	**192,685**		**57,806**	**18,695**	**39,111**		**45,821**	**425,822**	**0**	**(380,001)**

Notes:
1. Opportunities to utilize topsoil as fill will be explored with final design.

Stantec

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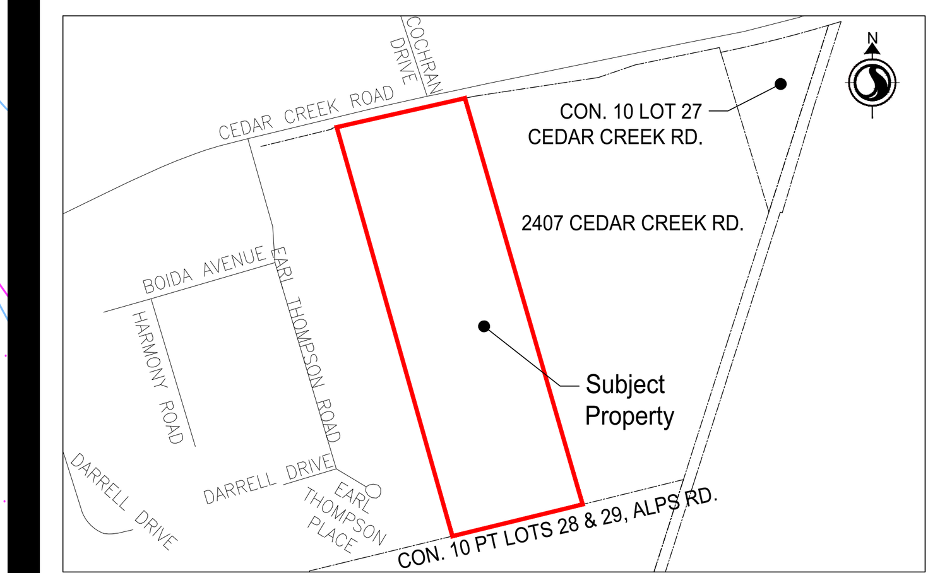
Tel: (519) 579-4410
www.stantec.com

Key Map NTS.



Notes

1. ELEV'S ARE REFERRED TO THE CANADIAN GEODETIC VERTICAL DATUM (CGVD-1928:1978)
   BM1: PNT:102 N:4797898.320 E:546236.366 ELEV: 312.205 (SIB)
   BM2: PNT:115 N:4798062.046 E:546096.888 ELEV: 314.320 (CONCRETE MONUMENT)
2. DRAFT PLAN PREPARED BY STANTEC CONSULTING LTD., DATED JANUARY 2024.
3. CALCULATED PLAN PREPARED BY STANTEC CONSULTING LTD., DATED JANUARY 2024.
4. TOPOGRAPHICAL SURVEY PREPARED BY STANTEC CONSULTING LTD., DATED APRIL 2022. ADDITIONAL TOPOGRAPHICAL INFORMATION BY STANTEC CONSULTING LTD., DATED MAY 2022 AND JUNE 2022.

Legend

Elevations Table

Number	Minimum Elevation	Maximum Elevation	Area	Color
1	-5.36	-5.00	114.21	
2	-5.00	-4.00	1379.10	
3	-4.00	-3.00	2445.49	
4	-3.00	-2.00	4304.01	
5	-2.00	-1.00	8559.59	
6	-1.00	-0.10	15700.41	
7	-0.10	0.10	7118.05	
8	0.10	1.00	32932.86	
9	1.00	2.00	30243.09	
10	2.00	3.00	34616.70	
11	3.00	4.00	31358.10	
12	4.00	5.00	10173.85	
13	5.00	6.00	5899.42	
14	6.00	7.00	6101.19	
15	7.00	7.32	1614.67	

Revision/Issue	By	Appd	YYYY.MM.DD
0. DRAFT PLAN FIRST SUBMISSION	BWM	KRB	2024.01.18

File Name: 161414214_C-900CF	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD
	BWM	BWM	KRB	2024.01.18

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Client/Project

CEDAR CREEK ROAD HOLDINGS INC.

2509 CEDAR CREEK ROAD, AYR

TOWNSHIP OF NORTH DUMFRIES, ON

Title

PRELIMINARY CUT/FILL PLAN

Project No. 161414214

Scale 1:1500 (0 15 45 75m)

Revision 0 | Sheet

Drawing No. **C-900**

ORIGINAL SHEET - ARCH D

APPENDIX C

2509 Cedar Creek Road, Ayr ON - Water and Sewage System Feasibility Study Dated January 24, 2024

Stantec

Memo

To:	Kevin Brousseau, L.E.T., C.E.T. Principal, Practice Leader - Community Development Stantec Waterloo Office	From:	Jean Hébert, P. Eng. Stantec Ottawa Office
Project/File:	1614-14214	Date:	January 24, 2024

Reference: 2509 Cedar Creek Road, Ayr ON - Water and Sewage System Feasibility Study

Our review of the underground water conditions and land available at the seven proposed industrial lots at 2509 Cedar Creek Road concluded that the potential number of employees per site would vary from 24 to 84, depending on the soils characteristics at a given lot, and on the type of sewage treatment retained (conventional septic system or tertiary treatment system) by the landlord. In summary, the tertiary treatment system would allow an increase in serviced population (by about one half), compared to the conventional septic system, and would depend on the location of the commercial lot, as per the following chart.

Lot No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
No of employees With conventional septic system	37	37	24	37	56	56	56
No of employees With tertiary treatment system	59	59	40	59	84	84	84

The above is developed on the assumption that the absorption area, including the septic field, and an infiltration gallery for the drinking water system process wastewater, are to be set within a 20 m by 30 m area.

To support higher number of employees at a given commercial lot, the landowner would have to allocate more room for the absorption area, which implies allocating less room for the building and/or the parking space.

Best regards,

STANTEC CONSULTING LTD.

Jean Hébert

P.Eng. (ON) PEO No. 90272949

Jean Hébert P.Eng.
Senior Environmental Engineer
Phone: (613) 725-5562 Mobile: 613-294-4264 jean.hebert@stantec.com

APPENDIX C-1 – Septic System Assessment Methodology

The serviced population has been established based on daily design sewage flow rates and septic system design parameters as per the Ontario Building Code – Part 8 – Septic Systems, hereafter referred to as the OBC, as follows.

- Flow rate per employee per 8-hour shift = 75 L/d per employee
- Flow rate per toilet accessible to truckers = 950 L/d/toilet
- Office building: allocate one employee per 9.3 m^2 (100 sq. ft) = 75 L/d per employee

Soils characteristics have been assessed from well record datasheets for wells located north and west of the proposed commercial sites, available at https://www.ontario.ca/page/map-well-records

The time of percolation, i.e., the number of minutes for water to travel by one cm into the soils, has been deduced for each of the future lots, based on the type of soils at the nearby wells. That information will be updated prior to detailed design phase, using data from geotechnical and hydrogeological reports to be issued by Stantec.,

The theoretical time of percolation, as reported in the following table, extracted from Table 2-8 of the Sewerage System Standard Practice Manual (Version 2) prepared by the British Columbia Onsite Sewage Association, and from Supplementary Standard SB-6 (Percolation Time and Soil Descriptions) from the Government of Ontario's On-Site Sewage Systems Regulations, is deemed to be relatively conservative. On-site percolation tests would have to be conducted prior to detailed design phase, to validate those values, although the actual value could be slightly better (i.e., water may flow faster). Table 1 on next page presents the percolation time for different types of soils.

The OBC includes various options for private sewage disposal systems. The conventional septic system consists of a two-compartment septic system, followed by a septic bed, fed either by gravity (should site topography allows it) or with an effluent pump. The gravity system is the most economical where soils consist of sand, as it is the case at most of the industrial lots; however, requires the largest septic field footprint.

The tertiary system is an advanced treatment system with a modified septic tank, used as a digester, followed by a biofilter tank, a recirculation pump, and an effluent pump feeding a modified septic field. The treatment process normally occurs within the septic field; with a tertiary system the treatment process, would be accommodated in the modified septic tanks, with the final septic field footprint reduced up to one third in size. This would allow for an increase in the number of employees at a given industrial lot, for the same septic field footprint.

Septic field can be positioned as close as 3.0 m from the property limit, so the septic field could be set much closer to the property limit than shown on the typical arrangement sketch on Drawings C-400 to C-401.

Table C-1: Estimated Percolation Rate based on Soil Type

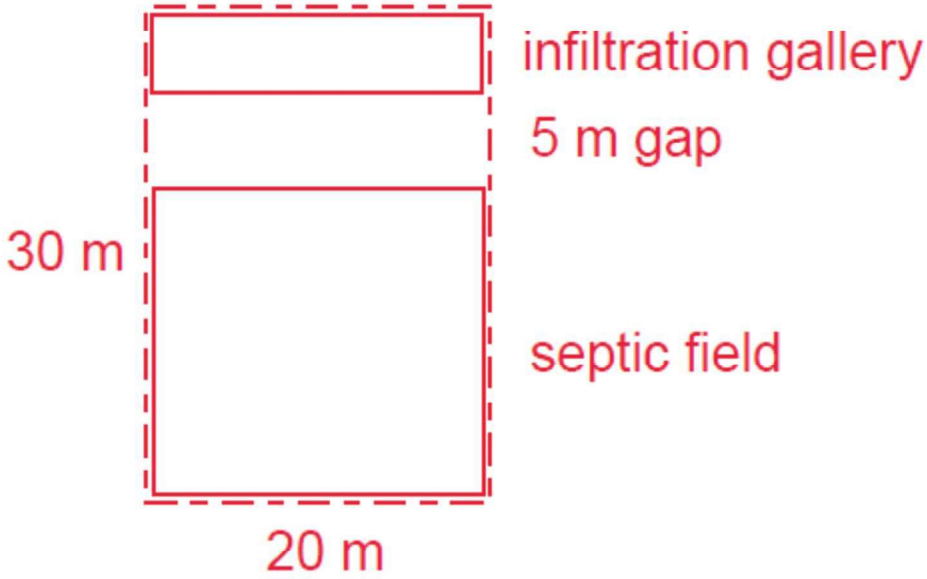
Soil Type	Percolation Rate (min/cm)
Sand	7
Silty Sand	14
Sandy Silt	28
Silt	28
Fine silt	28
Clayed sand	35
Clayey Silt	35
Silty Clay-Silt	35
Sandy Clay	35
Silty Clay	35
Clay	35

Office wastewater normally has ammonia concentration about 50% higher than typical residential wastewater, as it cannot rely on dishwasher, shower, and source of wastewater other than toilets and sinks to dilute sewage water. The septic field area is based on final ammonia disposal. For such reasons, the septic field area for an industrial building should be increased by 50%, compared to the result obtained while applying OBC design rules, which were developed for residential housing.

Process wastewater generated by various well water treatment equipment (iron filter, water softener, reverse osmosis) could be disposed of at an infiltration gallery, at a rate of 100 L/m^2/d. The nature of such process wastewater for this case is reviewed under Appendix C-2.

Horizontal gap (spacing) between infiltration gallery and septic field should be minimum 5 m, to avoid interference between both systems. Figure C-1 on next page shows how the infiltration gallery and the septic field could be set within a 20 m by 30 m absorption area:

Figure C-1 – Typical Absorption Area Setting



Any lot with combined flow rate (sewage flow and process wastewater flow) below 10,000 L/d is to be subject to approval by local authority, while any lot with higher daily flow rate would imply an application to the Ontario Ministry of the Environment, Conservation and Parks (MECP). This corresponds to 54 employees, at 75 L per 8-hour shift each, plus one trucker toilet at 950 L per day.

For reference, typical precast concrete septic tanks in Ontario are designed and fabricated for a one-meter burial depth, measured from the top of the slab to the highest ground surface elevation, above the tank and up to 5 meters measured horizontally from the tank exterior walls. Special order tanks designed for two-meter burial depth, measured above tank and up to seven meters from the tank wall, are available upon request, with an additional cost below $2,000 per tank. This safety parameter applies to ground surface usage, i.e., that no vehicle, and particularly no commercial truck, shall be allowed to drive over within the above-defined limits. The issue is that the vehicle load distributed by the soils would impact the tank walls, at the risk of exceeding the wall strength.

APPENDIX C-2 – Site Specific Conditions

Here are the site-specific conditions affecting the septic system capacity assessment.

Drawings C-400 to C-402 show the proposed building, septic tank and septic field setting at Lot no. 1 to Lot 7.

Most of the site is to be occupied by a parking lot, and office building approximately 1,858 to 2,787 m^2 range (20,000 to 30,000 ft^2).

A location allocated to support an absorption area of 20 m by 30 m would be required. This area would include a reverse osmosis concentrate disposal gallery (refer to discussion below) and the septic field (downstream either a conventional septic system tank or a tertiary treatment system group of tanks). The inclusion of an infiltration gallery will be required, on the following basis.

From **Table 2** - Summary of Groundwater Analytical Results - Hydrogeological Investigation in Support of Official Plan and Zoning Bylaw Amendments Site: 2509 Cedar Creek Road, Ayr ON, at the end of this Appendix C-2, well water in the local aquifer have chloride, hardness, sodium, iron and total dissolved solids considerably above aesthetic limit, which would require water to be treated with a water softener and a reverse osmosis filter, followed by calcium carbonate contact vessel to reduce filtered water corrosiveness. Depending on well water quality, an iron filter may be required. Such treatment process implies that, for every liter of drinking water produced, about 1.3 liter of process wastewater would be generated as follows: 1 L of concentrate from the reverse osmosis filter, continuously during water production, 0.15 L for iron filter backwash overnight, and 0.15 L brine regeneration volume overnight at the water softener. This process wastewater should be directed to an infiltration gallery, separated from the septic field, as there is practically no organic loading in that water. Such gallery would be part of the 20 m X 30 m absorption area, as shown on **Figure C-1** above.

Drawings C-400 to C-402 show the proposed absorption field (including the septic field, the infiltration gallery for process wastewater, and 5-m gap in between) located toward the front end of the industrial lot. Should gravity flow installation from the building sewer to the septic tank then to the absorption field be unachievable, a pump would be required to convey either raw sewage to the septic tank or septic tank effluent to the septic field.

An alternative to avoid installing such pump(s), the septic tank and the absorption field could be installed toward the back of the industrial sites, as ground surface generally slopes down, as shown on Drawings C-400 to C-402. This configuration implies to set the well at the front of the

lot, and to configure the parking lot around the septic tank and septic field, considering the later should be at least 15 meters from the top of the drainage ditch.

About the infiltration gallery:

The reverse osmosis concentrate is released on a continuous basis during water production process, while the iron filter backwash water and water softener brine are released at high flow rates, for a few minutes at a time. Those process wastewater would need an equalization tank and pumping system, to dose such water at a lower flow rate to the infiltration gallery. Concentrate and brine may be collected into the same basin, while iron fitter backwash water would be collected into a separate tank, working as a clarifier. After a few hours of settling, clarified water would be pumped to the infiltration gallery, at a reduced flow rate. Iron sludge at the bottom of the tank would be pumped out by a sewage vacuum truck on a year basis.

Absorption field and various tank locations, with required protection perimeters, would be reviewed at detailed design phase of each industrial lot, once final use, building size and the number of employees has been confirmed.

Table 2
Summary of Groundwater Analytical Results
Hydrogeological Investigation in Support of Official Plan and Zoning Bylaw Amendments Site: 2509 Cedar Creek Road, Ayr ON

Sample Location			111 Earl Thompson Road		121 Earl Thompson Road	2396 Cedar Creek Road		2407 Cedar Creek Road	
Sample Date			13-May-22	13-May-22	13-May-22	13-May-22	13-May-22	13-May-22	13-May-22
Sample ID			WG-161414214-20220513-SH3	WG-161414214-20220513-SH3 Lab-Dup	WG-161414214-20220513-SH2	WG-161414214-20220513-SH4	WG-161414214-20220513-SH4 Lab-Dup	WG-161414214-20220513-SH1	WG-161414214-20220513-SH1 Lab-Dup
Sampling Company			STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			BV	BV	BV	BV	BV	BV	BV
Laboratory Work Order			C2D0478	C2D0478	C2D0478	C2D0478	C2D0478	C2D0478	C2D0478
Laboratory Sample ID			SPU232	SPU232	SPU231	SPU233	SPU233	SPU230	SPU230
Sample Type	Units	ODWS		Lab Replicate			Lab Replicate		Lab Replicate
General Chemistry									
Alkalinity, Bicarbonate (as CaCO3)	mg/L	n/v	290	-	260	260	-	250	-
Alkalinity, Carbonate (as CaCO3)	mg/L	n/v	2.8	-	2.2	2.8	-	2.7	-
Alkalinity, Total (as CaCO3)	mg/L	30-500[E]	300	300	270	260	-	250	-
Ammonia (as N)	mg/L	n/v	<0.050	-	<0.050	<0.050	-	<0.050	<0.050
Anion Sum	me/L	n/v	21.7	-	54.1	8.24	-	7.81	-
Cation Sum	me/L	n/v	22.5	-	55.1	8.48	-	8.12	-
Chloride	mg/L	250[C]	**520[C]**	-	**1,700[C]**	54	-	40	-
Dissolved Organic Carbon (DOC)	mg/L	5[C]	0.71	-	0.56	0.47	-	<0.40	-
Electrical Conductivity, Lab	µmhos/cm	n/v	2,400	2,400	6,100	810	-	760	-
Hardness (as CaCO3)	mg/L	80-100[E]	**590[E]**	-	**870[E]**	**350[E]**	-	**360[E]**	-
Ion Balance	%	n/v	1.74	-	0.880	1.43	-	1.90	-
Langelier Index (at 20 C)	none	n/v	1.09	-	1.01	1.01	-	0.995	-
Langelier Index (at 4 C)	none	n/v	0.843	-	0.772	0.759	-	0.747	-
Nitrate (as N)	mg/L	10.0_d[B]	3.69	-	0.97	5.97	-	7.06	-
Nitrite (as N)	mg/L	1.0_d[B]	<0.010	-	<0.010	<0.010	-	<0.010	-
Orthophosphate (as P)	mg/L	n/v	0.012	-	<0.010	<0.010	-	<0.010	-
pH, lab	S.U.	6.5-8.5[E]	8.01	8.03	7.95	8.07	-	8.06	-
Saturation pH (at 20 C)	none	n/v	6.92	-	6.93	7.06	-	7.06	-
Saturation pH (at 4 C)	none	n/v	7.17	-	7.18	7.31	-	7.31	-
Sulfate	mg/L	500_h[C]	42	-	58	53	-	55	-
Total Dissolved Solids (Calculated)	mg/L	500[C]	**1,200[C]**	-	**3,100[C]**	460	-	440	-
Total Suspended Solids	mg/L	n/v	2	2	2	1	-	<1	-
Microbiological Analysis									
Escherichia coli (E.Coli)	cfu/100mL	0[A]	0	-	0	0	-	0	-
Total Coliform Background	cfu/100mL	n/v	0	-	0	17	-	0	-
Total Coliforms	cfu/100mL	0[A]	0	-	0	**1[A]**	-	0	-
Metals									
Aluminum	mg/L	0.1[E]	<0.0049	-	<0.0049	0.0077	0.0055	0.0093	-
Antimony	mg/L	0.006[B]	<0.00050	-	<0.00050	<0.00050	<0.00050	<0.00050	-
Arsenic	mg/L	0.01[B]	<0.0010	-	<0.0010	<0.0010	<0.0010	<0.0010	-
Barium	mg/L	1[B]	0.29	-	0.28	0.088	0.091	0.098	-
Beryllium	mg/L	n/v	<0.00040	-	<0.00040	<0.00040	<0.00040	<0.00040	-
Boron	mg/L	5[B]	0.014	-	0.014	0.012	0.012	0.011	-
Cadmium	mg/L	0.005[B]	<0.000090	-	<0.000090	<0.000090	<0.000090	<0.000090	-
Calcium	mg/L	n/v	150	-	230	96	97	98	-
Chromium	mg/L	0.05[B]	<0.0050	-	<0.0050	<0.0050	<0.0050	<0.0050	-
Cobalt	mg/L	n/v	<0.00050	-	<0.00050	<0.00050	<0.00050	<0.00050	-
Copper	mg/L	1[C]	0.013	-	0.013	<0.00090	<0.00090	0.0010	-
Iron	mg/L	0.3[C]	<0.10	-	0.11	**0.35[C]**	**0.35[C]**	<0.10	-
Lead	mg/L	0.01[B]	<0.00050	-	<0.00050	<0.00050	<0.00050	<0.00050	-
Lithium	mg/L	n/v	0.0070	-	0.013	<0.0050	<0.0050	<0.0050	-
Magnesium	mg/L	n/v	50	-	74	26	26	29	-
Manganese	mg/L	0.05[C]	0.0037	-	0.0047	<0.0020	<0.0020	<0.0020	-
Molybdenum	mg/L	n/v	<0.00050	-	0.00056	<0.00050	<0.00050	<0.00050	-
Nickel	mg/L	n/v	<0.0010	-	<0.0010	<0.0010	<0.0010	<0.0010	-
Phosphorus	mg/L	n/v	<0.10	-	<0.10	<0.10	<0.10	<0.10	-
Potassium	mg/L	n/v	2.3	-	4.1	1.2	1.2	1.5	-
Selenium	mg/L	0.05[B]	<0.0020	-	<0.0020	<0.0020	<0.0020	<0.0020	-
Silicon	mg/L	n/v	6.2	-	6.6	5.9	5.9	6.5	-
Silver	mg/L	n/v	<0.000090	-	<0.000090	<0.000090	<0.000090	<0.000090	-
Sodium	mg/L	200_g[C] 20_g[D]	**250[CD]**	-	**860[CD]**	**34[D]**	**33[D]**	19	-
Strontium	mg/L	n/v	0.27	-	0.65	0.46	0.45	0.49	-
Thallium	mg/L	n/v	<0.000050	-	<0.000050	<0.000050	<0.000050	<0.000050	-

Notes:

ODWS	Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines (MOE, 2006), in support of O.Reg 169/03 (January 1, 2018)
A	Schedule 1 - Microbiological Standards (expressed as a maximum)
B	Schedule 2 - Chemical Standards (expressed as a maximum acceptable concentration)
C	ODWS Table 4 - Chemical/Physical Objectives and Guidelines, Aesthetic Objectives
D	ODWS Table 4 - Medical Officer of Health Reporting Limit
E	ODWS Table 4 - Chemical/Physical Objectives and Guidelines, Operational Guidelines
6.5[A]	Concentration exceeds the indicated standard.
15.2	Measured concentration did not exceed the indicated standard.
<0.50	Laboratory reporting limit was greater than the applicable standard.
<0.03	Analyte was not detected at a concentration greater than the laboratory reporting limit.
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.

Table 2
Summary of Groundwater Analytical Results
Hydrogeological Investigation in Support of Official Plan and Zoning Bylaw Amendments Site: 2509 Cedar Creek Road, Ayr ON

Sample Location			111 Earl Thompson Road		121 Earl Thompson Road	2396 Cedar Creek Road		2407 Cedar Creek Road	
Sample Date			13-May-22	13-May-22	13-May-22	13-May-22	13-May-22	13-May-22	13-May-22
Sample ID			WG-161414214-20220513-SH3	WG-161414214-20220513-SH3 Lab-Dup	WG-161414214-20220513-SH2	WG-161414214-20220513-SH4	WG-161414214-20220513-SH4 Lab-Dup	WG-161414214-20220513-SH1	WG-161414214-20220513-SH1 Lab-Dup
Sampling Company			STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			BV	BV	BV	BV	BV	BV	BV
Laboratory Work Order			C2D0478	C2D0478	C2D0478	C2D0478	C2D0478	C2D0478	C2D0478
Laboratory Sample ID			SPU232	SPU232	SPU231	SPU233	SPU233	SPU230	SPU230
Sample Type	Units	ODWS		Lab Replicate			Lab Replicate		Lab Replicate
Titanium	mg/L	n/v	<0.0050	-	<0.0050	<0.0050	<0.0050	<0.0050	-
Uranium	mg/L	0.02[B]	0.00066	-	0.00099	0.00042	0.00038	0.00051	-
Vanadium	mg/L	n/v	<0.00050	-	<0.00050	<0.00050	<0.00050	<0.00050	-
Zinc	mg/L	5[C]	0.018	-	0.019	0.027	0.027	0.015	-

[d] Where both nitrate and nitrite are present, the total of the two should not exceed 10 mg/L (as nitrogen).

[g,CD] The aesthetic objective for sodium in drinking water is 200 mg/L. The local Medical Officer of Health should be notified when the sodium concentrati exceeds 20 mg/L so that this information may be communicated to local physicians for their use with patients on sodium restricted diets.

[h] When sulfate levels exceed 500 mg/L, water may have a laxative effect on some people.

APPENDIX C-3 – Septic System Assessment

The maximum possible office floor space (30,000 sq. ft = 2,787 m^2) could support at maximum 300 employees, at 9.3 m^2 (100 sq. ft) office space per each employee (from the Ontario Building Code), for a total of 22,477 L/d. It is understood that a major portion of the building area is to be allocated for industrial activity, so the net area used as office space, and the corresponding number of employees, would be much lower than the above. Assuming that half of the building area is allocated for office space, the balance being for industrial usage, then the net serviceable population would be between 100 and 150 employees.

Large number of parking spots would be required for so many employees. For reference, one of the largest business centers in that neighborhood, Farrow at 106 Earl Thompson Road, has about 120 parking spaces. To review the ultimate parking space capacity per lot, we verify what each lot could service, considering the absorption field allocation of 600 m^2 = 20 m X 30 m as per typical sketch in Figure C-1, in terms of number of employees. Those are based on the following assumptions:

- Unit flow rate per employee per 8-hour shift is 75 liters (from Ontario Building Code)
- Unit flow rate for the trucker toilet is 950 liters per day (from Ontario Building Code).
- Total flow rate is twice the theoretical domestic sewage flow rate, to consider concentrate release by the reverse osmosis filter.
- A 50% safety factor has been applied.
- Tertiary treatment is provided, to maximize hydraulic loading, and serviced population, within the septic field.

Table C-2: Estimated Maximum Number of Employees per Industrial Lot, for a 20 m X 30 m Septic Field

Lot No.	Percolation Time (min/cm)	Max number of employees, for a 20 m X 30 m septic field	Corresponding daily flow rate, including Reverse Osmosis concentrate (L/d)
1	10	59	10750
2	10	59	10750
3	14	40	7900
4	10	59	10750
5	7	84	14500
6	7	84	14500
7	7	84	14500

Note: Lot no. 8 is dedicated to the stormwater management pond and will not have a septic system.

It is possible to reach higher number of employees, by maximizing the ground level area dedicated to parking space while still maintaining adequate buffer up to the property limit, the building, the septic system, and the stormwater ditches. The following table shows an estimate of the maximum number of employees at each lot, with the corresponding daily sewage flow rate.

Table C-3: Estimated Maximum Number of Employees per Industrial Lot, based on parking space capacity.

Lot No.	Maximum number of cars	Corresponding daily flow rate, including Reverse Osmosis concentrate (L/d)
1	159	25750
2	173	27850
3	159	25750
4	180	28900
5	180	28900
6	194	31000
7	187	29950

Those values are above the estimated capacity of the theoretical 20 m X 30 m septic field. Practically, each site could be developed to support such number of employees, provided the septic field area be increased accordingly at the front end of the lot.

Beyond these surface land occupancy issues, we shall consider the impact of converting most of the lot surface into impermeable surface (at the building, parking lot and driveway). This would reduce the net transfer of rainwater to the aquifer, with associated impact on the aquifer regeneration capacity.

APPENDIX D

SCS Curve Number Determination

SWM Facility Design Calculations

SWMHYMO Input and Output Files

Swale Sizing Calculations

2509 Cedar Creek Road (161414214)
NRCS (SCS) Curve Number Determination

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

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

HYDROLOGIC SOIL TYPE (%)								
	Hydrologic Soil Type							
Catchment	A	AB	B	BC	C	CD	D	TOTAL
Existing Conditions								
105		100						100
106		100						100
103		100						100
102		100						100
100		40			60			100
104		100						100
/		100						100
101		100						100
Proposed Conditions								
200		100.0						100
201		100.0						100
202		100.0						100
203		100.0						100
204		100.0						100
205		100.0						100
206		100.0						100
208		100.0						100
207		100.0						100
102		100.0						100
103		100.0						100
100		40.0			60.0			100
104		100.0						100
101		100						100

LAND USE (%)									
Catchment	Meadow	Woodlot	Gravel	Lawns	Pasture Range	Crop	Fallow (Bare)	Impervious	Total
Existing Conditions									
105						95		5	100
106						100			100
103				20				80	100
102				20				80	100
100				20				80	100
104						100			100
/						100			100
101				40				60	100
Proposed Conditions									
200				100					100
201				10				90	100
202				10				90	100
203				100					100
204				10				90	100
205				85				15	100
206				100					100
208				100				0	100
207				100					100
102				20				80	100
103				20				80	100
100				20				80	100
104						100			100
101				40				60	100

CURVE NUMBER (CN)										
Catchment	Meadow	Woodlot	Gravel	Lawns	Pasture Range	Crop	Fallow (Bare)	Impervious	Weighted CN	Pervious CN
Existing Conditions										
105	0	0	0	0	0	67	0	5	71	70
106	0	0	0	0	0	70	0	0	70	70
103	0	0	0	10	0	0	0	78	88	50
102	0	0	0	10	0	0	0	78	88	50
100	0	0	0	13	0	0	0	78	91	64
104	0	0	0	0	0	70	0	0	70	70
/	0	0	0	0	0	70	0	0	70	70
101	0	0	0	20	0	0	0	59	79	50
Proposed Conditions										
200	0	0	0	50	0	0	0	0	50	50
201	0	0	0	5	0	0	0	88	93	50
202	0	0	0	5	0	0	0	88	93	50
203	0	0	0	50	0	0	0	0	50	50
204	0	0	0	5	0	0	0	88	93	50
205	0	0	0	43	0	0	0	15	57	50
206	0	0	0	50	0	0	0	0	50	50
208	0	0	0	50	0	0	0	0	50	50
207	0	0	0	50	0	0	0	0	50	50
102	0	0	0	10	0	0	0	78	88	50
103	0	0	0	10	0	0	0	78	88	50
100	0	0	0	13	0	0	0	78	91	64
104	0	0	0	0	0	70	0	0	70	70
101	0	0	0	20	0	0	0	59	79	50

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

2509 Cedar Creek Road (161414214)
SWMHYMO Parameters

Existing Conditions

Area Description	Catchment ID	SWMHYMO Command	Area (ha)	CN	TIMP	XIMP	Start of path elevation	End of path elevation	Slope (%)	Length (m)	Pervious RC	Tc (hrs)	Tp (hrs)
Agricultural area in the north portion of the site with house and driveway, draining to agricultural land to the east and eventually to creek	105	DESIGN NASHYD	7.06	71	0.05		316.0	305.5	3.5%	300	0.22	0.55	0.33
Agricultural area in the south portion of the site draining to agricultural land to the south and eventually to creek	106	DESIGN NASHYD	11.00	70	0.00		314.0	301.0	2.2%	600	0.22	0.91	0.54
External catchment west of the site, containing a portion of existing industrial property, draining east into the site and ultimately flowing south	103	DESIGN STANDHYD	4.52	50	0.80	0.50	319.0	310.0	5.3%	170			
Large external catchment west of site, containing exisiting industrial property draining into private SWM feature and then onto site and ultimately flowing south	102	DESIGN STANDHYD	12.64	50	0.80	0.50	338.0	315.0	3.1%	750			
Large external catchment of industrial property and part of Hwy 401 north of the site, draining south into the site and flowing out to the east.	100	CALIB STANDHYD	55.94	64	0.80	0.50	335.0	311.5	1.6%	1500	Pervious Slope = 2%, Pervious Length = 30m	MNP: 0.25, MNI: 0.02	IAper: 5mm, IAimp: 2mm
External agricultural area to the north-east of site draining to site and subsequently to agricultural area to the east	104	DESIGN NASHYD	0.73	70	0.00		318.0	314.5	3.5%	100	0.22	0.32	0.19
External catchment containing some of Cedar Creek Road, some industrial property, and a grassed area near Hwy 401 off-ramp, entering site in the north and draining overland to the east.	101	DESIGN STANDHYD	14.55	50	0.60	0.48	338.0	313.5	2.3%	1050			

Proposed Conditions

Area Description	Catchment ID	SWMHYMO Command	Area (ha)	CN	TIMP	XIMP	Start of path elevation	End of path elevation	Slope (%)	Length (m)	Pervious RC	Tc (hrs)	Tp (hrs)
Small catchment in in northwest corner of property comprising a small portion of the West Road Ditch, draining to storm sewer and discharging uncontrolled to the east	200	DESIGN NASHHYD	0.14	50	0.00				1.5%	90	0.15	0.43	0.26
Small catchment in the northwest corner of property containing a portion of the East Road Ditch and developed land, draining to storm sewer and discharging uncontrolled to the east.	201	DESIGN STANDHYD	0.64	50	0.90	0.50			2.0%	75			
Large catchment of developed area covering the east portion of the site, draining to Rear Lot Ditch and entering the SWMF through the East Forebay	202	DESIGN STANDHYD	8.82	50	0.90	0.80			2.0%	115			
Small catchment on the east side of the site containing By Pass Storm Sewer outlet and plunge pool, draining offsite to the east	203	DESIGN NASHYD	0.55	50	0.00				2.0%	10	0.15	0.13	0.08
Large catchment of impervious area, draining to the west and into the East Road Ditch, entering the SWMF through the West Forebay.	204	DESIGN STANDHYD	4.92	50	0.90	0.80			2.0%	80			
SWM pond, located in south portion of the property	205	DESIGN NASHYD	1.63	57	0.15				2.0%	200	0.15	0.58	0.35
Grassed swale (West Road Ditch), located on the far west side of the property, directing flows around the SWMF and to the Outlet Channel at the southeast corner of the property.	206	DESIGN NASHYD	1.22	50	0.00				1.5%	900	0.15	1.35	0.81
Constructed conveyance channel (Outlet Channel), directing flows to Cedar Creek in the northeast	208	DESIGN NASHYD	1.13	50	0.00	0.00	302.00	296.50	0.01	725.00	0.22	1.41	0.85
Small catchment south of the SWMF, draining offsite to the south	207	DESIGN NASHYD	0.14	50	0.00				2.0%	7	0.15	0.11	0.07
Large external industrial area west of site, draining into private SWM feature and then entering swale, routing flows around SWMF to conveyance channel to Cedar Creek.	102	DESIGN STANDHYD	12.64	50	0.80	0.50	338.00	315.00	3.1%	750			
External catchment west of the site, containing a portion of existing industrial property, draining east into the site and ultimately flowing south to swale around SWM pond	103	DESIGN STANDHYD	4.52	50	0.80	0.50	319.00	310.00	5.3%	170			
Large external catchment of industrial property and part of Hwy 401 north of the site, draining south into the site and flowing out to the east.	100	CALIB STANDHYD	55.94	64	0.80	0.50	335.00	311.50	1.6%	1500	Pervious Slope = 2%, Pervious Length = 30m	MNP: 0.25, MNI: 0.02	IAper: 5mm, IAimp: 2mm
external catchment at the northeast corner of the site, draining to the site and following rear-lot swale, entering SWMF at its northeast inlet.	104	DESIGN NASHYD	0.73	70	0.00		318.0	314.5	3.5%	100	0.22	0.32	0.19
External catchment containing some of Cedar Creek Road, existing industrial property, and a grassed area near Hwy 401 off-ramp, entering storm sewer on site and draining to the east.	101	DESIGN STANDHYD	14.55	50	0.60	0.48	338.00	313.50	2.3%	1050			
		Total to SWM Pond	16.10		78%								
		Total developed area to SWM pond											

Notes:

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

TIMP ..... ► *Total percent impervious*

XIMP ..... ► *Percent impervious directly connected*

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

Where: *C = Runoff Coefficient = 0.22 or 0.15 according to MTO Design chart 1.07 for 'cultivated' or 'lawn' on sandy soil*
L = Length of Overland Flow (m)
S = Slope (%)

Time to Peak (hr) ..... ► $Tp = 0.6Tc$

2509 Cedar Creek Road (161414214)
Stormwater Management Facility Design Calculations

	Rating Curve										Volume Estimation						
			Infiltration			Surface Discharge			Total Pond			Infiltration Basin			Overflow Spillway	Total Flow	Parameters
	Elevation (m)		Infiltration (m³/s)	Volume	Infiltration Drawdown (hrs)	Surface Discharge (m³/s)	Active (m³)	Surface Drawdown (hrs)	Total Storage (m³)	Total Drawdown (hrs)	Elevation (m)	Area (m²)	Total Volume (m³)	Elevation (m)			
Maximum sedimentation depth	301.50		0.044						23		301.50	5524	23	301.50			High Flow Weir
	301.60	0.10	0.044	653	4.1				653	4.1	301.60	6381	653	301.60			Spillway Invert (m) / Top of Berm (m)
	301.70	0.20	0.044	1299	8.1				1,299	8.1	301.70	6538	1,299	301.70			302.50 / 303.00
	301.80	0.30	0.044	1960	12.2				1,960	12.2	301.80	6696	1,960	301.80			Spillway Length @ Invert (m) / Max. Flow Depth (m)
	301.90	0.40	0.044	2638	16.5				2,638	16.5	301.90	6855	2,638	301.90			3 / 0.50
	302.00	0.50	0.044	3331	20.8				3,331	20.8	302.00	7014	3,331	302.00			Side Slopes (ratio of H:V) / Topwidth
	302.10	0.60	0.044	4041	25.2				4,041	25.2	302.10	7173	4,041	302.10			10.00 / 13.00
	302.20	0.70	0.044	4766	29.8				4,766	25.2	302.20	7329	4,766	302.20			Weir Coefficient (Rectangle) / Weir Coeff. (Triangle)
	302.30	0.80	0.044	5506	34.4				5,506	25.2	302.30	7481	5,506	302.30			1.70 / 1.30
	302.40	0.90	0.044	6262	39.1				6,262	25.2	302.40	7631	6,262	302.40			Infiltration
Weir elevation	302.50	1.00	0.044	7033	43.9				7,033	25.2	302.50	7780	7,033	302.50			Infiltration Footprint (m²)
	302.60	1.10				0.202	785	2.2	7,818	27.4	302.60	7928	7,818	302.60	0.202	0.202	5524
	302.70	1.20				0.689	1,586	2.7	8,618	27.9	302.70	8072	8,618	302.70	0.689	0.689	Factored Infiltration Rate (mm/hr)
	302.80	1.30				1.479	2,400	2.9	9,432	28.1	302.80	8213	9,432	302.80	1.479	1.479	29
	302.90	1.40				2.606	3,228	3.0	10,261	28.2	302.90	8353	10,261	302.90	2.606	2.606	Infiltration Rate (m³/s)
Top of pond	303.00	1.50				4.101	4,070	3.0	11,103	28.3	303.00	8489	11,103	303.00	4.101	4.101	0.044

Notes:

Drawdown Time Calculations Greater than 0.1 m above the permanent pool

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

where

T=drawdown time in hours

v_2=starting pond volume

v_2=ending pond volume

Q_2=starting flow

Q_1=ending flow

From 0.0 to 0.1 m above the permanent pool

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

where

T=drawdown time in hours

v_2=starting pond volume

v_2=ending pond volume

Q_2=starting flow

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

where

L = bottom width of spillway

H = head above weir invert

S = side slopes (ratio of H:V)

C_{wt} = weir coefficient (triangular)

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

Sharp crested semi-circular weir equation

Sharp crested semi-circular weir equation

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

where

C = sharp crested semi-circular weir coefficient

D = diameter of orifice

H = head above orifice invert

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

Orifice Flow Calculations: Orifice flow equation

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

where

C = orifice coefficient

A = area of orifice

g = acceleration due to gravity

H = head above centre line of orifice

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

2509 Cedar Creek Road (161414214)
External Stormwater Management Facility Design Calculations*

Rating Curve										Volume Estimation			Elevation (m)			Parameters	
		Infiltration			Surface Discharge			Total Pond			Infiltration Basin			Overflow Spillway (m³/s)	Total Flow		
Elevation (m)		Infiltration (m³/s)	Volume	Infiltration Drawdown (hrs)	Surface Discharge (m³/s)	Active (m³)	Surface Drawdown (hrs)	Total Storage (m³)	Total Drawdown (hrs)	Elevation (m)	Area (m²)	Total Volume (m³)					
312.00		0.018	438	6.9						312.00	1,750	438	312.00			High Flow Weir	
312.10	0.10	0.018	639	10.1				438	10.1	312.10	2,286	639	312.10			Spillway Invert (m)	Top of Berm (m)
312.20	0.20	0.018	861	13.7				639	13.7	312.20	2,142	861	312.20			313.20	314.00
312.30	0.30	0.018	1100	17.5				861	17.5	312.30	2,649	1,100	312.30			Spillway Length @ Invert (m)	Max. Flow Depth (m)
312.40	0.40	0.018	1340	21.3				1,100	21.3	312.40	2,142	1,340	312.40			10	0.80
312.50	0.50	0.018	1610	25.6				1,340	25.6	312.50	3,265	1,610	312.50			Side Slopes (ratio of H:V)	Topwidth
312.60	0.60	0.018	1884	29.9				1,610	29.9	312.60	2,219	1,884	312.60			3.00	14.80
312.70	0.70	0.018	2171	34.5				1,884	30.1	312.70	3,507	2,171	312.70			Weir Coefficient (Rectangle)	Weir Coeff. (Triangle)
312.80	0.80	0.018	2474	39.3				2,171	30.2	312.80	2,567	2,474	312.80			1.70	1.30
312.90	0.90	0.018	2778	44.1				2,474	30.2	312.90	3,507	2,778	312.90			Infiltration	
313.00	1.00	0.018	3094	49.1				2,778	30.3	313.00	2,811	3,094	313.00			Infiltration Footprint (m²)	
313.10	1.10	0.018	3427	54.4				3,094	30.3	313.10	3,844	3,427	313.10			1750	
313.20	1.20	0.018	3759	59.7				3,427	30.3	313.20	2,811	3,759	313.20			Factored Infiltration Rate (mm/hr)	
313.30	1.30				0.550	366	0.18	3,759	30.3	313.30	4,506	4,125	313.30	0.550	0.550	36	
313.40	1.40				1.590	756	0.29	4,125	30.3	313.40	3,289	4,515	313.40	1.590	1.590	Infiltration Rate (m³/s)	
313.50	1.50				2.986	1,145	0.33	4,515	29.9	313.50	4,506	4,905	313.50	2.986	2.986	0.018	
313.60	1.60				4.695	1,535	0.36			313.60	3,289	5,294	313.60	4.695	4.695		
313.70	1.70				6.700	1,959	0.38			313.70	5,184	5,718	313.70	6.700	6.700		
313.80	1.80				8.988	2,407	0.40			313.80	3,781	6,166	313.80	8.988	8.988		
313.90	1.90				11.555	2,855	0.41			313.90	5,184	6,615	313.90	11.555	11.555		
314.00	2.00				14.397	3,304	0.42			314.00	3,781	7,063	314.00	14.397	14.397		

Notes:

Drawdown Time Calculations Greater than 0.1 m above the permanent pool

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

where

T=drawdown time in hours

v_2=starting pond volume

v_2=ending pond volume

Q_2=starting flow

Q_1=ending flow

From 0.0 to 0.1 m above the permanent pool

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

where

T=drawdown time in hours

v_2=starting pond volume

v_2=ending pond volume

Q_2=starting flow

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

where

L = bottom width of spillway

H = head above weir invert

S = side slopes (ratio of H:V)

C_{wt} = weir coefficient (triangular)

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

Orifice Flow Calculations: Orifice flow equation

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

where

C = orifice coefficient

A = area of orifice

g = acceleration due to gravity

H = head above centre line of orifice

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

Sharp crested semi-circular weir equation

Sharp crested semi-circular weir equation

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

where

C = sharp crested semi-circular weir coefficient

D = diameter of orifice

H = head above orifice invert

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

*External SWM Facility modelled according to assumptions made based on LiDAR data and the surrounding soil characteristics

2509 Cedar Creek Road (161414214)
Sediment Forebay Sizing Calculations
Using MOE - SWMPD Manual (2003)

East Forebay

Dispersion Length

Dist = 8Q/dv

= 52 m

y_s = total depth of sediment in forebay (m) — y_s = 0.5
Q = inlet flow (m^3/s) — Q = 2.294 — Note 1.
d = depth of perm pool in forebay above y_s (m) — d = 0.7
v_f = desired vel in forebay (m/s) — v_f = 0.5

West Forebay)

Dispersion Length

Dist = 8Q/dv

= 30 m

y_s = total depth of sediment in forebay (m) — y_s = 0.5
Q = inlet flow (m^3/s) — Q = 1.323 — Note 1.
d = depth of perm pool in forebay above y_s (m) — d = 0.7
v_f = desired vel in forebay (m/s) — v_f = 0.5

East Forebay

Cleanout Frequency

Table 5.3 MOEE SWMPP Guidelines

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

= 7.3 years

A_{sew} = Contributing Sewer Area (ha) — A_{sew} = 9.55
Imp = Percent Impervious (%) — Imp = 80%
load = Sediment Loading (m^3/ha) — load = 3.4
effic = Removal Efficiency (%) - Level 1 — effic = 80%
Targ = Cleanout Frequency Target (years) — Targ = 7
Vol = Sediment volume (m^3) — Vol = 190 — Note 2.

Therefore, **Cleanout Frequency Satisfied**

West Forebay

Cleanout Frequency

Table 5.3 MOEE SWMPP Guidelines

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

= 9.6 years

A_{sew} = Contributing Sewer Area (ha) — A_{sew} = 4.92
Imp = Percent Impervious (%) — Imp = 80%
load = Sediment Loading (m^3/ha) — load = 3.4
effic = Removal Efficiency (%) - Level 1 — effic = 80%
Targ = Cleanout Frequency Target (years) — Targ = 7
Vol = Sediment volume (m^3) — Vol = 129 — Note 2.

Therefore, **Cleanout Frequency Satisfied**

Notes
1. Peak inlet flows to SWM facility based on SWMHYMO modelling (5-year storm)
2. Volume of bottom 0.5 m depth, the maximum sediment accumulation depth

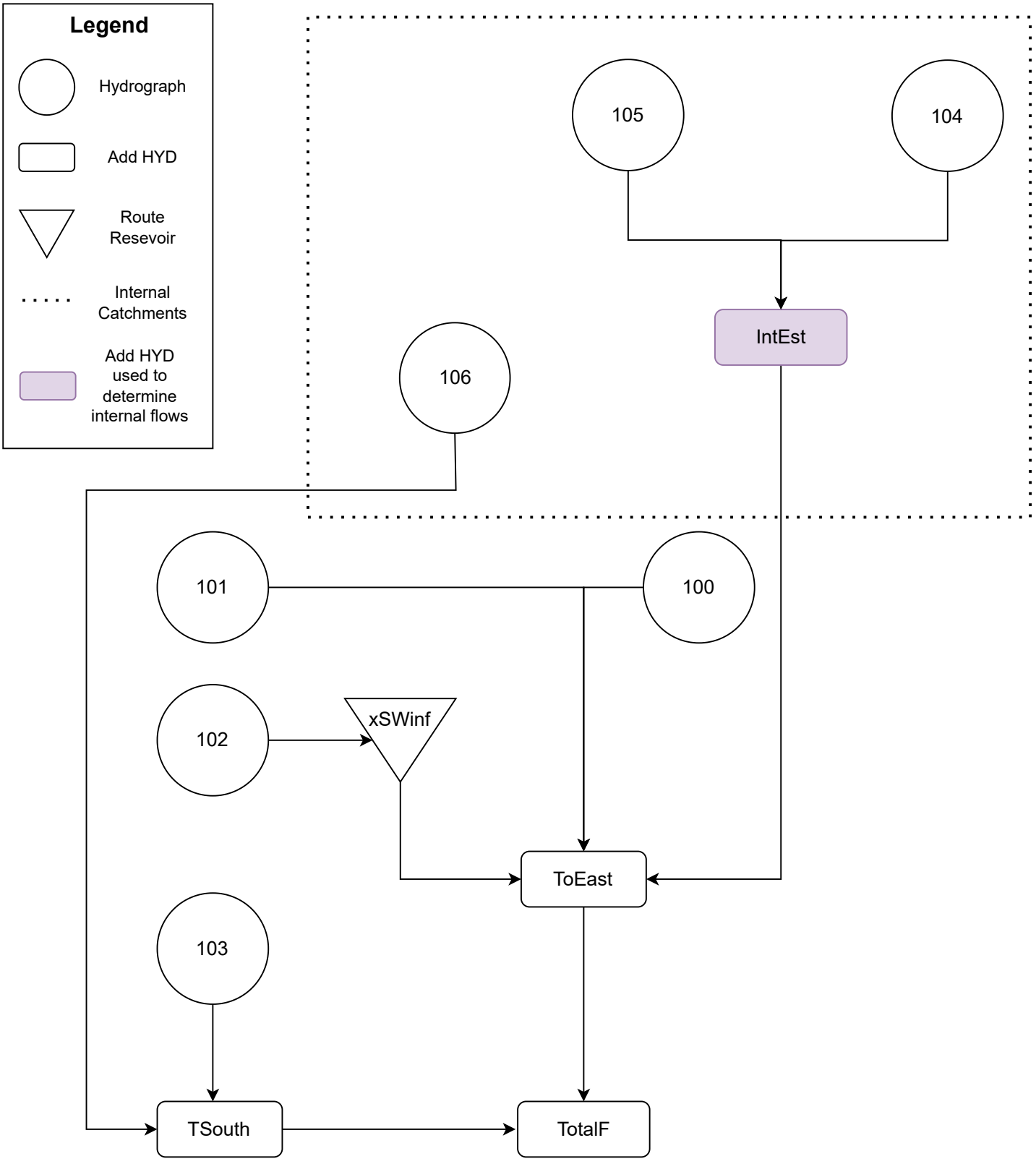
2509 Cedar Creek Road (161414214)

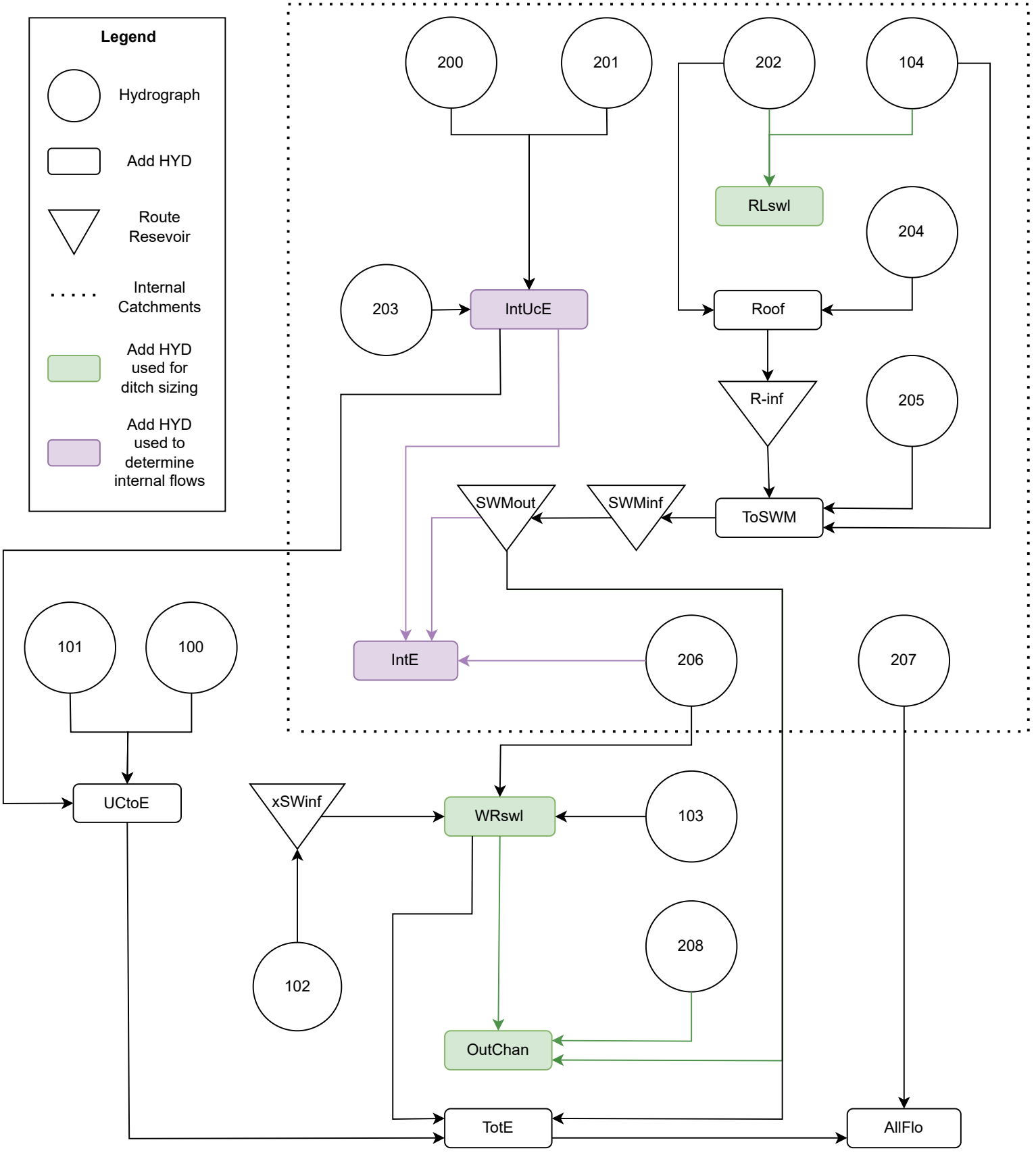
Stormwater Quality Volumetric Requirements (Future Conditions)

Drainage Area (ha)[2]	Total % Imp.	Level	Facility Type	Water Quality Unit Volume Requirements [1]	Water Quality Volume Requirements
				Total Unit Volume (m^3/ha)	Total MOE Volume
16.10	78%	Enhanced	Infiltration	38	608

[1] Water quality unit volume requirements based on Table 3.2, Stormwater Management Planning & Design Manual (MOE 2003)

[2] Drainage Area for Quality control represents total storm sewer drainage area to SWM Facility and includes the area of the SWM block itself and external area draining onto site


Legend
Hydrograph
Add HYD
Route Resevoir
Internal Catchments
Add HYD used to determine internal flows
105
104
IntEst
106
101
100
102
xSWinf
ToEast
103
TSouth
TotalF


Legend
Hydrograph
Add HYD
Route Resevoir
Internal Catchments
Add HYD used for ditch sizing
Add HYD used to determine internal flows
200
201
202
104
RLswl
204
203
IntUcE
Roof
R-inf
205
SWMout
SWMinf
ToSWM
101
100
IntE
206
207
UCtoE
xSWinf
WRswl
103
208
102
OutChan
TotE
AllFlo

```
00001> 2     Metric units
00002> *#*************************************************************************
00003> *#  Project Name: [2509 Cedar Creek Road SWM - Ayr, ON] Project # : [161414214]
00004> *#  Date         : 01-25-2024
00005> *#  Modeller     : [Amy Kyle, Water Resources Specialist]
00006> *#  Company      : Stantec Consulting Ltd. (Waterloo)
00007> *#  License #    : 4730904
00008> *#
00009> *#  This hydrologic analysis prepared to provide pond sizing
00010> *#  for the 2509 Cedar Creek Road SWM Facility
00011> *#  The storm events modelled are:
00012> *#  25mm, 2, 5, 25, 50, and 100-year Chicago storms (City of Kitchener IDF)
00013> *#  and the Regional Event
00014> *#*************************************************************************
00015> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[1]
00016> *%                   ["Kit25mm.4hr"] <--storm filename, one per line for NSTORM
00017> *%------------------|-------------------------------------------------------|
00018> READ STORM           STORM_FILENAME=["STORM.001"]
00019> *%------------------|-------------------------------------------------------|
00020> *#=========================================================================
00021> *# Pre-Development Drainage Area (Internal Catchments)
00022> *#=========================================================================
00023> *#------------------|-------------------------------------------------------|
00024> *#
00025> *#                    Existing internal area draining to the east
00026> *#
00027> *#------------------|-------------------------------------------------------|
00028> DESIGN NASHYD        ID=[1], NHYD=["105"], DT=[1]min, AREA=[7.06](ha),
00029>                      DWF=[0](cms), CN/C=[71], TP=[0.33]hrs,
00030>                      RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
00031> *%------------------|-------------------------------------------------------|
00032> *#
00033> *#    Small external area entering site from east and draining south / east
00034> *#
00035> *#------------------|-------------------------------------------------------|
00036> DESIGN NASHYD        ID=[2], NHYD=["104"], DT=[1]min, AREA=[0.73](ha),
00037>                      DWF=[0](cms), CN/C=[70], TP=[0.19]hrs,
00038>                      RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
00039> *#------------------|-------------------------------------------------------|
00040> *#
00041> *#                      Total existing area draining to the east
00042> *#
00043> *#------------------|-------------------------------------------------------|
00044> ADD HYD              IDsum=[3], NHYD=["IntEst"], IDs to add=[1+2]
00045> *%------------------|-------------------------------------------------------|
00046> *#
00047> *#                    Existing internal area draining to the south
00048> *#
00049> *#------------------|-------------------------------------------------------|
00050> DESIGN NASHYD        ID=[4], NHYD=["106"], DT=[1]min, AREA=[11.00](ha),
00051>                      DWF=[0](cms), CN/C=[70], TP=[0.54]hrs,
00052>                      RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
00053> *%------------------|-------------------------------------------------------|
00054> *#=========================================================================
00055> *# Total Pre-Development Drainage Area (Including Large External Catchments)
00056> *#=========================================================================
00057> *#------------------|-------------------------------------------------------|
00058> *#
00059> *#  External industrial catchment and part of Hwy 401, draining south into the
00060> *#                      site and flowing south / east.
00061> *#
00062> *#------------------|-------------------------------------------------------|
00063> CALIB STANDHYD       ID=[2], NHYD=["100"], DT=[1](min), AREA=[55.94](ha),
00064>                      XIMP=[0.50], TIMP=[0.80], DWF=[0](cms), LOSS=[2],
00065>                      SCS curve number CN=[64],
00066>                      Pervious   surfaces: IAper=[5](mm), SLPP=[2](%),
00067>                                           LGP=[30](m), MNP=[0.25], SCP=[0](min),
00068>                      Impervious surfaces: IAimp=[2](mm), SLPI=[1.6](%),
00069>                                           LGI=[1500](m), MNI=[0.02], SCI=[0](min)
00070>                      RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00071> *#*%----------------|-------------------------------------------------------
00072> *#
00073> *#  External catchment containing a portion of Cedar Creek Road, a portion of
00074> *#         industrial area, and a grassed area near Hwy 401 off-ramp,
00075> *#            draining south into site and flowing south / east.
00076> *#
00077> *#------------------|-------------------------------------------------------|
00078> DESIGN STANDHYD     ID=[6], NHYD=["101"], DT=[1]min, AREA=[14.55](ha),
00079>                      XIMP=[0.48], TIMP=[0.60], DWF=[0](cms), LOSS=[2], CN=[50],
00080>                      SLOPE=[2.3](%), RAINFALL=[ , , , , ](mm/hr), END=-1
00081> *%------------------|-------------------------------------------------------|
00082> *#
00083> *# External catchment west of site, containing exisiting industrial
00084> *# property draining into private SWM feature and then onto site flowing east
00085> *#
00086> *#------------------|-------------------------------------------------------|
00087> DESIGN STANDHYD     ID=[7], NHYD=["102"], DT=[1]min, AREA=[12.64](ha),
00088>                      XIMP=[0.50], TIMP=[0.80], DWF=[0](cms), LOSS=[2], CN=[50],
00089>                      SLOPE=[3.1](%), RAINFALL=[ , , , , ](mm/hr), END=-1
00090> *#------------------|-------------------------------------------------------|
00091> *#
00092> *#                       Infiltration in External SWM Feature
00093> *#
00094> *#------------------|-------------------------------------------------------|
00095> ROUTE RESERVOIR     IDout=[8],   NHYD=["xSWinf"],  IDin=[7],
00096>                      RDT=[1](min),
00097>                            TABLE of ( OUTFLOW-STORAGE ) values
00098>                                       (cms) - (ha-m)
00099>                                     [   0.0  ,  0.0 ]
00100>                                     [   0.018 ,  0.0438 ]
00101>                                     [   0.018 ,  0.3759 ]
00102>                                     [   -1  ,  -1  ]  (max twenty pts)
00103>                            IDovf=[9], NHYDovf=["OVF-xI"]
00104> *%------------------|-------------------------------------------------------|
00105> *#
00106> *#                       Total existing area draining to the east
00107> *#
00108> *#------------------|-------------------------------------------------------|
00109> ADD HYD              IDsum=[5], NHYD=["ToEast"], IDs to add=[2+3+6+9]
00110> *#------------------|-------------------------------------------------------|
00111> *#
00112> *# External catchment west of the site, containing a portion of existing
00113> *# industrial property, draining east into the site and flowing south.
00114> *#
00115> *#------------------|-------------------------------------------------------|
00116> DESIGN STANDHYD     ID=[1], NHYD=["103"], DT=[1]min, AREA=[4.52](ha),
00117>                      XIMP=[0.50], TIMP=[0.80], DWF=[0](cms), LOSS=[2], CN=[50],
00118>                      SLOPE=[5.3](%), RAINFALL=[ , , , , ](mm/hr), END=-1
00119> *#------------------|-------------------------------------------------------|
00120> *#
00121> *#                              Total Flows to the south
00122> *#
00123> *#------------------|-------------------------------------------------------|
00124> ADD HYD              IDsum=[2], NHYD=["TSouth"], IDs to add=[4+1]
00125> *%------------------|-------------------------------------------------------|
00126> *#
00127> *#                  Total Flows from site (eventually to Cedar Creek)
00128> *#
00129> *#------------------|-------------------------------------------------------|
00130> ADD HYD              IDsum=[3], NHYD=["TotalF"], IDs to add=[5+2]
00131> *%------------------|-------------------------------------------------------|
00132> *%------------------|-------------------------------------------------------|
00133> START               TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[2]
00134> *                    ["Kit2yr.3hr"] <--storm filename, one per line for NSTORM ti
00135> *%------------------|-------------------------------------------------------|
00136> START               TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[5]
00137> *                    ["Kit5yr.3hr"] <--storm filename, one per line for NSTORM ti
00138> *%------------------|-------------------------------------------------------|
00139> START               TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[10]
00140> *                    ["Kit10yr.3hr"] <--storm filename, one per line for NSTORM t
00141> *%------------------|-------------------------------------------------------|
00142> START               TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[25]
00143> *                    ["Kit25yr.3hr"] <--storm filename, one per line for NSTORM t
00144> *%------------------|-------------------------------------------------------|
00145> START               TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[50]
00146> *                    ["Kit50yr.3hr"] <--storm filename, one per line for NSTORM t
00147> *%------------------|-------------------------------------------------------|
00148> START               TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[100
00149> *                    ["Kit100yr.3hr"] <--storm filename, one per line for NSTORM
00150> *%------------------|-------------------------------------------------------|
00151> START               TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[500
00152> *                    ["hurhaz48.stm"] <--storm filename, one per line for NSTORM
00153> *%------------------|-------------------------------------------------------|
00154> FINISH
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```

```
00001> 2     Metric units
00002> *#*****************************************************************************
00003> *#  Project Name: [2509 Cedar Creek Road SWM - Ayr, ON] Project #: [161414214]
00004> *#  Date         : 01/25/2024
00005> *#  Modeller     : [Amy Kyle, Water Resources Specialist]
00006> *#  Company      : Stantec Consulting Ltd. (Waterloo)
00007> *#  License #    : 4730904
00008> *#
00009> *#  This hydrologic analysis prepared to provide pond sizing
00010> *#  for the 2509 Cedar Creek Road SWM Facility
00011> *#  The storm events modelled are:
00012> *#  25mm, 2, 5, 25, 50, and 100-year Chicago storms (City of Kitchener IDF)
00013> *#  and the Regional Event
00014> *#*****************************************************************************
00015> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[1]
00016> *%                   ["Kit25mm.4hr"] <--storm filename, one per line for NSTORM
00017> *%-----------------|-------------------------------------------------------------|
00018> READ STORM          STORM_FILENAME=["STORM.001"]
00019> *#-----------------|-------------------------------------------------------------|
00020> *#=============================================================================
00021> *# Proposed Drainage Conditions (Internal Areas)
00022> *#=============================================================================
00023> *#-----------------|-------------------------------------------------------------|
00024> *#
00025> *#    Small portion of West Road Ditch draining offsite to the east through
00026> *#                            By-Pass Storm Sewer(BPSS)
00027> *#
00028> *#-----------------|-------------------------------------------------------------|
00029> DESIGN NASHYD       ID=[1], NHYD=["200"], DT=[1]min, AREA=[0.14](ha),
00030>                     DWF=[0](cms), CN/C=[50], TP=[0.26]hrs,
00031>                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
00032> *#-----------------|-------------------------------------------------------------|
00033> *#
00034> *#  Proposed developed catchment draining offsite to the east through BPSS
00035> *#
00036> *#-----------------|-------------------------------------------------------------|
00037> DESIGN STANDHYD     ID=[2], NHYD=["201"], DT=[1]min, AREA=[0.64](ha),
00038>                     XIMP=[0.50], TIMP=[0.90], DWF=[0](cms), LOSS=[2], CN=[50],
00039>                     SLOPE=[2](%), RAINFALL=[ , , , , ](mm/hr), END=-1
00040> *#-----------------|-------------------------------------------------------------|
00041> *#
00042> *# Proposed internal grassed area and plunge pool draining offsite to the east
00043> *#
00044> *#-----------------|-------------------------------------------------------------|
00045> DESIGN NASHYD       ID=[3], NHYD=["203"], DT=[1]min, AREA=[0.55](ha),
00046>                     DWF=[0](cms), CN/C=[50], TP=[0.08]hrs,
00047>                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
00048> *#-----------------|-------------------------------------------------------------|
00049> *#
00050> *#          Total internal area draining onto agricultural area to the east
00051> *#
00052> *#-----------------|-------------------------------------------------------------|
00053> ADD HYD             IDsum=[5], NHYD=["IntUcE"], IDs to add=[1+2+3]
00054> *%-----------------|-------------------------------------------------------------|
00055> *#
00056> *#             Proposed industrial lots draining to Rear Lot Ditch
00057> *#
00058> *#-----------------|-------------------------------------------------------------|
00059> DESIGN STANDHYD     ID=[6], NHYD=["202"], DT=[1]min, AREA=[8.82](ha),
00060>                     XIMP=[0.80], TIMP=[0.90], DWF=[0](cms), LOSS=[2], CN=[50],
00061>                     SLOPE=[2](%), RAINFALL=[ , , , , ](mm/hr), END=-1
00062> *#-----------------|-------------------------------------------------------------|
00063> *#
00064> *#    External agricultural area draining onsite and entering Rear Lot Ditch
00065> *#
00066> *#-----------------|-------------------------------------------------------------|
00067> DESIGN NASHYD       ID=[7], NHYD=["104"], DT=[1]min, AREA=[0.73](ha),
00068>                     DWF=[0](cms), CN/C=[70], TP=[0.19]hrs,
00069>                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
00070> *#-----------------|-------------------------------------------------------------|
00071> *#
00072> *#      Total area entering Rear Lot Ditch and entering SWMF at East inlet
00073> *#
00074> *#-----------------|-------------------------------------------------------------|
00075> ADD HYD             IDsum=[8], NHYD=["RLswl"], IDs to add=[6+7]
00076> *%-----------------|-------------------------------------------------------------|
00077> *#
00078> *#   Proposed industrial lots draining to East Road Ditch within catchment,
00079> *#                          and new internal roadway
00080> *#
00081> *#-----------------|-------------------------------------------------------------|
00082> DESIGN STANDHYD     ID=[1], NHYD=["204"], DT=[1]min, AREA=[4.92](ha),
00083>                     XIMP=[0.80], TIMP=[0.90], DWF=[0](cms), LOSS=[2], CN=[50],
00084>                     SLOPE=[2](%), RAINFALL=[ , , , , ](mm/hr), END=-1
00085> *#-----------------|-------------------------------------------------------------|
00086> *#
00087> *#             Rooftop infiltration lumped together and sized for 25mm
00088> *#         runoff volume from an assumed 0.15ha rooftop area per lot (7 lots)
00089> *#
00090> *#-----------------|-------------------------------------------------------------|
00091> ADD HYD             IDsum=[2], NHYD=["Roof"], IDs to add=[1+6]
00092> *%-----------------|-------------------------------------------------------------|
00093> ROUTE RESERVOIR     IDout=[4],   NHYD=["R-inf"],  IDin=[2],
00094>                     RDT=[1](min),
00095>                           TABLE of ( OUTFLOW-STORAGE ) values
00096>                                      (cms) - (ha-m)
00097>                                    [   0.0   ,  0.0 ]
00098>                                    [   0.00001 ,  0.02625 ]
00099>                                    [   -1    ,  -1  ]  (max twenty pts)
00100>                           IDovf=[10], NHYDovf=["infO"]
00101> *#-----------------|-------------------------------------------------------------|
00102> *#
00103> *#              Proposed SWM facility catchment (infiltration basin)
00104> *#
00105> *#-----------------|-------------------------------------------------------------|
00106> DESIGN NASHYD       ID=[9], NHYD=["205"], DT=[1]min, AREA=[1.63](ha),
00107>                     DWF=[0](cms), CN/C=[57], TP=[0.35]hrs,
00108>                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
00109> *#-----------------|-------------------------------------------------------------|
00110> *#
00111> *#                         All flows entering SWM facility
00112> *#
00113> *#-----------------|-------------------------------------------------------------|
00114> ADD HYD             IDsum=[6], NHYD=["ToSWM"], IDs to add=[10+7+9]
00115> *%-----------------|-------------------------------------------------------------|
00116> *#
00117> *#                      Infiltration Portion of SWM facility
00118> *#
00119> *#-----------------|-------------------------------------------------------------|
00120> ROUTE RESERVOIR     IDout=[7],   NHYD=["SWMinf"],  IDin=[6],
00121>                     RDT=[1](min),
00122>                           TABLE of ( OUTFLOW-STORAGE ) values
00123>                                      (cms) - (ha-m)
00124>                                    [   0.0   ,  0.0 ]
00125>                                    [   0.044 ,  0.0653 ]
00126>                                    [   0.044 ,  0.7033 ]
00127>                                    [   -1  ,  -1  ]  (max twenty pts)
00128>                           IDovf=[8], NHYDovf=["OVF-I"]
00129> *#-----------------|-------------------------------------------------------------|
00130> *#
00131> *#                        Active Storage Portion of SWM facility
00132> *#
00133> *#-----------------|-------------------------------------------------------------|
00134> ROUTE RESERVOIR     IDout=[1],   NHYD=["SWMout"],  IDin=[8],
00135>                     RDT=[1](min),
00136>                           TABLE of ( OUTFLOW-STORAGE ) values
00137>                                      (cms) - (ha-m)
00138>                                    [   0.0   ,  0.0 ]
00139>                                    [   0.202 ,  0.0785 ]
00140>                                    [   0.689 ,  0.1586 ]
00141>                                    [   1.479 ,  0.2400 ]
00142>                                    [   4.101 ,  0.4070 ]
00143>                                    [   -1  ,  -1  ]  (max twenty pts)
00144>                           IDovf=[2], NHYDovf=["OVF"]
00145> *#-----------------|-------------------------------------------------------------|
00146> *#
00147> *#    West Road Ditch, conveying external drainage from the west around the
00148> *#                    proposed SWM facility to Outlet Channel
00149> *#
00150> *#-----------------|-------------------------------------------------------------|
00151> DESIGN NASHYD       ID=[2], NHYD=["206"], DT=[1]min, AREA=[1.22](ha),
00152>                     DWF=[0](cms), CN/C=[50], TP=[0.81]hrs,
00153>                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
00154> *#-----------------|-------------------------------------------------------------|
00155> *#
00156> *#        Grassed area south of SWM facility draining offsite to the south
00157> *#
00158> *#-----------------|-------------------------------------------------------------|
00159> DESIGN NASHYD       ID=[10], NHYD=["207"], DT=[1]min, AREA=[0.14](ha),
00160>                     DWF=[0](cms), CN/C=[50], TP=[0.07]hrs,
00161>                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
00162> *#-----------------|-------------------------------------------------------------|
00163> *#
00164> *#                Total Flows to the east from internal catchments
00165> *#
00166> *#-----------------|-------------------------------------------------------------|
00167> ADD HYD             IDsum=[7], NHYD=["IntE"], IDs to add=[5+1+2]
00168> *#-----------------|-------------------------------------------------------------|
00169> *#=============================================================================
00170> *# Proposed Drainage Conditions (Including External Catchment Flows to Ditches)
00171> *#=============================================================================
00172> *#-----------------|-------------------------------------------------------------|
00173> *#
00174> *# External industrial catchment and part of Hwy 401, draining south across
00175> *#                   Cedar Creek Road and entering BPSS
00176> *#
00177> *#-----------------|-------------------------------------------------------------|
00178> CALIB STANDHYD      ID=[3], NHYD=["100"], DT=[1](min), AREA=[55.94](ha),
00179>                     XIMP=[0.50], TIMP=[0.80], DWF=[0](cms), LOSS=[2],
00180>                     SCS curve number CN=[64],
00181>                     Pervious   surfaces: IAper=[5](mm), SLPP=[2](%),
00182>                                          LGP=[30](m), MNP=[0.25], SCP=[0](min),
00183>                     Impervious surfaces: IAimp=[2](mm), SLPI=[1.6](%),
00184>                                          LGI=[1500](m), MNI=[0.02], SCI=[0](min)
00185>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00186> *#-----------------|-------------------------------------------------------------|
00187> *#
00188> *#  External catchment containing a portion of Cedar Creek Road, a portion
00189> *#  of industrial area, and a grassed area near Hwy 401 off-ramp, entering BPSS
00190> *#
00191> *#-----------------|-------------------------------------------------------------|
00192> DESIGN STANDHYD     ID=[7], NHYD=["101"], DT=[1]min, AREA=[14.55](ha),
00193>                     XIMP=[0.48], TIMP=[0.60], DWF=[0](cms), LOSS=[2], CN=[50],
00194>                     SLOPE=[2.3](%), RAINFALL=[ , , , , ](mm/hr), END=-1
00195> *#-----------------|-------------------------------------------------------------|
00196> *#
00197> *#     Total area draining offsite to east onto agricultural area to the east
00198> *#
00199> *#-----------------|-------------------------------------------------------------|
00200> ADD HYD             IDsum=[9], NHYD=["UCtoE"], IDs to add=[5+3+7]
00201> *#-----------------|-------------------------------------------------------------|
00202> *#
00203> *#   Large external catchment west of site containing industrial property,
00204> *#  draining into private SWM feature and then into West Road Ditch, routing
00205> *#             around SWM facility and entering Outlet Channel
00206> *#
00207> *#-----------------|-------------------------------------------------------------|
00208> DESIGN STANDHYD     ID=[4], NHYD=["102"], DT=[1]min, AREA=[12.64](ha),
00209>                     XIMP=[0.50], TIMP=[0.80], DWF=[0](cms), LOSS=[2], CN=[50],
00210>                     SLOPE=[3.1](%), RAINFALL=[ , , , , ](mm/hr), END=-1
00211> *#-----------------|-------------------------------------------------------------|
00212> *#
00213> *#                        Infiltration in External SWM Feature
00214> *#
00215> *#-----------------|-------------------------------------------------------------|
00216> ROUTE RESERVOIR     IDout=[5],   NHYD=["xSWinf"],  IDin=[4],
00217>                     RDT=[1](min),
00218>                           TABLE of ( OUTFLOW-STORAGE ) values
00219>                                      (cms) - (ha-m)
00220>                                    [   0.0   ,  0.0 ]
00221>                                    [   0.018 ,  0.0438 ]
00222>                                    [   0.018 ,  0.3759 ]
00223>                                    [   -1  ,  -1  ]  (max twenty pts)
00224>                           IDovf=[6], NHYDovf=["OVF-xI"]
00225> *#-----------------|-------------------------------------------------------------|
00226> *#
00227> *# External catchment west of the site, containing a portion of exisiting
00228> *# industrial property, draining east into West Road Ditch, routing around
00229> *#                    SWM facility and entering Outlet Channel
00230> *#
00231> *#-----------------|-------------------------------------------------------------|
00232> DESIGN STANDHYD     ID=[7], NHYD=["103"], DT=[1]min, AREA=[4.52](ha),
00233>                     XIMP=[0.50], TIMP=[0.80], DWF=[0](cms), LOSS=[2], CN=[50],
00234>                     SLOPE=[5.3](%), RAINFALL=[ , , , , ](mm/hr), END=-1
00235> *#-----------------|-------------------------------------------------------------|
00236> *#
00237> *#                Total Flows through West Road Ditch
00238> *#
00239> *#-----------------|-------------------------------------------------------------|
00240> ADD HYD             IDsum=[8], NHYD=["WRswl"], IDs to add=[6+7+2]
00241> *#-----------------|-------------------------------------------------------------|
00242> DESIGN NASHYD       ID=[5], NHYD=["208"], DT=[1]min, AREA=[1.13](ha),
00243>                     DWF=[0](cms), CN/C=[50], TP=[0.85]hrs,
00244>                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
00245> *#-----------------|-------------------------------------------------------------|
00246> *#
00247> *#                Total Flows through Outlet Channel
00248> *#
00249> *#-----------------|-------------------------------------------------------------|
00250> ADD HYD             IDsum=[3], NHYD=["OutChan"], IDs to add=[1+8+5]
00251> *#-----------------|-------------------------------------------------------------|
00252> *#
00253> *#                Total Flows to the east (eventually to Cedar Creek)
00254> *#
```

```
*#-----------------|---------------------------------------------------------|
ADD HYD             IDsum=[4], NHYD=["TotE"], IDs to add=[1+8+9]
*#-----------------|---------------------------------------------------------|
*#
*#                          Total Flows from the Site
*#
*#-----------------|---------------------------------------------------------|
ADD HYD             IDsum=[6], NHYD=["AllFlo"], IDs to add=[4+10]
*%-----------------|---------------------------------------------------------|
START               TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[2]
*                   ["Kit2yr.3hr"] <--storm filename, one per line for NSTORM ti
*%-----------------|---------------------------------------------------------|
START               TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[5]
*                   ["Kit5yr.3hr"] <--storm filename, one per line for NSTORM ti
*%-----------------|---------------------------------------------------------|
START               TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[10]
*                   ["Kit10yr.3hr"] <--storm filename, one per line for NSTORM t
*%-----------------|---------------------------------------------------------|
START               TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[25]
*                   ["Kit25yr.3hr"] <--storm filename, one per line for NSTORM t
*%-----------------|---------------------------------------------------------|
START               TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[50]
*                   ["Kit50yr.3hr"] <--storm filename, one per line for NSTORM t
*%-----------------|---------------------------------------------------------|
START               TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[100
*                   ["Kit100yr.3hr"] <--storm filename, one per line for NSTORM
*%-----------------|---------------------------------------------------------|
START               TZERO=[0.0]hrs or date,  METOUT=[2],  NSTORM=[1],  NRUN=[500
*                   ["hurhaz48.stm"] <--storm filename, one per line for NSTORM
*%-----------------|---------------------------------------------------------|
FINISH
```

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

   SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
   S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
   SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
       S   W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
   SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
                                                         9   9  9   9   # 4730904
        StormWater Management HYdrologic Model            999    999    =========

 ********************************************************************************
 ***************************** SWMHYMO Ver/4.05  ********************************
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors      *********
 *********                  OTTHYMO-83 and OTTHYMO-89.                  *********
 ********************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
 *********                  Ottawa,  Ontario: (613) 836-3884           *********
 *********                  Gatineau, Quebec: (819) 243-6858           *********
 *********                  E-Mail: swmhymo@jfsa.Com                   *********
 ********************************************************************************

 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: Stantec Consulting Ltd. (Kitchener)          +++++++++
 +++++++++                Kitchener             SERIAL#:4730904       +++++++++
 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ********************************************************************************
 *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *********
 *********           Maximum value for ID numbers  :     10           *********
 *********           Max. number of rainfall points: 105408           *********
 *********           Max. number of flow points    : 105408           *********
 ********************************************************************************


 **********************   D E T A I L E D   O U T P U T   **********************
 ********************************************************************************
 *         DATE: 2024-01-25     TIME: 15:08:53     RUN COUNTER: 000239         *
 ********************************************************************************
 * Input   filename: C:\SWMHYMO\CEDARC~1\202401~4\CCrPre.dat                    *
 * Output  filename: C:\SWMHYMO\CEDARC~1\202401~4\CCrPre.out                    *
 * Summary filename: C:\SWMHYMO\CEDARC~1\202401~4\CCrPre.sum                    *
 * User comments:                                                               *
 * 1:_____________________________________________________________________________*
 * 2:_____________________________________________________________________________*
 * 3:_____________________________________________________________________________*
 ********************************************************************************

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

```
001:0001--------------------------------------------------------------------------
--
*#************************************************************************
*#  Project Name: [2509 Cedar Creek Road SWM - Ayr, ON] Project # : [161414214]
*#  Date        : 01-25-2024
*#  Modeller    : [Amy Kyle, Water Resources Specialist]
*#  Company     : Stantec Consulting Ltd. (Waterloo)
*#  License #   : 4730904
*#
*#  This hydrologic analysis prepared to provide pond sizing
*#  for the 2509 Cedar Creek Road SWM Facility
*#  The storm events modelled are:
*#  25mm, 2, 5, 25, 50, and 100-year Chicago storms (City of Kitchener IDF)
*#  and the Regional Event
*#************************************************************************
--------------------
| START            |  Project  dir.: C:\SWMHYMO\CEDARC~1\202401~4\

--------------------  Rainfall dir.: C:\SWMHYMO\CEDARC~1\202401~4\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
           #  1=Kit25mm.4hr
--------------------------------------------------------------------------------
--
001:0002--------------------------------------------------------------------------
--
--------------------
| READ STORM       |    Filename: 25 mm, 4hr Chicago Storm - Kitchener IDF
| Ptotal=  25.00 mm|    Comments: 25 mm, 4hr Chicago Storm - Kitchener IDF
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   1.465 |   1.08   4.024 |   2.08   5.764 |   3.08   2.074
               .17   1.540 |   1.17   4.814 |   2.17   4.969 |   3.17   1.977
               .25   1.625 |   1.25   6.025 |   2.25   4.374 |   3.25   1.889
               .33   1.720 |   1.33   8.114 |   2.33   3.913 |   3.33   1.810
               .42   1.829 |   1.42  12.526 |   2.42   3.545 |   3.42   1.737
               .50   1.955 |   1.50  27.198 |   2.50   3.245 |   3.50   1.671
               .58   2.101 |   1.58  74.855 |   2.58   2.994 |   3.58   1.610
               .67   2.274 |   1.67  31.410 |   2.67   2.782 |   3.67   1.553
               .75   2.482 |   1.75  16.819 |   2.75   2.601 |   3.75   1.501
               .83   2.736 |   1.83  11.357 |   2.83   2.443 |   3.83   1.453
               .92   3.055 |   1.92   8.563 |   2.92   2.305 |   3.92   1.408
              1.00   3.468 |   2.00   6.882 |   3.00   2.183 |   4.00   1.366

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

```
001:0003-------------------------------------------------------------------------
--
*#=========================================================================
*# Pre-Development Drainage Area (Internal Catchments)
*#=========================================================================
*#-----------------|---------------------------------------------------------|
*#
*#                   Existing internal area draining to the east
*#
*#-----------------|---------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    7.06   Curve Number   (CN)=71.00
| 01:105    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .817

     PEAK FLOW       (cms)=     .073 (i)
     TIME TO PEAK    (hrs)=    2.000
     RUNOFF VOLUME    (mm)=    4.340
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .174

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

-------------------------------------------------------------------------------
--
001:0004-------------------------------------------------------------------------
--
*#
*#    Small external area entering site from east and draining south / east
*#
*#-----------------|---------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .73   Curve Number   (CN)=70.00
| 02:104    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .190

     Unit Hyd Qpeak  (cms)=     .147

     PEAK FLOW       (cms)=     .010 (i)
     TIME TO PEAK    (hrs)=    1.817
     RUNOFF VOLUME    (mm)=    4.172
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .167

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

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

```
001:0005-------------------------------------------------------------------------
--
*#----------------|-------------------------------------------------------------|
*#
*#                    Total existing area draining to the east
*#
*#----------------|-------------------------------------------------------------|
------------------------
| ADD HYD (IntEst    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:105           7.06     .073    2.00   4.34    .000

                     +ID2 02:104            .73     .010    1.82   4.17    .000

                      ============================================================
                      SUM 03:IntEst        7.79     .081    1.97   4.32    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--
001:0006-------------------------------------------------------------------------
--
*#
*#                  Existing internal area draining to the south
*#
*#----------------|-------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=   11.00   Curve Number   (CN)=70.00
| 04:106    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .540

     Unit Hyd Qpeak  (cms)=     .778

     PEAK FLOW       (cms)=     .078 (i)
     TIME TO PEAK    (hrs)=    2.283
     RUNOFF VOLUME    (mm)=    4.173
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .167

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

-------------------------------------------------------------------------------
--
001:0007-------------------------------------------------------------------------
--
*#============================================================================
*# Total Pre-Development Drainage Area (Including Large External Catchments)
*#============================================================================
```

```
*#----------------|------------------------------------------------------------|
*#
*#  External industrial catchment and part of Hwy 401, draining south into the
*#                      site and flowing south / east.
*#
*#----------------|------------------------------------------------------------|
----------------------
| CALIB STANDHYD     |   Area    (ha)=   55.94
| 02:100    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      44.75         11.19
     Dep. Storage     (mm)=       2.00          5.00
     Average Slope     (%)=       1.60          2.00
     Length            (m)=    1500.00         30.00
     Mannings n           =       .020          .250

     Max.eff.Inten.(mm/hr)=      35.29         17.90
               over (min)        22.00         34.00
     Storage Coeff.  (min)=      22.13 (ii)    33.94 (ii)
     Unit Hyd. Tpeak (min)=      22.00         34.00
     Unit Hyd. peak  (cms)=        .05           .03
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.75           .32          1.952 (iii)
     TIME TO PEAK    (hrs)=       1.92          2.20          1.933
     RUNOFF VOLUME    (mm)=      23.00          6.60         14.800
     TOTAL RAINFALL   (mm)=      25.00         25.00         25.000
     RUNOFF COEFFICIENT   =        .92           .26           .592

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  64.0    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.

--------------------------------------------------------------------------------
--
001:0008--------------------------------------------------------------------------
--
*#*%----------------|------------------------------------------------------------
*#
*#  External catchment containing a portion of Cedar Creek Road, a portion of
*#         industrial area, and a grassed area near Hwy 401 off-ramp,
*#            draining south into site and flowing south / east.
*#
*#----------------|------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   14.55
| 06:101    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   48.00
----------------------
```

```
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.73         5.82
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.30         2.30
     Length            (m)=     311.45        40.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=      74.85         3.89
               over (min)        4.00        29.00
     Storage Coeff.  (min)=       4.42 (ii)   29.21 (ii)
     Unit Hyd. Tpeak (min)=       4.00        29.00
     Unit Hyd. peak  (cms)=        .26          .04
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.04          .04          1.041 (iii)
     TIME TO PEAK    (hrs)=       1.62         2.12          1.617
     RUNOFF VOLUME    (mm)=      24.20         2.59         12.965
     TOTAL RAINFALL   (mm)=      25.00        25.00         25.000
     RUNOFF COEFFICIENT   =        .97          .10           .519

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
001:0009--------------------------------------------------------------------------
--
*#
*# External catchment west of site, containing exisiting industrial
*# property draining into private SWM feature and then onto site flowing east
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   12.64
| 07:102    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.11         2.53
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       3.10         3.10
     Length            (m)=     290.29        40.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=      74.85        19.51
               over (min)        4.00        16.00
     Storage Coeff.  (min)=       3.87 (ii)   15.77 (ii)
     Unit Hyd. Tpeak (min)=       4.00        16.00
     Unit Hyd. peak  (cms)=        .29          .07
```

```
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .97          .08          1.002 (iii)
     TIME TO PEAK    (hrs)=       1.62         1.87          1.617
     RUNOFF VOLUME    (mm)=      24.20         4.72         14.463
     TOTAL RAINFALL   (mm)=      25.00        25.00         25.000
     RUNOFF COEFFICIENT   =        .97          .19           .579

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
001:0010---------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#                     Infiltration in External SWM Feature
*#
*#-----------------|-------------------------------------------------------|
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>07:(102   )   |
| OUT<08:(xSWinf)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .018  .3759E+00
                            .018  .4380E-01   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >07: (102   )      12.64     1.002     1.617     14.463
     OUTFLOW<08: (xSWinf)      12.64      .018     1.583     14.463
    OVERFLOW<09: (OVF-xI)        .00      .000      .000       .000

                  TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                  CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                  PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=    1.797
                  TIME SHIFT OF PEAK FLOW         (min)=    -2.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.1636E+00

--------------------------------------------------------------------------------
--
001:0011---------------------------------------------------------------------
--
```

```
*#
*#                     Total existing area draining to the east
*#
*#-----------------|-------------------------------------------------------------|
------------------------
| ADD HYD (ToEast    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 02:100           55.94    1.952    1.93  14.80    .000

                    +ID2 03:IntEst         7.79     .081    1.97   4.32    .000

                    +ID3 06:101           14.55    1.041    1.62  12.96    .000

                    +ID4 09:OVF-xI          .00     .000     .00    .00    .000
**DRY**
                     ============================================================
                     SUM 05:ToEast        78.28    2.284    1.92  13.42    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--
001:0012----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*# External catchment west of the site, containing a portion of existing
*# industrial property, draining east into the site and flowing south.
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    4.52
| 01:103    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.62          .90
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       5.30         5.30
     Length            (m)=     173.59        40.00
     Mannings n             =       .013         .250

     Max.eff.Inten.(mm/hr)=      74.85        22.59
               over (min)         2.00        12.00
     Storage Coeff.  (min)=       2.42 (ii)   11.97 (ii)
     Unit Hyd. Tpeak (min)=       2.00        12.00
     Unit Hyd. peak  (cms)=        .49          .09
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .42          .04          .430 (iii)
     TIME TO PEAK    (hrs)=       1.58         1.78         1.583
```

```
     RUNOFF VOLUME    (mm)=      24.20         4.73         14.463
     TOTAL RAINFALL   (mm)=      25.00        25.00         25.000
     RUNOFF COEFFICIENT   =        .97          .19           .579

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

------------------------------------------------------------------------------
--
001:0013----------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*#                             Total Flows to the south
*#
*#-----------------|------------------------------------------------------------|
------------------------
| ADD HYD (TSouth    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 04:106          11.00     .078    2.28   4.17    .000

                     +ID2 01:103           4.52     .430    1.58  14.46    .000

                      ============================================================
                      SUM 02:TSouth       15.52     .435    1.58   7.17    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
001:0014----------------------------------------------------------------------
--
*#
*#                 Total Flows from site (eventually to Cedar Creek)
*#
*#-----------------|------------------------------------------------------------|
------------------------
| ADD HYD (TotalF    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 05:ToEast       78.28    2.284    1.92  13.42    .000

                     +ID2 02:TSouth       15.52     .435    1.58   7.17    .000

                      ============================================================
                      SUM 03:TotalF       93.80    2.426    1.92  12.38    .000
```

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

--------------------------------------------------------------------------------
--
001:0015--------------------------------------------------------------------------
--
  ** END OF RUN :   1

********************************************************************************




--------------------
| START            |  Project  dir.: C:\SWMHYMO\CEDARC~1\202401~4\

--------------------  Rainfall dir.: C:\SWMHYMO\CEDARC~1\202401~4\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 002
    NSTORM=   1
           #  1=Kit2yr.3hr
--------------------------------------------------------------------------------
--
002:0002--------------------------------------------------------------------------
--
*#*****************************************************************************
*#  Project Name: [2509 Cedar Creek Road SWM - Ayr, ON] Project # : [161414214]
*#  Date        : 01-25-2024
*#  Modeller    : [Amy Kyle, Water Resources Specialist]
*#  Company     : Stantec Consulting Ltd. (Waterloo)
*#  License #   : 4730904
*#
*#  This hydrologic analysis prepared to provide pond sizing
*#  for the 2509 Cedar Creek Road SWM Facility
*#  The storm events modelled are:
*#  25mm, 2, 5, 25, 50, and 100-year Chicago storms (City of Kitchener IDF)
*#  and the Regional Event
*#*****************************************************************************
--------------------------------------------------------------------------------
--
002:0002--------------------------------------------------------------------------
--
--------------------
| READ STORM       |    Filename: 2-yr, 3hr Chicago Storm - Kitchener IDF
| Ptotal=  34.27 mm|    Comments: 2-yr, 3hr Chicago Storm - Kitchener IDF
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.08	2.837	.83	15.850	1.58	7.979	2.33	3.697
.17	3.094	.92	36.885	1.67	7.027	2.42	3.501
.25	3.409	1.00	109.401	1.75	6.286	2.50	3.326
.33	3.803	1.08	47.437	1.83	5.694	2.58	3.169
.42	4.314	1.17	26.381	1.92	5.211	2.67	3.028
.50	5.002	1.25	18.051	2.00	4.807	2.75	2.899
.58	5.982	1.33	13.687	2.08	4.466	2.83	2.783
.67	7.493	1.42	11.030	2.17	4.173	2.92	2.676
.75	10.127	1.50	9.251	2.25	3.920	3.00	2.578

```
--------------------------------------------------------------------------------
--
002:0003----------------------------------------------------------------------
--
*#=====================================================================
*# Pre-Development Drainage Area (Internal Catchments)
*#=====================================================================
*#-----------------|-------------------------------------------------------|
*#
*#                   Existing internal area draining to the east
*#
*#-----------------|-------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    7.06   Curve Number   (CN)=71.00
| 01:105    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .817

     PEAK FLOW       (cms)=     .134 (i)
     TIME TO PEAK    (hrs)=    1.433
     RUNOFF VOLUME    (mm)=    7.867
     TOTAL RAINFALL   (mm)=   34.271
     RUNOFF COEFFICIENT   =     .230

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

--------------------------------------------------------------------------------
--
002:0004----------------------------------------------------------------------
--
*#
*#    Small external area entering site from east and draining south / east
*#
*#-----------------|-------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .73   Curve Number   (CN)=70.00
| 02:104    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
```

```
----------------------   U.H. Tp(hrs)=    .190

     Unit Hyd Qpeak  (cms)=     .147

     PEAK FLOW       (cms)=     .018 (i)
     TIME TO PEAK    (hrs)=    1.250
     RUNOFF VOLUME    (mm)=    7.583
     TOTAL RAINFALL   (mm)=   34.271
     RUNOFF COEFFICIENT   =     .221

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

--------------------------------------------------------------------------------
--
002:0005--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                    Total existing area draining to the east
*#
*#-----------------|-------------------------------------------------------------|
------------------------
| ADD HYD (IntEst    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:105           7.06     .134    1.43   7.87    .000

                     +ID2 02:104            .73     .018    1.25   7.58    .000

                      ============================================================
                      SUM 03:IntEst        7.79     .148    1.42   7.84    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--
002:0006--------------------------------------------------------------------------
--
*#
*#                  Existing internal area draining to the south
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=   11.00   Curve Number   (CN)=70.00
| 04:106    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .540

     Unit Hyd Qpeak  (cms)=     .778

     PEAK FLOW       (cms)=     .146 (i)
```

```
     TIME TO PEAK    (hrs)=    1.733
     RUNOFF VOLUME    (mm)=    7.583
     TOTAL RAINFALL   (mm)=   34.271
     RUNOFF COEFFICIENT   =     .221

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

--------------------------------------------------------------------------------
--
002:0007--------------------------------------------------------------------------
--
*#=============================================================================
*# Total Pre-Development Drainage Area (Including Large External Catchments)
*#=============================================================================
*#-----------------|-------------------------------------------------------------|
*#
*#  External industrial catchment and part of Hwy 401, draining south into the
*#                       site and flowing south / east.
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| CALIB STANDHYD     |   Area    (ha)=   55.94
| 02:100    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      44.75        11.19
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.60         2.00
     Length            (m)=    1500.00        30.00
     Mannings n           =       .020         .250

     Max.eff.Inten.(mm/hr)=      58.21        37.61
               over (min)        18.00        27.00
     Storage Coeff.  (min)=      18.11 (ii)   26.90 (ii)
     Unit Hyd. Tpeak (min)=      18.00        27.00
     Unit Hyd. peak  (cms)=        .06          .04
                                                        *TOTALS*
     PEAK FLOW       (cms)=       2.84          .68         3.293 (iii)
     TIME TO PEAK    (hrs)=       1.27         1.50         1.300
     RUNOFF VOLUME    (mm)=      32.27        11.65        21.959
     TOTAL RAINFALL   (mm)=      34.27        34.27        34.271
     RUNOFF COEFFICIENT   =        .94          .34          .641

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  64.0    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.

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

```
--
002:0008-------------------------------------------------------------------------
--
*#*%-----------------|-------------------------------------------------------
*#
*#  External catchment containing a portion of Cedar Creek Road, a portion of
*#         industrial area, and a grassed area near Hwy 401 off-ramp,
*#            draining south into site and flowing south / east.
*#
*#-----------------|-------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   14.55
| 06:101    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   48.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.73         5.82
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.30         2.30
     Length            (m)=     311.45        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     109.40         8.66
               over (min)        4.00        22.00
     Storage Coeff.  (min)=       3.80 (ii)   21.80 (ii)
     Unit Hyd. Tpeak (min)=       4.00        22.00
     Unit Hyd. peak  (cms)=        .29          .05
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.57          .08         1.587 (iii)
     TIME TO PEAK    (hrs)=       1.03         1.42         1.033
     RUNOFF VOLUME    (mm)=      33.47         4.80        18.562
     TOTAL RAINFALL   (mm)=      34.27        34.27        34.271
     RUNOFF COEFFICIENT   =        .98          .14          .542

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

-------------------------------------------------------------------------------
--
002:0009-------------------------------------------------------------------------
--
*#
*# External catchment west of site, containing exisiting industrial
*# property draining into private SWM feature and then onto site flowing east
*#
*#-----------------|-------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   12.64
```

```
| 07:102    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.11         2.53
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       3.10         3.10
     Length            (m)=     290.29        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     109.40        40.60
               over (min)         3.00        12.00
     Storage Coeff.  (min)=       3.33 (ii)   12.20 (ii)
     Unit Hyd. Tpeak (min)=       3.00        12.00
     Unit Hyd. peak  (cms)=        .35          .09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.52          .17          1.577 (iii)
     TIME TO PEAK    (hrs)=       1.02         1.22          1.017
     RUNOFF VOLUME    (mm)=      33.47         8.38         20.926
     TOTAL RAINFALL   (mm)=      34.27        34.27         34.271
     RUNOFF COEFFICIENT   =        .98          .24           .611

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
002:0010--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                     Infiltration in External SWM Feature
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>07:(102   )   |
| OUT<08:(xSWinf)   |    =========  OUTLFOW STORAGE TABLE  =========
----------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                            (cms)    (ha.m.)   |    (cms)    (ha.m.)
                             .000  .0000E+00   |     .018  .3759E+00
                             .018  .4380E-01   |     .000  .0000E+00

     ROUTING RESULTS           AREA     QPEAK     TPEAK       R.V.
     --------------------      (ha)     (cms)     (hrs)       (mm)
     INFLOW >07: (102   )     12.64     1.577     1.017     20.926
     OUTFLOW<08: (xSWinf)     12.64      .018      .967     20.926
    OVERFLOW<09: (OVF-xI)       .00      .000      .000       .000
```

```
                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    1.141
                    TIME SHIFT OF PEAK FLOW         (min)=    -3.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.2478E+00

------------------------------------------------------------------------------
--
002:0011----------------------------------------------------------------------
--
*#
*#                     Total existing area draining to the east
*#
*#-----------------|------------------------------------------------------------|
------------------------
| ADD HYD (ToEast    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 02:100          55.94    3.293    1.30  21.96    .000

                     +ID2 03:IntEst        7.79     .148    1.42   7.84    .000

                     +ID3 06:101          14.55    1.587    1.03  18.56    .000

                     +ID4 09:OVF-xI         .00     .000     .00    .00    .000
**DRY**
                      ============================================================
                      SUM 05:ToEast       78.28    3.920    1.28  19.92    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
002:0012----------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*# External catchment west of the site, containing a portion of existing
*# industrial property, draining east into the site and flowing south.
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    4.52
| 01:103    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
```

```
     Surface Area     (ha)=       3.62          .90
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       5.30         5.30
     Length            (m)=     173.59        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     109.40        45.49
               over (min)         2.00         9.00
     Storage Coeff.  (min)=       2.08 (ii)    9.30 (ii)
     Unit Hyd. Tpeak (min)=       2.00         9.00
     Unit Hyd. peak  (cms)=        .54          .12
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .63          .07          .655 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.17         1.000
     RUNOFF VOLUME    (mm)=      33.47         8.38        20.926
     TOTAL RAINFALL   (mm)=      34.27        34.27        34.271
     RUNOFF COEFFICIENT   =        .98          .24          .611

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

------------------------------------------------------------------------------
--
002:0013----------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*#                            Total Flows to the south
*#
*#-----------------|------------------------------------------------------------|
-------------------------
| ADD HYD (TSouth    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
-------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 04:106          11.00     .146    1.73   7.58    .000

                     +ID2 01:103           4.52     .655    1.00  20.93    .000

                      ============================================================
                      SUM 02:TSouth       15.52     .662    1.00  11.47    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
002:0014----------------------------------------------------------------------
--
```

```
*#
*#                 Total Flows from site (eventually to Cedar Creek)
*#
*#-----------------|-------------------------------------------------------------|
------------------------
| ADD HYD (TotalF    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 05:ToEast       78.28    3.920    1.28  19.92    .000

                     +ID2 02:TSouth       15.52     .662    1.00  11.47    .000

                      ============================================================
                      SUM 03:TotalF       93.80    4.170    1.27  18.52    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--
002:0015-----------------------------------------------------------------------
--
-------------------------------------------------------------------------------
--
002:0002-----------------------------------------------------------------------
--
  ** END OF RUN :   4

*******************************************************************************




--------------------
| START            |  Project  dir.: C:\SWMHYMO\CEDARC~1\202401~4\

-------------------  Rainfall dir.: C:\SWMHYMO\CEDARC~1\202401~4\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 005
    NSTORM=   1
           #  1=Kit5yr.3hr
-------------------------------------------------------------------------------
--
005:0002-----------------------------------------------------------------------
--
*#*****************************************************************************
*#  Project Name: [2509 Cedar Creek Road SWM - Ayr, ON] Project # : [161414214]
*#  Date        : 01-25-2024
```

```
*#  Modeller    : [Amy Kyle, Water Resources Specialist]
*#  Company     : Stantec Consulting Ltd. (Waterloo)
*#  License #   : 4730904
*#
*#  This hydrologic analysis prepared to provide pond sizing
*#  for the 2509 Cedar Creek Road SWM Facility
*#  The storm events modelled are:
*#  25mm, 2, 5, 25, 50, and 100-year Chicago storms (City of Kitchener IDF)
*#  and the Regional Event
*#*************************************************************************
--------------------------------------------------------------------------------
--
005:0002--------------------------------------------------------------------------
--
--------------------
| READ STORM       |    Filename: 5-yr, 3hr Chicago Storm - Kitchener IDF
| Ptotal=  47.26 mm|    Comments: 5-yr, 3hr Chicago Storm - Kitchener IDF
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   3.031 |    .83  24.598 |   1.58  11.053 |   2.33   4.231
               .17   3.380 |    .92  57.395 |   1.67   9.458 |   2.42   3.949
               .25   3.819 |   1.00 139.288 |   1.75   8.241 |   2.50   3.701
               .33   4.385 |   1.08  72.741 |   1.83   7.286 |   2.58   3.483
               .42   5.141 |   1.17  42.120 |   1.92   6.519 |   2.67   3.288
               .50   6.195 |   1.25  28.378 |   2.00   5.892 |   2.75   3.114
               .58   7.751 |   1.33  20.884 |   2.08   5.370 |   2.83   2.957
               .67  10.239 |   1.42  16.280 |   2.17   4.930 |   2.92   2.815
               .75  14.725 |   1.50  13.216 |   2.25   4.554 |   3.00   2.687

--------------------------------------------------------------------------------
--
005:0003--------------------------------------------------------------------------
--
*#=========================================================================
*# Pre-Development Drainage Area (Internal Catchments)
*#=========================================================================
*#-----------------|---------------------------------------------------------|
*#
*#                   Existing internal area draining to the east
*#
*#-----------------|---------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    7.06   Curve Number   (CN)=71.00
| 01:105    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .817

     PEAK FLOW       (cms)=     .255 (i)
```

```
     TIME TO PEAK    (hrs)=    1.450
     RUNOFF VOLUME    (mm)=   14.005
     TOTAL RAINFALL   (mm)=   47.258
     RUNOFF COEFFICIENT   =     .296

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

-------------------------------------------------------------------------------
--
005:0004----------------------------------------------------------------------
--
*#
*#    Small external area entering site from east and draining south / east
*#
*#-----------------|-------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .73   Curve Number   (CN)=70.00
| 02:104    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .190

     Unit Hyd Qpeak  (cms)=     .147

     PEAK FLOW       (cms)=     .035 (i)
     TIME TO PEAK    (hrs)=    1.250
     RUNOFF VOLUME    (mm)=   13.542
     TOTAL RAINFALL   (mm)=   47.258
     RUNOFF COEFFICIENT   =     .287

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

-------------------------------------------------------------------------------
--
005:0005----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#                    Total existing area draining to the east
*#
*#-----------------|-------------------------------------------------------|
------------------------
| ADD HYD (IntEst    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:105            7.06     .255    1.45  14.00    .000

                    +ID2 02:104             .73     .035    1.25  13.54    .000

                     ============================================================
                     SUM 03:IntEst         7.79     .283    1.42  13.96    .000
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
--------------------------------------------------------------------------------
--
005:0006----------------------------------------------------------------------
--
*#
*#                  Existing internal area draining to the south
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=   11.00   Curve Number   (CN)=70.00
| 04:106    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .540

     Unit Hyd Qpeak  (cms)=     .778

     PEAK FLOW       (cms)=     .278 (i)
     TIME TO PEAK    (hrs)=    1.717
     RUNOFF VOLUME    (mm)=   13.542
     TOTAL RAINFALL   (mm)=   47.258
     RUNOFF COEFFICIENT   =     .287

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

--------------------------------------------------------------------------------
--
005:0007----------------------------------------------------------------------
--
*#============================================================================
*# Total Pre-Development Drainage Area (Including Large External Catchments)
*#============================================================================
*#-----------------|------------------------------------------------------------|
*#
*#  External industrial catchment and part of Hwy 401, draining south into the
*#                       site and flowing south / east.
*#
*#-----------------|------------------------------------------------------------|
----------------------
| CALIB STANDHYD     |   Area    (ha)=   55.94
| 02:100    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      44.75        11.19
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.60         2.00
     Length            (m)=    1500.00        30.00
     Mannings n           =       .020         .250

     Max.eff.Inten.(mm/hr)=      89.81        77.05
```

```
               over (min)       15.00        22.00
     Storage Coeff.  (min)=     15.23 (ii)   21.82 (ii)
     Unit Hyd. Tpeak (min)=     15.00        22.00
     Unit Hyd. peak  (cms)=       .07          .05
                                                        *TOTALS*
     PEAK FLOW       (cms)=      4.46         1.42         5.512 (iii)
     TIME TO PEAK    (hrs)=      1.23         1.42         1.283
     RUNOFF VOLUME    (mm)=     45.26        20.00        32.629
     TOTAL RAINFALL   (mm)=     47.26        47.26        47.258
     RUNOFF COEFFICIENT   =       .96          .42          .690

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  64.0    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.

--------------------------------------------------------------------------------
--
005:0008--------------------------------------------------------------------------
--
*#*%-----------------|------------------------------------------------------------
*#
*#  External catchment containing a portion of Cedar Creek Road, a portion of
*#         industrial area, and a grassed area near Hwy 401 off-ramp,
*#            draining south into site and flowing south / east.
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   14.55
| 06:101    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   48.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.73         5.82
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.30         2.30
     Length            (m)=     311.45        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     139.29        19.01
               over (min)         3.00        17.00
     Storage Coeff.  (min)=       3.45 (ii)   16.59 (ii)
     Unit Hyd. Tpeak (min)=       3.00        17.00
     Unit Hyd. peak  (cms)=        .34          .07
                                                        *TOTALS*
     PEAK FLOW       (cms)=       2.18          .19         2.214 (iii)
     TIME TO PEAK    (hrs)=       1.02         1.33         1.017
     RUNOFF VOLUME    (mm)=      46.46         8.80        26.877
     TOTAL RAINFALL   (mm)=      47.26        47.26        47.258
     RUNOFF COEFFICIENT   =        .98          .19          .569
```

```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
005:0009--------------------------------------------------------------------------
--
*#
*# External catchment west of site, containing exisiting industrial
*# property draining into private SWM feature and then onto site flowing east
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   12.64
| 07:102    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.11         2.53
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       3.10         3.10
     Length            (m)=     290.29        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     139.29        78.90
               over (min)         3.00        10.00
     Storage Coeff.  (min)=       3.02 (ii)    9.82 (ii)
     Unit Hyd. Tpeak (min)=       3.00        10.00
     Unit Hyd. peak  (cms)=        .37          .11
                                                          *TOTALS*
     PEAK FLOW       (cms)=       2.04          .35          2.179 (iii)
     TIME TO PEAK    (hrs)=       1.02         1.20          1.017
     RUNOFF VOLUME    (mm)=      46.46        14.68         30.571
     TOTAL RAINFALL   (mm)=      47.26        47.26         47.258
     RUNOFF COEFFICIENT   =        .98          .31           .647

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
005:0010--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
```

```
*#
*#                     Infiltration in External SWM Feature
*#
*#-----------------|------------------------------------------------------------|
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>07:(102   )   |
| OUT<08:(xSWinf)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .018  .3759E+00
                            .018  .4380E-01   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >07: (102   )      12.64     2.179     1.017     30.571
     OUTFLOW<08: (xSWinf)      12.64      .018      .917     30.570
    OVERFLOW<09: (OVF-xI)        .00      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=     .826
                   TIME SHIFT OF PEAK FLOW         (min)=    -6.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.3695E+00

--------------------------------------------------------------------------------
--
005:0011-----------------------------------------------------------------------
--
*#
*#                     Total existing area draining to the east
*#
*#-----------------|------------------------------------------------------------|
------------------------
| ADD HYD (ToEast    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 02:100           55.94    5.512    1.28  32.63    .000

                     +ID2 03:IntEst         7.79     .283    1.42  13.96    .000

                     +ID3 06:101           14.55    2.214    1.02  26.88    .000

                     +ID4 09:OVF-xI          .00     .000     .00    .00    .000
**DRY**
                      ============================================================
                      SUM 05:ToEast        78.28    6.604    1.25  29.70    .000
```

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

------------------------------------------------------------------------------
--
005:0012----------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*# External catchment west of the site, containing a portion of existing
*# industrial property, draining east into the site and flowing south.
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    4.52
| 01:103    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.62          .90
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       5.30         5.30
     Length            (m)=     173.59        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     139.29        81.28
               over (min)        2.00         8.00
     Storage Coeff.  (min)=       1.89 (ii)    7.61 (ii)
     Unit Hyd. Tpeak (min)=       2.00         8.00
     Unit Hyd. peak  (cms)=        .58          .15
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .82          .14          .881 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.15         1.000
     RUNOFF VOLUME    (mm)=      46.46        14.68        30.571
     TOTAL RAINFALL   (mm)=      47.26        47.26        47.258
     RUNOFF COEFFICIENT   =        .98          .31          .647

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

------------------------------------------------------------------------------
--
005:0013----------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*#                           Total Flows to the south
*#
```

```
*#-----------------|------------------------------------------------------------|
------------------------
| ADD HYD (TSouth    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 04:106          11.00     .278    1.72  13.54    .000

                     +ID2 01:103           4.52     .881    1.00  30.57    .000

                      ============================================================
                      SUM 02:TSouth       15.52     .895    1.00  18.50    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
005:0014----------------------------------------------------------------------
--
*#
*#                 Total Flows from site (eventually to Cedar Creek)
*#
*#-----------------|------------------------------------------------------------|
------------------------
| ADD HYD (TotalF    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 05:ToEast       78.28    6.604    1.25  29.70    .000

                     +ID2 02:TSouth       15.52     .895    1.00  18.50    .000

                      ============================================================
                      SUM 03:TotalF       93.80    7.048    1.25  27.85    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
005:0015----------------------------------------------------------------------
--
------------------------------------------------------------------------------
--
005:0002----------------------------------------------------------------------
--
------------------------------------------------------------------------------
--
005:0002----------------------------------------------------------------------
--
  ** END OF RUN :   9

********************************************************************************
```

```
--------------------
| START            |  Project  dir.: C:\SWMHYMO\CEDARC~1\202401~4\

--------------------  Rainfall dir.: C:\SWMHYMO\CEDARC~1\202401~4\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 010
    NSTORM=   1
           #  1=Kit10yr.3hr
--------------------------------------------------------------------------------
--
010:0002----------------------------------------------------------------------------
--
*#*****************************************************************************
*#  Project Name: [2509 Cedar Creek Road SWM - Ayr, ON] Project # : [161414214]
*#  Date        : 01-25-2024
*#  Modeller    : [Amy Kyle, Water Resources Specialist]
*#  Company     : Stantec Consulting Ltd. (Waterloo)
*#  License #   : 4730904
*#
*#  This hydrologic analysis prepared to provide pond sizing
*#  for the 2509 Cedar Creek Road SWM Facility
*#  The storm events modelled are:
*#  25mm, 2, 5, 25, 50, and 100-year Chicago storms (City of Kitchener IDF)
*#  and the Regional Event
*#*****************************************************************************
--------------------------------------------------------------------------------
--
010:0002----------------------------------------------------------------------------
--
--------------------
| READ STORM       |    Filename: 10-yr, 3hr Chicago Storm - Kitchener IDF
| Ptotal=  56.28 mm|    Comments: 10-yr, 3hr Chicago Storm - Kitchener IDF
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   3.160 |    .83  29.808 |   1.58  12.832 |   2.33   4.548
               .17   3.560 |    .92  70.748 |   1.67  10.862 |   2.42   4.218
               .25   4.067 |   1.00 169.551 |   1.75   9.368 |   2.50   3.931
               .33   4.729 |   1.08  89.762 |   1.83   8.203 |   2.58   3.678
               .42   5.623 |   1.17  51.823 |   1.92   7.274 |   2.67   3.454
               .50   6.884 |   1.25  34.566 |   2.00   6.519 |   2.75   3.255
               .58   8.770 |   1.33  25.132 |   2.08   5.895 |   2.83   3.076
               .67  11.826 |   1.42  19.351 |   2.17   5.372 |   2.92   2.915
```

```
              .75  17.407 |   1.50  15.520 |   2.25   4.928 |   3.00   2.770

--------------------------------------------------------------------------------
--
010:0003----------------------------------------------------------------------------
--
*#==============================================================================
*# Pre-Development Drainage Area (Internal Catchments)
*#==============================================================================
*#-----------------|------------------------------------------------------------|
*#
*#                   Existing internal area draining to the east
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    7.06   Curve Number   (CN)=71.00
| 01:105    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .817

     PEAK FLOW       (cms)=     .359 (i)
     TIME TO PEAK    (hrs)=    1.433
     RUNOFF VOLUME    (mm)=   18.931
     TOTAL RAINFALL   (mm)=   56.282
     RUNOFF COEFFICIENT   =     .336

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

--------------------------------------------------------------------------------
--
010:0004----------------------------------------------------------------------------
--
*#
*#    Small external area entering site from east and draining south / east
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .73   Curve Number   (CN)=70.00
| 02:104    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .190

     Unit Hyd Qpeak  (cms)=     .147

     PEAK FLOW       (cms)=     .050 (i)
     TIME TO PEAK    (hrs)=    1.250
     RUNOFF VOLUME    (mm)=   18.339
     TOTAL RAINFALL   (mm)=   56.282
     RUNOFF COEFFICIENT   =     .326
```

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

--------------------------------------------------------------------------------
--
010:0005--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                    Total existing area draining to the east
*#
*#-----------------|-------------------------------------------------------------|
------------------------
| ADD HYD (IntEst    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:105           7.06     .359    1.43  18.93    .000

                     +ID2 02:104            .73     .050    1.25  18.34    .000

                      ============================================================
                      SUM 03:IntEst        7.79     .399    1.42  18.88    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--
010:0006--------------------------------------------------------------------------
--
*#
*#                  Existing internal area draining to the south
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=   11.00   Curve Number   (CN)=70.00
| 04:106    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .540

     Unit Hyd Qpeak  (cms)=     .778

     PEAK FLOW       (cms)=     .389 (i)
     TIME TO PEAK    (hrs)=    1.717
     RUNOFF VOLUME    (mm)=   18.340
     TOTAL RAINFALL   (mm)=   56.282
     RUNOFF COEFFICIENT   =     .326

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

--------------------------------------------------------------------------------
--
010:0007--------------------------------------------------------------------------
```

```
--
*#==============================================================================
*# Total Pre-Development Drainage Area (Including Large External Catchments)
*#==============================================================================
*#-----------------|------------------------------------------------------------|
*#
*#  External industrial catchment and part of Hwy 401, draining south into the
*#                      site and flowing south / east.
*#
*#-----------------|------------------------------------------------------------|
----------------------
| CALIB STANDHYD     |   Area    (ha)=   55.94
| 02:100    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      44.75         11.19
     Dep. Storage     (mm)=       2.00          5.00
     Average Slope     (%)=       1.60          2.00
     Length            (m)=    1500.00         30.00
     Mannings n           =       .020          .250

     Max.eff.Inten.(mm/hr)=     112.83        111.58
               over (min)        14.00         20.00
     Storage Coeff.  (min)=      13.90 (ii)    19.59 (ii)
     Unit Hyd. Tpeak (min)=      14.00         20.00
     Unit Hyd. peak  (cms)=        .08           .06
                                                      *TOTALS*
     PEAK FLOW       (cms)=       5.73          2.08          7.366 (iii)
     TIME TO PEAK    (hrs)=       1.22          1.38          1.267
     RUNOFF VOLUME    (mm)=      54.28         26.44         40.362
     TOTAL RAINFALL   (mm)=      56.28         56.28         56.282
     RUNOFF COEFFICIENT   =        .96           .47           .717

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  64.0    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.

--------------------------------------------------------------------------------
--
010:0008-----------------------------------------------------------------------
--
*#*%-----------------|------------------------------------------------------------
*#
*#  External catchment containing a portion of Cedar Creek Road, a portion of
*#         industrial area, and a grassed area near Hwy 401 off-ramp,
*#            draining south into site and flowing south / east.
*#
*#-----------------|------------------------------------------------------------|
```

```
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   14.55
| 06:101    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   48.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.73         5.82
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.30         2.30
     Length            (m)=     311.45        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     169.55        29.79
               over (min)         3.00        14.00
     Storage Coeff.  (min)=       3.19 (ii)   14.17 (ii)
     Unit Hyd. Tpeak (min)=       3.00        14.00
     Unit Hyd. peak  (cms)=        .36          .08
                                                      *TOTALS*
     PEAK FLOW       (cms)=       2.71          .29         2.782 (iii)
     TIME TO PEAK    (hrs)=       1.02         1.28         1.017
     RUNOFF VOLUME    (mm)=      55.48        12.13        32.940
     TOTAL RAINFALL   (mm)=      56.28        56.28        56.282
     RUNOFF COEFFICIENT   =        .99          .22          .585

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
010:0009--------------------------------------------------------------------------
--
*#
*# External catchment west of site, containing exisiting industrial
*# property draining into private SWM feature and then onto site flowing east
*#
*#-----------------|-----------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   12.64
| 07:102    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.11         2.53
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       3.10         3.10
     Length            (m)=     290.29        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     169.55       112.10
```

```
               over (min)        3.00         9.00
     Storage Coeff.  (min)=       2.79 (ii)    8.70 (ii)
     Unit Hyd. Tpeak (min)=       3.00         9.00
     Unit Hyd. peak  (cms)=        .39          .13
                                                        *TOTALS*
     PEAK FLOW       (cms)=       2.53          .52         2.765 (iii)
     TIME TO PEAK    (hrs)=       1.02         1.17         1.017
     RUNOFF VOLUME    (mm)=      55.48        19.71        37.598
     TOTAL RAINFALL   (mm)=      56.28        56.28        56.282
     RUNOFF COEFFICIENT   =        .99          .35          .668

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
010:0010--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                     Infiltration in External SWM Feature
*#
*#-----------------|-------------------------------------------------------------|
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>07:(102   )   |
| OUT<08:(xSWinf)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .018  .3759E+00
                            .018  .4380E-01   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >07: (102   )      12.64     2.765     1.017     37.598
     OUTFLOW<08: (xSWinf)      10.45      .018      .883     37.596
    OVERFLOW<09: (OVF-xI)       2.19      .422     1.600     37.598

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        2
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=     1.57
                    PERCENTAGE OF TIME OVERFLOWING    (%)=     1.15


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=     .651
                    TIME SHIFT OF PEAK FLOW         (min)=    -8.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.3759E+00
```

```
--------------------------------------------------------------------------------
--
010:0011----------------------------------------------------------------------
--
*#
*#                     Total existing area draining to the east
*#
*#-----------------|-------------------------------------------------------|
------------------------
| ADD HYD (ToEast    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 02:100          55.94    7.366    1.27  40.36    .000

                     +ID2 03:IntEst        7.79     .399    1.42  18.88    .000

                     +ID3 06:101          14.55    2.782    1.02  32.94    .000

                     +ID4 09:OVF-xI        2.19     .422    1.60  37.60    .000

                      =======================================================
                      SUM 05:ToEast       80.47    8.840    1.22  36.86    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--
010:0012----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*# External catchment west of the site, containing a portion of existing
*# industrial property, draining east into the site and flowing south.
*#
*#-----------------|-------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    4.52
| 01:103    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.62          .90
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       5.30         5.30
     Length            (m)=     173.59        40.00
     Mannings n             =       .013         .250

     Max.eff.Inten.(mm/hr)=     169.55       117.15
               over (min)        2.00         7.00
     Storage Coeff.  (min)=       1.75 (ii)    6.69 (ii)
     Unit Hyd. Tpeak (min)=       2.00         7.00
```

```
     Unit Hyd. peak  (cms)=        .61          .17
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.01          .21          1.112 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.12          1.000
     RUNOFF VOLUME    (mm)=      55.48        19.71         37.598
     TOTAL RAINFALL   (mm)=      56.28        56.28         56.282
     RUNOFF COEFFICIENT   =        .99          .35           .668

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
010:0013---------------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*#                            Total Flows to the south
*#
*#-----------------|------------------------------------------------------------|
------------------------
| ADD HYD (TSouth    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 04:106          11.00     .389    1.72  18.34    .000

                     +ID2 01:103           4.52    1.112    1.00  37.60    .000

                      ============================================================
                      SUM 02:TSouth       15.52    1.133    1.00  23.95    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--
010:0014---------------------------------------------------------------------------
--
*#
*#                 Total Flows from site (eventually to Cedar Creek)
*#
*#-----------------|------------------------------------------------------------|
------------------------
| ADD HYD (TotalF    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 05:ToEast       80.47    8.840    1.22  36.86    .000

                     +ID2 02:TSouth       15.52    1.133    1.00  23.95    .000
```

```
                    ============================================================
                    SUM 03:TotalF        95.99    9.434    1.22  34.78    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--
010:0015--------------------------------------------------------------------------
--
--------------------------------------------------------------------------------
--
010:0002--------------------------------------------------------------------------
--
--------------------------------------------------------------------------------
--
010:0002--------------------------------------------------------------------------
--
--------------------------------------------------------------------------------
--
010:0002--------------------------------------------------------------------------
--
  ** END OF RUN :  24

********************************************************************************




--------------------
| START            |  Project  dir.: C:\SWMHYMO\CEDARC~1\202401~4\

--------------------  Rainfall dir.: C:\SWMHYMO\CEDARC~1\202401~4\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 025
    NSTORM=   1
           #  1=Kit25yr.3hr
--------------------------------------------------------------------------------
--
025:0002--------------------------------------------------------------------------
--
*#*****************************************************************************
*#  Project Name: [2509 Cedar Creek Road SWM - Ayr, ON] Project # : [161414214]
*#  Date        : 01-25-2024
*#  Modeller    : [Amy Kyle, Water Resources Specialist]
*#  Company     : Stantec Consulting Ltd. (Waterloo)
```

```
*#  License #   : 4730904
*#
*#  This hydrologic analysis prepared to provide pond sizing
*#  for the 2509 Cedar Creek Road SWM Facility
*#  The storm events modelled are:
*#  25mm, 2, 5, 25, 50, and 100-year Chicago storms (City of Kitchener IDF)
*#  and the Regional Event
*#*************************************************************************
-------------------------------------------------------------------------------
--
025:0002----------------------------------------------------------------------
--
--------------------
| READ STORM       |    Filename: 25-yr, 3hr Chicago Storm - Kitchener IDF
| Ptotal=  68.26 mm|    Comments: 25-yr, 3hr Chicago Storm - Kitchener IDF
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   3.567 |    .83  38.324 |   1.58  16.257 |   2.33   5.336
               .17   4.072 |    .92  87.426 |   1.67  13.647 |   2.42   4.912
               .25   4.719 |   1.00 191.557 |   1.75  11.668 |   2.50   4.544
               .33   5.571 |   1.08 109.318 |   1.83  10.127 |   2.58   4.222
               .42   6.733 |   1.17  65.637 |   1.92   8.900 |   2.67   3.938
               .50   8.387 |   1.25  44.391 |   2.00   7.906 |   2.75   3.686
               .58  10.876 |   1.33  32.362 |   2.08   7.088 |   2.83   3.461
               .67  14.925 |   1.42  24.846 |   2.17   6.405 |   2.92   3.260
               .75  22.291 |   1.50  19.811 |   2.25   5.829 |   3.00   3.079

-------------------------------------------------------------------------------
--
025:0003----------------------------------------------------------------------
--
*#=========================================================================
*# Pre-Development Drainage Area (Internal Catchments)
*#=========================================================================
*#-----------------|-------------------------------------------------------|
*#
*#                   Existing internal area draining to the east
*#
*#-----------------|-------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    7.06   Curve Number   (CN)=71.00
| 01:105    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .817

     PEAK FLOW       (cms)=     .498 (i)
     TIME TO PEAK    (hrs)=    1.450
     RUNOFF VOLUME    (mm)=   26.137
```

```
     TOTAL RAINFALL   (mm)=   68.256
     RUNOFF COEFFICIENT   =     .383

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

------------------------------------------------------------------------------
--
025:0004--------------------------------------------------------------------
--
*#
*#    Small external area entering site from east and draining south / east
*#
*#-----------------|-------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .73   Curve Number   (CN)=70.00
| 02:104    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .190

     Unit Hyd Qpeak  (cms)=     .147

     PEAK FLOW       (cms)=     .068 (i)
     TIME TO PEAK    (hrs)=    1.250
     RUNOFF VOLUME    (mm)=   25.376
     TOTAL RAINFALL   (mm)=   68.256
     RUNOFF COEFFICIENT   =     .372

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

------------------------------------------------------------------------------
--
025:0005--------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#                    Total existing area draining to the east
*#
*#-----------------|-------------------------------------------------------|
------------------------
| ADD HYD (IntEst    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:105           7.06     .498    1.45  26.14    .000

                     +ID2 02:104            .73     .068    1.25  25.38    .000

                      ============================================================
                      SUM 03:IntEst        7.79     .553    1.42  26.07    .000


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

```
--------------------------------------------------------------------------------
--
025:0006--------------------------------------------------------------------------
--
*#
*#                  Existing internal area draining to the south
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=   11.00   Curve Number   (CN)=70.00
| 04:106    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .540

     Unit Hyd Qpeak  (cms)=     .778

     PEAK FLOW       (cms)=     .544 (i)
     TIME TO PEAK    (hrs)=    1.717
     RUNOFF VOLUME    (mm)=   25.376
     TOTAL RAINFALL   (mm)=   68.256
     RUNOFF COEFFICIENT   =     .372

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

--------------------------------------------------------------------------------
--
025:0007--------------------------------------------------------------------------
--
*#============================================================================
*# Total Pre-Development Drainage Area (Including Large External Catchments)
*#============================================================================
*#-----------------|------------------------------------------------------------|
*#
*#  External industrial catchment and part of Hwy 401, draining south into the
*#                      site and flowing south / east.
*#
*#-----------------|------------------------------------------------------------|
----------------------
| CALIB STANDHYD     |   Area    (ha)=   55.94
| 02:100    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      44.75        11.19
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.60         2.00
     Length            (m)=    1500.00        30.00
     Mannings n           =       .020         .250

     Max.eff.Inten.(mm/hr)=     135.90       155.96
               over (min)       13.00        18.00
     Storage Coeff.  (min)=      12.90 (ii)   17.88 (ii)
```

```
     Unit Hyd. Tpeak (min)=      13.00        18.00
     Unit Hyd. peak  (cms)=        .09          .06
                                                          *TOTALS*
     PEAK FLOW       (cms)=       7.08         2.96          9.560 (iii)
     TIME TO PEAK    (hrs)=       1.20         1.35          1.250
     RUNOFF VOLUME    (mm)=      66.25        35.57         50.915
     TOTAL RAINFALL   (mm)=      68.26        68.26         68.256
     RUNOFF COEFFICIENT   =        .97          .52           .746

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  64.0    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.

--------------------------------------------------------------------------------
--
025:0008--------------------------------------------------------------------------
--
*#*%-----------------|------------------------------------------------------------
*#
*#  External catchment containing a portion of Cedar Creek Road, a portion of
*#         industrial area, and a grassed area near Hwy 401 off-ramp,
*#            draining south into site and flowing south / east.
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   14.55
| 06:101    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   48.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.73         5.82
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.30         2.30
     Length            (m)=     311.45        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     191.56        42.07
               over (min)        3.00        13.00
     Storage Coeff.  (min)=       3.03 (ii)   12.60 (ii)
     Unit Hyd. Tpeak (min)=       3.00        13.00
     Unit Hyd. peak  (cms)=        .37          .09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       3.14          .44          3.259 (iii)
     TIME TO PEAK    (hrs)=       1.02         1.27          1.017
     RUNOFF VOLUME    (mm)=      67.46        17.15         41.299
     TOTAL RAINFALL   (mm)=      68.26        68.26         68.256
     RUNOFF COEFFICIENT   =        .99          .25           .605

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
```

```
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
025:0009--------------------------------------------------------------------------
--
*#
*# External catchment west of site, containing exisiting industrial
*# property draining into private SWM feature and then onto site flowing east
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   12.64
| 07:102    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.11          2.53
     Dep. Storage     (mm)=        .80          1.50
     Average Slope     (%)=       3.10          3.10
     Length            (m)=     290.29         40.00
     Mannings n             =       .013          .250

     Max.eff.Inten.(mm/hr)=     191.56        150.65
               over (min)         3.00          8.00
     Storage Coeff.  (min)=       2.66 (ii)     7.91 (ii)
     Unit Hyd. Tpeak (min)=       3.00          8.00
     Unit Hyd. peak  (cms)=        .41           .14
                                                          *TOTALS*
     PEAK FLOW       (cms)=       2.92           .73           3.301 (iii)
     TIME TO PEAK    (hrs)=       1.02          1.17           1.017
     RUNOFF VOLUME    (mm)=      67.46         27.04          47.250
     TOTAL RAINFALL   (mm)=      68.26         68.26          68.256
     RUNOFF COEFFICIENT   =        .99           .40            .692

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
025:0010--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                     Infiltration in External SWM Feature
```

```
*#
*#-----------------|------------------------------------------------------------|
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>07:(102   )   |
| OUT<08:(xSWinf)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .018  .3759E+00
                            .018  .4380E-01   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >07: (102   )      12.64     3.301     1.017     47.250
     OUTFLOW<08: (xSWinf)       8.32      .018      .850     47.249
    OVERFLOW<09: (OVF-xI)       4.32     1.421     1.283     47.250

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        4
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=     1.87
                    PERCENTAGE OF TIME OVERFLOWING    (%)=     1.37


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=     .545
                    TIME SHIFT OF PEAK FLOW         (min)=   -10.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.3759E+00

-------------------------------------------------------------------------------
--
025:0011--------------------------------------------------------------------------
--
*#
*#                      Total existing area draining to the east
*#
*#-----------------|------------------------------------------------------------|
------------------------
| ADD HYD (ToEast    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 02:100          55.94    9.560    1.25  50.91    .000

                     +ID2 03:IntEst        7.79     .553    1.42  26.07    .000

                     +ID3 06:101          14.55    3.259    1.02  41.30    .000

                     +ID4 09:OVF-xI        4.32    1.421    1.28  47.25    .000

                      ============================================================
                      SUM 05:ToEast       82.60   12.689    1.28  46.69    .000


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

```
--------------------------------------------------------------------------------
--
025:0012--------------------------------------------------------------------------
--
*#----------------|------------------------------------------------------------|
*#
*# External catchment west of the site, containing a portion of existing
*# industrial property, draining east into the site and flowing south.
*#
*#----------------|------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    4.52
| 01:103    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.62          .90
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       5.30         5.30
     Length            (m)=     173.59        40.00
     Mannings n             =       .013         .250

     Max.eff.Inten.(mm/hr)=     191.56       159.27
               over (min)        2.00         6.00
     Storage Coeff.  (min)=       1.66 (ii)    6.04 (ii)
     Unit Hyd. Tpeak (min)=       2.00         6.00
     Unit Hyd. peak  (cms)=        .63          .19
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.15          .29         1.319 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.12         1.000
     RUNOFF VOLUME    (mm)=      67.46        27.04        47.250
     TOTAL RAINFALL   (mm)=      68.26        68.26        68.256
     RUNOFF COEFFICIENT   =        .99          .40          .692

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
025:0013--------------------------------------------------------------------------
--
*#----------------|------------------------------------------------------------|
*#
*#                           Total Flows to the south
*#
*#----------------|------------------------------------------------------------|
------------------------
```

ADD HYD (TSouth)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID1 04:106	11.00	.544	1.72	25.38	.000
	+ID2 01:103	4.52	1.319	1.00	47.25	.000
	SUM 02:TSouth	15.52	1.350	1.00	31.75	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

025:0014

*#
*# Total Flows from site (eventually to Cedar Creek)
*#

ADD HYD (TotalF)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID1 05:ToEast	82.60	12.689	1.28	46.69	.000
	+ID2 02:TSouth	15.52	1.350	1.00	31.75	.000
	SUM 03:TotalF	98.12	13.432	1.28	44.32	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

025:0015

025:0002

025:0002

025:0002

```
--
025:0002--------------------------------------------------------------------------
--
  ** END OF RUN :  49

********************************************************************************




--------------------
| START            |  Project  dir.: C:\SWMHYMO\CEDARC~1\202401~4\

--------------------  Rainfall dir.: C:\SWMHYMO\CEDARC~1\202401~4\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 050
    NSTORM=   1
           #  1=Kit50yr.3hr
--------------------------------------------------------------------------------
--
050:0002--------------------------------------------------------------------------
--
*#*****************************************************************************
*#  Project Name: [2509 Cedar Creek Road SWM - Ayr, ON] Project # : [161414214]
*#  Date        : 01-25-2024
*#  Modeller    : [Amy Kyle, Water Resources Specialist]
*#  Company     : Stantec Consulting Ltd. (Waterloo)
*#  License #   : 4730904
*#
*#  This hydrologic analysis prepared to provide pond sizing
*#  for the 2509 Cedar Creek Road SWM Facility
*#  The storm events modelled are:
*#  25mm, 2, 5, 25, 50, and 100-year Chicago storms (City of Kitchener IDF)
*#  and the Regional Event
*#*****************************************************************************
--------------------------------------------------------------------------------
--
050:0002--------------------------------------------------------------------------
--
--------------------
| READ STORM       |    Filename: 50-yr, 3hr Chicago Storm - Kitchener IDF
| Ptotal=  77.24 mm|    Comments: 50-yr, 3hr Chicago Storm - Kitchener IDF
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   3.816 |    .83  44.095 |   1.58  18.483 |   2.33   5.829
               .17   4.387 |    .92  99.987 |   1.67  15.446 |   2.42   5.344
```

```
              .25   5.123 |   1.00 214.691 |   1.75  13.144 |   2.50   4.924
              .33   6.098 |   1.08 124.641 |   1.83  11.355 |   2.58   4.558
              .42   7.433 |   1.17  75.450 |   1.92   9.934 |   2.67   4.235
              .50   9.341 |   1.25  51.107 |   2.00   8.785 |   2.75   3.950
              .58  12.226 |   1.33  37.204 |   2.08   7.841 |   2.83   3.697
              .67  16.932 |   1.42  28.478 |   2.17   7.055 |   2.92   3.470
              .75  25.505 |   1.50  22.619 |   2.25   6.393 |   3.00   3.267

------------------------------------------------------------------------------
--
050:0003----------------------------------------------------------------------
--
*#============================================================================
*# Pre-Development Drainage Area (Internal Catchments)
*#============================================================================
*#-----------------|----------------------------------------------------------|
*#
*#                   Existing internal area draining to the east
*#
*#-----------------|----------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    7.06   Curve Number   (CN)=71.00
| 01:105    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .817

     PEAK FLOW       (cms)=     .616 (i)
     TIME TO PEAK    (hrs)=    1.450
     RUNOFF VOLUME    (mm)=   31.959
     TOTAL RAINFALL   (mm)=   77.237
     RUNOFF COEFFICIENT   =     .414

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

------------------------------------------------------------------------------
--
050:0004----------------------------------------------------------------------
--
*#
*#    Small external area entering site from east and draining south / east
*#
*#-----------------|----------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .73   Curve Number   (CN)=70.00
| 02:104    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .190

     Unit Hyd Qpeak  (cms)=     .147
```

```
     PEAK FLOW       (cms)=     .084 (i)
     TIME TO PEAK    (hrs)=    1.250
     RUNOFF VOLUME    (mm)=   31.074
     TOTAL RAINFALL   (mm)=   77.237
     RUNOFF COEFFICIENT   =     .402

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

------------------------------------------------------------------------------
--
050:0005----------------------------------------------------------------------
--
*#-----------------|--------------------------------------------------------|
*#
*#                    Total existing area draining to the east
*#
*#-----------------|--------------------------------------------------------|
------------------------
| ADD HYD (IntEst    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:105           7.06     .616    1.45  31.96    .000

                     +ID2 02:104            .73     .084    1.25  31.07    .000

                      ============================================================
                      SUM 03:IntEst         7.79     .684    1.42  31.88    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
050:0006----------------------------------------------------------------------
--
*#
*#                  Existing internal area draining to the south
*#
*#-----------------|--------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=   11.00   Curve Number   (CN)=70.00
| 04:106    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .540

     Unit Hyd Qpeak  (cms)=     .778

     PEAK FLOW       (cms)=     .673 (i)
     TIME TO PEAK    (hrs)=    1.717
     RUNOFF VOLUME    (mm)=   31.074
     TOTAL RAINFALL   (mm)=   77.237
     RUNOFF COEFFICIENT   =     .402
```

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

--------------------------------------------------------------------------------
--
050:0007--------------------------------------------------------------------------
--
*#=============================================================================
*# Total Pre-Development Drainage Area (Including Large External Catchments)
*#=============================================================================
*#-----------------|-------------------------------------------------------------|
*#
*#  External industrial catchment and part of Hwy 401, draining south into the
*#                       site and flowing south / east.
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| CALIB STANDHYD     |   Area    (ha)=   55.94
| 02:100    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      44.75         11.19
     Dep. Storage     (mm)=       2.00          5.00
     Average Slope     (%)=       1.60          2.00
     Length            (m)=    1500.00         30.00
     Mannings n           =       .020          .250

     Max.eff.Inten.(mm/hr)=     158.05        194.43
               over (min)        12.00         17.00
     Storage Coeff.  (min)=      12.15 (ii)    16.70 (ii)
     Unit Hyd. Tpeak (min)=      12.00         17.00
     Unit Hyd. peak  (cms)=        .09           .07
                                                          *TOTALS*
     PEAK FLOW       (cms)=       8.29          3.74          11.442 (iii)
     TIME TO PEAK    (hrs)=       1.18          1.32           1.233
     RUNOFF VOLUME    (mm)=      75.23         42.76          58.997
     TOTAL RAINFALL   (mm)=      77.24         77.24          77.237
     RUNOFF COEFFICIENT   =        .97           .55            .764

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  64.0    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.

--------------------------------------------------------------------------------
--
050:0008--------------------------------------------------------------------------
--
*#*%-----------------|-------------------------------------------------------------
```

```
*#
*#  External catchment containing a portion of Cedar Creek Road, a portion of
*#         industrial area, and a grassed area near Hwy 401 off-ramp,
*#            draining south into site and flowing south / east.
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   14.55
| 06:101    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   48.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.73         5.82
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.30         2.30
     Length            (m)=     311.45        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     214.69        54.05
               over (min)        3.00        12.00
     Storage Coeff.  (min)=       2.90 (ii)   11.55 (ii)
     Unit Hyd. Tpeak (min)=       3.00        12.00
     Unit Hyd. peak  (cms)=        .38          .10
                                                      *TOTALS*
     PEAK FLOW       (cms)=       3.56          .57         3.739 (iii)
     TIME TO PEAK    (hrs)=       1.02         1.25         1.017
     RUNOFF VOLUME    (mm)=      76.44        21.32        47.778
     TOTAL RAINFALL   (mm)=      77.24        77.24        77.237
     RUNOFF COEFFICIENT   =        .99          .28          .619

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
050:0009--------------------------------------------------------------------------
--
*#
*# External catchment west of site, containing exisiting industrial
*# property draining into private SWM feature and then onto site flowing east
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   12.64
| 07:102    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.11         2.53
```

```
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       3.10         3.10
     Length            (m)=     290.29        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     214.69       188.85
               over (min)         3.00         7.00
     Storage Coeff.  (min)=       2.54 (ii)    7.34 (ii)
     Unit Hyd. Tpeak (min)=       3.00         7.00
     Unit Hyd. peak  (cms)=        .42          .16
                                                          *TOTALS*
     PEAK FLOW       (cms)=       3.30          .93          3.858 (iii)
     TIME TO PEAK    (hrs)=       1.02         1.13          1.017
     RUNOFF VOLUME    (mm)=      76.44        32.95         54.694
     TOTAL RAINFALL   (mm)=      77.24        77.24         77.237
     RUNOFF COEFFICIENT   =        .99          .43           .708

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

------------------------------------------------------------------------------
--
050:0010--------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#                     Infiltration in External SWM Feature
*#
*#-----------------|-------------------------------------------------------|
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>07:(102   )   |
| OUT<08:(xSWinf)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .018  .3759E+00
                            .018  .4380E-01   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >07: (102   )      12.64     3.858     1.017     54.694
     OUTFLOW<08: (xSWinf)       7.19      .018      .817     54.693
    OVERFLOW<09: (OVF-xI)       5.45     2.263     1.200     54.694

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        2
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=     1.97
                    PERCENTAGE OF TIME OVERFLOWING    (%)=     1.44
```

```
                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=     .467
                    TIME SHIFT OF PEAK FLOW         (min)=   -12.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.3759E+00

--------------------------------------------------------------------------------
--
050:0011----------------------------------------------------------------------
--
*#
*#                      Total existing area draining to the east
*#
*#-----------------|-------------------------------------------------------|
------------------------
| ADD HYD (ToEast    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 02:100          55.94   11.442    1.23  59.00    .000

                     +ID2 03:IntEst        7.79     .684    1.42  31.88    .000

                     +ID3 06:101          14.55    3.739    1.02  47.78    .000

                     +ID4 09:OVF-xI        5.45    2.263    1.20  54.69    .000

                      ========================================================
                      SUM 05:ToEast       83.73   16.169    1.20  54.24    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--
050:0012----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*# External catchment west of the site, containing a portion of existing
*# industrial property, draining east into the site and flowing south.
*#
*#-----------------|-------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    4.52
| 01:103    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.62          .90
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       5.30         5.30
     Length            (m)=     173.59        40.00
```

```
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     214.69       195.13
               over (min)        2.00         6.00
     Storage Coeff.  (min)=       1.59 (ii)    5.62 (ii)
     Unit Hyd. Tpeak (min)=       2.00         6.00
     Unit Hyd. peak  (cms)=        .64          .20
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.30          .36          1.513 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.10          1.000
     RUNOFF VOLUME    (mm)=      76.44        32.95         54.694
     TOTAL RAINFALL   (mm)=      77.24        77.24         77.237
     RUNOFF COEFFICIENT   =        .99          .43           .708

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

------------------------------------------------------------------------------
--
050:0013----------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*#                            Total Flows to the south
*#
*#-----------------|------------------------------------------------------------|
------------------------
| ADD HYD (TSouth    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 04:106          11.00     .673    1.72  31.07    .000

                     +ID2 01:103           4.52    1.513    1.00  54.69    .000

                      ============================================================
                      SUM 02:TSouth       15.52    1.554    1.00  37.95    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
050:0014----------------------------------------------------------------------
--
*#
*#                Total Flows from site (eventually to Cedar Creek)
*#
*#-----------------|------------------------------------------------------------|
```

```
------------------------
| ADD HYD (TotalF    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 05:ToEast       83.73   16.169    1.20  54.24    .000

                     +ID2 02:TSouth       15.52    1.554    1.00  37.95    .000

                      ============================================================
                      SUM 03:TotalF       99.25   17.136    1.20  51.70    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
050:0015----------------------------------------------------------------------
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------------------------------------------------------------------------------
--
050:0002----------------------------------------------------------------------
--
------------------------------------------------------------------------------
--
050:0002----------------------------------------------------------------------
--
------------------------------------------------------------------------------
--
050:0002----------------------------------------------------------------------
--
------------------------------------------------------------------------------
--
050:0002----------------------------------------------------------------------
--
------------------------------------------------------------------------------
--
050:0002----------------------------------------------------------------------
--
  ** END OF RUN :  99

********************************************************************************




--------------------
| START            |  Project  dir.: C:\SWMHYMO\CEDARC~1\202401~4\

--------------------  Rainfall dir.: C:\SWMHYMO\CEDARC~1\202401~4\
```

```
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 100
    NSTORM=   1
           #  1=Kit100yr.3hr
--------------------------------------------------------------------------------
--
100:0002--------------------------------------------------------------------------
--
*#*****************************************************************************
*#  Project Name: [2509 Cedar Creek Road SWM - Ayr, ON] Project # : [161414214]
*#  Date        : 01-25-2024
*#  Modeller    : [Amy Kyle, Water Resources Specialist]
*#  Company     : Stantec Consulting Ltd. (Waterloo)
*#  License #   : 4730904
*#
*#  This hydrologic analysis prepared to provide pond sizing
*#  for the 2509 Cedar Creek Road SWM Facility
*#  The storm events modelled are:
*#  25mm, 2, 5, 25, 50, and 100-year Chicago storms (City of Kitchener IDF)
*#  and the Regional Event
*#*****************************************************************************
--------------------------------------------------------------------------------
--
100:0002--------------------------------------------------------------------------
--
--------------------
| READ STORM       |    Filename: 100-yr, 3hr Chicago Storm - Kitchener ID
| Ptotal=  87.07 mm|    Comments: 100-yr, 3hr Chicago Storm - Kitchener ID
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.08	4.087	.83	50.502	1.58	20.973	2.33	6.373
.17	4.733	.92	113.675	1.67	17.458	2.42	5.820
.25	5.569	1.00	239.354	1.75	14.796	2.50	5.342
.33	6.681	1.08	141.249	1.83	12.729	2.58	4.926
.42	8.210	1.17	86.233	1.92	11.089	2.67	4.561
.50	10.405	1.25	58.548	2.00	9.765	2.75	4.239
.58	13.734	1.33	42.595	2.08	8.679	2.83	3.953
.67	19.179	1.42	32.533	2.17	7.777	2.92	3.698
.75	29.096	1.50	25.760	2.25	7.018	3.00	3.469

```
--------------------------------------------------------------------------------
--
100:0003--------------------------------------------------------------------------
--
*#==============================================================================
*# Pre-Development Drainage Area (Internal Catchments)
*#==============================================================================
*#-----------------|------------------------------------------------------------|
```

```
*#
*#                   Existing internal area draining to the east
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    7.06   Curve Number   (CN)=71.00
| 01:105    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .817

     PEAK FLOW       (cms)=     .752 (i)
     TIME TO PEAK    (hrs)=    1.433
     RUNOFF VOLUME    (mm)=   38.675
     TOTAL RAINFALL   (mm)=   87.067
     RUNOFF COEFFICIENT   =     .444

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

------------------------------------------------------------------------------
--
100:0004---------------------------------------------------------------------
--
*#
*#    Small external area entering site from east and draining south / east
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .73   Curve Number   (CN)=70.00
| 02:104    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .190

     Unit Hyd Qpeak  (cms)=     .147

     PEAK FLOW       (cms)=     .103 (i)
     TIME TO PEAK    (hrs)=    1.250
     RUNOFF VOLUME    (mm)=   37.658
     TOTAL RAINFALL   (mm)=   87.067
     RUNOFF COEFFICIENT   =     .433

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

------------------------------------------------------------------------------
--
100:0005---------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                    Total existing area draining to the east
*#
```

```
*#-----------------|-------------------------------------------------------|
------------------------
| ADD HYD (IntEst    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:105           7.06     .752    1.43  38.68    .000

                     +ID2 02:104            .73     .103    1.25  37.66    .000

                      ===========================================================
                      SUM 03:IntEst        7.79     .836    1.42  38.58    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--
100:0006----------------------------------------------------------------------
--
*#
*#                  Existing internal area draining to the south
*#
*#-----------------|-------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=   11.00   Curve Number   (CN)=70.00
| 04:106    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .540

     Unit Hyd Qpeak  (cms)=     .778

     PEAK FLOW       (cms)=     .823 (i)
     TIME TO PEAK    (hrs)=    1.700
     RUNOFF VOLUME    (mm)=   37.659
     TOTAL RAINFALL   (mm)=   87.067
     RUNOFF COEFFICIENT   =     .433

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

-------------------------------------------------------------------------------
--
100:0007----------------------------------------------------------------------
--
*#============================================================================
*# Total Pre-Development Drainage Area (Including Large External Catchments)
*#============================================================================
*#-----------------|-------------------------------------------------------|
*#
*#  External industrial catchment and part of Hwy 401, draining south into the
*#                      site and flowing south / east.
*#
*#-----------------|-------------------------------------------------------|
```

```
----------------------
| CALIB STANDHYD     |   Area    (ha)=   55.94
| 02:100    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      44.75         11.19
     Dep. Storage     (mm)=       2.00          5.00
     Average Slope     (%)=       1.60          2.00
     Length            (m)=    1500.00         30.00
     Mannings n           =       .020          .250

     Max.eff.Inten.(mm/hr)=     177.53        239.93
               over (min)       12.00         16.00
     Storage Coeff.  (min)=      11.60 (ii)    15.78 (ii)
     Unit Hyd. Tpeak (min)=      12.00         16.00
     Unit Hyd. peak  (cms)=        .10           .07
                                                      *TOTALS*
     PEAK FLOW       (cms)=       9.52          4.63         13.580 (iii)
     TIME TO PEAK    (hrs)=       1.18          1.30          1.217
     RUNOFF VOLUME    (mm)=      85.06         50.88         67.975
     TOTAL RAINFALL   (mm)=      87.07         87.07         87.067
     RUNOFF COEFFICIENT   =        .98           .58           .781

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  64.0    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.

--------------------------------------------------------------------------------
--
100:0008--------------------------------------------------------------------------
--
*#*%-----------------|------------------------------------------------------------
*#
*#  External catchment containing a portion of Cedar Creek Road, a portion of
*#         industrial area, and a grassed area near Hwy 401 off-ramp,
*#            draining south into site and flowing south / east.
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   14.55
| 06:101    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   48.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.73          5.82
     Dep. Storage     (mm)=        .80          1.50
     Average Slope     (%)=       2.30          2.30
     Length            (m)=     311.45         40.00
     Mannings n           =       .013          .250
```

```
     Max.eff.Inten.(mm/hr)=     239.35        68.89
               over (min)        3.00        11.00
     Storage Coeff.  (min)=       2.77 (ii)   10.63 (ii)
     Unit Hyd. Tpeak (min)=       3.00        11.00
     Unit Hyd. peak  (cms)=        .39          .11
                                                          *TOTALS*
     PEAK FLOW       (cms)=       4.01          .73          4.274 (iii)
     TIME TO PEAK    (hrs)=       1.02         1.23          1.017
     RUNOFF VOLUME    (mm)=      86.27        26.24         55.053
     TOTAL RAINFALL   (mm)=      87.07        87.07         87.067
     RUNOFF COEFFICIENT   =        .99          .30           .632

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
100:0009----------------------------------------------------------------------
--
*#
*# External catchment west of site, containing exisiting industrial
*# property draining into private SWM feature and then onto site flowing east
*#
*#-----------------|-------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   12.64
| 07:102    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.11          2.53
     Dep. Storage     (mm)=        .80          1.50
     Average Slope     (%)=       3.10          3.10
     Length            (m)=     290.29         40.00
     Mannings n           =       .013          .250

     Max.eff.Inten.(mm/hr)=     239.35       228.73
               over (min)        2.00          7.00
     Storage Coeff.  (min)=       2.43 (ii)    6.88 (ii)
     Unit Hyd. Tpeak (min)=       2.00          7.00
     Unit Hyd. peak  (cms)=        .49           .16
                                                          *TOTALS*
     PEAK FLOW       (cms)=       3.81          1.15          4.403 (iii)
     TIME TO PEAK    (hrs)=       1.00          1.13          1.017
     RUNOFF VOLUME    (mm)=      86.27        39.75         63.011
     TOTAL RAINFALL   (mm)=      87.07        87.07         87.067
     RUNOFF COEFFICIENT   =        .99          .46           .724
```

```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
100:0010--------------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*#                      Infiltration in External SWM Feature
*#
*#-----------------|------------------------------------------------------------|
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>07:(102   )   |
| OUT<08:(xSWinf)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .018  .3759E+00
                            .018  .4380E-01   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >07: (102   )      12.64     4.403     1.017     63.011
     OUTFLOW<08: (xSWinf)       6.24      .018      .783     63.010
    OVERFLOW<09: (OVF-xI)       6.40     3.189     1.133     63.011

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        2
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=     2.02
                    PERCENTAGE OF TIME OVERFLOWING    (%)=     1.48


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=     .409
                    TIME SHIFT OF PEAK FLOW         (min)=   -14.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.3759E+00

--------------------------------------------------------------------------------
--
100:0011--------------------------------------------------------------------------
--
*#
*#                      Total existing area draining to the east
*#
*#-----------------|------------------------------------------------------------|
------------------------
| ADD HYD (ToEast    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
```

```
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 02:100           55.94   13.580    1.22  67.98    .000

                     +ID2 03:IntEst         7.79     .836    1.42  38.58    .000

                     +ID3 06:101           14.55    4.274    1.02  55.05    .000

                     +ID4 09:OVF-xI         6.40    3.189    1.13  63.01    .000

                      ============================================================
                      SUM 05:ToEast        84.68   19.260    1.18  62.68    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
100:0012----------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*# External catchment west of the site, containing a portion of existing
*# industrial property, draining east into the site and flowing south.
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    4.52
| 01:103    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.62          .90
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       5.30         5.30
     Length            (m)=     173.59        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     239.35       247.90
               over (min)        2.00         5.00
     Storage Coeff.  (min)=       1.52 (ii)    5.19 (ii)
     Unit Hyd. Tpeak (min)=       2.00         5.00
     Unit Hyd. peak  (cms)=        .66          .22
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.46          .46          1.767 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.08          1.000
     RUNOFF VOLUME    (mm)=      86.27        39.75         63.011
     TOTAL RAINFALL   (mm)=      87.07        87.07         87.067
     RUNOFF COEFFICIENT   =        .99          .46           .724

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

100:0013---
*#----------|----------|
*#
*# Total Flows to the south
*#
*#----------|----------|

ADD HYD (TSouth)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
ID1 04:106	11.00	.823	1.70	37.66	.000
+ID2 01:103	4.52	1.767	1.00	63.01	.000
SUM 02:TSouth	15.52	1.819	1.00	45.04	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

100:0014---
*#
*# Total Flows from site (eventually to Cedar Creek)
*#
*#----------|----------|

ADD HYD (TotalF)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
ID1 05:ToEast	84.68	19.260	1.18	62.68	.000
+ID2 02:TSouth	15.52	1.819	1.00	45.04	.000
SUM 03:TotalF	100.20	20.460	1.18	59.94	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

100:0015---

```
--
------------------------------------------------------------------------------
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100:0002--------------------------------------------------------------------
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100:0002--------------------------------------------------------------------
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100:0002--------------------------------------------------------------------
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------------------------------------------------------------------------------
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100:0002--------------------------------------------------------------------
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100:0002--------------------------------------------------------------------
--
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--
100:0002--------------------------------------------------------------------
--
  ** END OF RUN : 499

*******************************************************************************




--------------------
| START            |  Project  dir.: C:\SWMHYMO\CEDARC~1\202401~4\

-------------------  Rainfall dir.: C:\SWMHYMO\CEDARC~1\202401~4\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 500
    NSTORM=   1
           #  1=hurhaz48.stm
------------------------------------------------------------------------------
--
500:0002--------------------------------------------------------------------
--
*#*****************************************************************************
*#  Project Name: [2509 Cedar Creek Road SWM - Ayr, ON] Project # : [161414214]
*#  Date        : 01-25-2024
```

```
*#  Modeller    : [Amy Kyle, Water Resources Specialist]
*#  Company     : Stantec Consulting Ltd. (Waterloo)
*#  License #   : 4730904
*#
*#  This hydrologic analysis prepared to provide pond sizing
*#  for the 2509 Cedar Creek Road SWM Facility
*#  The storm events modelled are:
*#  25mm, 2, 5, 25, 50, and 100-year Chicago storms (City of Kitchener IDF)
*#  and the Regional Event
*#*************************************************************************
--------------------------------------------------------------------------------
--
500:0002--------------------------------------------------------------------------
--
--------------------
| READ STORM       |    Filename: REGIONAL STORM
| Ptotal= 285.00 mm|    Comments: REGIONAL STORM
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.25	2.000	12.25	2.000	24.25	2.000	36.25	6.000
.50	2.000	12.50	2.000	24.50	2.000	36.50	6.000
.75	2.000	12.75	2.000	24.75	2.000	36.75	6.000
1.00	2.000	13.00	2.000	25.00	2.000	37.00	6.000
1.25	2.000	13.25	2.000	25.25	2.000	37.25	4.000
1.50	2.000	13.50	2.000	25.50	2.000	37.50	4.000
1.75	2.000	13.75	2.000	25.75	2.000	37.75	4.000
2.00	2.000	14.00	2.000	26.00	2.000	38.00	4.000
2.25	2.000	14.25	2.000	26.25	2.000	38.25	6.000
2.50	2.000	14.50	2.000	26.50	2.000	38.50	6.000
2.75	2.000	14.75	2.000	26.75	2.000	38.75	6.000
3.00	2.000	15.00	2.000	27.00	2.000	39.00	6.000
3.25	2.000	15.25	2.000	27.25	2.000	39.25	13.000
3.50	2.000	15.50	2.000	27.50	2.000	39.50	13.000
3.75	2.000	15.75	2.000	27.75	2.000	39.75	13.000
4.00	2.000	16.00	2.000	28.00	2.000	40.00	13.000
4.25	2.000	16.25	2.000	28.25	2.000	40.25	17.000
4.50	2.000	16.50	2.000	28.50	2.000	40.50	17.000
4.75	2.000	16.75	2.000	28.75	2.000	40.75	17.000
5.00	2.000	17.00	2.000	29.00	2.000	41.00	17.000
5.25	2.000	17.25	2.000	29.25	2.000	41.25	13.000
5.50	2.000	17.50	2.000	29.50	2.000	41.50	13.000
5.75	2.000	17.75	2.000	29.75	2.000	41.75	13.000
6.00	2.000	18.00	2.000	30.00	2.000	42.00	13.000
6.25	2.000	18.25	2.000	30.25	2.000	42.25	23.000
6.50	2.000	18.50	2.000	30.50	2.000	42.50	23.000
6.75	2.000	18.75	2.000	30.75	2.000	42.75	23.000
7.00	2.000	19.00	2.000	31.00	2.000	43.00	23.000
7.25	2.000	19.25	2.000	31.25	2.000	43.25	13.000
7.50	2.000	19.50	2.000	31.50	2.000	43.50	13.000

```
              7.75   2.000 |  19.75   2.000 |  31.75   2.000 |  43.75  13.000
              8.00   2.000 |  20.00   2.000 |  32.00   2.000 |  44.00  13.000
              8.25   2.000 |  20.25   2.000 |  32.25   2.000 |  44.25  13.000
              8.50   2.000 |  20.50   2.000 |  32.50   2.000 |  44.50  13.000
              8.75   2.000 |  20.75   2.000 |  32.75   2.000 |  44.75  13.000
              9.00   2.000 |  21.00   2.000 |  33.00   2.000 |  45.00  13.000
              9.25   2.000 |  21.25   2.000 |  33.25   2.000 |  45.25  53.000
              9.50   2.000 |  21.50   2.000 |  33.50   2.000 |  45.50  53.000
              9.75   2.000 |  21.75   2.000 |  33.75   2.000 |  45.75  53.000
             10.00   2.000 |  22.00   2.000 |  34.00   2.000 |  46.00  53.000
             10.25   2.000 |  22.25   2.000 |  34.25   2.000 |  46.25  38.000
             10.50   2.000 |  22.50   2.000 |  34.50   2.000 |  46.50  38.000
             10.75   2.000 |  22.75   2.000 |  34.75   2.000 |  46.75  38.000
             11.00   2.000 |  23.00   2.000 |  35.00   2.000 |  47.00  38.000
             11.25   2.000 |  23.25   2.000 |  35.25   3.000 |  47.25  13.000
             11.50   2.000 |  23.50   2.000 |  35.50   3.000 |  47.50  13.000
             11.75   2.000 |  23.75   2.000 |  35.75   3.000 |  47.75  13.000
             12.00   2.000 |  24.00   2.000 |  36.00   3.000 |  48.00  13.000

--------------------------------------------------------------------------------
--
500:0003-------------------------------------------------------------------------
--
*#==============================================================================
*# Pre-Development Drainage Area (Internal Catchments)
*#==============================================================================
*#-----------------|------------------------------------------------------------|
*#
*#                   Existing internal area draining to the east
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    7.06   Curve Number   (CN)=71.00
| 01:105    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .817

     PEAK FLOW       (cms)=     .895 (i)
     TIME TO PEAK    (hrs)=   46.083
     RUNOFF VOLUME    (mm)=  207.548
     TOTAL RAINFALL   (mm)=  285.000
     RUNOFF COEFFICIENT   =     .728

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

--------------------------------------------------------------------------------
--
500:0004-------------------------------------------------------------------------
--
```

```
*#
*#    Small external area entering site from east and draining south / east
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .73   Curve Number   (CN)=70.00
| 02:104    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .190

     Unit Hyd Qpeak  (cms)=     .147

     PEAK FLOW       (cms)=     .095 (i)
     TIME TO PEAK    (hrs)=   46.017
     RUNOFF VOLUME    (mm)=  204.845
     TOTAL RAINFALL   (mm)=  285.000
     RUNOFF COEFFICIENT   =     .719

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

-------------------------------------------------------------------------------
--
500:0005----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                    Total existing area draining to the east
*#
*#-----------------|-------------------------------------------------------------|
-------------------------
| ADD HYD (IntEst    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
-------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:105            7.06     .895   46.08 207.55    .000

                     +ID2 02:104             .73     .095   46.02 204.85    .000

                      ============================================================
                      SUM 03:IntEst         7.79     .989   46.07 207.29    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--
500:0006----------------------------------------------------------------------
--
*#
*#                  Existing internal area draining to the south
*#
*#-----------------|-------------------------------------------------------------|
----------------------
```

```
| DESIGN NASHYD      |   Area    (ha)=   11.00   Curve Number   (CN)=70.00
| 04:106    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
---------------------   U.H. Tp(hrs)=    .540

     Unit Hyd Qpeak  (cms)=     .778

     PEAK FLOW       (cms)=    1.242 (i)
     TIME TO PEAK    (hrs)=   46.367
     RUNOFF VOLUME    (mm)=  204.845
     TOTAL RAINFALL   (mm)=  285.000
     RUNOFF COEFFICIENT   =     .719

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

--------------------------------------------------------------------------------
--
500:0007--------------------------------------------------------------------------
--
*#=============================================================================
*# Total Pre-Development Drainage Area (Including Large External Catchments)
*#=============================================================================
*#-----------------|-------------------------------------------------------------|
*#
*#  External industrial catchment and part of Hwy 401, draining south into the
*#                       site and flowing south / east.
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| CALIB STANDHYD     |   Area    (ha)=   55.94
| 02:100    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      44.75         11.19
     Dep. Storage     (mm)=       2.00          5.00
     Average Slope     (%)=       1.60          2.00
     Length            (m)=    1500.00         30.00
     Mannings n             =       .020          .250

     Max.eff.Inten.(mm/hr)=      53.00        126.91
               over (min)        19.00         24.00
     Storage Coeff.  (min)=      18.81 (ii)    24.21 (ii)
     Unit Hyd. Tpeak (min)=      19.00         24.00
     Unit Hyd. peak  (cms)=        .06           .05
                                                          *TOTALS*
     PEAK FLOW       (cms)=       3.91          3.57          7.465 (iii)
     TIME TO PEAK    (hrs)=      46.07         46.17         46.100
     RUNOFF VOLUME    (mm)=     282.91        235.37        259.226
     TOTAL RAINFALL   (mm)=     285.00        285.00        285.000
     RUNOFF COEFFICIENT   =        .99           .83           .910
```

```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  64.0    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.

--------------------------------------------------------------------------------
--
500:0008--------------------------------------------------------------------------
--
*#*%-----------------|------------------------------------------------------------
*#
*#  External catchment containing a portion of Cedar Creek Road, a portion of
*#         industrial area, and a grassed area near Hwy 401 off-ramp,
*#            draining south into site and flowing south / east.
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   14.55
| 06:101    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   48.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.73         5.82
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.30         2.30
     Length            (m)=     311.45        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      53.00        54.13
               over (min)        5.00        14.00
     Storage Coeff.  (min)=       5.07 (ii)   13.72 (ii)
     Unit Hyd. Tpeak (min)=       5.00        14.00
     Unit Hyd. peak  (cms)=        .22          .08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.03          .85         1.875 (iii)
     TIME TO PEAK    (hrs)=      46.00        46.03        46.000
     RUNOFF VOLUME    (mm)=     284.19       168.10       223.839
     TOTAL RAINFALL   (mm)=     285.00       285.00       285.000
     RUNOFF COEFFICIENT   =       1.00          .59          .785

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
500:0009--------------------------------------------------------------------------
--
```

```
*#
*# External catchment west of site, containing exisiting industrial
*# property draining into private SWM feature and then onto site flowing east
*#
*#-----------------|---------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   12.64
| 07:102    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.11         2.53
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       3.10         3.10
     Length            (m)=     290.29        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      53.00       119.98
               over (min)        4.00        10.00
     Storage Coeff.  (min)=       4.45 (ii)   10.20 (ii)
     Unit Hyd. Tpeak (min)=       4.00        10.00
     Unit Hyd. peak  (cms)=        .26          .11
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .93          .83         1.765 (iii)
     TIME TO PEAK    (hrs)=      46.00        46.00        46.000
     RUNOFF VOLUME    (mm)=     284.17       209.52       246.871
     TOTAL RAINFALL   (mm)=     285.00       285.00       285.000
     RUNOFF COEFFICIENT   =       1.00          .74          .866

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
500:0010-----------------------------------------------------------------------
--
*#-----------------|---------------------------------------------------------|
*#
*#                     Infiltration in External SWM Feature
*#
*#-----------------|---------------------------------------------------------|
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>07:(102   )   |
| OUT<08:(xSWinf)   |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00   |     .018  .3759E+00
```

```
                          .018  .4380E-01   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     -------------------        (ha)     (cms)     (hrs)       (mm)
     INFLOW >07: (102   )      12.64     1.765    46.000    246.871
     OUTFLOW<08: (xSWinf)       2.73      .018     4.833    246.884
    OVERFLOW<09: (OVF-xI)       9.91     1.746    46.000    246.871

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        2
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=    15.28
                    PERCENTAGE OF TIME OVERFLOWING    (%)=     8.41


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    1.020
                    TIME SHIFT OF PEAK FLOW         (min)= -2470.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.3759E+00

------------------------------------------------------------------------------
--
500:0011----------------------------------------------------------------------
--
*#
*#                     Total existing area draining to the east
*#
*#-----------------|-------------------------------------------------------|
------------------------
| ADD HYD (ToEast    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 02:100          55.94    7.465   46.10 259.23    .000

                     +ID2 03:IntEst        7.79     .989   46.07 207.29    .000

                     +ID3 06:101          14.55    1.875   46.00 223.84    .000

                     +ID4 09:OVF-xI        9.91    1.746   46.00 246.87    .000

                      ========================================================
                      SUM 05:ToEast       88.19   11.995   46.02 247.41    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
500:0012----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*# External catchment west of the site, containing a portion of existing
*# industrial property, draining east into the site and flowing south.
```

```
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    4.52
| 01:103    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.62          .90
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       5.30         5.30
     Length            (m)=     173.59        40.00
     Mannings n             =       .013         .250

     Max.eff.Inten.(mm/hr)=      53.00       120.05
               over (min)        3.00         8.00
     Storage Coeff.  (min)=       2.78 (ii)    7.68 (ii)
     Unit Hyd. Tpeak (min)=       3.00         8.00
     Unit Hyd. peak  (cms)=        .39          .15
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .33          .30          .633 (iii)
     TIME TO PEAK    (hrs)=      45.73        46.00        46.000
     RUNOFF VOLUME    (mm)=     284.18       209.52       246.871
     TOTAL RAINFALL   (mm)=     285.00       285.00       285.000
     RUNOFF COEFFICIENT   =       1.00          .74          .866

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
500:0013--------------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*#                            Total Flows to the south
*#
*#-----------------|------------------------------------------------------------|
------------------------
| ADD HYD (TSouth    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 04:106          11.00    1.242   46.37 204.85    .000

                     +ID2 01:103           4.52     .633   46.00 246.87    .000

                      ============================================================
                      SUM 02:TSouth       15.52    1.755   46.02 217.08    .000
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--
500:0014----------
--
*#
*#   Total Flows from site (eventually to Cedar Creek)
*#
*#-----------------|---|

| ADD HYD (TotalF   ) | ID: NHYD   AREA   QPEAK   TPEAK   R.V.   DWF
------------------------   (ha)   (cms)   (hrs)   (mm)   (cms)
                      ID1 05:ToEast   88.19   11.995   46.02 247.41   .000

                     +ID2 02:TSouth   15.52   1.755   46.02 217.08   .000

                      ==
                      SUM 03:TotalF   103.71   13.750   46.02 242.87   .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--
500:0015----------
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500:0002----------
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500:0002----------
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500:0002----------
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500:0002----------
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500:0002----------
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500:0002----------
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500:0002----------------------------------------------------------------------------
--
------------------------------------------------------------------------------------
--
500:0002----------------------------------------------------------------------------
--
      FINISH
------------------------------------------------------------------------------------
--
************************************************************************************
**
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2024-01-25     at 15:08:57
====================================================================================
==
```

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

   SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
   S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
   SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
       S   W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
   SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
                                                         9   9  9   9   # 4730904
        StormWater Management HYdrologic Model            999    999    =========

 ********************************************************************************
 ***************************** SWMHYMO Ver/4.05  ********************************
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors      *********
 *********                  OTTHYMO-83 and OTTHYMO-89.                  *********
 ********************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
 *********                  Ottawa,  Ontario: (613) 836-3884           *********
 *********                  Gatineau, Quebec: (819) 243-6858           *********
 *********                  E-Mail: swmhymo@jfsa.Com                   *********
 ********************************************************************************

 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: Stantec Consulting Ltd. (Kitchener)          +++++++++
 +++++++++                Kitchener             SERIAL#:4730904       +++++++++
 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ********************************************************************************
 *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *********
 *********           Maximum value for ID numbers  :     10           *********
 *********           Max. number of rainfall points: 105408           *********
 *********           Max. number of flow points    : 105408           *********
 ********************************************************************************


 ***********************   D E T A I L E D   O U T P U T   **********************
 ********************************************************************************
 *         DATE: 2024-01-25     TIME: 15:14:59     RUN COUNTER: 000240         *
 ********************************************************************************
 * Input   filename: C:\SWMHYMO\CEDARC~1\202401~4\CCrPost.dat                    *
 * Output  filename: C:\SWMHYMO\CEDARC~1\202401~4\CCrPost.out                    *
 * Summary filename: C:\SWMHYMO\CEDARC~1\202401~4\CCrPost.sum                    *
 * User comments:                                                               *
 * 1:_____________________________________________________________________________*
 * 2:_____________________________________________________________________________*
 * 3:_____________________________________________________________________________*
 ********************************************************************************

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

```
001:0001-------------------------------------------------------------------------
--
*#*****************************************************************************
*#  Project Name: [2509 Cedar Creek Road SWM - Ayr, ON] Project #: [161414214]
*#  Date        : 01/25/2024
*#  Modeller    : [Amy Kyle, Water Resources Specialist]
*#  Company     : Stantec Consulting Ltd. (Waterloo)
*#  License #   : 4730904
*#
*#  This hydrologic analysis prepared to provide pond sizing
*#  for the 2509 Cedar Creek Road SWM Facility
*#  The storm events modelled are:
*#  25mm, 2, 5, 25, 50, and 100-year Chicago storms (City of Kitchener IDF)
*#  and the Regional Event
*#*****************************************************************************
--------------------
| START            |  Project  dir.: C:\SWMHYMO\CEDARC~1\202401~4\

--------------------  Rainfall dir.: C:\SWMHYMO\CEDARC~1\202401~4\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
           #  1=Kit25mm.4hr
-------------------------------------------------------------------------------
--
001:0002-------------------------------------------------------------------------
--
--------------------
| READ STORM       |    Filename: 25 mm, 4hr Chicago Storm - Kitchener IDF
| Ptotal=  25.00 mm|    Comments: 25 mm, 4hr Chicago Storm - Kitchener IDF
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   1.465 |   1.08   4.024 |   2.08   5.764 |   3.08   2.074
               .17   1.540 |   1.17   4.814 |   2.17   4.969 |   3.17   1.977
               .25   1.625 |   1.25   6.025 |   2.25   4.374 |   3.25   1.889
               .33   1.720 |   1.33   8.114 |   2.33   3.913 |   3.33   1.810
               .42   1.829 |   1.42  12.526 |   2.42   3.545 |   3.42   1.737
               .50   1.955 |   1.50  27.198 |   2.50   3.245 |   3.50   1.671
               .58   2.101 |   1.58  74.855 |   2.58   2.994 |   3.58   1.610
               .67   2.274 |   1.67  31.410 |   2.67   2.782 |   3.67   1.553
               .75   2.482 |   1.75  16.819 |   2.75   2.601 |   3.75   1.501
               .83   2.736 |   1.83  11.357 |   2.83   2.443 |   3.83   1.453
               .92   3.055 |   1.92   8.563 |   2.92   2.305 |   3.92   1.408
              1.00   3.468 |   2.00   6.882 |   3.00   2.183 |   4.00   1.366

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

```
001:0003-------------------------------------------------------------------------
--
*#----------------|-------------------------------------------------------------|
*#=============================================================================
*# Proposed Drainage Conditions (Internal Areas)
*#=============================================================================
*#----------------|-------------------------------------------------------------|
*#
*#    Small portion of West Road Ditch draining offsite to the east through
*#                            By-Pass Storm Sewer(BPSS)
*#
*#----------------|-------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .14   Curve Number   (CN)=50.00
| 01:200    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .260

     Unit Hyd Qpeak  (cms)=     .021

     PEAK FLOW       (cms)=     .001 (i)
     TIME TO PEAK    (hrs)=    1.917
     RUNOFF VOLUME    (mm)=    1.986
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .079

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

-------------------------------------------------------------------------------
--
001:0004-------------------------------------------------------------------------
--
*#----------------|-------------------------------------------------------------|
*#
*#  Proposed developed catchment draining offsite to the east through BPSS
*#
*#----------------|-------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=     .64
| 02:201    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .58          .06
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      65.32        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      74.85        90.91
               over (min)         2.00         9.00
     Storage Coeff.  (min)=       1.80 (ii)    9.14 (ii)
```

```
     Unit Hyd. Tpeak (min)=       2.00         9.00
     Unit Hyd. peak  (cms)=        .60          .12
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .06          .01          .067 (iii)
     TIME TO PEAK    (hrs)=       1.58         1.72         1.583
     RUNOFF VOLUME    (mm)=      24.20         8.08        16.141
     TOTAL RAINFALL   (mm)=      25.00        25.00        25.000
     RUNOFF COEFFICIENT   =        .97          .32          .646

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

-------------------------------------------------------------------------------
--
001:0005----------------------------------------------------------------------
--
*#-----------------|---------------------------------------------------------|
*#
*# Proposed internal grassed area and plunge pool draining offsite to the east
*#
*#-----------------|---------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .55   Curve Number   (CN)=50.00
| 03:203    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .080

     Unit Hyd Qpeak  (cms)=     .263

     PEAK FLOW       (cms)=     .005 (i)
     TIME TO PEAK    (hrs)=    1.667
     RUNOFF VOLUME    (mm)=    1.990
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .080

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

-------------------------------------------------------------------------------
--
001:0006----------------------------------------------------------------------
--
*#-----------------|---------------------------------------------------------|
*#
*#          Total internal area draining onto agricultural area to the east
*#
*#-----------------|---------------------------------------------------------|
-----------------------
| ADD HYD (IntUcE    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
```

```
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:200             .14     .001    1.92   1.99    .000

                     +ID2 02:201             .64     .067    1.58  16.14    .000

                     +ID3 03:203             .55     .005    1.67   1.99    .000

                      ============================================================
                      SUM 05:IntUcE         1.33     .071    1.58   8.80    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--
001:0007---------------------------------------------------------------------
--
*#
*#             Proposed industrial lots draining to Rear Lot Ditch
*#
*#-----------------|-------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    8.82
| 06:202    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   80.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       7.94          .88
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     242.49        40.00
     Mannings n             =       .013         .250

     Max.eff.Inten.(mm/hr)=      74.85        10.94
               over (min)        4.00        21.00
     Storage Coeff.  (min)=       3.96 (ii)   21.07 (ii)
     Unit Hyd. Tpeak (min)=       4.00        21.00
     Unit Hyd. peak  (cms)=        .28          .05
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.08          .02          1.085 (iii)
     TIME TO PEAK    (hrs)=       1.62         1.97          1.617
     RUNOFF VOLUME    (mm)=      24.20         3.89         20.138
     TOTAL RAINFALL   (mm)=      25.00        25.00         25.000
     RUNOFF COEFFICIENT   =        .97          .16           .806

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.
```

```
--------------------------------------------------------------------------------
--
001:0008--------------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*#    External agricultural area draining onsite and entering Rear Lot Ditch
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .73   Curve Number   (CN)=70.00
| 07:104    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .190

     Unit Hyd Qpeak  (cms)=     .147

     PEAK FLOW       (cms)=     .010 (i)
     TIME TO PEAK    (hrs)=    1.817
     RUNOFF VOLUME    (mm)=    4.172
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .167

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

--------------------------------------------------------------------------------
--
001:0009--------------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*#      Total area entering Rear Lot Ditch and entering SWMF at East inlet
*#
*#-----------------|------------------------------------------------------------|
-------------------------
| ADD HYD (RLswl     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
-------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 06:202            8.82    1.085    1.62  20.14    .000

                     +ID2 07:104             .73     .010    1.82   4.17    .000

                      ============================================================
                      SUM 08:RLswl          9.55    1.089    1.62  18.92    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--
001:0010--------------------------------------------------------------------------
--
```

```
*#
*#   Proposed industrial lots draining to East Road Ditch within catchment,
*#                          and new internal roadway
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    4.92
| 01:204    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   80.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.43          .49
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     181.11        40.00
     Mannings n             =       .013         .250

     Max.eff.Inten.(mm/hr)=      74.85        11.23
               over (min)        3.00        20.00
     Storage Coeff.  (min)=       3.33 (ii)   20.25 (ii)
     Unit Hyd. Tpeak (min)=       3.00        20.00
     Unit Hyd. peak  (cms)=        .35          .06
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .65          .01          .654 (iii)
     TIME TO PEAK    (hrs)=       1.60         1.95         1.600
     RUNOFF VOLUME    (mm)=      24.20         3.89        20.138
     TOTAL RAINFALL   (mm)=      25.00        25.00        25.000
     RUNOFF COEFFICIENT   =        .97          .16          .806

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
001:0011--------------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*#             Rooftop infiltration lumped together and sized for 25mm
*#         runoff volume from an assumed 0.15ha rooftop area per lot (7 lots)
*#
*#-----------------|------------------------------------------------------------|
------------------------
| ADD HYD (Roof      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:204           4.92     .654    1.60  20.14    .000

                    +ID2 06:202           8.82    1.085    1.62  20.14    .000
```

```
                    ============================================================
                    SUM 02:Roof          13.74    1.729    1.60  20.14    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--
001:0012--------------------------------------------------------------------------
--
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>02:(Roof  )   |
| OUT<04:(R-inf )   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .000  .2625E-01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >02: (Roof  )      13.74     1.729     1.600     20.138
     OUTFLOW<04: (R-inf )       1.30      .000     1.300      4.309
    OVERFLOW<10: (infO  )      12.44     1.719     1.617     20.138

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        4
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=     4.85
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .28


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=     .001
                    TIME SHIFT OF PEAK FLOW         (min)=   -18.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.2625E-01

      *** WARNING: Outflow volume is less than inflow volume.
--------------------------------------------------------------------------------
--
001:0013--------------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*#              Proposed SWM facility catchment (infiltration basin)
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    1.63   Curve Number   (CN)=57.00
| 09:205    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .350

     Unit Hyd Qpeak  (cms)=     .178
```

```
     PEAK FLOW       (cms)=     .009 (i)
     TIME TO PEAK    (hrs)=    2.033
     RUNOFF VOLUME    (mm)=    2.567
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .103

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

------------------------------------------------------------------------------
--
001:0014---------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#                       All flows entering SWM facility
*#
*#-----------------|-------------------------------------------------------|
------------------------
| ADD HYD (ToSWM     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 10:infO         12.44    1.719    1.62  20.14    .000

                     +ID2 07:104            .73     .010    1.82   4.17    .000

                     +ID3 09:205           1.63     .009    2.03   2.57    .000

                      ============================================================
                      SUM 06:ToSWM         14.80    1.725    1.62  17.41    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
001:0015---------------------------------------------------------------------
--
*#
*#                     Infiltration Portion of SWM facility
*#
*#-----------------|-------------------------------------------------------|
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>06:(ToSWM )   |
| OUT<07:(SWMinf)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .044  .7033E+00
                            .044  .6530E-01   |     .000  .0000E+00
```

```
     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >06: (ToSWM )      14.80     1.725     1.617     17.414
     OUTFLOW<07: (SWMinf)      14.80      .044     1.617     17.414
    OVERFLOW<08: (OVF-I )        .00      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=    2.551
                   TIME SHIFT OF PEAK FLOW         (min)=      .00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.2158E+00

--------------------------------------------------------------------------------
--
001:0016--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                     Active Storage Portion of SWM facility
*#
*#-----------------|-------------------------------------------------------------|
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>08:(OVF-I )   |
| OUT<01:(SWMout)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |    1.479  .2400E+00
                            .202  .7850E-01   |    4.101  .4070E+00
                            .689  .1586E+00   |     .000  .0000E+00
      *** WARNING: Inflow hydrograph is dry.

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >08: (OVF-I )         .00      .000      .000       .000
     OUTFLOW<01: (SWMout)         .00      .000      .000       .000
    OVERFLOW<02: (OVF   )      13.74      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


*** WARNING: Inflow and ouflow hydrographs are dry.

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

```
001:0017-------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#    West Road Ditch, conveying external drainage from the west around the
*#                  proposed SWM facility to Outlet Channel
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    1.22   Curve Number   (CN)=50.00
| 02:206    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .810

     Unit Hyd Qpeak  (cms)=     .058

     PEAK FLOW       (cms)=     .003 (i)
     TIME TO PEAK    (hrs)=    2.650
     RUNOFF VOLUME    (mm)=    1.989
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .080

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

-------------------------------------------------------------------------------
--
001:0018-------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#        Grassed area south of SWM facility draining offsite to the south
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .14   Curve Number   (CN)=50.00
| 10:207    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .070

     Unit Hyd Qpeak  (cms)=     .076

     PEAK FLOW       (cms)=     .001 (i)
     TIME TO PEAK    (hrs)=    1.650
     RUNOFF VOLUME    (mm)=    1.989
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .080

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

-------------------------------------------------------------------------------
--
001:0019-------------------------------------------------------------------------
```

```
--
*#-----------------|---------------------------------------------------------|
*#
*#                Total Flows to the east from internal catchments
*#
*#-----------------|---------------------------------------------------------|
-------------------------
| ADD HYD (IntE      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
-------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 05:IntUcE         1.33     .071    1.58   8.80    .000

                    +ID2 01:SWMout          .00     .000     .00    .00    .000
**DRY**
                    +ID3 02:206            1.22     .003    2.65   1.99    .000

                     ============================================================
                     SUM 07:IntE           2.55     .071    1.58   5.54    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--
001:0020----------------------------------------------------------------------
--
*#-----------------|---------------------------------------------------------|
*#=========================================================================
*# Proposed Drainage Conditions (Including External Catchment Flows to Ditches)
*#=========================================================================
*#-----------------|---------------------------------------------------------|
*#
*# External industrial catchment and part of Hwy 401, draining south across
*#                   Cedar Creek Road and entering BPSS
*#
*#-----------------|---------------------------------------------------------|
----------------------
| CALIB STANDHYD     |   Area    (ha)=   55.94
| 03:100    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      44.75        11.19
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.60         2.00
     Length            (m)=    1500.00        30.00
     Mannings n           =       .020         .250

     Max.eff.Inten.(mm/hr)=      35.29        17.90
               over (min)        22.00        34.00
     Storage Coeff.  (min)=      22.13 (ii)   33.94 (ii)
     Unit Hyd. Tpeak (min)=      22.00        34.00
```

```
     Unit Hyd. peak  (cms)=        .05          .03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.75          .32          1.952 (iii)
     TIME TO PEAK    (hrs)=       1.92         2.20          1.933
     RUNOFF VOLUME    (mm)=      23.00         6.60         14.800
     TOTAL RAINFALL   (mm)=      25.00        25.00         25.000
     RUNOFF COEFFICIENT   =        .92          .26           .592

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  64.0    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.

--------------------------------------------------------------------------------
--
001:0021--------------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*#  External catchment containing a portion of Cedar Creek Road, a portion
*#  of industrial area, and a grassed area near Hwy 401 off-ramp, entering BPSS
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   14.55
| 07:101    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   48.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.73         5.82
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.30         2.30
     Length            (m)=     311.45        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      74.85         3.89
               over (min)        4.00        29.00
     Storage Coeff.  (min)=       4.42 (ii)   29.21 (ii)
     Unit Hyd. Tpeak (min)=       4.00        29.00
     Unit Hyd. peak  (cms)=        .26          .04
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.04          .04          1.041 (iii)
     TIME TO PEAK    (hrs)=       1.62         2.12          1.617
     RUNOFF VOLUME    (mm)=      24.20         2.59         12.965
     TOTAL RAINFALL   (mm)=      25.00        25.00         25.000
     RUNOFF COEFFICIENT   =        .97          .10           .519

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

------------------------------------------------------------------------------
--
001:0022----------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*#     Total area draining offsite to east onto agricultural area to the east
*#
*#-----------------|------------------------------------------------------------|
------------------------
| ADD HYD (UCtoE     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 05:IntUcE         1.33     .071    1.58   8.80    .000

                     +ID2 03:100           55.94    1.952    1.93  14.80    .000

                     +ID3 07:101           14.55    1.041    1.62  12.96    .000

                      ============================================================
                      SUM 09:UCtoE         71.82    2.222    1.92  14.32    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
001:0023----------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*#   Large external catchment west of site containing industrial property,
*#  draining into private SWM feature and then into West Road Ditch, routing
*#             around SWM facility and entering Outlet Channel
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   12.64
| 04:102    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.11         2.53
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       3.10         3.10
     Length            (m)=     290.29        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      74.85        19.51
```

```
               over (min)        4.00        16.00
     Storage Coeff.  (min)=       3.87 (ii)   15.77 (ii)
     Unit Hyd. Tpeak (min)=       4.00        16.00
     Unit Hyd. peak  (cms)=        .29          .07
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .97          .08          1.002 (iii)
     TIME TO PEAK    (hrs)=       1.62         1.87          1.617
     RUNOFF VOLUME    (mm)=      24.20         4.72         14.463
     TOTAL RAINFALL   (mm)=      25.00        25.00         25.000
     RUNOFF COEFFICIENT   =        .97          .19           .579

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

------------------------------------------------------------------------------
--
001:0024--------------------------------------------------------------------
--
*#-----------------|---------------------------------------------------------|
*#
*#                     Infiltration in External SWM Feature
*#
*#-----------------|---------------------------------------------------------|
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(102   )   |
| OUT<05:(xSWinf)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .018  .3759E+00
                            .018  .4380E-01   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (102   )      12.64     1.002     1.617     14.463
     OUTFLOW<05: (xSWinf)      12.64      .018     1.583     14.463
    OVERFLOW<06: (OVF-xI)        .00      .000      .000       .000

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    1.797
                    TIME SHIFT OF PEAK FLOW         (min)=    -2.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.1636E+00
```

```
--------------------------------------------------------------------------------
--
001:0025--------------------------------------------------------------------------
--
*#----------------|------------------------------------------------------------|
*#
*# External catchment west of the site, containing a portion of exisiting
*# industrial property, draining east into West Road Ditch, routing around
*#                     SWM facility and entering Outlet Channel
*#
*#----------------|------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    4.52
| 07:103    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.62          .90
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       5.30         5.30
     Length            (m)=     173.59        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      74.85        22.59
               over (min)         2.00        12.00
     Storage Coeff.  (min)=       2.42 (ii)   11.97 (ii)
     Unit Hyd. Tpeak (min)=       2.00        12.00
     Unit Hyd. peak  (cms)=        .49          .09
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .42          .04          .430 (iii)
     TIME TO PEAK    (hrs)=       1.58         1.78         1.583
     RUNOFF VOLUME    (mm)=      24.20         4.73        14.463
     TOTAL RAINFALL   (mm)=      25.00        25.00        25.000
     RUNOFF COEFFICIENT   =        .97          .19          .579

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
001:0026--------------------------------------------------------------------------
--
*#----------------|------------------------------------------------------------|
*#
*#                 Total Flows through West Road Ditch
*#
*#----------------|------------------------------------------------------------|
------------------------
```

```
| ADD HYD (WRswl     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 06:OVF-xI          .00     .000     .00    .00    .000
**DRY**
                     +ID2 07:103            4.52     .430    1.58  14.46    .000

                     +ID3 02:206            1.22     .003    2.65   1.99    .000

                      ============================================================
                      SUM 08:WRswl          5.74     .430    1.58  11.81    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--
001:0027---------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    1.13   Curve Number   (CN)=50.00
| 05:208    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .850

     Unit Hyd Qpeak  (cms)=     .051

     PEAK FLOW       (cms)=     .003 (i)
     TIME TO PEAK    (hrs)=    2.700
     RUNOFF VOLUME    (mm)=    1.989
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .080

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

-------------------------------------------------------------------------------
--
001:0028---------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#                 Total Flows through Outlet Channel
*#
*#-----------------|-------------------------------------------------------|
------------------------
| ADD HYD (OutChan   ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:SWMout          .00     .000     .00    .00    .000
**DRY**
                     +ID2 08:WRswl          5.74     .430    1.58  11.81    .000
```

```
                    +ID3 05:208            1.13     .003    2.70   1.99    .000

                     ============================================================
                     SUM 03:OutChan        6.87     .430    1.58  10.20    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--
001:0029---------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#                 Total Flows to the east (eventually to Cedar Creek)
*#
*#-----------------|-------------------------------------------------------|
------------------------
| ADD HYD (TotE      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:SWMout          .00     .000     .00    .00    .000
**DRY**
                    +ID2 08:WRswl           5.74     .430    1.58  11.81    .000

                    +ID3 09:UCtoE          71.82    2.222    1.92  14.32    .000

                     ============================================================
                     SUM 04:TotE           77.56    2.311    1.92  14.13    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--
001:0030---------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#                         Total Flows from the Site
*#
*#-----------------|-------------------------------------------------------|
------------------------
| ADD HYD (AllFlo    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 04:TotE           77.56    2.311    1.92  14.13    .000

                    +ID2 10:207              .14     .001    1.65   1.99    .000

                     ============================================================
                     SUM 06:AllFlo         77.70    2.312    1.92  14.11    .000
```

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

--------------------------------------------------------------------------------
--
001:0031--------------------------------------------------------------------------
--
  ** END OF RUN :   1

********************************************************************************




--------------------
| START            |  Project  dir.: C:\SWMHYMO\CEDARC~1\202401~4\

--------------------  Rainfall dir.: C:\SWMHYMO\CEDARC~1\202401~4\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 002
    NSTORM=   1
           #  1=Kit2yr.3hr
--------------------------------------------------------------------------------
--
002:0002--------------------------------------------------------------------------
--
*#*****************************************************************************
*#  Project Name: [2509 Cedar Creek Road SWM - Ayr, ON] Project #: [161414214]
*#  Date        : 01/25/2024
*#  Modeller    : [Amy Kyle, Water Resources Specialist]
*#  Company     : Stantec Consulting Ltd. (Waterloo)
*#  License #   : 4730904
*#
*#  This hydrologic analysis prepared to provide pond sizing
*#  for the 2509 Cedar Creek Road SWM Facility
*#  The storm events modelled are:
*#  25mm, 2, 5, 25, 50, and 100-year Chicago storms (City of Kitchener IDF)
*#  and the Regional Event
*#*****************************************************************************
--------------------------------------------------------------------------------
--
002:0002--------------------------------------------------------------------------
--
--------------------
| READ STORM       |    Filename: 2-yr, 3hr Chicago Storm - Kitchener IDF
| Ptotal=  34.27 mm|    Comments: 2-yr, 3hr Chicago Storm - Kitchener IDF
```

```
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   2.837 |    .83  15.850 |   1.58   7.979 |   2.33   3.697
               .17   3.094 |    .92  36.885 |   1.67   7.027 |   2.42   3.501
               .25   3.409 |   1.00 109.401 |   1.75   6.286 |   2.50   3.326
               .33   3.803 |   1.08  47.437 |   1.83   5.694 |   2.58   3.169
               .42   4.314 |   1.17  26.381 |   1.92   5.211 |   2.67   3.028
               .50   5.002 |   1.25  18.051 |   2.00   4.807 |   2.75   2.899
               .58   5.982 |   1.33  13.687 |   2.08   4.466 |   2.83   2.783
               .67   7.493 |   1.42  11.030 |   2.17   4.173 |   2.92   2.676
               .75  10.127 |   1.50   9.251 |   2.25   3.920 |   3.00   2.578

--------------------------------------------------------------------------------
--
002:0003----------------------------------------------------------------------
--
*#-----------------|--------------------------------------------------------|
*#========================================================================
*# Proposed Drainage Conditions (Internal Areas)
*#========================================================================
*#-----------------|--------------------------------------------------------|
*#
*#    Small portion of West Road Ditch draining offsite to the east through
*#                            By-Pass Storm Sewer(BPSS)
*#
*#-----------------|--------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .14   Curve Number   (CN)=50.00
| 01:200    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .260

     Unit Hyd Qpeak  (cms)=     .021

     PEAK FLOW       (cms)=     .001 (i)
     TIME TO PEAK    (hrs)=    1.350
     RUNOFF VOLUME    (mm)=    3.741
     TOTAL RAINFALL   (mm)=   34.271
     RUNOFF COEFFICIENT   =     .109

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

--------------------------------------------------------------------------------
--
002:0004----------------------------------------------------------------------
--
*#-----------------|--------------------------------------------------------|
*#
*#  Proposed developed catchment draining offsite to the east through BPSS
*#
```

```
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=     .64
| 02:201    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .58          .06
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      65.32        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     109.40       168.34
               over (min)        2.00         7.00
     Storage Coeff.  (min)=       1.55 (ii)    7.28 (ii)
     Unit Hyd. Tpeak (min)=       2.00         7.00
     Unit Hyd. peak  (cms)=        .65          .16
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .09          .02          .103 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.10         1.000
     RUNOFF VOLUME    (mm)=      33.47        13.61        23.542
     TOTAL RAINFALL   (mm)=      34.27        34.27        34.271
     RUNOFF COEFFICIENT   =        .98          .40          .687

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
002:0005--------------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*# Proposed internal grassed area and plunge pool draining offsite to the east
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .55   Curve Number   (CN)=50.00
| 03:203    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .080

     Unit Hyd Qpeak  (cms)=     .263

     PEAK FLOW       (cms)=     .010 (i)
     TIME TO PEAK    (hrs)=    1.083
     RUNOFF VOLUME    (mm)=    3.745
     TOTAL RAINFALL   (mm)=   34.271
```

```
     RUNOFF COEFFICIENT   =     .109

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

--------------------------------------------------------------------------------
--
002:0006--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#          Total internal area draining onto agricultural area to the east
*#
*#-----------------|-------------------------------------------------------------|
-------------------------
| ADD HYD (IntUcE    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
-------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:200            .14     .001    1.35   3.74    .000

                     +ID2 02:201            .64     .103    1.00  23.54    .000

                     +ID3 03:203            .55     .010    1.08   3.74    .000

                      ============================================================
                      SUM 05:IntUcE         1.33     .109    1.00  13.27    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--
002:0007--------------------------------------------------------------------------
--
*#
*#             Proposed industrial lots draining to Rear Lot Ditch
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    8.82
| 06:202    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   80.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       7.94          .88
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     242.49        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     109.40        23.44
               over (min)        3.00        16.00
     Storage Coeff.  (min)=       3.41 (ii)   16.02 (ii)
```

```
     Unit Hyd. Tpeak (min)=       3.00        16.00
     Unit Hyd. peak  (cms)=        .34          .07
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.69          .03          1.695 (iii)
     TIME TO PEAK    (hrs)=       1.02         1.30          1.017
     RUNOFF VOLUME    (mm)=      33.47         7.00         28.177
     TOTAL RAINFALL   (mm)=      34.27        34.27         34.271
     RUNOFF COEFFICIENT   =        .98          .20           .822

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

------------------------------------------------------------------------------
--
002:0008----------------------------------------------------------------------
--
*#-----------------|--------------------------------------------------------|
*#
*#    External agricultural area draining onsite and entering Rear Lot Ditch
*#
*#-----------------|--------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .73   Curve Number   (CN)=70.00
| 07:104    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .190

     Unit Hyd Qpeak  (cms)=     .147

     PEAK FLOW       (cms)=     .018 (i)
     TIME TO PEAK    (hrs)=    1.250
     RUNOFF VOLUME    (mm)=    7.583
     TOTAL RAINFALL   (mm)=   34.271
     RUNOFF COEFFICIENT   =     .221

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

------------------------------------------------------------------------------
--
002:0009----------------------------------------------------------------------
--
*#-----------------|--------------------------------------------------------|
*#
*#      Total area entering Rear Lot Ditch and entering SWMF at East inlet
*#
*#-----------------|--------------------------------------------------------|
------------------------
| ADD HYD (RLswl     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
```

```
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 06:202             8.82    1.695    1.02  28.18    .000

                    +ID2 07:104              .73     .018    1.25   7.58    .000

                     ============================================================
                     SUM 08:RLswl           9.55    1.700    1.02  26.60    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
002:0010----------------------------------------------------------------------
--
*#
*#   Proposed industrial lots draining to East Road Ditch within catchment,
*#                          and new internal roadway
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    4.92
| 01:204    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   80.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.43          .49
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     181.11        40.00
     Mannings n             =      .013         .250

     Max.eff.Inten.(mm/hr)=     109.40        24.32
               over (min)        3.00        15.00
     Storage Coeff.  (min)=       2.86 (ii)   15.28 (ii)
     Unit Hyd. Tpeak (min)=       3.00        15.00
     Unit Hyd. peak  (cms)=        .39          .07
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .99          .02          .990 (iii)
     TIME TO PEAK    (hrs)=       1.02         1.28         1.017
     RUNOFF VOLUME    (mm)=      33.47         7.00        28.177
     TOTAL RAINFALL   (mm)=      34.27        34.27        34.271
     RUNOFF COEFFICIENT   =        .98          .20          .822

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

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

```
--
002:0011-----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#             Rooftop infiltration lumped together and sized for 25mm
*#         runoff volume from an assumed 0.15ha rooftop area per lot (7 lots)
*#
*#-----------------|-------------------------------------------------------------|
------------------------
| ADD HYD (Roof      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:204           4.92     .990    1.02  28.18    .000

                     +ID2 06:202           8.82    1.695    1.02  28.18    .000

                      ============================================================
                      SUM 02:Roof         13.74    2.685    1.02  28.18    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--
002:0012-----------------------------------------------------------------------
--
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>02:(Roof  )   |
| OUT<04:(R-inf )   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .000  .2625E-01

     ROUTING RESULTS           AREA     QPEAK     TPEAK       R.V.
     --------------------      (ha)     (cms)     (hrs)       (mm)
     INFLOW >02: (Roof  )     13.74     2.685     1.017     28.177
     OUTFLOW<04: (R-inf )       .93      .000      .767      6.031
    OVERFLOW<10: (infO  )     12.81     2.653     1.017     28.177

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        5
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=     4.08
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .23


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=     .000
                    TIME SHIFT OF PEAK FLOW         (min)=   -15.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.2625E-01

      *** WARNING: Outflow volume is less than inflow volume.
```

```
--------------------------------------------------------------------------------
--
002:0013----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#              Proposed SWM facility catchment (infiltration basin)
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    1.63   Curve Number   (CN)=57.00
| 09:205    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .350

     Unit Hyd Qpeak  (cms)=     .178

     PEAK FLOW       (cms)=     .018 (i)
     TIME TO PEAK    (hrs)=    1.467
     RUNOFF VOLUME    (mm)=    4.786
     TOTAL RAINFALL   (mm)=   34.271
     RUNOFF COEFFICIENT   =     .140

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

--------------------------------------------------------------------------------
--
002:0014----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                       All flows entering SWM facility
*#
*#-----------------|-------------------------------------------------------------|
-------------------------
| ADD HYD (ToSWM     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
-------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 10:infO         12.81    2.653    1.02  28.18    .000

                     +ID2 07:104            .73     .018    1.25   7.58    .000

                     +ID3 09:205           1.63     .018    1.47   4.79    .000

                      ============================================================
                      SUM 06:ToSWM         15.17    2.661    1.02  24.67    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

```
002:0015-------------------------------------------------------------------------
--
*#
*#                     Infiltration Portion of SWM facility
*#
*#-----------------|-------------------------------------------------------|
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>06:(ToSWM )   |
| OUT<07:(SWMinf)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .044  .7033E+00
                            .044  .6530E-01   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >06: (ToSWM )      15.17     2.661     1.017     24.672
     OUTFLOW<07: (SWMinf)      15.17      .044     1.000     24.672
    OVERFLOW<08: (OVF-I )        .00      .000      .000       .000

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    1.653
                    TIME SHIFT OF PEAK FLOW         (min)=    -1.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.3378E+00

-------------------------------------------------------------------------------
--
002:0016-------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#                    Active Storage Portion of SWM facility
*#
*#-----------------|-------------------------------------------------------|
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>08:(OVF-I )   |
| OUT<01:(SWMout)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |    1.479  .2400E+00
                            .202  .7850E-01   |    4.101  .4070E+00
                            .689  .1586E+00   |     .000  .0000E+00
      *** WARNING: Inflow hydrograph is dry.
```

```
     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >08: (OVF-I )        .00      .000      .000       .000
     OUTFLOW<01: (SWMout)        .00      .000      .000       .000
    OVERFLOW<02: (OVF   )      13.74      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


*** WARNING: Inflow and ouflow hydrographs are dry.

-------------------------------------------------------------------------------
--
002:0017-----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#    West Road Ditch, conveying external drainage from the west around the
*#                  proposed SWM facility to Outlet Channel
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    1.22   Curve Number   (CN)=50.00
| 02:206    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .810

     Unit Hyd Qpeak  (cms)=     .058

     PEAK FLOW       (cms)=     .006 (i)
     TIME TO PEAK    (hrs)=    2.117
     RUNOFF VOLUME    (mm)=    3.744
     TOTAL RAINFALL   (mm)=   34.271
     RUNOFF COEFFICIENT   =     .109

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

-------------------------------------------------------------------------------
--
002:0018-----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#        Grassed area south of SWM facility draining offsite to the south
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .14   Curve Number   (CN)=50.00
| 10:207    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
```

```
----------------------   U.H. Tp(hrs)=    .070

     Unit Hyd Qpeak  (cms)=     .076

     PEAK FLOW       (cms)=     .003 (i)
     TIME TO PEAK    (hrs)=    1.083
     RUNOFF VOLUME    (mm)=    3.744
     TOTAL RAINFALL   (mm)=   34.271
     RUNOFF COEFFICIENT   =     .109

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

--------------------------------------------------------------------------------
--
002:0019--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                Total Flows to the east from internal catchments
*#
*#-----------------|-------------------------------------------------------------|
------------------------
| ADD HYD (IntE      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 05:IntUcE         1.33     .109    1.00  13.27    .000

                    +ID2 01:SWMout          .00     .000     .00    .00    .000
**DRY**
                    +ID3 02:206            1.22     .006    2.12   3.74    .000

                     ============================================================
                     SUM 07:IntE           2.55     .109    1.00   8.71    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--
002:0020--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#============================================================================
*# Proposed Drainage Conditions (Including External Catchment Flows to Ditches)
*#============================================================================
*#-----------------|-------------------------------------------------------------|
*#
*# External industrial catchment and part of Hwy 401, draining south across
*#                  Cedar Creek Road and entering BPSS
*#
*#-----------------|-------------------------------------------------------------|
```

```
----------------------
| CALIB STANDHYD     |   Area    (ha)=   55.94
| 03:100    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      44.75         11.19
     Dep. Storage     (mm)=       2.00          5.00
     Average Slope     (%)=       1.60          2.00
     Length            (m)=    1500.00         30.00
     Mannings n           =       .020          .250

     Max.eff.Inten.(mm/hr)=      58.21         37.61
               over (min)        18.00         27.00
     Storage Coeff.  (min)=      18.11 (ii)    26.90 (ii)
     Unit Hyd. Tpeak (min)=      18.00         27.00
     Unit Hyd. peak  (cms)=        .06           .04
                                                      *TOTALS*
     PEAK FLOW       (cms)=       2.84           .68          3.293 (iii)
     TIME TO PEAK    (hrs)=       1.27          1.50          1.300
     RUNOFF VOLUME    (mm)=      32.27         11.65         21.959
     TOTAL RAINFALL   (mm)=      34.27         34.27         34.271
     RUNOFF COEFFICIENT   =        .94           .34           .641

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  64.0    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.

--------------------------------------------------------------------------------
--
002:0021--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#  External catchment containing a portion of Cedar Creek Road, a portion
*#  of industrial area, and a grassed area near Hwy 401 off-ramp, entering BPSS
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   14.55
| 07:101    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   48.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.73          5.82
     Dep. Storage     (mm)=        .80          1.50
     Average Slope     (%)=       2.30          2.30
     Length            (m)=     311.45         40.00
     Mannings n           =       .013          .250
```

```
     Max.eff.Inten.(mm/hr)=     109.40         8.66
                over (min)        4.00        22.00
     Storage Coeff.  (min)=       3.80 (ii)   21.80 (ii)
     Unit Hyd. Tpeak (min)=       4.00        22.00
     Unit Hyd. peak  (cms)=        .29          .05
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.57          .08          1.587 (iii)
     TIME TO PEAK    (hrs)=       1.03         1.42          1.033
     RUNOFF VOLUME    (mm)=      33.47         4.80         18.562
     TOTAL RAINFALL   (mm)=      34.27        34.27         34.271
     RUNOFF COEFFICIENT   =        .98          .14           .542

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

------------------------------------------------------------------------------
--
002:0022----------------------------------------------------------------------
--
*#-----------------|--------------------------------------------------------|
*#
*#     Total area draining offsite to east onto agricultural area to the east
*#
*#-----------------|--------------------------------------------------------|
------------------------
| ADD HYD (UCtoE     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 05:IntUcE         1.33     .109    1.00  13.27    .000

                     +ID2 03:100           55.94    3.293    1.30  21.96    .000

                     +ID3 07:101           14.55    1.587    1.03  18.56    .000

                      ============================================================
                      SUM 09:UCtoE         71.82    3.823    1.27  21.11    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
002:0023----------------------------------------------------------------------
--
*#-----------------|--------------------------------------------------------|
*#
*#   Large external catchment west of site containing industrial property,
*#  draining into private SWM feature and then into West Road Ditch, routing
```

```
*#             around SWM facility and entering Outlet Channel
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   12.64
| 04:102    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.11         2.53
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       3.10         3.10
     Length            (m)=     290.29        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     109.40        40.60
               over (min)         3.00        12.00
     Storage Coeff.  (min)=       3.33 (ii)   12.20 (ii)
     Unit Hyd. Tpeak (min)=       3.00        12.00
     Unit Hyd. peak  (cms)=        .35          .09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.52          .17          1.577 (iii)
     TIME TO PEAK    (hrs)=       1.02         1.22          1.017
     RUNOFF VOLUME    (mm)=      33.47         8.38         20.926
     TOTAL RAINFALL   (mm)=      34.27        34.27         34.271
     RUNOFF COEFFICIENT   =        .98          .24           .611

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
002:0024--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                     Infiltration in External SWM Feature
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(102   )   |
| OUT<05:(xSWinf)   |    =========  OUTLFOW STORAGE TABLE  =========
----------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                            (cms)    (ha.m.)   |    (cms)    (ha.m.)
                             .000  .0000E+00   |     .018  .3759E+00
                             .018  .4380E-01   |     .000  .0000E+00
```

```
     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (102   )      12.64     1.577     1.017     20.926
     OUTFLOW<05: (xSWinf)      12.64      .018      .967     20.926
    OVERFLOW<06: (OVF-xI)        .00      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=    1.141
                   TIME SHIFT OF PEAK FLOW         (min)=    -3.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.2478E+00

--------------------------------------------------------------------------------
--
002:0025--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*# External catchment west of the site, containing a portion of exisiting
*# industrial property, draining east into West Road Ditch, routing around
*#                     SWM facility and entering Outlet Channel
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    4.52
| 07:103    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.62          .90
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       5.30         5.30
     Length            (m)=     173.59        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     109.40        45.49
               over (min)         2.00         9.00
     Storage Coeff.  (min)=       2.08 (ii)    9.30 (ii)
     Unit Hyd. Tpeak (min)=       2.00         9.00
     Unit Hyd. peak  (cms)=        .54          .12
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .63          .07          .655 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.17         1.000
     RUNOFF VOLUME    (mm)=      33.47         8.38        20.926
     TOTAL RAINFALL   (mm)=      34.27        34.27        34.271
     RUNOFF COEFFICIENT   =        .98          .24          .611

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
```

```
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
002:0026--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                 Total Flows through West Road Ditch
*#
*#-----------------|-------------------------------------------------------------|
------------------------
| ADD HYD (WRswl     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 06:OVF-xI          .00     .000     .00    .00    .000
**DRY**
                     +ID2 07:103            4.52     .655    1.00  20.93    .000

                     +ID3 02:206            1.22     .006    2.12   3.74    .000

                      ============================================================
                      SUM 08:WRswl          5.74     .655    1.00  17.27    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--
002:0027--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    1.13   Curve Number   (CN)=50.00
| 05:208    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .850

     Unit Hyd Qpeak  (cms)=     .051

     PEAK FLOW       (cms)=     .005 (i)
     TIME TO PEAK    (hrs)=    2.167
     RUNOFF VOLUME    (mm)=    3.744
     TOTAL RAINFALL   (mm)=   34.271
     RUNOFF COEFFICIENT   =     .109

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

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

```
--
002:0028-------------------------------------------------------------------------
--
*#-----------------|---------------------------------------------------------|
*#
*#                 Total Flows through Outlet Channel
*#
*#-----------------|---------------------------------------------------------|
------------------------
| ADD HYD (OutChan   ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:SWMout          .00     .000     .00    .00    .000
**DRY**
                     +ID2 08:WRswl           5.74     .655    1.00  17.27    .000

                     +ID3 05:208             1.13     .005    2.17   3.74    .000

                      ===========================================================
                      SUM 03:OutChan         6.87     .655    1.00  15.05    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--
002:0029-------------------------------------------------------------------------
--
*#-----------------|---------------------------------------------------------|
*#
*#                 Total Flows to the east (eventually to Cedar Creek)
*#
*#-----------------|---------------------------------------------------------|
------------------------
| ADD HYD (TotE      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:SWMout          .00     .000     .00    .00    .000
**DRY**
                     +ID2 08:WRswl           5.74     .655    1.00  17.27    .000

                     +ID3 09:UCtoE          71.82    3.823    1.27  21.11    .000

                      ===========================================================
                      SUM 04:TotE           77.56    4.001    1.27  20.83    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--
002:0030-------------------------------------------------------------------------
```

```
--
*#-----------------|------------------------------------------------------------|
*#
*#                         Total Flows from the Site
*#
*#-----------------|------------------------------------------------------------|
-------------------------
| ADD HYD (AllFlo    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
-------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 04:TotE          77.56    4.001    1.27  20.83    .000

                     +ID2 10:207             .14     .003    1.08   3.74    .000

                      ============================================================
                      SUM 06:AllFlo        77.70    4.002    1.27  20.80    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--
002:0031--------------------------------------------------------------------------
--
--------------------------------------------------------------------------------
--
002:0002--------------------------------------------------------------------------
--
  ** END OF RUN :   4

********************************************************************************




--------------------
| START            |  Project  dir.: C:\SWMHYMO\CEDARC~1\202401~4\

--------------------  Rainfall dir.: C:\SWMHYMO\CEDARC~1\202401~4\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 005
    NSTORM=   1
           #  1=Kit5yr.3hr
--------------------------------------------------------------------------------
--
005:0002--------------------------------------------------------------------------
--
*#*****************************************************************************
```

```
*#  Project Name: [2509 Cedar Creek Road SWM - Ayr, ON] Project #: [161414214]
*#  Date        : 01/25/2024
*#  Modeller    : [Amy Kyle, Water Resources Specialist]
*#  Company     : Stantec Consulting Ltd. (Waterloo)
*#  License #   : 4730904
*#
*#  This hydrologic analysis prepared to provide pond sizing
*#  for the 2509 Cedar Creek Road SWM Facility
*#  The storm events modelled are:
*#  25mm, 2, 5, 25, 50, and 100-year Chicago storms (City of Kitchener IDF)
*#  and the Regional Event
*#*************************************************************************
-------------------------------------------------------------------------------
--
005:0002----------------------------------------------------------------------
--
--------------------
| READ STORM       |    Filename: 5-yr, 3hr Chicago Storm - Kitchener IDF
| Ptotal=  47.26 mm|    Comments: 5-yr, 3hr Chicago Storm - Kitchener IDF
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   3.031 |    .83  24.598 |   1.58  11.053 |   2.33   4.231
               .17   3.380 |    .92  57.395 |   1.67   9.458 |   2.42   3.949
               .25   3.819 |   1.00 139.288 |   1.75   8.241 |   2.50   3.701
               .33   4.385 |   1.08  72.741 |   1.83   7.286 |   2.58   3.483
               .42   5.141 |   1.17  42.120 |   1.92   6.519 |   2.67   3.288
               .50   6.195 |   1.25  28.378 |   2.00   5.892 |   2.75   3.114
               .58   7.751 |   1.33  20.884 |   2.08   5.370 |   2.83   2.957
               .67  10.239 |   1.42  16.280 |   2.17   4.930 |   2.92   2.815
               .75  14.725 |   1.50  13.216 |   2.25   4.554 |   3.00   2.687

-------------------------------------------------------------------------------
--
005:0003----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#=============================================================================
*# Proposed Drainage Conditions (Internal Areas)
*#=============================================================================
*#-----------------|-------------------------------------------------------------|
*#
*#    Small portion of West Road Ditch draining offsite to the east through
*#                            By-Pass Storm Sewer(BPSS)
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .14   Curve Number   (CN)=50.00
| 01:200    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .260
```

```
     Unit Hyd Qpeak  (cms)=     .021

     PEAK FLOW       (cms)=     .003 (i)
     TIME TO PEAK    (hrs)=    1.367
     RUNOFF VOLUME    (mm)=    6.981
     TOTAL RAINFALL   (mm)=   47.258
     RUNOFF COEFFICIENT   =     .148

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

--------------------------------------------------------------------------------
--
005:0004--------------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*#  Proposed developed catchment draining offsite to the east through BPSS
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=     .64
| 02:201    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .58          .06
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      65.32        40.00
     Mannings n             =       .013         .250

     Max.eff.Inten.(mm/hr)=     139.29       286.71
               over (min)        1.00         6.00
     Storage Coeff.  (min)=       1.41 (ii)    6.04 (ii)
     Unit Hyd. Tpeak (min)=       1.00         6.00
     Unit Hyd. peak  (cms)=        .86          .19
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .12          .04          .143 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.08         1.000
     RUNOFF VOLUME    (mm)=      46.46        22.56        34.507
     TOTAL RAINFALL   (mm)=      47.26        47.26        47.258
     RUNOFF COEFFICIENT   =        .98          .48          .730

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

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

```
--
005:0005----------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*# Proposed internal grassed area and plunge pool draining offsite to the east
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .55   Curve Number   (CN)=50.00
| 03:203    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .080

     Unit Hyd Qpeak  (cms)=     .263

     PEAK FLOW       (cms)=     .019 (i)
     TIME TO PEAK    (hrs)=    1.100
     RUNOFF VOLUME    (mm)=    6.985
     TOTAL RAINFALL   (mm)=   47.258
     RUNOFF COEFFICIENT   =     .148

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

-------------------------------------------------------------------------------
--
005:0006----------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#          Total internal area draining onto agricultural area to the east
*#
*#-----------------|-------------------------------------------------------------|
------------------------
| ADD HYD (IntUcE    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:200            .14     .003    1.37   6.98    .000

                     +ID2 02:201            .64     .143    1.00  34.51    .000

                     +ID3 03:203            .55     .019    1.10   6.98    .000

                      ============================================================
                      SUM 05:IntUcE         1.33     .155    1.00  20.23    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--
005:0007----------------------------------------------------------------------------
```

```
--
*#
*#             Proposed industrial lots draining to Rear Lot Ditch
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    8.82
| 06:202    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   80.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       7.94          .88
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     242.49        40.00
     Mannings n             =       .013         .250

     Max.eff.Inten.(mm/hr)=     139.29        47.27
               over (min)        3.00        13.00
     Storage Coeff.  (min)=       3.09 (ii)   12.62 (ii)
     Unit Hyd. Tpeak (min)=       3.00        13.00
     Unit Hyd. peak  (cms)=        .37          .09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       2.26          .07          2.283 (iii)
     TIME TO PEAK    (hrs)=       1.02         1.25          1.017
     RUNOFF VOLUME    (mm)=      46.46        12.47         39.660
     TOTAL RAINFALL   (mm)=      47.26        47.26         47.258
     RUNOFF COEFFICIENT   =        .98          .26           .839

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
005:0008--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#    External agricultural area draining onsite and entering Rear Lot Ditch
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .73   Curve Number   (CN)=70.00
| 07:104    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .190

     Unit Hyd Qpeak  (cms)=     .147
```

```
     PEAK FLOW       (cms)=     .035 (i)
     TIME TO PEAK    (hrs)=    1.250
     RUNOFF VOLUME    (mm)=   13.542
     TOTAL RAINFALL   (mm)=   47.258
     RUNOFF COEFFICIENT   =     .287

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

------------------------------------------------------------------------------
--
005:0009--------------------------------------------------------------------
--
*#-----------------|---------------------------------------------------------|
*#
*#      Total area entering Rear Lot Ditch and entering SWMF at East inlet
*#
*#-----------------|---------------------------------------------------------|
------------------------
| ADD HYD (RLswl     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 06:202           8.82    2.283    1.02  39.66    .000

                     +ID2 07:104            .73     .035    1.25  13.54    .000

                      ============================================================
                      SUM 08:RLswl         9.55    2.294    1.02  37.66    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
005:0010--------------------------------------------------------------------
--
*#
*#   Proposed industrial lots draining to East Road Ditch within catchment,
*#                          and new internal roadway
*#
*#-----------------|---------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    4.92
| 01:204    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   80.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.43          .49
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     181.11        40.00
     Mannings n           =       .013         .250
```

```
     Max.eff.Inten.(mm/hr)=     139.29        48.75
                over (min)        3.00        12.00
     Storage Coeff.  (min)=       2.60 (ii)   12.00 (ii)
     Unit Hyd. Tpeak (min)=       3.00        12.00
     Unit Hyd. peak  (cms)=        .41          .09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.31          .04          1.323 (iii)
     TIME TO PEAK    (hrs)=       1.02         1.23          1.017
     RUNOFF VOLUME    (mm)=      46.46        12.47         39.660
     TOTAL RAINFALL   (mm)=      47.26        47.26         47.258
     RUNOFF COEFFICIENT   =        .98          .26           .839

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

------------------------------------------------------------------------------
--
005:0011----------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*#             Rooftop infiltration lumped together and sized for 25mm
*#         runoff volume from an assumed 0.15ha rooftop area per lot (7 lots)
*#
*#-----------------|------------------------------------------------------------|
-------------------------
| ADD HYD (Roof      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
-------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:204           4.92    1.323    1.02  39.66    .000

                     +ID2 06:202           8.82    2.283    1.02  39.66    .000

                      ============================================================
                      SUM 02:Roof         13.74    3.606    1.02  39.66    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
005:0012----------------------------------------------------------------------
--
----------------------
| ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
|  IN>02:(Roof  )    |
| OUT<04:(R-inf )    |    =========  OUTLFOW STORAGE TABLE  =========
--------------------     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
```

```
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00   |     .000  .2625E-01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >02: (Roof  )      13.74     3.606     1.017     39.660
     OUTFLOW<04: (R-inf )        .66      .000      .700      8.488
    OVERFLOW<10: (infO  )      13.08     3.571     1.017     39.660

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        5
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=     3.80
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .22


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=     .000
                   TIME SHIFT OF PEAK FLOW         (min)=   -19.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.2625E-01

      *** WARNING: Outflow volume is less than inflow volume.
------------------------------------------------------------------------------
--
005:0013----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#              Proposed SWM facility catchment (infiltration basin)
*#
*#-----------------|-------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    1.63   Curve Number   (CN)=57.00
| 09:205    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .350

     Unit Hyd Qpeak  (cms)=     .178

     PEAK FLOW       (cms)=     .035 (i)
     TIME TO PEAK    (hrs)=    1.483
     RUNOFF VOLUME    (mm)=    8.820
     TOTAL RAINFALL   (mm)=   47.258
     RUNOFF COEFFICIENT   =     .187

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

------------------------------------------------------------------------------
--
005:0014----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#                        All flows entering SWM facility
```

```
*#
*#-----------------|------------------------------------------------------------|
------------------------
| ADD HYD (ToSWM     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 10:infO         13.08    3.571    1.02  39.66    .000

                     +ID2 07:104            .73     .035    1.25  13.54    .000

                     +ID3 09:205           1.63     .035    1.48   8.82    .000

                      ============================================================
                      SUM 06:ToSWM        15.44    3.587    1.02  35.17    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--
005:0015---------------------------------------------------------------------------
--
*#
*#                     Infiltration Portion of SWM facility
*#
*#-----------------|------------------------------------------------------------|
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>06:(ToSWM )   |
| OUT<07:(SWMinf)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .044  .7033E+00
                            .044  .6530E-01   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >06: (ToSWM )      15.44     3.587     1.017     35.168
     OUTFLOW<07: (SWMinf)      15.44      .044      .950     35.168
    OVERFLOW<08: (OVF-I )        .00      .000      .000       .000

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    1.227
                    TIME SHIFT OF PEAK FLOW         (min)=    -4.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.5054E+00

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

```
--
005:0016-------------------------------------------------------------------------
--
*#-----------------|---------------------------------------------------------|
*#
*#                    Active Storage Portion of SWM facility
*#
*#-----------------|---------------------------------------------------------|
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>08:(OVF-I )   |
| OUT<01:(SWMout)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |    1.479  .2400E+00
                            .202  .7850E-01   |    4.101  .4070E+00
                            .689  .1586E+00   |     .000  .0000E+00
      *** WARNING: Inflow hydrograph is dry.

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     -------------------        (ha)     (cms)     (hrs)       (mm)
     INFLOW >08: (OVF-I )        .00      .000      .000       .000
     OUTFLOW<01: (SWMout)        .00      .000      .000       .000
    OVERFLOW<02: (OVF   )      13.74      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


*** WARNING: Inflow and ouflow hydrographs are dry.

-------------------------------------------------------------------------------
--
005:0017-------------------------------------------------------------------------
--
*#-----------------|---------------------------------------------------------|
*#
*#    West Road Ditch, conveying external drainage from the west around the
*#                  proposed SWM facility to Outlet Channel
*#
*#-----------------|---------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    1.22   Curve Number   (CN)=50.00
| 02:206    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .810

     Unit Hyd Qpeak  (cms)=     .058

     PEAK FLOW       (cms)=     .012 (i)
```

```
     TIME TO PEAK    (hrs)=    2.083
     RUNOFF VOLUME    (mm)=    6.984
     TOTAL RAINFALL   (mm)=   47.258
     RUNOFF COEFFICIENT   =     .148

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

-------------------------------------------------------------------------------
--
005:0018----------------------------------------------------------------------
--
*#-----------------|---------------------------------------------------------|
*#
*#        Grassed area south of SWM facility draining offsite to the south
*#
*#-----------------|---------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .14   Curve Number   (CN)=50.00
| 10:207    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .070

     Unit Hyd Qpeak  (cms)=     .076

     PEAK FLOW       (cms)=     .005 (i)
     TIME TO PEAK    (hrs)=    1.083
     RUNOFF VOLUME    (mm)=    6.984
     TOTAL RAINFALL   (mm)=   47.258
     RUNOFF COEFFICIENT   =     .148

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

-------------------------------------------------------------------------------
--
005:0019----------------------------------------------------------------------
--
*#-----------------|---------------------------------------------------------|
*#
*#                Total Flows to the east from internal catchments
*#
*#-----------------|---------------------------------------------------------|
------------------------
| ADD HYD (IntE      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 05:IntUcE         1.33     .155    1.00  20.23    .000

                    +ID2 01:SWMout          .00     .000     .00    .00    .000
**DRY**
                    +ID3 02:206            1.22     .012    2.08   6.98    .000

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

```
                    SUM 07:IntE           2.55     .155    1.00  13.89    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--
005:0020--------------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#============================================================================
*# Proposed Drainage Conditions (Including External Catchment Flows to Ditches)
*#============================================================================
*#-----------------|------------------------------------------------------------|
*#
*# External industrial catchment and part of Hwy 401, draining south across
*#                    Cedar Creek Road and entering BPSS
*#
*#-----------------|------------------------------------------------------------|
----------------------
| CALIB STANDHYD     |   Area    (ha)=   55.94
| 03:100    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      44.75         11.19
     Dep. Storage     (mm)=       2.00          5.00
     Average Slope     (%)=       1.60          2.00
     Length            (m)=    1500.00         30.00
     Mannings n           =       .020          .250

     Max.eff.Inten.(mm/hr)=      89.81         77.05
               over (min)        15.00         22.00
     Storage Coeff.  (min)=      15.23 (ii)    21.82 (ii)
     Unit Hyd. Tpeak (min)=      15.00         22.00
     Unit Hyd. peak  (cms)=        .07           .05
                                                      *TOTALS*
     PEAK FLOW       (cms)=       4.46          1.42          5.512 (iii)
     TIME TO PEAK    (hrs)=       1.23          1.42          1.283
     RUNOFF VOLUME    (mm)=      45.26         20.00         32.629
     TOTAL RAINFALL   (mm)=      47.26         47.26         47.258
     RUNOFF COEFFICIENT   =        .96           .42           .690

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  64.0    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.

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

```
005:0021-------------------------------------------------------------------------
--
*#----------------|-------------------------------------------------------------|
*#
*#  External catchment containing a portion of Cedar Creek Road, a portion
*#  of industrial area, and a grassed area near Hwy 401 off-ramp, entering BPSS
*#
*#----------------|-------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   14.55
| 07:101    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   48.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.73         5.82
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.30         2.30
     Length            (m)=     311.45        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     139.29        19.01
               over (min)        3.00        17.00
     Storage Coeff.  (min)=       3.45 (ii)   16.59 (ii)
     Unit Hyd. Tpeak (min)=       3.00        17.00
     Unit Hyd. peak  (cms)=        .34          .07
                                                          *TOTALS*
     PEAK FLOW       (cms)=       2.18          .19          2.214 (iii)
     TIME TO PEAK    (hrs)=       1.02         1.33          1.017
     RUNOFF VOLUME    (mm)=      46.46         8.80         26.877
     TOTAL RAINFALL   (mm)=      47.26        47.26         47.258
     RUNOFF COEFFICIENT   =        .98          .19           .569

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

-------------------------------------------------------------------------------
--
005:0022-------------------------------------------------------------------------
--
*#----------------|-------------------------------------------------------------|
*#
*#     Total area draining offsite to east onto agricultural area to the east
*#
*#----------------|-------------------------------------------------------------|
------------------------
| ADD HYD (UCtoE     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 05:IntUcE         1.33     .155    1.00  20.23    .000
```

+ID2	03:100	55.94	5.512	1.28	32.63	.000
+ID3	07:101	14.55	2.214	1.02	26.88	.000
SUM	09:UCtoE	71.82	6.441	1.23	31.23	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

005:0023

*#
*# Large external catchment west of site containing industrial property,
*# draining into private SWM feature and then into West Road Ditch, routing
*# around SWM facility and entering Outlet Channel
*#

DESIGN STANDHYD 04:102 DT= 1.00 | Area (ha)= 12.64
Total Imp(%)= 80.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	10.11	2.53	
Dep. Storage	(mm)=	.80	1.50	
Average Slope	(%)=	3.10	3.10	
Length	(m)=	290.29	40.00	
Mannings n	=	.013	.250	
Max.eff.Inten.(mm/hr)=		139.29	78.90	
over (min)		3.00	10.00	
Storage Coeff.	(min)=	3.02 (ii)	9.82 (ii)	
Unit Hyd. Tpeak	(min)=	3.00	10.00	
Unit Hyd. peak	(cms)=	.37	.11	
				TOTALS
PEAK FLOW	(cms)=	2.04	.35	2.179 (iii)
TIME TO PEAK	(hrs)=	1.02	1.20	1.017
RUNOFF VOLUME	(mm)=	46.46	14.68	30.571
TOTAL RAINFALL	(mm)=	47.26	47.26	47.258
RUNOFF COEFFICIENT	=	.98	.31	.647

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 50.0 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.

```
--------------------------------------------------------------------------------
--
005:0024--------------------------------------------------------------------------
--
*#----------------|------------------------------------------------------------|
*#
*#                     Infiltration in External SWM Feature
*#
*#----------------|------------------------------------------------------------|
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(102   )   |
| OUT<05:(xSWinf)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .018  .3759E+00
                            .018  .4380E-01   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (102   )      12.64     2.179     1.017     30.571
     OUTFLOW<05: (xSWinf)      12.64      .018      .917     30.570
    OVERFLOW<06: (OVF-xI)        .00      .000      .000       .000

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=     .826
                    TIME SHIFT OF PEAK FLOW         (min)=    -6.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.3695E+00

--------------------------------------------------------------------------------
--
005:0025--------------------------------------------------------------------------
--
*#----------------|------------------------------------------------------------|
*#
*# External catchment west of the site, containing a portion of exisiting
*# industrial property, draining east into West Road Ditch, routing around
*#                     SWM facility and entering Outlet Channel
*#
*#----------------|------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    4.52
| 07:103    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
```

```
     Surface Area     (ha)=       3.62          .90
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       5.30         5.30
     Length            (m)=     173.59        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     139.29        81.28
               over (min)         2.00         8.00
     Storage Coeff.  (min)=       1.89 (ii)    7.61 (ii)
     Unit Hyd. Tpeak (min)=       2.00         8.00
     Unit Hyd. peak  (cms)=        .58          .15
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .82          .14          .881 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.15         1.000
     RUNOFF VOLUME    (mm)=      46.46        14.68        30.571
     TOTAL RAINFALL   (mm)=      47.26        47.26        47.258
     RUNOFF COEFFICIENT   =        .98          .31          .647

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
005:0026--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                 Total Flows through West Road Ditch
*#
*#-----------------|-------------------------------------------------------------|
-------------------------
| ADD HYD (WRswl     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
-------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 06:OVF-xI          .00     .000     .00    .00    .000
**DRY**
                     +ID2 07:103            4.52     .881    1.00  30.57    .000

                     +ID3 02:206            1.22     .012    2.08   6.98    .000

                      ============================================================
                      SUM 08:WRswl          5.74     .881    1.00  25.56    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

```
005:0027-------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    1.13   Curve Number   (CN)=50.00
| 05:208    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .850

     Unit Hyd Qpeak  (cms)=     .051

     PEAK FLOW       (cms)=     .011 (i)
     TIME TO PEAK    (hrs)=    2.133
     RUNOFF VOLUME    (mm)=    6.984
     TOTAL RAINFALL   (mm)=   47.258
     RUNOFF COEFFICIENT   =     .148

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

-------------------------------------------------------------------------------
--
005:0028-------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                 Total Flows through Outlet Channel
*#
*#-----------------|-------------------------------------------------------------|
------------------------
| ADD HYD (OutChan   ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:SWMout          .00     .000     .00    .00    .000
**DRY**
                     +ID2 08:WRswl           5.74     .881    1.00  25.56    .000

                     +ID3 05:208             1.13     .011    2.13   6.98    .000

                      ============================================================
                      SUM 03:OutChan         6.87     .881    1.00  22.50    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--
005:0029-------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                 Total Flows to the east (eventually to Cedar Creek)
*#
```

```
*#-----------------|-------------------------------------------------------------|
------------------------
| ADD HYD (TotE      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:SWMout          .00     .000     .00    .00    .000
**DRY**
                    +ID2 08:WRswl          5.74     .881    1.00  25.56    .000

                    +ID3 09:UCtoE         71.82    6.441    1.23  31.23    .000

                     ============================================================
                     SUM 04:TotE          77.56    6.766    1.23  30.81    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
005:0030---------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                         Total Flows from the Site
*#
*#-----------------|-------------------------------------------------------------|
------------------------
| ADD HYD (AllFlo    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 04:TotE          77.56    6.766    1.23  30.81    .000

                    +ID2 10:207             .14     .005    1.08   6.98    .000

                     ============================================================
                     SUM 06:AllFlo        77.70    6.769    1.23  30.77    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
005:0031---------------------------------------------------------------------
--
------------------------------------------------------------------------------
--
005:0002---------------------------------------------------------------------
--
------------------------------------------------------------------------------
--
005:0002---------------------------------------------------------------------
--
```

```
  ** END OF RUN :   9

********************************************************************************




--------------------
| START            |  Project  dir.: C:\SWMHYMO\CEDARC~1\202401~4\

--------------------  Rainfall dir.: C:\SWMHYMO\CEDARC~1\202401~4\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 010
    NSTORM=   1
           #  1=Kit10yr.3hr
--------------------------------------------------------------------------------
--
010:0002-----------------------------------------------------------------------
--
*#*****************************************************************************
*#  Project Name: [2509 Cedar Creek Road SWM - Ayr, ON] Project #: [161414214]
*#  Date        : 01/25/2024
*#  Modeller    : [Amy Kyle, Water Resources Specialist]
*#  Company     : Stantec Consulting Ltd. (Waterloo)
*#  License #   : 4730904
*#
*#  This hydrologic analysis prepared to provide pond sizing
*#  for the 2509 Cedar Creek Road SWM Facility
*#  The storm events modelled are:
*#  25mm, 2, 5, 25, 50, and 100-year Chicago storms (City of Kitchener IDF)
*#  and the Regional Event
*#*****************************************************************************
--------------------------------------------------------------------------------
--
010:0002-----------------------------------------------------------------------
--
--------------------
| READ STORM       |    Filename: 10-yr, 3hr Chicago Storm - Kitchener IDF
| Ptotal=  56.28 mm|    Comments: 10-yr, 3hr Chicago Storm - Kitchener IDF
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   3.160 |    .83  29.808 |   1.58  12.832 |   2.33   4.548
               .17   3.560 |    .92  70.748 |   1.67  10.862 |   2.42   4.218
               .25   4.067 |   1.00 169.551 |   1.75   9.368 |   2.50   3.931
               .33   4.729 |   1.08  89.762 |   1.83   8.203 |   2.58   3.678
               .42   5.623 |   1.17  51.823 |   1.92   7.274 |   2.67   3.454
```

```
               .50   6.884 |   1.25  34.566 |   2.00   6.519 |   2.75   3.255
               .58   8.770 |   1.33  25.132 |   2.08   5.895 |   2.83   3.076
               .67  11.826 |   1.42  19.351 |   2.17   5.372 |   2.92   2.915
               .75  17.407 |   1.50  15.520 |   2.25   4.928 |   3.00   2.770

--------------------------------------------------------------------------------
--
010:0003----------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#============================================================================
*# Proposed Drainage Conditions (Internal Areas)
*#============================================================================
*#-----------------|------------------------------------------------------------|
*#
*#    Small portion of West Road Ditch draining offsite to the east through
*#                            By-Pass Storm Sewer(BPSS)
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .14   Curve Number   (CN)=50.00
| 01:200    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .260

     Unit Hyd Qpeak  (cms)=     .021

     PEAK FLOW       (cms)=     .004 (i)
     TIME TO PEAK    (hrs)=    1.367
     RUNOFF VOLUME    (mm)=    9.715
     TOTAL RAINFALL   (mm)=   56.282
     RUNOFF COEFFICIENT   =     .173

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

--------------------------------------------------------------------------------
--
010:0004----------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*#  Proposed developed catchment draining offsite to the east through BPSS
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=     .64
| 02:201    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .58          .06
     Dep. Storage     (mm)=        .80         1.50
```

```
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      65.32        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     169.55       414.94
               over (min)        1.00         5.00
     Storage Coeff.  (min)=       1.30 (ii)    5.30 (ii)
     Unit Hyd. Tpeak (min)=       1.00         5.00
     Unit Hyd. peak  (cms)=        .91          .22
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .15          .05          .184 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.07         1.000
     RUNOFF VOLUME    (mm)=      55.48        29.35        42.416
     TOTAL RAINFALL   (mm)=      56.28        56.28        56.282
     RUNOFF COEFFICIENT   =        .99          .52          .754

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
010:0005--------------------------------------------------------------------------
--
*#-----------------|---------------------------------------------------------|
*#
*# Proposed internal grassed area and plunge pool draining offsite to the east
*#
*#-----------------|---------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .55   Curve Number   (CN)=50.00
| 03:203    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .080

     Unit Hyd Qpeak  (cms)=     .263

     PEAK FLOW       (cms)=     .028 (i)
     TIME TO PEAK    (hrs)=    1.100
     RUNOFF VOLUME    (mm)=    9.719
     TOTAL RAINFALL   (mm)=   56.282
     RUNOFF COEFFICIENT   =     .173

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

--------------------------------------------------------------------------------
--
010:0006--------------------------------------------------------------------------
--
```

```
*#-----------------|---------------------------------------------------------|
*#
*#          Total internal area draining onto agricultural area to the east
*#
*#-----------------|---------------------------------------------------------|
------------------------
| ADD HYD (IntUcE    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:200            .14     .004    1.37   9.72    .000

                     +ID2 02:201            .64     .184    1.00  42.42    .000

                     +ID3 03:203            .55     .028    1.10   9.72    .000

                      ============================================================
                      SUM 05:IntUcE         1.33     .202    1.00  25.45    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--
010:0007----------------------------------------------------------------------
--
*#
*#             Proposed industrial lots draining to Rear Lot Ditch
*#
*#-----------------|---------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    8.82
| 06:202    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   80.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       7.94          .88
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     242.49        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     169.55        71.63
               over (min)        3.00        11.00
     Storage Coeff.  (min)=       2.86 (ii)   10.92 (ii)
     Unit Hyd. Tpeak (min)=       3.00        11.00
     Unit Hyd. peak  (cms)=        .39          .10
                                                      *TOTALS*
     PEAK FLOW       (cms)=       2.81          .11         2.846 (iii)
     TIME TO PEAK    (hrs)=       1.02         1.22         1.017
     RUNOFF VOLUME    (mm)=      55.48        16.89        47.765
     TOTAL RAINFALL   (mm)=      56.28        56.28        56.282
     RUNOFF COEFFICIENT   =        .99          .30          .849
```

```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
010:0008--------------------------------------------------------------------------
--
*#----------------|-------------------------------------------------------------|
*#
*#    External agricultural area draining onsite and entering Rear Lot Ditch
*#
*#----------------|-------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .73   Curve Number   (CN)=70.00
| 07:104    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .190

     Unit Hyd Qpeak  (cms)=     .147

     PEAK FLOW       (cms)=     .050 (i)
     TIME TO PEAK    (hrs)=    1.250
     RUNOFF VOLUME    (mm)=   18.339
     TOTAL RAINFALL   (mm)=   56.282
     RUNOFF COEFFICIENT   =     .326

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

--------------------------------------------------------------------------------
--
010:0009--------------------------------------------------------------------------
--
*#----------------|-------------------------------------------------------------|
*#
*#      Total area entering Rear Lot Ditch and entering SWMF at East inlet
*#
*#----------------|-------------------------------------------------------------|
------------------------
| ADD HYD (RLswl     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 06:202            8.82    2.846    1.02  47.76    .000

                    +ID2 07:104             .73     .050    1.25  18.34    .000

                     ============================================================
                     SUM 08:RLswl          9.55    2.862    1.02  45.52    .000
```

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

--------------------------------------------------------------------------------
--
010:0010--------------------------------------------------------------------------
--
*#
*#   Proposed industrial lots draining to East Road Ditch within catchment,
*#                          and new internal roadway
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    4.92
| 01:204    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   80.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.43          .49
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     181.11        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     169.55        74.78
               over (min)         2.00        10.00
     Storage Coeff.  (min)=       2.40 (ii)   10.33 (ii)
     Unit Hyd. Tpeak (min)=       2.00        10.00
     Unit Hyd. peak  (cms)=        .49          .11
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.67          .06          1.690 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.20          1.000
     RUNOFF VOLUME    (mm)=      55.48        16.89         47.765
     TOTAL RAINFALL   (mm)=      56.28        56.28         56.282
     RUNOFF COEFFICIENT   =        .99          .30           .849

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
010:0011--------------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*#             Rooftop infiltration lumped together and sized for 25mm
*#         runoff volume from an assumed 0.15ha rooftop area per lot (7 lots)
*#
```

```
*#-----------------|-------------------------------------------------------|
------------------------
| ADD HYD (Roof      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                          (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:204           4.92    1.690    1.00  47.76    .000

                     +ID2 06:202           8.82    2.846    1.02  47.76    .000

                      ============================================================
                      SUM 02:Roof         13.74    4.482    1.00  47.76    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--
010:0012----------------------------------------------------------------------
--
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>02:(Roof  )   |
| OUT<04:(R-inf )   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .000  .2625E-01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >02: (Roof  )      13.74     4.482     1.000     47.765
     OUTFLOW<04: (R-inf )        .55      .000      .667     10.223
    OVERFLOW<10: (infO  )      13.19     4.479     1.017     47.765

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        4
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=     3.65
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .21


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=     .000
                    TIME SHIFT OF PEAK FLOW         (min)=   -20.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.2625E-01

      *** WARNING: Outflow volume is less than inflow volume.
-------------------------------------------------------------------------------
--
010:0013----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#              Proposed SWM facility catchment (infiltration basin)
*#
```

```
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    1.63   Curve Number   (CN)=57.00
| 09:205    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .350

     Unit Hyd Qpeak  (cms)=     .178

     PEAK FLOW       (cms)=     .050 (i)
     TIME TO PEAK    (hrs)=    1.483
     RUNOFF VOLUME    (mm)=   12.180
     TOTAL RAINFALL   (mm)=   56.282
     RUNOFF COEFFICIENT   =     .216

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

-------------------------------------------------------------------------------
--
010:0014---------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*#                       All flows entering SWM facility
*#
*#-----------------|------------------------------------------------------------|
------------------------
| ADD HYD (ToSWM     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 10:infO          13.19    4.479    1.02  47.76    .000

                    +ID2 07:104             .73     .050    1.25  18.34    .000

                    +ID3 09:205            1.63     .050    1.48  12.18    .000

                     ============================================================
                     SUM 06:ToSWM         15.55    4.502    1.02  42.65    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--
010:0015---------------------------------------------------------------------
--
*#
*#                     Infiltration Portion of SWM facility
*#
*#-----------------|------------------------------------------------------------|
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
```

```
|  IN>06:(ToSWM )   |
| OUT<07:(SWMinf)   |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00   |     .044  .7033E+00
                           .044  .6530E-01   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >06: (ToSWM )      15.55     4.502     1.017     42.653
     OUTFLOW<07: (SWMinf)      15.55      .044      .917     42.653
    OVERFLOW<08: (OVF-I )        .00      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=     .977
                   TIME SHIFT OF PEAK FLOW         (min)=    -6.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.6250E+00

--------------------------------------------------------------------------------
--
010:0016----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                    Active Storage Portion of SWM facility
*#
*#-----------------|-------------------------------------------------------------|
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>08:(OVF-I )   |
| OUT<01:(SWMout)   |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00   |    1.479  .2400E+00
                           .202  .7850E-01   |    4.101  .4070E+00
                           .689  .1586E+00   |     .000  .0000E+00
      *** WARNING: Inflow hydrograph is dry.

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >08: (OVF-I )         .00      .000      .000       .000
     OUTFLOW<01: (SWMout)         .00      .000      .000       .000
    OVERFLOW<02: (OVF   )      13.74      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
```

```
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


*** WARNING: Inflow and ouflow hydrographs are dry.

-------------------------------------------------------------------------------
--
010:0017----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#    West Road Ditch, conveying external drainage from the west around the
*#                  proposed SWM facility to Outlet Channel
*#
*#-----------------|-------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    1.22   Curve Number   (CN)=50.00
| 02:206    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .810

     Unit Hyd Qpeak  (cms)=     .058

     PEAK FLOW       (cms)=     .017 (i)
     TIME TO PEAK    (hrs)=    2.067
     RUNOFF VOLUME    (mm)=    9.719
     TOTAL RAINFALL   (mm)=   56.282
     RUNOFF COEFFICIENT   =     .173

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

-------------------------------------------------------------------------------
--
010:0018----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#        Grassed area south of SWM facility draining offsite to the south
*#
*#-----------------|-------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .14   Curve Number   (CN)=50.00
| 10:207    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .070

     Unit Hyd Qpeak  (cms)=     .076

     PEAK FLOW       (cms)=     .007 (i)
     TIME TO PEAK    (hrs)=    1.083
     RUNOFF VOLUME    (mm)=    9.718
     TOTAL RAINFALL   (mm)=   56.282
```

```
     RUNOFF COEFFICIENT   =     .173

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

--------------------------------------------------------------------------------
--
010:0019----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                Total Flows to the east from internal catchments
*#
*#-----------------|-------------------------------------------------------------|
------------------------
| ADD HYD (IntE      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 05:IntUcE         1.33     .202    1.00  25.45    .000

                     +ID2 01:SWMout          .00     .000     .00    .00    .000
**DRY**
                     +ID3 02:206            1.22     .017    2.07   9.72    .000

                      ============================================================
                      SUM 07:IntE           2.55     .202    1.00  17.92    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--
010:0020----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#=============================================================================
*# Proposed Drainage Conditions (Including External Catchment Flows to Ditches)
*#=============================================================================
*#-----------------|-------------------------------------------------------------|
*#
*# External industrial catchment and part of Hwy 401, draining south across
*#                   Cedar Creek Road and entering BPSS
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| CALIB STANDHYD     |   Area    (ha)=   55.94
| 03:100    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      44.75        11.19
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.60         2.00
```

```
     Length            (m)=    1500.00        30.00
     Mannings n           =       .020         .250

     Max.eff.Inten.(mm/hr)=     112.83       111.58
               over (min)        14.00        20.00
     Storage Coeff.  (min)=      13.90 (ii)   19.59 (ii)
     Unit Hyd. Tpeak (min)=      14.00        20.00
     Unit Hyd. peak  (cms)=        .08          .06
                                                      *TOTALS*
     PEAK FLOW       (cms)=       5.73         2.08         7.366 (iii)
     TIME TO PEAK    (hrs)=       1.22         1.38         1.267
     RUNOFF VOLUME    (mm)=      54.28        26.44        40.362
     TOTAL RAINFALL   (mm)=      56.28        56.28        56.282
     RUNOFF COEFFICIENT   =        .96          .47          .717

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  64.0    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.

------------------------------------------------------------------------------
--
010:0021----------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*#  External catchment containing a portion of Cedar Creek Road, a portion
*#  of industrial area, and a grassed area near Hwy 401 off-ramp, entering BPSS
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   14.55
| 07:101    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   48.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.73         5.82
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.30         2.30
     Length            (m)=     311.45        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     169.55        29.79
               over (min)        3.00        14.00
     Storage Coeff.  (min)=       3.19 (ii)   14.17 (ii)
     Unit Hyd. Tpeak (min)=       3.00        14.00
     Unit Hyd. peak  (cms)=        .36          .08
                                                      *TOTALS*
     PEAK FLOW       (cms)=       2.71          .29         2.782 (iii)
     TIME TO PEAK    (hrs)=       1.02         1.28         1.017
```

```
     RUNOFF VOLUME    (mm)=      55.48        12.13         32.940
     TOTAL RAINFALL   (mm)=      56.28        56.28         56.282
     RUNOFF COEFFICIENT   =        .99          .22           .585

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
010:0022--------------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*#     Total area draining offsite to east onto agricultural area to the east
*#
*#-----------------|------------------------------------------------------------|
------------------------
| ADD HYD (UCtoE     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 05:IntUcE         1.33     .202    1.00  25.45    .000

                     +ID2 03:100           55.94    7.366    1.27  40.36    .000

                     +ID3 07:101           14.55    2.782    1.02  32.94    .000

                      ============================================================
                      SUM 09:UCtoE         71.82    8.624    1.22  38.58    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--
010:0023--------------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*#   Large external catchment west of site containing industrial property,
*#  draining into private SWM feature and then into West Road Ditch, routing
*#             around SWM facility and entering Outlet Channel
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   12.64
| 04:102    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
```

```
     Surface Area     (ha)=      10.11         2.53
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       3.10         3.10
     Length            (m)=     290.29        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     169.55       112.10
               over (min)         3.00         9.00
     Storage Coeff.  (min)=       2.79 (ii)    8.70 (ii)
     Unit Hyd. Tpeak (min)=       3.00         9.00
     Unit Hyd. peak  (cms)=        .39          .13
                                                          *TOTALS*
     PEAK FLOW       (cms)=       2.53          .52          2.765 (iii)
     TIME TO PEAK    (hrs)=       1.02         1.17          1.017
     RUNOFF VOLUME    (mm)=      55.48        19.71         37.598
     TOTAL RAINFALL   (mm)=      56.28        56.28         56.282
     RUNOFF COEFFICIENT   =        .99          .35           .668

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

------------------------------------------------------------------------------
--
010:0024----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#                     Infiltration in External SWM Feature
*#
*#-----------------|-------------------------------------------------------|
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(102   )   |
| OUT<05:(xSWinf)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .018  .3759E+00
                            .018  .4380E-01   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (102   )      12.64     2.765     1.017     37.598
     OUTFLOW<05: (xSWinf)      10.45      .018      .883     37.596
    OVERFLOW<06: (OVF-xI)       2.19      .422     1.600     37.598

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        2
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=     1.57
```

```
                    PERCENTAGE OF TIME OVERFLOWING    (%)=     1.15


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=     .651
                    TIME SHIFT OF PEAK FLOW         (min)=    -8.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.3759E+00

--------------------------------------------------------------------------------
--
010:0025--------------------------------------------------------------------------
--
*#----------------|------------------------------------------------------------|
*#
*# External catchment west of the site, containing a portion of exisiting
*# industrial property, draining east into West Road Ditch, routing around
*#                     SWM facility and entering Outlet Channel
*#
*#----------------|------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    4.52
| 07:103    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.62          .90
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       5.30         5.30
     Length            (m)=     173.59        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     169.55       117.15
               over (min)        2.00         7.00
     Storage Coeff.  (min)=       1.75 (ii)    6.69 (ii)
     Unit Hyd. Tpeak (min)=       2.00         7.00
     Unit Hyd. peak  (cms)=        .61          .17
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.01          .21          1.112 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.12          1.000
     RUNOFF VOLUME    (mm)=      55.48        19.71         37.598
     TOTAL RAINFALL   (mm)=      56.28        56.28         56.282
     RUNOFF COEFFICIENT   =        .99          .35           .668

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
010:0026--------------------------------------------------------------------------
```

```
--
*#-----------------|---------------------------------------------------------|
*#
*#                 Total Flows through West Road Ditch
*#
*#-----------------|---------------------------------------------------------|
-------------------------
| ADD HYD (WRswl     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
-------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 06:OVF-xI         2.19     .422    1.60  37.60    .000

                     +ID2 07:103            4.52    1.112    1.00  37.60    .000

                     +ID3 02:206            1.22     .017    2.07   9.72    .000

                      ============================================================
                      SUM 08:WRswl          7.93    1.112    1.00  33.31    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
010:0027---------------------------------------------------------------------
--
*#-----------------|---------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    1.13   Curve Number   (CN)=50.00
| 05:208    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .850

     Unit Hyd Qpeak  (cms)=     .051

     PEAK FLOW       (cms)=     .015 (i)
     TIME TO PEAK    (hrs)=    2.117
     RUNOFF VOLUME    (mm)=    9.719
     TOTAL RAINFALL   (mm)=   56.282
     RUNOFF COEFFICIENT   =     .173

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

------------------------------------------------------------------------------
--
010:0028---------------------------------------------------------------------
--
*#-----------------|---------------------------------------------------------|
*#
*#                 Total Flows through Outlet Channel
*#
*#-----------------|---------------------------------------------------------|
```

```
------------------------
| ADD HYD (OutChan   ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:SWMout          .00     .000     .00    .00    .000
**DRY**
                     +ID2 08:WRswl           7.93    1.112    1.00  33.31    .000

                     +ID3 05:208             1.13     .015    2.12   9.72    .000

                      ============================================================
                      SUM 03:OutChan         9.06    1.113    1.00  30.37    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--
010:0029---------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#                 Total Flows to the east (eventually to Cedar Creek)
*#
*#-----------------|-------------------------------------------------------|
------------------------
| ADD HYD (TotE      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:SWMout          .00     .000     .00    .00    .000
**DRY**
                     +ID2 08:WRswl           7.93    1.112    1.00  33.31    .000

                     +ID3 09:UCtoE          71.82    8.624    1.22  38.58    .000

                      ============================================================
                      SUM 04:TotE           79.75    9.079    1.20  38.06    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--
010:0030---------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#                         Total Flows from the Site
*#
*#-----------------|-------------------------------------------------------|
------------------------
| ADD HYD (AllFlo    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
```

```
-----------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 04:TotE          79.75    9.079    1.20  38.06    .000

                     +ID2 10:207             .14     .007    1.08   9.72    .000

                      ============================================================
                      SUM 06:AllFlo        79.89    9.085    1.20  38.01    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--
010:0031--------------------------------------------------------------------------
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--------------------------------------------------------------------------------
--
010:0002--------------------------------------------------------------------------
--
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--
010:0002--------------------------------------------------------------------------
--
--------------------------------------------------------------------------------
--
010:0002--------------------------------------------------------------------------
--
  ** END OF RUN :  24

*******************************************************************************




--------------------
| START            |  Project  dir.: C:\SWMHYMO\CEDARC~1\202401~4\

-------------------  Rainfall dir.: C:\SWMHYMO\CEDARC~1\202401~4\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 025
    NSTORM=   1
           #  1=Kit25yr.3hr
--------------------------------------------------------------------------------
--
025:0002--------------------------------------------------------------------------
--
*#*****************************************************************************
```

```
*#  Project Name: [2509 Cedar Creek Road SWM - Ayr, ON] Project #: [161414214]
*#  Date        : 01/25/2024
*#  Modeller    : [Amy Kyle, Water Resources Specialist]
*#  Company     : Stantec Consulting Ltd. (Waterloo)
*#  License #   : 4730904
*#
*#  This hydrologic analysis prepared to provide pond sizing
*#  for the 2509 Cedar Creek Road SWM Facility
*#  The storm events modelled are:
*#  25mm, 2, 5, 25, 50, and 100-year Chicago storms (City of Kitchener IDF)
*#  and the Regional Event
*#*************************************************************************
--------------------------------------------------------------------------------
--
025:0002--------------------------------------------------------------------------
--
--------------------
| READ STORM       |    Filename: 25-yr, 3hr Chicago Storm - Kitchener IDF
| Ptotal=  68.26 mm|    Comments: 25-yr, 3hr Chicago Storm - Kitchener IDF
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   3.567 |    .83  38.324 |   1.58  16.257 |   2.33   5.336
               .17   4.072 |    .92  87.426 |   1.67  13.647 |   2.42   4.912
               .25   4.719 |   1.00 191.557 |   1.75  11.668 |   2.50   4.544
               .33   5.571 |   1.08 109.318 |   1.83  10.127 |   2.58   4.222
               .42   6.733 |   1.17  65.637 |   1.92   8.900 |   2.67   3.938
               .50   8.387 |   1.25  44.391 |   2.00   7.906 |   2.75   3.686
               .58  10.876 |   1.33  32.362 |   2.08   7.088 |   2.83   3.461
               .67  14.925 |   1.42  24.846 |   2.17   6.405 |   2.92   3.260
               .75  22.291 |   1.50  19.811 |   2.25   5.829 |   3.00   3.079

--------------------------------------------------------------------------------
--
025:0003--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#=============================================================================
*# Proposed Drainage Conditions (Internal Areas)
*#=============================================================================
*#-----------------|-------------------------------------------------------------|
*#
*#    Small portion of West Road Ditch draining offsite to the east through
*#                            By-Pass Storm Sewer(BPSS)
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .14   Curve Number   (CN)=50.00
| 01:200    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .260
```

```
     Unit Hyd Qpeak  (cms)=     .021

     PEAK FLOW       (cms)=     .006 (i)
     TIME TO PEAK    (hrs)=    1.367
     RUNOFF VOLUME    (mm)=   13.890
     TOTAL RAINFALL   (mm)=   68.256
     RUNOFF COEFFICIENT   =     .203

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

-------------------------------------------------------------------------------
--
025:0004----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#  Proposed developed catchment draining offsite to the east through BPSS
*#
*#-----------------|-------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=     .64
| 02:201    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .58          .06
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      65.32        40.00
     Mannings n             =       .013         .250

     Max.eff.Inten.(mm/hr)=     191.56       521.87
               over (min)        1.00         5.00
     Storage Coeff.  (min)=       1.24 (ii)    4.88 (ii)
     Unit Hyd. Tpeak (min)=       1.00         5.00
     Unit Hyd. peak  (cms)=        .94          .23
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .17          .07          .217 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.07         1.000
     RUNOFF VOLUME    (mm)=      67.46        38.89        53.172
     TOTAL RAINFALL   (mm)=      68.26        68.26        68.256
     RUNOFF COEFFICIENT   =        .99          .57          .779

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

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

```
--
025:0005-------------------------------------------------------------------------
--
*#-----------------|-----------------------------------------------------------|
*#
*# Proposed internal grassed area and plunge pool draining offsite to the east
*#
*#-----------------|-----------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .55   Curve Number   (CN)=50.00
| 03:203    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .080

     Unit Hyd Qpeak  (cms)=     .263

     PEAK FLOW       (cms)=     .038 (i)
     TIME TO PEAK    (hrs)=    1.100
     RUNOFF VOLUME    (mm)=   13.893
     TOTAL RAINFALL   (mm)=   68.256
     RUNOFF COEFFICIENT   =     .204

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

-------------------------------------------------------------------------------
--
025:0006-------------------------------------------------------------------------
--
*#-----------------|-----------------------------------------------------------|
*#
*#          Total internal area draining onto agricultural area to the east
*#
*#-----------------|-----------------------------------------------------------|
------------------------
| ADD HYD (IntUcE    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:200            .14     .006    1.37  13.89    .000

                     +ID2 02:201            .64     .217    1.00  53.17    .000

                     +ID3 03:203            .55     .038    1.10  13.89    .000

                      ============================================================
                      SUM 05:IntUcE         1.33     .242    1.00  32.79    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--
025:0007-------------------------------------------------------------------------
```

```
--
*#
*#             Proposed industrial lots draining to Rear Lot Ditch
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    8.82
| 06:202    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   80.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       7.94          .88
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     242.49        40.00
     Mannings n             =       .013         .250

     Max.eff.Inten.(mm/hr)=     191.56       100.24
               over (min)        3.00        10.00
     Storage Coeff.  (min)=       2.72 (ii)    9.77 (ii)
     Unit Hyd. Tpeak (min)=       3.00        10.00
     Unit Hyd. peak  (cms)=        .40          .11
                                                        *TOTALS*
     PEAK FLOW       (cms)=       3.24          .16          3.305 (iii)
     TIME TO PEAK    (hrs)=       1.02         1.20          1.017
     RUNOFF VOLUME    (mm)=      67.46        23.43         58.651
     TOTAL RAINFALL   (mm)=      68.26        68.26         68.256
     RUNOFF COEFFICIENT   =        .99          .34           .859

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
025:0008--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#    External agricultural area draining onsite and entering Rear Lot Ditch
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .73   Curve Number   (CN)=70.00
| 07:104    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .190

     Unit Hyd Qpeak  (cms)=     .147
```

```
     PEAK FLOW       (cms)=     .068 (i)
     TIME TO PEAK    (hrs)=    1.250
     RUNOFF VOLUME    (mm)=   25.376
     TOTAL RAINFALL   (mm)=   68.256
     RUNOFF COEFFICIENT   =     .372

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

--------------------------------------------------------------------------------
--
025:0009--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#      Total area entering Rear Lot Ditch and entering SWMF at East inlet
*#
*#-----------------|-------------------------------------------------------------|
------------------------
| ADD HYD (RLswl     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 06:202           8.82    3.305    1.02  58.65    .000

                     +ID2 07:104            .73     .068    1.25  25.38    .000

                      ============================================================
                      SUM 08:RLswl         9.55    3.328    1.02  56.11    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--
025:0010--------------------------------------------------------------------------
--
*#
*#   Proposed industrial lots draining to East Road Ditch within catchment,
*#                          and new internal roadway
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    4.92
| 01:204    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   80.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.43          .49
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     181.11        40.00
     Mannings n           =       .013         .250
```

```
     Max.eff.Inten.(mm/hr)=     191.56       101.43
               over (min)        2.00         9.00
     Storage Coeff.  (min)=       2.28 (ii)    9.30 (ii)
     Unit Hyd. Tpeak (min)=       2.00         9.00
     Unit Hyd. peak  (cms)=        .51          .12
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.92          .09         1.951 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.18         1.000
     RUNOFF VOLUME    (mm)=      67.46        23.43        58.651
     TOTAL RAINFALL   (mm)=      68.26        68.26        68.256
     RUNOFF COEFFICIENT   =        .99          .34          .859

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

------------------------------------------------------------------------------
--
025:0011--------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#             Rooftop infiltration lumped together and sized for 25mm
*#         runoff volume from an assumed 0.15ha rooftop area per lot (7 lots)
*#
*#-----------------|-------------------------------------------------------|
-------------------------
| ADD HYD (Roof      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
-------------------------                          (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:204           4.92    1.951    1.00  58.65    .000

                     +ID2 06:202           8.82    3.305    1.02  58.65    .000

                      ============================================================
                      SUM 02:Roof         13.74    5.199    1.00  58.65    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
025:0012--------------------------------------------------------------------
--
----------------------
| ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
|  IN>02:(Roof  )    |
| OUT<04:(R-inf )    |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
```

```
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00   |     .000  .2625E-01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >02: (Roof  )      13.74     5.199     1.000     58.651
     OUTFLOW<04: (R-inf )        .45      .000      .600     12.554
    OVERFLOW<10: (infO  )      13.29     5.195     1.017     58.651

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        3
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=     3.62
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .21


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=     .000
                   TIME SHIFT OF PEAK FLOW         (min)=   -24.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.2625E-01

      *** WARNING: Outflow volume is less than inflow volume.
-------------------------------------------------------------------------------
--
025:0013---------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#              Proposed SWM facility catchment (infiltration basin)
*#
*#-----------------|-------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    1.63   Curve Number   (CN)=57.00
| 09:205    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .350

     Unit Hyd Qpeak  (cms)=     .178

     PEAK FLOW       (cms)=     .072 (i)
     TIME TO PEAK    (hrs)=    1.483
     RUNOFF VOLUME    (mm)=   17.248
     TOTAL RAINFALL   (mm)=   68.256
     RUNOFF COEFFICIENT   =     .253

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

-------------------------------------------------------------------------------
--
025:0014---------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#                        All flows entering SWM facility
```

```
*#
*#-----------------|------------------------------------------------------------|
------------------------
| ADD HYD (ToSWM     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------ -                (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 10:infO         13.29    5.195    1.02  58.65    .000

                     +ID2 07:104            .73     .068    1.25  25.38    .000

                     +ID3 09:205           1.63     .072    1.48  17.25    .000

                      ============================================================
                      SUM 06:ToSWM        15.65    5.227    1.02  52.79    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--
025:0015---------------------------------------------------------------------
--
*#
*#                     Infiltration Portion of SWM facility
*#
*#-----------------|------------------------------------------------------------|
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>06:(ToSWM )   |
| OUT<07:(SWMinf)   |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00   |     .044  .7033E+00
                           .044  .6530E-01   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     -------------------        (ha)     (cms)     (hrs)       (mm)
     INFLOW >06: (ToSWM )      15.65     5.227     1.017     52.787
     OUTFLOW<07: (SWMinf)      14.07      .044      .883     52.787
    OVERFLOW<08: (OVF-I )       1.58      .442     1.817     52.787

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        2
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=     1.28
                    PERCENTAGE OF TIME OVERFLOWING    (%)=     1.32


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=     .842
                    TIME SHIFT OF PEAK FLOW         (min)=    -8.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.7033E+00

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

```
--
025:0016-------------------------------------------------------------------------
--
*#----------------|-------------------------------------------------------------|
*#
*#                    Active Storage Portion of SWM facility
*#
*#----------------|-------------------------------------------------------------|
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>08:(OVF-I )   |
| OUT<01:(SWMout)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |    1.479  .2400E+00
                            .202  .7850E-01   |    4.101  .4070E+00
                            .689  .1586E+00   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >08: (OVF-I )       1.58      .442     1.817     52.787
     OUTFLOW<01: (SWMout)       1.58      .115     2.717     52.787
    OVERFLOW<02: (OVF   )        .00      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   25.991
                   TIME SHIFT OF PEAK FLOW         (min)=    54.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.4460E-01

-------------------------------------------------------------------------------
--
025:0017-------------------------------------------------------------------------
--
*#----------------|-------------------------------------------------------------|
*#
*#    West Road Ditch, conveying external drainage from the west around the
*#                  proposed SWM facility to Outlet Channel
*#
*#----------------|-------------------------------------------------------------|
---------------------
| DESIGN NASHYD     |   Area    (ha)=    1.22   Curve Number   (CN)=50.00
| 02:206    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
---------------------   U.H. Tp(hrs)=    .810

     Unit Hyd Qpeak  (cms)=     .058
```

```
     PEAK FLOW       (cms)=     .024 (i)
     TIME TO PEAK    (hrs)=    2.067
     RUNOFF VOLUME    (mm)=   13.893
     TOTAL RAINFALL   (mm)=   68.256
     RUNOFF COEFFICIENT   =     .204

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

------------------------------------------------------------------------------
--
025:0018--------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#        Grassed area south of SWM facility draining offsite to the south
*#
*#-----------------|-------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .14   Curve Number   (CN)=50.00
| 10:207    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .070

     Unit Hyd Qpeak  (cms)=     .076

     PEAK FLOW       (cms)=     .010 (i)
     TIME TO PEAK    (hrs)=    1.100
     RUNOFF VOLUME    (mm)=   13.892
     TOTAL RAINFALL   (mm)=   68.256
     RUNOFF COEFFICIENT   =     .204

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

------------------------------------------------------------------------------
--
025:0019--------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#                Total Flows to the east from internal catchments
*#
*#-----------------|-------------------------------------------------------|
------------------------
| ADD HYD (IntE      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 05:IntUcE         1.33     .242    1.00  32.79    .000

                    +ID2 01:SWMout         1.58     .115    2.72  52.79    .000

                    +ID3 02:206            1.22     .024    2.07  13.89    .000
```

```
                    ============================================================
                    SUM 07:IntE           4.13     .242    1.00  34.86    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--
025:0020--------------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#============================================================================
*# Proposed Drainage Conditions (Including External Catchment Flows to Ditches)
*#============================================================================
*#-----------------|------------------------------------------------------------|
*#
*# External industrial catchment and part of Hwy 401, draining south across
*#                    Cedar Creek Road and entering BPSS
*#
*#-----------------|------------------------------------------------------------|
----------------------
| CALIB STANDHYD     |   Area    (ha)=   55.94
| 03:100    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      44.75        11.19
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.60         2.00
     Length            (m)=    1500.00        30.00
     Mannings n           =       .020         .250

     Max.eff.Inten.(mm/hr)=     135.90       155.96
               over (min)       13.00        18.00
     Storage Coeff.  (min)=      12.90 (ii)   17.88 (ii)
     Unit Hyd. Tpeak (min)=      13.00        18.00
     Unit Hyd. peak  (cms)=        .09          .06
                                                      *TOTALS*
     PEAK FLOW       (cms)=       7.08         2.96         9.560 (iii)
     TIME TO PEAK    (hrs)=       1.20         1.35         1.250
     RUNOFF VOLUME    (mm)=      66.25        35.57        50.915
     TOTAL RAINFALL   (mm)=      68.26        68.26        68.256
     RUNOFF COEFFICIENT   =        .97          .52          .746

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  64.0    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.

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

```
--
025:0021-------------------------------------------------------------------------
--
*#----------------|-------------------------------------------------------------|
*#
*#  External catchment containing a portion of Cedar Creek Road, a portion
*#  of industrial area, and a grassed area near Hwy 401 off-ramp, entering BPSS
*#
*#----------------|-------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   14.55
| 07:101    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   48.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.73         5.82
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.30         2.30
     Length            (m)=     311.45        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     191.56        42.07
               over (min)        3.00        13.00
     Storage Coeff.  (min)=       3.03 (ii)   12.60 (ii)
     Unit Hyd. Tpeak (min)=       3.00        13.00
     Unit Hyd. peak  (cms)=        .37          .09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       3.14          .44         3.259 (iii)
     TIME TO PEAK    (hrs)=       1.02         1.27          1.017
     RUNOFF VOLUME    (mm)=      67.46        17.15         41.299
     TOTAL RAINFALL   (mm)=      68.26        68.26         68.256
     RUNOFF COEFFICIENT   =        .99          .25           .605

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

-------------------------------------------------------------------------------
--
025:0022-------------------------------------------------------------------------
--
*#----------------|-------------------------------------------------------------|
*#
*#     Total area draining offsite to east onto agricultural area to the east
*#
*#----------------|-------------------------------------------------------------|
------------------------
| ADD HYD (UCtoE     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
```

```
                  ID1 05:IntUcE         1.33     .242    1.00  32.79    .000

                 +ID2 03:100           55.94    9.560    1.25  50.91    .000

                 +ID3 07:101           14.55    3.259    1.02  41.30    .000

                  ============================================================
                  SUM 09:UCtoE         71.82   11.268    1.20  48.63    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
025:0023---------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#   Large external catchment west of site containing industrial property,
*#  draining into private SWM feature and then into West Road Ditch, routing
*#             around SWM facility and entering Outlet Channel
*#
*#-----------------|-------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   12.64
| 04:102    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.11         2.53
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       3.10         3.10
     Length            (m)=     290.29        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     191.56       150.65
               over (min)         3.00         8.00
     Storage Coeff.  (min)=       2.66 (ii)    7.91 (ii)
     Unit Hyd. Tpeak (min)=       3.00         8.00
     Unit Hyd. peak  (cms)=        .41          .14
                                                        *TOTALS*
     PEAK FLOW       (cms)=       2.92          .73          3.301 (iii)
     TIME TO PEAK    (hrs)=       1.02         1.17          1.017
     RUNOFF VOLUME    (mm)=      67.46        27.04         47.250
     TOTAL RAINFALL   (mm)=      68.26        68.26         68.256
     RUNOFF COEFFICIENT   =        .99          .40           .692

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

------------------------------------------------------------------------------
--
025:0024--------------------------------------------------------------------
--
*#-----------------|---------------------------------------------------------|
*#
*#                      Infiltration in External SWM Feature
*#
*#-----------------|---------------------------------------------------------|
----------------------
| ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
|  IN>04:(102    )   |
| OUT<05:(xSWinf)    |    =========  OUTLFOW STORAGE TABLE  =========
----------------------    OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
                            (cms)    (ha.m.)    |    (cms)    (ha.m.)
                             .000  .0000E+00    |     .018  .3759E+00
                             .018  .4380E-01    |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (102   )      12.64     3.301     1.017     47.250
     OUTFLOW<05: (xSWinf)       8.32      .018      .850     47.249
    OVERFLOW<06: (OVF-xI)       4.32     1.421     1.283     47.250

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        4
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=     1.87
                    PERCENTAGE OF TIME OVERFLOWING    (%)=     1.37


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=     .545
                    TIME SHIFT OF PEAK FLOW         (min)=   -10.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.3759E+00

------------------------------------------------------------------------------
--
025:0025--------------------------------------------------------------------
--
*#-----------------|---------------------------------------------------------|
*#
*# External catchment west of the site, containing a portion of exisiting
*# industrial property, draining east into West Road Ditch, routing around
*#                      SWM facility and entering Outlet Channel
*#
*#-----------------|---------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    4.52
| 07:103    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
```

```
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.62          .90
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       5.30         5.30
     Length            (m)=     173.59        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     191.56       159.27
               over (min)         2.00         6.00
     Storage Coeff.  (min)=       1.66 (ii)    6.04 (ii)
     Unit Hyd. Tpeak (min)=       2.00         6.00
     Unit Hyd. peak  (cms)=        .63          .19
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.15          .29         1.319 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.12         1.000
     RUNOFF VOLUME    (mm)=      67.46        27.04        47.250
     TOTAL RAINFALL   (mm)=      68.26        68.26        68.256
     RUNOFF COEFFICIENT   =        .99          .40          .692

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

-------------------------------------------------------------------------------
--
025:0026----------------------------------------------------------------------
--
*#----------------|-------------------------------------------------------|
*#
*#                 Total Flows through West Road Ditch
*#
*#----------------|-------------------------------------------------------|
------------------------
| ADD HYD (WRswl     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 06:OVF-xI         4.32    1.421    1.28  47.25    .000

                    +ID2 07:103            4.52    1.319    1.00  47.25    .000

                    +ID3 02:206            1.22     .024    2.07  13.89    .000

                     ============================================================
                     SUM 08:WRswl         10.06    1.871    1.28  43.20    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

```
--
025:0027------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    1.13   Curve Number   (CN)=50.00
| 05:208    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .850

     Unit Hyd Qpeak  (cms)=     .051

     PEAK FLOW       (cms)=     .022 (i)
     TIME TO PEAK    (hrs)=    2.117
     RUNOFF VOLUME    (mm)=   13.893
     TOTAL RAINFALL   (mm)=   68.256
     RUNOFF COEFFICIENT   =     .204

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

------------------------------------------------------------------------------
--
025:0028------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#                 Total Flows through Outlet Channel
*#
*#-----------------|-------------------------------------------------------|
------------------------
| ADD HYD (OutChan   ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:SWMout        1.58     .115    2.72  52.79    .000

                     +ID2 08:WRswl        10.06    1.871    1.28  43.20    .000

                     +ID3 05:208           1.13     .022    2.12  13.89    .000

                      ============================================================
                      SUM 03:OutChan      12.77    1.877    1.28  41.80    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
025:0029------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#                 Total Flows to the east (eventually to Cedar Creek)
```

```
*#
*#-----------------|-------------------------------------------------------------|
------------------------
| ADD HYD (TotE      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:SWMout        1.58     .115    2.72  52.79    .000

                     +ID2 08:WRswl        10.06    1.871    1.28  43.20    .000

                     +ID3 09:UCtoE        71.82   11.268    1.20  48.63    .000

                      ============================================================
                      SUM 04:TotE         83.46   12.737    1.28  48.06    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
025:0030---------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                         Total Flows from the Site
*#
*#-----------------|-------------------------------------------------------------|
------------------------
| ADD HYD (AllFlo    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 04:TotE         83.46   12.737    1.28  48.06    .000

                     +ID2 10:207            .14     .010    1.10  13.89    .000

                      ============================================================
                      SUM 06:AllFlo       83.60   12.743    1.28  48.00    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
025:0031---------------------------------------------------------------------
--
------------------------------------------------------------------------------
--
025:0002---------------------------------------------------------------------
--
------------------------------------------------------------------------------
--
025:0002---------------------------------------------------------------------
```

```
--
--------------------------------------------------------------------------------
--
025:0002--------------------------------------------------------------------------
--
--------------------------------------------------------------------------------
--
025:0002--------------------------------------------------------------------------
--
  ** END OF RUN :  49

********************************************************************************




--------------------
| START            |  Project  dir.: C:\SWMHYMO\CEDARC~1\202401~4\

--------------------  Rainfall dir.: C:\SWMHYMO\CEDARC~1\202401~4\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 050
    NSTORM=   1
           #  1=Kit50yr.3hr
--------------------------------------------------------------------------------
--
050:0002--------------------------------------------------------------------------
--
*#*****************************************************************************
*#  Project Name: [2509 Cedar Creek Road SWM - Ayr, ON] Project #: [161414214]
*#  Date        : 01/25/2024
*#  Modeller    : [Amy Kyle, Water Resources Specialist]
*#  Company     : Stantec Consulting Ltd. (Waterloo)
*#  License #   : 4730904
*#
*#  This hydrologic analysis prepared to provide pond sizing
*#  for the 2509 Cedar Creek Road SWM Facility
*#  The storm events modelled are:
*#  25mm, 2, 5, 25, 50, and 100-year Chicago storms (City of Kitchener IDF)
*#  and the Regional Event
*#*****************************************************************************
--------------------------------------------------------------------------------
--
050:0002--------------------------------------------------------------------------
--
--------------------
| READ STORM       |    Filename: 50-yr, 3hr Chicago Storm - Kitchener IDF
```

```
| Ptotal=  77.24 mm|    Comments: 50-yr, 3hr Chicago Storm - Kitchener IDF
--------------------
               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
                .08   3.816 |    .83  44.095 |   1.58  18.483 |   2.33   5.829
                .17   4.387 |    .92  99.987 |   1.67  15.446 |   2.42   5.344
                .25   5.123 |   1.00 214.691 |   1.75  13.144 |   2.50   4.924
                .33   6.098 |   1.08 124.641 |   1.83  11.355 |   2.58   4.558
                .42   7.433 |   1.17  75.450 |   1.92   9.934 |   2.67   4.235
                .50   9.341 |   1.25  51.107 |   2.00   8.785 |   2.75   3.950
                .58  12.226 |   1.33  37.204 |   2.08   7.841 |   2.83   3.697
                .67  16.932 |   1.42  28.478 |   2.17   7.055 |   2.92   3.470
                .75  25.505 |   1.50  22.619 |   2.25   6.393 |   3.00   3.267

------------------------------------------------------------------------------
--
050:0003----------------------------------------------------------------------
--
*#-----------------|--------------------------------------------------------|
*#========================================================================
*# Proposed Drainage Conditions (Internal Areas)
*#========================================================================
*#-----------------|--------------------------------------------------------|
*#
*#    Small portion of West Road Ditch draining offsite to the east through
*#                            By-Pass Storm Sewer(BPSS)
*#
*#-----------------|--------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .14   Curve Number   (CN)=50.00
| 01:200    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .260

     Unit Hyd Qpeak  (cms)=     .021

     PEAK FLOW       (cms)=     .007 (i)
     TIME TO PEAK    (hrs)=    1.367
     RUNOFF VOLUME    (mm)=   17.392
     TOTAL RAINFALL   (mm)=   77.237
     RUNOFF COEFFICIENT   =     .225

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

------------------------------------------------------------------------------
--
050:0004----------------------------------------------------------------------
--
*#-----------------|--------------------------------------------------------|
*#
*#  Proposed developed catchment draining offsite to the east through BPSS
```

```
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=     .64
| 02:201    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .58          .06
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      65.32        40.00
     Mannings n             =       .013         .250

     Max.eff.Inten.(mm/hr)=     214.69       624.10
               over (min)        1.00         5.00
     Storage Coeff.  (min)=       1.18 (ii)    4.58 (ii)
     Unit Hyd. Tpeak (min)=       1.00         5.00
     Unit Hyd. peak  (cms)=        .97          .24
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .19          .08          .250 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.07         1.000
     RUNOFF VOLUME    (mm)=      76.44        46.34        61.388
     TOTAL RAINFALL   (mm)=      77.24        77.24        77.237
     RUNOFF COEFFICIENT   =        .99          .60          .795

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

------------------------------------------------------------------------------
--
050:0005---------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*# Proposed internal grassed area and plunge pool draining offsite to the east
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .55   Curve Number   (CN)=50.00
| 03:203    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .080

     Unit Hyd Qpeak  (cms)=     .263

     PEAK FLOW       (cms)=     .048 (i)
     TIME TO PEAK    (hrs)=    1.100
     RUNOFF VOLUME    (mm)=   17.396
```

```
     TOTAL RAINFALL   (mm)=   77.237
     RUNOFF COEFFICIENT   =     .225

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

------------------------------------------------------------------------------
--
050:0006--------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#          Total internal area draining onto agricultural area to the east
*#
*#-----------------|-------------------------------------------------------|
------------------------
| ADD HYD (IntUcE    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:200            .14     .007    1.37  17.39    .000

                     +ID2 02:201            .64     .250    1.00  61.39    .000

                     +ID3 03:203            .55     .048    1.10  17.40    .000

                      ========================================================
                      SUM 05:IntUcE         1.33     .281    1.00  38.56    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
050:0007--------------------------------------------------------------------
--
*#
*#             Proposed industrial lots draining to Rear Lot Ditch
*#
*#-----------------|-------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    8.82
| 06:202    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   80.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       7.94          .88
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     242.49        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     214.69       125.13
                over (min)        3.00         9.00
```

```
     Storage Coeff.  (min)=       2.60 (ii)    9.05 (ii)
     Unit Hyd. Tpeak (min)=       3.00         9.00
     Unit Hyd. peak  (cms)=        .41          .13
                                                          *TOTALS*
     PEAK FLOW       (cms)=       3.67          .21          3.766 (iii)
     TIME TO PEAK    (hrs)=       1.02         1.18          1.017
     RUNOFF VOLUME    (mm)=      76.44        28.75         66.900
     TOTAL RAINFALL   (mm)=      77.24        77.24         77.237
     RUNOFF COEFFICIENT   =        .99          .37           .866

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
050:0008--------------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*#    External agricultural area draining onsite and entering Rear Lot Ditch
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .73   Curve Number   (CN)=70.00
| 07:104    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .190

     Unit Hyd Qpeak  (cms)=     .147

     PEAK FLOW       (cms)=     .084 (i)
     TIME TO PEAK    (hrs)=    1.250
     RUNOFF VOLUME    (mm)=   31.074
     TOTAL RAINFALL   (mm)=   77.237
     RUNOFF COEFFICIENT   =     .402

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

--------------------------------------------------------------------------------
--
050:0009--------------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*#      Total area entering Rear Lot Ditch and entering SWMF at East inlet
*#
*#-----------------|------------------------------------------------------------|
------------------------
```

ADD HYD (RLswl)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID1 06:202	8.82	3.766	1.02	66.90	.000
	+ID2 07:104	.73	.084	1.25	31.07	.000
	SUM 08:RLswl	9.55	3.795	1.02	64.16	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

050:0010

---

*#
*# Proposed industrial lots draining to East Road Ditch within catchment,
*# and new internal roadway
*#

*#----------|----------|

DESIGN STANDHYD	Area (ha)= 4.92
01:204 DT= 1.00	Total Imp(%)= 90.00 Dir. Conn.(%)= 80.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	4.43	.49	
Dep. Storage	(mm)=	.80	1.50	
Average Slope	(%)=	2.00	2.00	
Length	(m)=	181.11	40.00	
Mannings n	=	.013	.250	
Max.eff.Inten.(mm/hr)	=	214.69	125.13	
over (min)		2.00	9.00	
Storage Coeff. (min)	=	2.18 (ii)	8.64 (ii)	
Unit Hyd. Tpeak (min)	=	2.00	9.00	
Unit Hyd. peak (cms)	=	.53	.13	
				TOTALS
PEAK FLOW	(cms)=	2.17	.12	2.213 (iii)
TIME TO PEAK	(hrs)=	1.00	1.18	1.000
RUNOFF VOLUME	(mm)=	76.44	28.75	66.900
TOTAL RAINFALL	(mm)=	77.24	77.24	77.237
RUNOFF COEFFICIENT	=	.99	.37	.866

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 50.0 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.

```
--------------------------------------------------------------------------------
--
050:0011--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#             Rooftop infiltration lumped together and sized for 25mm
*#         runoff volume from an assumed 0.15ha rooftop area per lot (7 lots)
*#
*#-----------------|-------------------------------------------------------------|
------------------------
| ADD HYD (Roof      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:204           4.92    2.213    1.00  66.90    .000

                     +ID2 06:202           8.82    3.766    1.02  66.90    .000

                      ============================================================
                      SUM 02:Roof         13.74    5.921    1.00  66.90    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--
050:0012--------------------------------------------------------------------------
--
----------------------
| ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
|  IN>02:(Roof  )    |
| OUT<04:(R-inf )    |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .000  .2625E-01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >02: (Roof  )      13.74     5.921     1.000     66.900
     OUTFLOW<04: (R-inf )        .39      .000      .583     14.319
    OVERFLOW<10: (infO  )      13.35     5.911     1.017     66.900

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        5
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=     3.53
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .20


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=     .000
                    TIME SHIFT OF PEAK FLOW         (min)=   -25.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.2625E-01
```

```
      *** WARNING: Outflow volume is less than inflow volume.
-------------------------------------------------------------------------------
--
050:0013----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#              Proposed SWM facility catchment (infiltration basin)
*#
*#-----------------|-------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    1.63   Curve Number   (CN)=57.00
| 09:205    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .350

     Unit Hyd Qpeak  (cms)=     .178

     PEAK FLOW       (cms)=     .090 (i)
     TIME TO PEAK    (hrs)=    1.483
     RUNOFF VOLUME    (mm)=   21.455
     TOTAL RAINFALL   (mm)=   77.237
     RUNOFF COEFFICIENT   =     .278

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

-------------------------------------------------------------------------------
--
050:0014----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#                        All flows entering SWM facility
*#
*#-----------------|-------------------------------------------------------|
------------------------
| ADD HYD (ToSWM     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 10:infO          13.35    5.911    1.02  66.90    .000

                    +ID2 07:104             .73     .084    1.25  31.07    .000

                    +ID3 09:205            1.63     .090    1.48  21.46    .000

                     ============================================================
                     SUM 06:ToSWM         15.71    5.952    1.02  60.52    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

```
--
050:0015-------------------------------------------------------------------------
--
*#
*#                     Infiltration Portion of SWM facility
*#
*#-----------------|-------------------------------------------------------------|
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>06:(ToSWM )   |
| OUT<07:(SWMinf)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .044  .7033E+00
                            .044  .6530E-01   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >06: (ToSWM )      15.71     5.952     1.017     60.519
     OUTFLOW<07: (SWMinf)      12.28      .044      .850     60.518
    OVERFLOW<08: (OVF-I )       3.43     1.262     1.433     60.519

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        2
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=     1.63
                   PERCENTAGE OF TIME OVERFLOWING    (%)=     1.68


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=     .739
                   TIME SHIFT OF PEAK FLOW         (min)=   -10.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.7033E+00

-------------------------------------------------------------------------------
--
050:0016-------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                    Active Storage Portion of SWM facility
*#
*#-----------------|-------------------------------------------------------------|
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>08:(OVF-I )   |
| OUT<01:(SWMout)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |    1.479  .2400E+00
                            .202  .7850E-01   |    4.101  .4070E+00
                            .689  .1586E+00   |     .000  .0000E+00
```

```
     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >08: (OVF-I )       3.43     1.262     1.433     60.519
     OUTFLOW<01: (SWMout)       3.43      .322     2.067     60.518
    OVERFLOW<02: (OVF   )        .00      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   25.553
                   TIME SHIFT OF PEAK FLOW         (min)=    38.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.9830E-01

--------------------------------------------------------------------------------
--
050:0017--------------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*#    West Road Ditch, conveying external drainage from the west around the
*#                  proposed SWM facility to Outlet Channel
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    1.22   Curve Number   (CN)=50.00
| 02:206    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .810

     Unit Hyd Qpeak  (cms)=     .058

     PEAK FLOW       (cms)=     .031 (i)
     TIME TO PEAK    (hrs)=    2.067
     RUNOFF VOLUME    (mm)=   17.396
     TOTAL RAINFALL   (mm)=   77.237
     RUNOFF COEFFICIENT   =     .225

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

--------------------------------------------------------------------------------
--
050:0018--------------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*#        Grassed area south of SWM facility draining offsite to the south
*#
*#-----------------|------------------------------------------------------------|
----------------------
```

```
| DESIGN NASHYD      |   Area    (ha)=     .14   Curve Number   (CN)=50.00
| 10:207    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
---------------------   U.H. Tp(hrs)=    .070

     Unit Hyd Qpeak  (cms)=     .076

     PEAK FLOW       (cms)=     .013 (i)
     TIME TO PEAK    (hrs)=    1.100
     RUNOFF VOLUME    (mm)=   17.395
     TOTAL RAINFALL   (mm)=   77.237
     RUNOFF COEFFICIENT   =     .225

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

--------------------------------------------------------------------------------
--
050:0019--------------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*#                Total Flows to the east from internal catchments
*#
*#-----------------|------------------------------------------------------------|
------------------------
| ADD HYD (IntE      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 05:IntUcE         1.33     .281    1.00  38.56    .000

                    +ID2 01:SWMout         3.43     .322    2.07  60.52    .000

                    +ID3 02:206            1.22     .031    2.07  17.40    .000

                     ============================================================
                     SUM 07:IntE           5.98     .374    2.05  46.83    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--
050:0020--------------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#================================================================================
*# Proposed Drainage Conditions (Including External Catchment Flows to Ditches)
*#================================================================================
*#-----------------|------------------------------------------------------------|
*#
*# External industrial catchment and part of Hwy 401, draining south across
*#                   Cedar Creek Road and entering BPSS
```

```
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| CALIB STANDHYD     |   Area    (ha)=   55.94
| 03:100    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      44.75         11.19
     Dep. Storage     (mm)=       2.00          5.00
     Average Slope     (%)=       1.60          2.00
     Length            (m)=    1500.00         30.00
     Mannings n             =       .020          .250

     Max.eff.Inten.(mm/hr)=     158.05        194.43
               over (min)       12.00         17.00
     Storage Coeff.  (min)=      12.15 (ii)    16.70 (ii)
     Unit Hyd. Tpeak (min)=      12.00         17.00
     Unit Hyd. peak  (cms)=        .09           .07
                                                      *TOTALS*
     PEAK FLOW       (cms)=       8.29          3.74         11.442 (iii)
     TIME TO PEAK    (hrs)=       1.18          1.32          1.233
     RUNOFF VOLUME    (mm)=      75.23         42.76         58.997
     TOTAL RAINFALL   (mm)=      77.24         77.24         77.237
     RUNOFF COEFFICIENT   =        .97           .55           .764

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  64.0    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.

--------------------------------------------------------------------------------
--
050:0021---------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#  External catchment containing a portion of Cedar Creek Road, a portion
*#  of industrial area, and a grassed area near Hwy 401 off-ramp, entering BPSS
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   14.55
| 07:101    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   48.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.73          5.82
     Dep. Storage     (mm)=        .80          1.50
     Average Slope     (%)=       2.30          2.30
     Length            (m)=     311.45         40.00
```

```
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     214.69        54.05
               over (min)         3.00        12.00
     Storage Coeff.  (min)=       2.90 (ii)   11.55 (ii)
     Unit Hyd. Tpeak (min)=       3.00        12.00
     Unit Hyd. peak  (cms)=        .38          .10
                                                          *TOTALS*
     PEAK FLOW       (cms)=       3.56          .57          3.739 (iii)
     TIME TO PEAK    (hrs)=       1.02         1.25          1.017
     RUNOFF VOLUME    (mm)=      76.44        21.32         47.778
     TOTAL RAINFALL   (mm)=      77.24        77.24         77.237
     RUNOFF COEFFICIENT   =        .99          .28           .619

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

------------------------------------------------------------------------------
--
050:0022---------------------------------------------------------------------
--
*#-----------------|--------------------------------------------------------|
*#
*#     Total area draining offsite to east onto agricultural area to the east
*#
*#-----------------|--------------------------------------------------------|
------------------------
| ADD HYD (UCtoE     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 05:IntUcE         1.33     .281    1.00  38.56    .000

                     +ID2 03:100           55.94   11.442    1.23  59.00    .000

                     +ID3 07:101           14.55    3.739    1.02  47.78    .000

                      ============================================================
                      SUM 09:UCtoE         71.82   13.561    1.20  56.35    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
050:0023---------------------------------------------------------------------
--
*#-----------------|--------------------------------------------------------|
*#
```

```
*#   Large external catchment west of site containing industrial property,
*#  draining into private SWM feature and then into West Road Ditch, routing
*#             around SWM facility and entering Outlet Channel
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   12.64
| 04:102    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.11         2.53
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       3.10         3.10
     Length            (m)=     290.29        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     214.69       188.85
               over (min)         3.00         7.00
     Storage Coeff.  (min)=       2.54 (ii)    7.34 (ii)
     Unit Hyd. Tpeak (min)=       3.00         7.00
     Unit Hyd. peak  (cms)=        .42          .16
                                                        *TOTALS*
     PEAK FLOW       (cms)=       3.30          .93          3.858 (iii)
     TIME TO PEAK    (hrs)=       1.02         1.13          1.017
     RUNOFF VOLUME    (mm)=      76.44        32.95         54.694
     TOTAL RAINFALL   (mm)=      77.24        77.24         77.237
     RUNOFF COEFFICIENT   =        .99          .43           .708

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
050:0024--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                     Infiltration in External SWM Feature
*#
*#-----------------|-------------------------------------------------------------|
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(102   )   |
| OUT<05:(xSWinf)   |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)    |    (cms)    (ha.m.)
                           .000  .0000E+00    |     .018  .3759E+00
```

```
                          .018  .4380E-01   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (102   )      12.64     3.858     1.017     54.694
     OUTFLOW<05: (xSWinf)       7.19      .018      .817     54.693
    OVERFLOW<06: (OVF-xI)       5.45     2.263     1.200     54.694

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        2
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=     1.97
                    PERCENTAGE OF TIME OVERFLOWING    (%)=     1.44


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=     .467
                    TIME SHIFT OF PEAK FLOW         (min)=   -12.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.3759E+00

--------------------------------------------------------------------------------
--
050:0025--------------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*# External catchment west of the site, containing a portion of exisiting
*# industrial property, draining east into West Road Ditch, routing around
*#                     SWM facility and entering Outlet Channel
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    4.52
| 07:103    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.62          .90
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       5.30         5.30
     Length            (m)=     173.59        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     214.69       195.13
               over (min)        2.00         6.00
     Storage Coeff.  (min)=       1.59 (ii)    5.62 (ii)
     Unit Hyd. Tpeak (min)=       2.00         6.00
     Unit Hyd. peak  (cms)=        .64          .20
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.30          .36         1.513 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.10         1.000
     RUNOFF VOLUME    (mm)=      76.44        32.95        54.694
     TOTAL RAINFALL   (mm)=      77.24        77.24        77.237
     RUNOFF COEFFICIENT   =        .99          .43          .708
```

```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
050:0026--------------------------------------------------------------------------
--
*#----------------|------------------------------------------------------------|
*#
*#                 Total Flows through West Road Ditch
*#
*#----------------|------------------------------------------------------------|
------------------------
| ADD HYD (WRswl     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 06:OVF-xI         5.45    2.263    1.20  54.69    .000

                     +ID2 07:103            4.52    1.513    1.00  54.69    .000

                     +ID3 02:206            1.22     .031    2.07  17.40    .000

                      ============================================================
                      SUM 08:WRswl         11.19    2.977    1.20  50.63    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--
050:0027--------------------------------------------------------------------------
--
*#----------------|------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    1.13   Curve Number   (CN)=50.00
| 05:208    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .850

     Unit Hyd Qpeak  (cms)=     .051

     PEAK FLOW       (cms)=     .027 (i)
     TIME TO PEAK    (hrs)=    2.117
     RUNOFF VOLUME    (mm)=   17.396
     TOTAL RAINFALL   (mm)=   77.237
     RUNOFF COEFFICIENT   =     .225

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

```
--------------------------------------------------------------------------------
--
050:0028--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                 Total Flows through Outlet Channel
*#
*#-----------------|-------------------------------------------------------------|
------------------------
| ADD HYD (OutChan   ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:SWMout        3.43     .322    2.07  60.52    .000

                     +ID2 08:WRswl        11.19    2.977    1.20  50.63    .000

                     +ID3 05:208           1.13     .027    2.12  17.40    .000

                      ============================================================
                      SUM 03:OutChan      15.75    2.982    1.20  50.39    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--
050:0029--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                 Total Flows to the east (eventually to Cedar Creek)
*#
*#-----------------|-------------------------------------------------------------|
------------------------
| ADD HYD (TotE      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:SWMout        3.43     .322    2.07  60.52    .000

                     +ID2 08:WRswl        11.19    2.977    1.20  50.63    .000

                     +ID3 09:UCtoE        71.82   13.561    1.20  56.35    .000

                      ============================================================
                      SUM 04:TotE         86.44   16.538    1.20  55.77    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

```
--
050:0030-------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                         Total Flows from the Site
*#
*#-----------------|-------------------------------------------------------------|
------------------------
| ADD HYD (AllFlo    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 04:TotE          86.44   16.538    1.20  55.77    .000

                     +ID2 10:207             .14     .013    1.10  17.40    .000

                      ============================================================
                      SUM 06:AllFlo        86.58   16.548    1.20  55.71    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
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050:0031-------------------------------------------------------------------------
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-------------------------------------------------------------------------------
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050:0002-------------------------------------------------------------------------
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050:0002-------------------------------------------------------------------------
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050:0002-------------------------------------------------------------------------
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050:0002-------------------------------------------------------------------------
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--
050:0002-------------------------------------------------------------------------
--
  ** END OF RUN :  99

********************************************************************************
```

```
--------------------
| START            |  Project  dir.: C:\SWMHYMO\CEDARC~1\202401~4\

--------------------  Rainfall dir.: C:\SWMHYMO\CEDARC~1\202401~4\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 100
    NSTORM=   1
           #  1=Kit100yr.3hr
-------------------------------------------------------------------------------
--
100:0002----------------------------------------------------------------------
--
*#*****************************************************************************
*#  Project Name: [2509 Cedar Creek Road SWM - Ayr, ON] Project #: [161414214]
*#  Date        : 01/25/2024
*#  Modeller    : [Amy Kyle, Water Resources Specialist]
*#  Company     : Stantec Consulting Ltd. (Waterloo)
*#  License #   : 4730904
*#
*#  This hydrologic analysis prepared to provide pond sizing
*#  for the 2509 Cedar Creek Road SWM Facility
*#  The storm events modelled are:
*#  25mm, 2, 5, 25, 50, and 100-year Chicago storms (City of Kitchener IDF)
*#  and the Regional Event
*#*****************************************************************************
-------------------------------------------------------------------------------
--
100:0002----------------------------------------------------------------------
--
--------------------
| READ STORM       |    Filename: 100-yr, 3hr Chicago Storm - Kitchener ID
| Ptotal=  87.07 mm|    Comments: 100-yr, 3hr Chicago Storm - Kitchener ID
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   4.087 |    .83  50.502 |   1.58  20.973 |   2.33   6.373
               .17   4.733 |    .92 113.675 |   1.67  17.458 |   2.42   5.820
               .25   5.569 |   1.00 239.354 |   1.75  14.796 |   2.50   5.342
               .33   6.681 |   1.08 141.249 |   1.83  12.729 |   2.58   4.926
               .42   8.210 |   1.17  86.233 |   1.92  11.089 |   2.67   4.561
               .50  10.405 |   1.25  58.548 |   2.00   9.765 |   2.75   4.239
               .58  13.734 |   1.33  42.595 |   2.08   8.679 |   2.83   3.953
               .67  19.179 |   1.42  32.533 |   2.17   7.777 |   2.92   3.698
               .75  29.096 |   1.50  25.760 |   2.25   7.018 |   3.00   3.469
```

```
--------------------------------------------------------------------------------
--
100:0003------------------------------------------------------------------------
--
*#-----------------|---------------------------------------------------------|
*#=========================================================================
*# Proposed Drainage Conditions (Internal Areas)
*#=========================================================================
*#-----------------|---------------------------------------------------------|
*#
*#    Small portion of West Road Ditch draining offsite to the east through
*#                           By-Pass Storm Sewer(BPSS)
*#
*#-----------------|---------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .14   Curve Number   (CN)=50.00
| 01:200    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .260

     Unit Hyd Qpeak  (cms)=     .021

     PEAK FLOW       (cms)=     .009 (i)
     TIME TO PEAK    (hrs)=    1.367
     RUNOFF VOLUME    (mm)=   21.559
     TOTAL RAINFALL   (mm)=   87.067
     RUNOFF COEFFICIENT   =     .248

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

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--
100:0004------------------------------------------------------------------------
--
*#-----------------|---------------------------------------------------------|
*#
*#  Proposed developed catchment draining offsite to the east through BPSS
*#
*#-----------------|---------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=     .64
| 02:201    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .58          .06
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      65.32        40.00
     Mannings n             =       .013         .250

     Max.eff.Inten.(mm/hr)=     239.35       761.63
```

```
               over (min)        1.00         4.00
     Storage Coeff.  (min)=       1.13 (ii)    4.27 (ii)
     Unit Hyd. Tpeak (min)=       1.00         4.00
     Unit Hyd. peak  (cms)=       1.00          .27
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .21          .10          .295 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.05         1.000
     RUNOFF VOLUME    (mm)=      86.27        54.73        70.497
     TOTAL RAINFALL   (mm)=      87.07        87.07        87.067
     RUNOFF COEFFICIENT   =        .99          .63          .810

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

------------------------------------------------------------------------------
--
100:0005----------------------------------------------------------------------
--
*#-----------------|--------------------------------------------------------|
*#
*# Proposed internal grassed area and plunge pool draining offsite to the east
*#
*#-----------------|--------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .55   Curve Number   (CN)=50.00
| 03:203    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .080

     Unit Hyd Qpeak  (cms)=     .263

     PEAK FLOW       (cms)=     .060 (i)
     TIME TO PEAK    (hrs)=    1.100
     RUNOFF VOLUME    (mm)=   21.562
     TOTAL RAINFALL   (mm)=   87.067
     RUNOFF COEFFICIENT   =     .248

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

------------------------------------------------------------------------------
--
100:0006----------------------------------------------------------------------
--
*#-----------------|--------------------------------------------------------|
*#
*#          Total internal area draining onto agricultural area to the east
*#
*#-----------------|--------------------------------------------------------|
```

ADD HYD (IntUcE)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
ID1	01:200	.14	.009	1.37	21.56	.000
+ID2	02:201	.64	.295	1.00	70.50	.000
+ID3	03:203	.55	.060	1.10	21.56	.000
SUM	05:IntUcE	1.33	.334	1.00	45.11	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

100:0007---
*#
*# Proposed industrial lots draining to Rear Lot Ditch
*#
*#----------|----------|

DESIGN STANDHYD	Area (ha)= 8.82
06:202 DT= 1.00	Total Imp(%)= 90.00 Dir. Conn.(%)= 80.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	7.94	.88	
Dep. Storage	(mm)=	.80	1.50	
Average Slope	(%)=	2.00	2.00	
Length	(m)=	242.49	40.00	
Mannings n	=	.013	.250	
Max.eff.Inten.(mm/hr)=		239.35	154.12	
over (min)		2.00	8.00	
Storage Coeff. (min)=		2.49 (ii)	8.43 (ii)	
Unit Hyd. Tpeak (min)=		2.00	8.00	
Unit Hyd. peak (cms)=		.48	.14	
				TOTALS
PEAK FLOW	(cms)=	4.24	.26	4.348 (iii)
TIME TO PEAK	(hrs)=	1.00	1.17	1.000
RUNOFF VOLUME	(mm)=	86.27	34.93	75.999
TOTAL RAINFALL	(mm)=	87.07	87.07	87.067
RUNOFF COEFFICIENT	=	.99	.40	.873

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 50.0 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.

-------------------------------------------------------------------------------
--
100:0008----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#    External agricultural area draining onsite and entering Rear Lot Ditch
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .73   Curve Number   (CN)=70.00
| 07:104    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .190

     Unit Hyd Qpeak  (cms)=     .147

     PEAK FLOW       (cms)=     .103 (i)
     TIME TO PEAK    (hrs)=    1.250
     RUNOFF VOLUME    (mm)=   37.658
     TOTAL RAINFALL   (mm)=   87.067
     RUNOFF COEFFICIENT   =     .433

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

-------------------------------------------------------------------------------
--
100:0009----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#      Total area entering Rear Lot Ditch and entering SWMF at East inlet
*#
*#-----------------|-------------------------------------------------------------|
------------------------
| ADD HYD (RLswl     ) | ID: NHYD         AREA     QPEAK   TPEAK    R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)    (mm)   (cms)
                     ID1 06:202            8.82    4.348    1.00   76.00    .000

                    +ID2 07:104             .73     .103    1.25   37.66    .000

                     ============================================================
                     SUM 08:RLswl          9.55    4.377    1.00   73.07    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

```
100:0010-----------------------------------------------------------------------
--
*#
*#   Proposed industrial lots draining to East Road Ditch within catchment,
*#                          and new internal roadway
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    4.92
| 01:204    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   80.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.43          .49
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     181.11        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     239.35       154.12
               over (min)         2.00         8.00
     Storage Coeff.  (min)=       2.09 (ii)    8.03 (ii)
     Unit Hyd. Tpeak (min)=       2.00         8.00
     Unit Hyd. peak  (cms)=        .54          .14
                                                        *TOTALS*
     PEAK FLOW       (cms)=       2.44          .15         2.502 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.17         1.000
     RUNOFF VOLUME    (mm)=      86.27        34.93        75.999
     TOTAL RAINFALL   (mm)=      87.07        87.07        87.067
     RUNOFF COEFFICIENT   =        .99          .40          .873

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

-----------------------------------------------------------------------------
--
100:0011-----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#             Rooftop infiltration lumped together and sized for 25mm
*#         runoff volume from an assumed 0.15ha rooftop area per lot (7 lots)
*#
*#-----------------|-------------------------------------------------------------|
------------------------
| ADD HYD (Roof      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:204            4.92    2.502    1.00  76.00    .000
```

```
                    +ID2 06:202            8.82    4.348    1.00  76.00    .000

                     ============================================================
                     SUM 02:Roof          13.74    6.850    1.00  76.00    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
100:0012--------------------------------------------------------------------
--
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>02:(Roof  )   |
| OUT<04:(R-inf )   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .000  .2625E-01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >02: (Roof  )      13.74     6.850     1.000     75.999
     OUTFLOW<04: (R-inf )        .35      .000      .550     16.267
    OVERFLOW<10: (infO  )      13.39     6.755     1.017     75.999

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        4
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=     3.52
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .20


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=     .000
                    TIME SHIFT OF PEAK FLOW         (min)=   -27.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.2625E-01

      *** WARNING: Outflow volume is less than inflow volume.
------------------------------------------------------------------------------
--
100:0013--------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*#              Proposed SWM facility catchment (infiltration basin)
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    1.63   Curve Number   (CN)=57.00
| 09:205    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .350
```

```
     Unit Hyd Qpeak  (cms)=     .178

     PEAK FLOW       (cms)=     .112 (i)
     TIME TO PEAK    (hrs)=    1.483
     RUNOFF VOLUME    (mm)=   26.415
     TOTAL RAINFALL   (mm)=   87.067
     RUNOFF COEFFICIENT   =     .303

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

--------------------------------------------------------------------------------
--
100:0014--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                        All flows entering SWM facility
*#
*#-----------------|-------------------------------------------------------------|
------------------------
| ADD HYD (ToSWM     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 10:infO         13.39    6.755    1.02  76.00    .000

                     +ID2 07:104            .73     .103    1.25  37.66    .000

                     +ID3 09:205           1.63     .112    1.48  26.41    .000

                      ============================================================
                      SUM 06:ToSWM        15.75    6.807    1.02  69.09    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--
100:0015--------------------------------------------------------------------------
--
*#
*#                     Infiltration Portion of SWM facility
*#
*#-----------------|-------------------------------------------------------------|
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>06:(ToSWM )   |
| OUT<07:(SWMinf)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .044  .7033E+00
```

```
                          .044  .6530E-01   |     .000  .0000E+00

     ROUTING RESULTS           AREA     QPEAK     TPEAK       R.V.
     --------------------      (ha)     (cms)     (hrs)       (mm)
     INFLOW >06: (ToSWM )     15.75     6.807     1.017     69.093
     OUTFLOW<07: (SWMinf)     10.77      .044      .833     69.092
    OVERFLOW<08: (OVF-I )      4.99     2.319     1.283     69.093

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        1
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=     1.80
                   PERCENTAGE OF TIME OVERFLOWING    (%)=     1.85


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=     .646
                   TIME SHIFT OF PEAK FLOW         (min)=   -11.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.7033E+00

--------------------------------------------------------------------------------
--
100:0016--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                    Active Storage Portion of SWM facility
*#
*#-----------------|-------------------------------------------------------------|
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>08:(OVF-I )   |
| OUT<01:(SWMout)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |    1.479  .2400E+00
                            .202  .7850E-01   |    4.101  .4070E+00
                            .689  .1586E+00   |     .000  .0000E+00

     ROUTING RESULTS           AREA     QPEAK     TPEAK       R.V.
     --------------------      (ha)     (cms)     (hrs)       (mm)
     INFLOW >08: (OVF-I )      4.99     2.319     1.283     69.093
     OUTFLOW<01: (SWMout)      4.99      .631     1.783     69.093
    OVERFLOW<02: (OVF   )       .00      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   27.206
                   TIME SHIFT OF PEAK FLOW         (min)=    30.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.1491E+00
```

```
--------------------------------------------------------------------------------
--
100:0017------------------------------------------------------------------------
--
*#-----------------|---------------------------------------------------------|
*#
*#    West Road Ditch, conveying external drainage from the west around the
*#                  proposed SWM facility to Outlet Channel
*#
*#-----------------|---------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    1.22   Curve Number   (CN)=50.00
| 02:206    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .810

     Unit Hyd Qpeak  (cms)=     .058

     PEAK FLOW       (cms)=     .038 (i)
     TIME TO PEAK    (hrs)=    2.067
     RUNOFF VOLUME    (mm)=   21.562
     TOTAL RAINFALL   (mm)=   87.067
     RUNOFF COEFFICIENT   =     .248

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

--------------------------------------------------------------------------------
--
100:0018------------------------------------------------------------------------
--
*#-----------------|---------------------------------------------------------|
*#
*#        Grassed area south of SWM facility draining offsite to the south
*#
*#-----------------|---------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .14   Curve Number   (CN)=50.00
| 10:207    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .070

     Unit Hyd Qpeak  (cms)=     .076

     PEAK FLOW       (cms)=     .016 (i)
     TIME TO PEAK    (hrs)=    1.100
     RUNOFF VOLUME    (mm)=   21.561
     TOTAL RAINFALL   (mm)=   87.067
     RUNOFF COEFFICIENT   =     .248

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

```
--------------------------------------------------------------------------------
--
100:0019----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                Total Flows to the east from internal catchments
*#
*#-----------------|-------------------------------------------------------------|
------------------------
| ADD HYD (IntE      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 05:IntUcE         1.33     .334    1.00  45.11    .000

                     +ID2 01:SWMout         4.99     .631    1.78  69.09    .000

                     +ID3 02:206            1.22     .038    2.07  21.56    .000

                      ============================================================
                      SUM 07:IntE           7.54     .705    1.75  57.17    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--
100:0020----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#=============================================================================
*# Proposed Drainage Conditions (Including External Catchment Flows to Ditches)
*#=============================================================================
*#-----------------|-------------------------------------------------------------|
*#
*# External industrial catchment and part of Hwy 401, draining south across
*#                   Cedar Creek Road and entering BPSS
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| CALIB STANDHYD     |   Area    (ha)=   55.94
| 03:100    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      44.75        11.19
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.60         2.00
     Length            (m)=    1500.00        30.00
     Mannings n           =       .020         .250

     Max.eff.Inten.(mm/hr)=     177.53       239.93
```

```
               over (min)       12.00        16.00
     Storage Coeff.  (min)=     11.60 (ii)   15.78 (ii)
     Unit Hyd. Tpeak (min)=     12.00        16.00
     Unit Hyd. peak  (cms)=       .10          .07
                                                        *TOTALS*
     PEAK FLOW       (cms)=      9.52         4.63        13.580 (iii)
     TIME TO PEAK    (hrs)=      1.18         1.30         1.217
     RUNOFF VOLUME    (mm)=     85.06        50.88        67.975
     TOTAL RAINFALL   (mm)=     87.07        87.07        87.067
     RUNOFF COEFFICIENT   =       .98          .58          .781

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  64.0    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.

------------------------------------------------------------------------------
--
100:0021--------------------------------------------------------------------
--
*#-----------------|---------------------------------------------------------|
*#
*#  External catchment containing a portion of Cedar Creek Road, a portion
*#  of industrial area, and a grassed area near Hwy 401 off-ramp, entering BPSS
*#
*#-----------------|---------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   14.55
| 07:101    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   48.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.73         5.82
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.30         2.30
     Length            (m)=     311.45        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     239.35        68.89
               over (min)         3.00        11.00
     Storage Coeff.  (min)=       2.77 (ii)   10.63 (ii)
     Unit Hyd. Tpeak (min)=       3.00        11.00
     Unit Hyd. peak  (cms)=        .39          .11
                                                        *TOTALS*
     PEAK FLOW       (cms)=       4.01          .73         4.274 (iii)
     TIME TO PEAK    (hrs)=       1.02         1.23         1.017
     RUNOFF VOLUME    (mm)=      86.27        26.24        55.053
     TOTAL RAINFALL   (mm)=      87.07        87.07        87.067
     RUNOFF COEFFICIENT   =        .99          .30          .632
```

```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

------------------------------------------------------------------------------
--
100:0022--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#     Total area draining offsite to east onto agricultural area to the east
*#
*#-----------------|-------------------------------------------------------------|
-------------------------
| ADD HYD (UCtoE     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 05:IntUcE         1.33     .334    1.00  45.11    .000

                     +ID2 03:100           55.94   13.580    1.22  67.98    .000

                     +ID3 07:101           14.55    4.274    1.02  55.05    .000

                      ============================================================
                      SUM 09:UCtoE         71.82   16.132    1.18  64.93    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
100:0023--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#   Large external catchment west of site containing industrial property,
*#  draining into private SWM feature and then into West Road Ditch, routing
*#             around SWM facility and entering Outlet Channel
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   12.64
| 04:102    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.11         2.53
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       3.10         3.10
     Length            (m)=     290.29        40.00
```

```
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     239.35       228.73
               over (min)        2.00         7.00
     Storage Coeff.  (min)=       2.43 (ii)    6.88 (ii)
     Unit Hyd. Tpeak (min)=       2.00         7.00
     Unit Hyd. peak  (cms)=        .49          .16
                                                          *TOTALS*
     PEAK FLOW       (cms)=       3.81         1.15          4.403 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.13          1.017
     RUNOFF VOLUME    (mm)=      86.27        39.75         63.011
     TOTAL RAINFALL   (mm)=      87.07        87.07         87.067
     RUNOFF COEFFICIENT   =        .99          .46           .724

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
100:0024--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                      Infiltration in External SWM Feature
*#
*#-----------------|-------------------------------------------------------------|
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(102   )   |
| OUT<05:(xSWinf)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .018  .3759E+00
                            .018  .4380E-01   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (102   )      12.64     4.403     1.017     63.011
     OUTFLOW<05: (xSWinf)       6.24      .018      .783     63.010
    OVERFLOW<06: (OVF-xI)       6.40     3.189     1.133     63.011

                  TOTAL NUMBER OF SIMULATED OVERFLOWS  =        2
                  CUMULATIVE TIME OF OVERFLOWS  (hours)=     2.02
                  PERCENTAGE OF TIME OVERFLOWING    (%)=     1.48


                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=     .409
```

```
                  TIME SHIFT OF PEAK FLOW         (min)=   -14.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.3759E+00

--------------------------------------------------------------------------------
--
100:0025--------------------------------------------------------------------------
--
*#----------------|------------------------------------------------------------|
*#
*# External catchment west of the site, containing a portion of exisiting
*# industrial property, draining east into West Road Ditch, routing around
*#                     SWM facility and entering Outlet Channel
*#
*#----------------|------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    4.52
| 07:103    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.62          .90
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       5.30         5.30
     Length            (m)=     173.59        40.00
     Mannings n             =       .013         .250

     Max.eff.Inten.(mm/hr)=     239.35       247.90
               over (min)        2.00         5.00
     Storage Coeff.  (min)=       1.52 (ii)    5.19 (ii)
     Unit Hyd. Tpeak (min)=       2.00         5.00
     Unit Hyd. peak  (cms)=        .66          .22
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.46          .46          1.767 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.08          1.000
     RUNOFF VOLUME    (mm)=      86.27        39.75         63.011
     TOTAL RAINFALL   (mm)=      87.07        87.07         87.067
     RUNOFF COEFFICIENT   =        .99          .46           .724

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

--------------------------------------------------------------------------------
--
100:0026--------------------------------------------------------------------------
--
*#----------------|------------------------------------------------------------|
*#
*#                 Total Flows through West Road Ditch
```

```
*#
*#-----------------|-------------------------------------------------------------|
------------------------
| ADD HYD (WRswl     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------ -                (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 06:OVF-xI        6.40    3.189    1.13  63.01    .000

                     +ID2 07:103           4.52    1.767    1.00  63.01    .000

                     +ID3 02:206           1.22     .038    2.07  21.56    .000

                      ============================================================
                      SUM 08:WRswl        12.14    4.256    1.13  58.84    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--
100:0027--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    1.13   Curve Number   (CN)=50.00
| 05:208    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .850

     Unit Hyd Qpeak  (cms)=     .051

     PEAK FLOW       (cms)=     .034 (i)
     TIME TO PEAK    (hrs)=    2.117
     RUNOFF VOLUME    (mm)=   21.562
     TOTAL RAINFALL   (mm)=   87.067
     RUNOFF COEFFICIENT   =     .248

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

--------------------------------------------------------------------------------
--
100:0028--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                 Total Flows through Outlet Channel
*#
*#-----------------|-------------------------------------------------------------|
------------------------
| ADD HYD (OutChan   ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------ -                (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:SWMout        4.99     .631    1.78  69.09    .000
```

```
                    +ID2 08:WRswl         12.14    4.256    1.13  58.84    .000

                    +ID3 05:208            1.13     .034    2.12  21.56    .000

                     ============================================================
                     SUM 03:OutChan       18.25    4.260    1.13  59.34    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--
100:0029---------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#                 Total Flows to the east (eventually to Cedar Creek)
*#
*#-----------------|-------------------------------------------------------|
------------------------
| ADD HYD (TotE      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:SWMout         4.99     .631    1.78  69.09    .000

                    +ID2 08:WRswl         12.14    4.256    1.13  58.84    .000

                    +ID3 09:UCtoE         71.82   16.132    1.18  64.93    .000

                     ============================================================
                     SUM 04:TotE          88.94   19.839    1.17  64.34    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--
100:0030---------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#                         Total Flows from the Site
*#
*#-----------------|-------------------------------------------------------|
------------------------
| ADD HYD (AllFlo    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 04:TotE          88.94   19.839    1.17  64.34    .000

                    +ID2 10:207             .14     .016    1.10  21.56    .000
```

```
                    ============================================================
                    SUM 06:AllFlo        89.08   19.853    1.17  64.27    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
100:0031--------------------------------------------------------------------
--
------------------------------------------------------------------------------
--
100:0002--------------------------------------------------------------------
--
------------------------------------------------------------------------------
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100:0002--------------------------------------------------------------------
--
------------------------------------------------------------------------------
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100:0002--------------------------------------------------------------------
--
------------------------------------------------------------------------------
--
100:0002--------------------------------------------------------------------
--
------------------------------------------------------------------------------
--
100:0002--------------------------------------------------------------------
--
------------------------------------------------------------------------------
--
100:0002--------------------------------------------------------------------
--
  ** END OF RUN : 499

*******************************************************************************




--------------------
| START            |  Project  dir.: C:\SWMHYMO\CEDARC~1\202401~4\

--------------------  Rainfall dir.: C:\SWMHYMO\CEDARC~1\202401~4\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
```

```
    NRUN  = 500
    NSTORM=   1
           #  1=hurhaz48.stm
-------------------------------------------------------------------------------
--
500:0002---------------------------------------------------------------------
--
*#*****************************************************************************
*#  Project Name: [2509 Cedar Creek Road SWM - Ayr, ON] Project #: [161414214]
*#  Date        : 01/25/2024
*#  Modeller    : [Amy Kyle, Water Resources Specialist]
*#  Company     : Stantec Consulting Ltd. (Waterloo)
*#  License #   : 4730904
*#
*#  This hydrologic analysis prepared to provide pond sizing
*#  for the 2509 Cedar Creek Road SWM Facility
*#  The storm events modelled are:
*#  25mm, 2, 5, 25, 50, and 100-year Chicago storms (City of Kitchener IDF)
*#  and the Regional Event
*#*****************************************************************************
-------------------------------------------------------------------------------
--
500:0002---------------------------------------------------------------------
--
--------------------
| READ STORM       |    Filename: REGIONAL STORM
| Ptotal= 285.00 mm|    Comments: REGIONAL STORM
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.25	2.000	12.25	2.000	24.25	2.000	36.25	6.000
.50	2.000	12.50	2.000	24.50	2.000	36.50	6.000
.75	2.000	12.75	2.000	24.75	2.000	36.75	6.000
1.00	2.000	13.00	2.000	25.00	2.000	37.00	6.000
1.25	2.000	13.25	2.000	25.25	2.000	37.25	4.000
1.50	2.000	13.50	2.000	25.50	2.000	37.50	4.000
1.75	2.000	13.75	2.000	25.75	2.000	37.75	4.000
2.00	2.000	14.00	2.000	26.00	2.000	38.00	4.000
2.25	2.000	14.25	2.000	26.25	2.000	38.25	6.000
2.50	2.000	14.50	2.000	26.50	2.000	38.50	6.000
2.75	2.000	14.75	2.000	26.75	2.000	38.75	6.000
3.00	2.000	15.00	2.000	27.00	2.000	39.00	6.000
3.25	2.000	15.25	2.000	27.25	2.000	39.25	13.000
3.50	2.000	15.50	2.000	27.50	2.000	39.50	13.000
3.75	2.000	15.75	2.000	27.75	2.000	39.75	13.000
4.00	2.000	16.00	2.000	28.00	2.000	40.00	13.000
4.25	2.000	16.25	2.000	28.25	2.000	40.25	17.000
4.50	2.000	16.50	2.000	28.50	2.000	40.50	17.000
4.75	2.000	16.75	2.000	28.75	2.000	40.75	17.000
5.00	2.000	17.00	2.000	29.00	2.000	41.00	17.000

5.25	2.000	17.25	2.000	29.25	2.000	41.25	13.000
5.50	2.000	17.50	2.000	29.50	2.000	41.50	13.000
5.75	2.000	17.75	2.000	29.75	2.000	41.75	13.000
6.00	2.000	18.00	2.000	30.00	2.000	42.00	13.000
6.25	2.000	18.25	2.000	30.25	2.000	42.25	23.000
6.50	2.000	18.50	2.000	30.50	2.000	42.50	23.000
6.75	2.000	18.75	2.000	30.75	2.000	42.75	23.000
7.00	2.000	19.00	2.000	31.00	2.000	43.00	23.000
7.25	2.000	19.25	2.000	31.25	2.000	43.25	13.000
7.50	2.000	19.50	2.000	31.50	2.000	43.50	13.000
7.75	2.000	19.75	2.000	31.75	2.000	43.75	13.000
8.00	2.000	20.00	2.000	32.00	2.000	44.00	13.000
8.25	2.000	20.25	2.000	32.25	2.000	44.25	13.000
8.50	2.000	20.50	2.000	32.50	2.000	44.50	13.000
8.75	2.000	20.75	2.000	32.75	2.000	44.75	13.000
9.00	2.000	21.00	2.000	33.00	2.000	45.00	13.000
9.25	2.000	21.25	2.000	33.25	2.000	45.25	53.000
9.50	2.000	21.50	2.000	33.50	2.000	45.50	53.000
9.75	2.000	21.75	2.000	33.75	2.000	45.75	53.000
10.00	2.000	22.00	2.000	34.00	2.000	46.00	53.000
10.25	2.000	22.25	2.000	34.25	2.000	46.25	38.000
10.50	2.000	22.50	2.000	34.50	2.000	46.50	38.000
10.75	2.000	22.75	2.000	34.75	2.000	46.75	38.000
11.00	2.000	23.00	2.000	35.00	2.000	47.00	38.000
11.25	2.000	23.25	2.000	35.25	3.000	47.25	13.000
11.50	2.000	23.50	2.000	35.50	3.000	47.50	13.000
11.75	2.000	23.75	2.000	35.75	3.000	47.75	13.000
12.00	2.000	24.00	2.000	36.00	3.000	48.00	13.000

```
--------------------------------------------------------------------------------
--
500:0003----------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#============================================================================
*# Proposed Drainage Conditions (Internal Areas)
*#============================================================================
*#-----------------|------------------------------------------------------------|
*#
*#    Small portion of West Road Ditch draining offsite to the east through
*#                            By-Pass Storm Sewer(BPSS)
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .14   Curve Number   (CN)=50.00
| 01:200    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .260

     Unit Hyd Qpeak  (cms)=     .021
```

```
     PEAK FLOW       (cms)=     .014 (i)
     TIME TO PEAK    (hrs)=   46.050
     RUNOFF VOLUME    (mm)=  149.528
     TOTAL RAINFALL   (mm)=  285.000
     RUNOFF COEFFICIENT   =     .525

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

-------------------------------------------------------------------------------
--
500:0004---------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#  Proposed developed catchment draining offsite to the east through BPSS
*#
*#-----------------|-------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=     .64
| 02:201    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .58          .06
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      65.32        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      53.00       256.36
               over (min)         2.00         7.00
     Storage Coeff.  (min)=       2.07 (ii)    6.91 (ii)
     Unit Hyd. Tpeak (min)=       2.00         7.00
     Unit Hyd. peak  (cms)=        .55          .16
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .05          .05          .093 (iii)
     TIME TO PEAK    (hrs)=      45.50        46.00        46.000
     RUNOFF VOLUME    (mm)=     284.18       241.57       262.896
     TOTAL RAINFALL   (mm)=     285.00       285.00       285.000
     RUNOFF COEFFICIENT   =       1.00          .85          .922

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

-------------------------------------------------------------------------------
--
500:0005---------------------------------------------------------------------
--
```

```
*#-----------------|---------------------------------------------------------|
*#
*# Proposed internal grassed area and plunge pool draining offsite to the east
*#
*#-----------------|---------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .55   Curve Number   (CN)=50.00
| 03:203    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .080

     Unit Hyd Qpeak  (cms)=     .263

     PEAK FLOW       (cms)=     .058 (i)
     TIME TO PEAK    (hrs)=   46.000
     RUNOFF VOLUME    (mm)=  149.530
     TOTAL RAINFALL   (mm)=  285.000
     RUNOFF COEFFICIENT   =     .525

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

-------------------------------------------------------------------------------
--
500:0006----------------------------------------------------------------------
--
*#-----------------|---------------------------------------------------------|
*#
*#          Total internal area draining onto agricultural area to the east
*#
*#-----------------|---------------------------------------------------------|
------------------------
| ADD HYD (IntUcE    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:200            .14     .014   46.05 149.53    .000

                     +ID2 02:201            .64     .093   46.00 262.90    .000

                     +ID3 03:203            .55     .058   46.00 149.53    .000

                      ============================================================
                      SUM 05:IntUcE         1.33     .165   46.00 204.08    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--
500:0007----------------------------------------------------------------------
--
*#
*#             Proposed industrial lots draining to Rear Lot Ditch
```

```
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    8.82
| 06:202    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   80.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       7.94          .88
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     242.49        40.00
     Mannings n             =       .013         .250

     Max.eff.Inten.(mm/hr)=      53.00        92.43
               over (min)        5.00        12.00
     Storage Coeff.  (min)=       4.55 (ii)   11.83 (ii)
     Unit Hyd. Tpeak (min)=       5.00        12.00
     Unit Hyd. peak  (cms)=        .24          .10
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.04          .22         1.261 (iii)
     TIME TO PEAK    (hrs)=      46.00        46.02        46.000
     RUNOFF VOLUME    (mm)=     284.17       196.45       266.654
     TOTAL RAINFALL   (mm)=     285.00       285.00       285.000
     RUNOFF COEFFICIENT   =       1.00          .69          .936

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

-------------------------------------------------------------------------------
--
500:0008----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#    External agricultural area draining onsite and entering Rear Lot Ditch
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .73   Curve Number   (CN)=70.00
| 07:104    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .190

     Unit Hyd Qpeak  (cms)=     .147

     PEAK FLOW       (cms)=     .095 (i)
     TIME TO PEAK    (hrs)=   46.017
     RUNOFF VOLUME    (mm)=  204.845
```

```
     TOTAL RAINFALL   (mm)=  285.000
     RUNOFF COEFFICIENT   =     .719

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

--------------------------------------------------------------------------------
--
500:0009--------------------------------------------------------------------------
--
*#-----------------|------------------------------------------------------------|
*#
*#      Total area entering Rear Lot Ditch and entering SWMF at East inlet
*#
*#-----------------|------------------------------------------------------------|
------------------------
| ADD HYD (RLswl     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 06:202           8.82    1.261   46.00 266.65    .000

                     +ID2 07:104            .73     .095   46.02 204.85    .000

                      ============================================================
                      SUM 08:RLswl         9.55    1.357   46.00 261.93    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--
500:0010--------------------------------------------------------------------------
--
*#
*#   Proposed industrial lots draining to East Road Ditch within catchment,
*#                          and new internal roadway
*#
*#-----------------|------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    4.92
| 01:204    DT= 1.00 |   Total Imp(%)=   90.00   Dir. Conn.(%)=   80.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.43          .49
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     181.11        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      53.00        92.46
               over (min)        4.00        11.00
     Storage Coeff.  (min)=       3.82 (ii)   11.10 (ii)
```

```
     Unit Hyd. Tpeak (min)=       4.00        11.00
     Unit Hyd. peak  (cms)=        .29          .10
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .58          .12          .704 (iii)
     TIME TO PEAK    (hrs)=      45.98        46.00        46.000
     RUNOFF VOLUME    (mm)=     284.17       196.44       266.654
     TOTAL RAINFALL   (mm)=     285.00       285.00       285.000
     RUNOFF COEFFICIENT   =       1.00          .69          .936

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

------------------------------------------------------------------------------
--
500:0011----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#             Rooftop infiltration lumped together and sized for 25mm
*#         runoff volume from an assumed 0.15ha rooftop area per lot (7 lots)
*#
*#-----------------|-------------------------------------------------------|
------------------------
| ADD HYD (Roof      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:204            4.92     .704   46.00 266.65    .000

                    +ID2 06:202            8.82    1.261   46.00 266.65    .000

                     ============================================================
                     SUM 02:Roof          13.74    1.965   46.00 266.65    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
500:0012----------------------------------------------------------------------
--
----------------------
| ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
|  IN>02:(Roof  )    |
| OUT<04:(R-inf )    |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)    |    (cms)    (ha.m.)
                            .000  .0000E+00    |     .000  .2625E-01
```

```
     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >02: (Roof  )      13.74     1.965    46.000    266.654
     OUTFLOW<04: (R-inf )        .10      .000     1.700     57.057
    OVERFLOW<10: (infO  )      13.64     1.965    46.000    266.654

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        5
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=    48.10
                   PERCENTAGE OF TIME OVERFLOWING    (%)=     2.74


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=     .001
                   TIME SHIFT OF PEAK FLOW         (min)= -2658.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.2625E-01

      *** WARNING: Outflow volume is less than inflow volume.
-------------------------------------------------------------------------------
--
500:0013-----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#              Proposed SWM facility catchment (infiltration basin)
*#
*#-----------------|-------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    1.63   Curve Number   (CN)=57.00
| 09:205    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .350

     Unit Hyd Qpeak  (cms)=     .178

     PEAK FLOW       (cms)=     .178 (i)
     TIME TO PEAK    (hrs)=   46.117
     RUNOFF VOLUME    (mm)=  169.164
     TOTAL RAINFALL   (mm)=  285.000
     RUNOFF COEFFICIENT   =     .594

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

-------------------------------------------------------------------------------
--
500:0014-----------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#                       All flows entering SWM facility
*#
*#-----------------|-------------------------------------------------------|
------------------------
```

ADD HYD (ToSWM)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
ID1	10:infO	13.64	1.965	46.00	266.65	.000
+ID2	07:104	.73	.095	46.02	204.85	.000
+ID3	09:205	1.63	.178	46.12	169.16	.000
SUM	06:ToSWM	16.00	2.235	46.00	253.90	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

500:0015---
*#
*# Infiltration Portion of SWM facility
*#
*#-----|-----|

ROUTE RESERVOIR	IN>06:(ToSWM)	OUT<07:(SWMinf)

Requested routing time step = 1.0 min.

OUTLFOW STORAGE TABLE

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
.000	.0000E+00	.044	.7033E+00
.044	.6530E-01	.000	.0000E+00

ROUTING RESULTS	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW >06: (ToSWM)	16.00	2.235	46.000	253.903
OUTFLOW<07: (SWMinf)	5.58	.044	6.517	253.894
OVERFLOW<08: (OVF-I)	10.42	2.190	46.000	253.903

TOTAL NUMBER OF SIMULATED OVERFLOWS = 2
CUMULATIVE TIME OF OVERFLOWS (hours)= 8.37
PERCENTAGE OF TIME OVERFLOWING (%)= 5.87

PEAK FLOW REDUCTION [Qout/Qin](%)= 1.969
TIME SHIFT OF PEAK FLOW (min)= -2369.00
MAXIMUM STORAGE USED (ha.m.)=.7033E+00

500:0016---

```
*#-----------------|---------------------------------------------------------|
*#
*#                    Active Storage Portion of SWM facility
*#
*#-----------------|---------------------------------------------------------|
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>08:(OVF-I )   |
| OUT<01:(SWMout)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |    1.479  .2400E+00
                            .202  .7850E-01   |    4.101  .4070E+00
                            .689  .1586E+00   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >08: (OVF-I )      10.42     2.190    46.000    253.903
     OUTFLOW<01: (SWMout)      10.42     2.145    46.050    253.902
    OVERFLOW<02: (OVF   )        .00      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   97.929
                   TIME SHIFT OF PEAK FLOW         (min)=     3.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.2824E+00

--------------------------------------------------------------------------------
--
500:0017--------------------------------------------------------------------------
--
*#-----------------|---------------------------------------------------------|
*#
*#    West Road Ditch, conveying external drainage from the west around the
*#                  proposed SWM facility to Outlet Channel
*#
*#-----------------|---------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    1.22   Curve Number   (CN)=50.00
| 02:206    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .810

     Unit Hyd Qpeak  (cms)=     .058

     PEAK FLOW       (cms)=     .100 (i)
     TIME TO PEAK    (hrs)=   47.067
     RUNOFF VOLUME    (mm)=  149.530
```

```
     TOTAL RAINFALL   (mm)=  285.000
     RUNOFF COEFFICIENT   =     .525

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

------------------------------------------------------------------------------
--
500:0018---------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#        Grassed area south of SWM facility draining offsite to the south
*#
*#-----------------|-------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=     .14   Curve Number   (CN)=50.00
| 10:207    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .070

     Unit Hyd Qpeak  (cms)=     .076

     PEAK FLOW       (cms)=     .015 (i)
     TIME TO PEAK    (hrs)=   46.000
     RUNOFF VOLUME    (mm)=  149.530
     TOTAL RAINFALL   (mm)=  285.000
     RUNOFF COEFFICIENT   =     .525

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

------------------------------------------------------------------------------
--
500:0019---------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#                Total Flows to the east from internal catchments
*#
*#-----------------|-------------------------------------------------------|
------------------------
| ADD HYD (IntE      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 05:IntUcE         1.33     .165   46.00 204.08    .000

                    +ID2 01:SWMout        10.42    2.145   46.05 253.90    .000

                    +ID3 02:206            1.22     .100   47.07 149.53    .000

                     ============================================================
                     SUM 07:IntE          12.97    2.375   46.02 238.98    .000
```

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

------------------------------------------------------------------------------
--
500:0020--------------------------------------------------------------------
--
*#-----------------|---------------------------------------------------------|
*#=========================================================================
*# Proposed Drainage Conditions (Including External Catchment Flows to Ditches)
*#=========================================================================
*#-----------------|---------------------------------------------------------|
*#
*# External industrial catchment and part of Hwy 401, draining south across
*#                   Cedar Creek Road and entering BPSS
*#
*#-----------------|---------------------------------------------------------|
----------------------
| CALIB STANDHYD     |   Area    (ha)=   55.94
| 03:100    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      44.75         11.19
     Dep. Storage     (mm)=       2.00          5.00
     Average Slope     (%)=       1.60          2.00
     Length            (m)=    1500.00         30.00
     Mannings n           =       .020          .250

     Max.eff.Inten.(mm/hr)=      53.00        126.91
               over (min)        19.00         24.00
     Storage Coeff.  (min)=      18.81 (ii)    24.21 (ii)
     Unit Hyd. Tpeak (min)=      19.00         24.00
     Unit Hyd. peak  (cms)=        .06           .05
                                                        *TOTALS*
     PEAK FLOW       (cms)=       3.91          3.57          7.465 (iii)
     TIME TO PEAK    (hrs)=      46.07         46.17         46.100
     RUNOFF VOLUME    (mm)=     282.91        235.37        259.226
     TOTAL RAINFALL   (mm)=     285.00        285.00        285.000
     RUNOFF COEFFICIENT   =        .99           .83           .910

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  64.0    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.

------------------------------------------------------------------------------
--
500:0021--------------------------------------------------------------------
--
```

```
*#-----------------|---------------------------------------------------------|
*#
*#  External catchment containing a portion of Cedar Creek Road, a portion
*#  of industrial area, and a grassed area near Hwy 401 off-ramp, entering BPSS
*#
*#-----------------|---------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   14.55
| 07:101    DT= 1.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   48.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.73         5.82
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       2.30         2.30
     Length            (m)=     311.45        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      53.00        54.13
               over (min)        5.00        14.00
     Storage Coeff.  (min)=       5.07 (ii)   13.72 (ii)
     Unit Hyd. Tpeak (min)=       5.00        14.00
     Unit Hyd. peak  (cms)=        .22          .08
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.03          .85         1.875 (iii)
     TIME TO PEAK    (hrs)=      46.00        46.03        46.000
     RUNOFF VOLUME    (mm)=     284.19       168.10       223.839
     TOTAL RAINFALL   (mm)=     285.00       285.00       285.000
     RUNOFF COEFFICIENT   =       1.00          .59          .785

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

-------------------------------------------------------------------------------
--
500:0022----------------------------------------------------------------------
--
*#-----------------|---------------------------------------------------------|
*#
*#     Total area draining offsite to east onto agricultural area to the east
*#
*#-----------------|---------------------------------------------------------|
------------------------
| ADD HYD (UCtoE     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                    ID1 05:IntUcE         1.33     .165   46.00 204.08    .000

                   +ID2 03:100           55.94    7.465   46.10 259.23    .000
```

```
                  +ID3 07:101           14.55    1.875   46.00 223.84    .000

                   ============================================================
                   SUM 09:UCtoE          71.82    9.434   46.03 251.04    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
500:0023---------------------------------------------------------------------
--
*#-----------------|--------------------------------------------------------|
*#
*#   Large external catchment west of site containing industrial property,
*#  draining into private SWM feature and then into West Road Ditch, routing
*#             around SWM facility and entering Outlet Channel
*#
*#-----------------|--------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=   12.64
| 04:102    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.11         2.53
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       3.10         3.10
     Length            (m)=     290.29        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      53.00       119.98
               over (min)         4.00        10.00
     Storage Coeff.  (min)=       4.45 (ii)   10.20 (ii)
     Unit Hyd. Tpeak (min)=       4.00        10.00
     Unit Hyd. peak  (cms)=        .26          .11
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .93          .83         1.765 (iii)
     TIME TO PEAK    (hrs)=      46.00        46.00        46.000
     RUNOFF VOLUME    (mm)=     284.17       209.52       246.871
     TOTAL RAINFALL   (mm)=     285.00       285.00       285.000
     RUNOFF COEFFICIENT   =       1.00          .74          .866

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

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

```
--
500:0024-------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*#                      Infiltration in External SWM Feature
*#
*#-----------------|-------------------------------------------------------------|
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(102   )   |
| OUT<05:(xSWinf)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .018  .3759E+00
                            .018  .4380E-01   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (102   )      12.64     1.765    46.000    246.871
     OUTFLOW<05: (xSWinf)       2.73      .018     4.833    246.884
    OVERFLOW<06: (OVF-xI)       9.91     1.746    46.000    246.871

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        2
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=    15.28
                    PERCENTAGE OF TIME OVERFLOWING    (%)=     8.41


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    1.020
                    TIME SHIFT OF PEAK FLOW         (min)= -2470.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.3759E+00

-------------------------------------------------------------------------------
--
500:0025-------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------------|
*#
*# External catchment west of the site, containing a portion of exisiting
*# industrial property, draining east into West Road Ditch, routing around
*#                      SWM facility and entering Outlet Channel
*#
*#-----------------|-------------------------------------------------------------|
----------------------
| DESIGN STANDHYD    |   Area    (ha)=    4.52
| 07:103    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   50.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.62          .90
     Dep. Storage     (mm)=        .80         1.50
```

```
     Average Slope     (%)=       5.30         5.30
     Length            (m)=     173.59        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      53.00       120.05
               over (min)         3.00         8.00
     Storage Coeff.  (min)=       2.78 (ii)    7.68 (ii)
     Unit Hyd. Tpeak (min)=       3.00         8.00
     Unit Hyd. peak  (cms)=        .39          .15
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .33          .30          .633 (iii)
     TIME TO PEAK    (hrs)=      45.73        46.00        46.000
     RUNOFF VOLUME    (mm)=     284.18       209.52       246.871
     TOTAL RAINFALL   (mm)=     285.00       285.00       285.000
     RUNOFF COEFFICIENT   =       1.00          .74          .866

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  50.0    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.

------------------------------------------------------------------------------
--
500:0026--------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#                 Total Flows through West Road Ditch
*#
*#-----------------|-------------------------------------------------------|
------------------------
| ADD HYD (WRswl     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 06:OVF-xI        9.91    1.746   46.00 246.87    .000

                     +ID2 07:103           4.52     .633   46.00 246.87    .000

                     +ID3 02:206           1.22     .100   47.07 149.53    .000

                      ============================================================
                      SUM 08:WRswl        15.65    2.451   46.00 239.28    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--
500:0027--------------------------------------------------------------------
--
```

```
*#-----------------|-------------------------------------------------------|
----------------------
| DESIGN NASHYD      |   Area    (ha)=    1.13   Curve Number   (CN)=50.00
| 05:208    DT= 1.00 |   Ia      (mm)=   1.500   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .850

     Unit Hyd Qpeak  (cms)=     .051

     PEAK FLOW       (cms)=     .092 (i)
     TIME TO PEAK    (hrs)=   47.100
     RUNOFF VOLUME    (mm)=  149.530
     TOTAL RAINFALL   (mm)=  285.000
     RUNOFF COEFFICIENT   =     .525

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

--------------------------------------------------------------------------------
--
500:0028--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#                 Total Flows through Outlet Channel
*#
*#-----------------|-------------------------------------------------------|
------------------------
| ADD HYD (OutChan   ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:SWMout        10.42    2.145   46.05 253.90    .000

                     +ID2 08:WRswl         15.65    2.451   46.00 239.28    .000

                     +ID3 05:208            1.13     .092   47.10 149.53    .000

                      ============================================================
                      SUM 03:OutChan       27.20    4.650   46.00 241.15    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--
500:0029--------------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#                 Total Flows to the east (eventually to Cedar Creek)
*#
*#-----------------|-------------------------------------------------------|
------------------------
```

```
| ADD HYD (TotE      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:SWMout        10.42    2.145   46.05 253.90    .000

                     +ID2 08:WRswl         15.65    2.451   46.00 239.28    .000

                     +ID3 09:UCtoE         71.82    9.434   46.03 251.04    .000

                      ============================================================
                      SUM 04:TotE          97.89   14.011   46.02 249.46    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--
500:0030---------------------------------------------------------------------
--
*#-----------------|-------------------------------------------------------|
*#
*#                         Total Flows from the Site
*#
*#-----------------|-------------------------------------------------------|
------------------------
| ADD HYD (AllFlo    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 04:TotE          97.89   14.011   46.02 249.46    .000

                     +ID2 10:207             .14     .015   46.00 149.53    .000

                      ============================================================
                      SUM 06:AllFlo        98.03   14.026   46.02 249.32    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--
500:0031---------------------------------------------------------------------
--
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500:0002---------------------------------------------------------------------
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500:0002---------------------------------------------------------------------
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500:0002----------------------------------------------------------------------------
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500:0002----------------------------------------------------------------------------
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500:0002----------------------------------------------------------------------------
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500:0002----------------------------------------------------------------------------
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500:0002----------------------------------------------------------------------------
--
      FINISH
------------------------------------------------------------------------------------
--
************************************************************************************
**
     WARNINGS / ERRORS / NOTES
     -------------------------
 001:0012 ROUTE RESERVOIR
      *** WARNING: Outflow volume is less than inflow volume.
 001:0016 ROUTE RESERVOIR
      *** WARNING: Inflow hydrograph is dry.
 002:0012 ROUTE RESERVOIR
      *** WARNING: Outflow volume is less than inflow volume.
 002:0016 ROUTE RESERVOIR
      *** WARNING: Inflow hydrograph is dry.
 005:0012 ROUTE RESERVOIR
      *** WARNING: Outflow volume is less than inflow volume.
 005:0016 ROUTE RESERVOIR
      *** WARNING: Inflow hydrograph is dry.
 010:0012 ROUTE RESERVOIR
      *** WARNING: Outflow volume is less than inflow volume.
 010:0016 ROUTE RESERVOIR
      *** WARNING: Inflow hydrograph is dry.
 025:0012 ROUTE RESERVOIR
      *** WARNING: Outflow volume is less than inflow volume.
      *** WARNING: Outflow volume is less than inflow volume.
      *** WARNING: Outflow volume is less than inflow volume.
      *** WARNING: Outflow volume is less than inflow volume.
   Simulation ended on 2024-01-25     at 15:15:07
================================================================================
==
```

Manning's Equation Calculations for Flow in a Channel

2509 Cedar Creek Road

Section: West Road Ditch

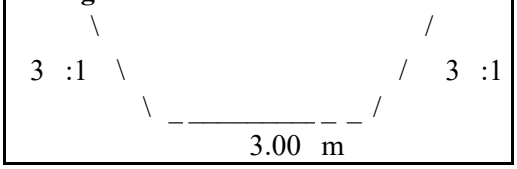
Input Data:

Flow =	4.256	m^3/s
Manning's 'n' =	0.025	
Channel Slope =	1.0%	
Side Slope =	3	m/m [3 means 3:1]
Side Slope =	3	m/m [3 means 3:1]
Bottom Width =	3	m [0 = triangular, +ve = trapezoidal]

Calculated Values:

Velocity =	2.00	m/s
Area=	2.130	m^2
Wetted Perimeter =	6.035	m
Hydraulic Radius (R) =	0.353	m

Configuration:



Depth Estimate:

Estimated Flow Depth = **0.480 m** lhs-rhs = -0.00038

Note: Calculations are correct when lhs-rhs = 0

Section: West Road Ditch (South of SWMF)

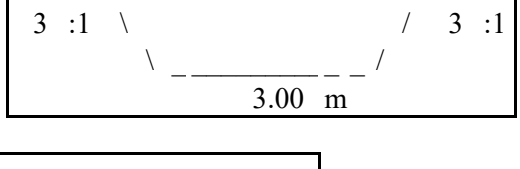
Input Data:

Flow =	4.256	m^3/s
Manning's 'n' =	0.025	
Channel Slope =	0.5%	
Side Slope =	3	m/m [3 means 3:1]
Side Slope =	3	m/m [3 means 3:1]
Bottom Width =	3	m [0 = triangular, +ve = trapezoidal]

Calculated Values:

Velocity =	1.56	m/s
Area=	2.726	m^2
Wetted Perimeter =	6.645	m
Hydraulic Radius (R) =	0.410	m

Configuration:



Depth Estimate:

Estimated Flow Depth = **0.576 m** lhs-rhs = 3.8E-06

Note: Calculations are correct when lhs-rhs = 0

Manning's Equation Calculations for Flow in a Channel

2509 Cedar Creek Road

Section: Rear Lot Ditch

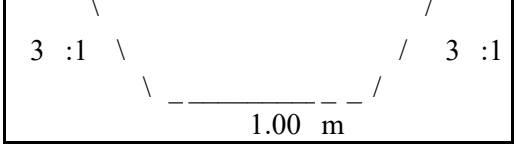
Input Data:

Flow =	4.377	m^3/s
Manning's 'n' =	0.025	
Channel Slope =	1.0%	
Side Slope =	3	m/m [3 means 3:1]
Side Slope =	3	m/m [3 means 3:1]
Bottom Width =	1	m [0 = triangular, +ve = trapezoidal]

Calculated Values:

Velocity =	2.13	m/s
Area=	2.054	m^2
Wetted Perimeter =	5.285	m
Hydraulic Radius (R) =	0.389	m

Configuration:



Depth Estimate:

Estimated Flow Depth = **0.677 m** lhs-rhs = 0.00018

Note: Calculations are correct when lhs-rhs = 0

Section: East Road Ditch

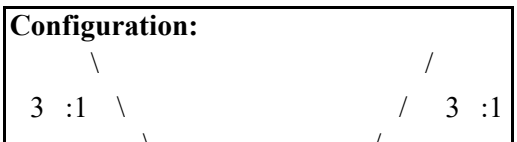
Input Data:

Flow =	2.502	m^3/s
Manning's 'n' =	0.025	
Channel Slope =	1.2%	
Side Slope =	3	m/m [3 means 3:1]
Side Slope =	3	m/m [3 means 3:1]
Bottom Width =	0	m [0 = triangular, +ve = trapezoidal]

Calculated Values:

Velocity =	1.99	m/s
Area=	1.255	m^2
Wetted Perimeter =	4.091	m
Hydraulic Radius (R) =	0.307	m

Configuration:



Depth Estimate:

Estimated Flow Depth = **0.647 m** lhs-rhs = 0.00031

Note: Calculations are correct when lhs-rhs = 0

Manning's Equation Calculations for Flow in a Channel

2509 Cedar Creek Road

Section: Outlet Channel

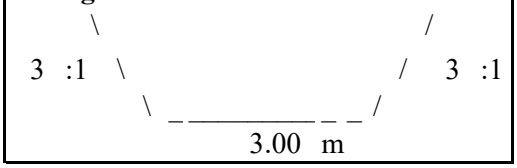
Input Data:

Flow =	4.65	m^3/s
Manning's 'n' =	0.025	
Channel Slope =	0.5%	
Side Slope =	3	m/m [3 means 3:1]
Side Slope =	3	m/m [3 means 3:1]
Bottom Width =	3	m [0 = triangular, +ve = trapezoidal]

Calculated Values:

Velocity =	1.60	m/s
Area=	2.904	m^2
Wetted Perimeter =	6.818	m
Hydraulic Radius (R) =	0.426	m

Configuration:



Depth Estimate:

Estimated Flow Depth = **0.604 m** lhs-rhs = 0.00014

Note: Calculations are correct when lhs-rhs = 0

APPENDIX E

Utility Correspondence

Nicholas, Pacifique

From: Nicholas, Pacifique
Sent: Thursday, August 3, 2023 3:14 PM
To: Steffler, Daniel
Subject: RE: 161414214- 2509 Cedar Creek Road - Utility

Hi Dan,

Thank you very much for providing this information.
Our understating is that Bell sees no concern with supporting the proposed development given the surrounding existing infrastructure. Could you please confirm this?

Thank you,

Pacifique Nicholas, P.Eng., M.Eng., PMP®.
Project Coordinator - Community Development
Direct: 519 585-7484
Mobile: 226 581-2805
Fax: 519 579-6733
Pacifique.nicholas@stantec.com

Stantec
100-300 Hagey Boulevard
Waterloo ON N2L 0A4

Stantec

From: Steffler, Daniel <daniel.steffler@bell.ca>
Sent: Wednesday, August 2, 2023 6:00 PM
To: Nicholas, Pacifique <Pacifique.Nicholas@stantec.com>
Subject: RE: 161414214- 2509 Cedar Creek Road - Utility

See attached. The black line is existing duct to our fibre pedestal. The red is our proposed new to get fibre to your development.

thanks

Bell

Dan Steffler
Specialist – Network Provisioning
F2-20 Water Street North
Kitchener, Ontario
N2H 5A5
Phone: 519-568-5785
Cell: 519-577-2531
daniel.steffler@bell.ca

From: Nicholas, Pacifique <Pacifique.Nicholas@stantec.com>
Sent: July-27-23 1:49 PM
To: Steffler, Daniel <daniel.steffler@bell.ca>
Subject: [EXT]RE: 161414214- 2509 Cedar Creek Road - Utility

Hi Dan,

Could you please reattach the drawing? I could not find the attachment as addressed in your email.

Thanks,

Pacifique Nicholas, P.Eng., M.Eng., PMP®.
Project Coordinator - Community Development
Direct: 519 585-7484
Mobile: 226 581-2805
Fax: 519 579-6733
Pacifique.nicholas@stantec.com

Stantec
100-300 Hagey Boulevard
Waterloo ON N2L 0A4

From: Nicholas, Pacifique
Sent: Wednesday, July 26, 2023 8:45 AM
To: Steffler, Daniel <daniel.steffler@bell.ca>
Subject: RE: 161414214- 2509 Cedar Creek Road - Utility

Hi Dan,

I do not see the attachment in this email. Could you please verify if it was attached properly?
We have not stated the construction yet. We are still in the process of Draft Plan approval.

Thanks,

Pacifique Nicholas, P.Eng., M.Eng., PMP®.
Project Coordinator - Community Development
Direct: 519 585-7484
Mobile: 226 581-2805
Fax: 519 579-6733
Pacifique.nicholas@stantec.com

Stantec
100-300 Hagey Boulevard
Waterloo ON N2L 0A4

From: Steffler, Daniel <daniel.steffler@bell.ca>
Sent: Tuesday, July 25, 2023 6:18 PM
To: Nicholas, Pacifique <Pacifique.Nicholas@stantec.com>
Subject: RE: 161414214- 2509 Cedar Creek Road - Utility

Hello,

See attached, we have a fibre ped on opposite side of Earl Thompson with conduit crossing and goes down Earl Thompson. We will use that duct and trench down Cedar Creek to your development. Have any lots started construction? thanks

Bell

Dan Steffler
Specialist – Network Provisioning
F2-20 Water Street North
Kitchener, Ontario
N2H 5A5
Phone: 519-568-5785
Cell: 519-577-2531
daniel.steffler@bell.ca

From: Nicholas, Pacifique <Pacifique.Nicholas@stantec.com>
Sent: July-17-23 11:15 AM
To: Steffler, Daniel <daniel.steffler@bell.ca>
Subject: [EXT]161414214- 2509 Cedar Creek Road - Utility

Hi Dan,

We are currently working towards completing the preliminary engineering for the above noted development in support of draft plan approval which will follow with detail design.
Please find attached Conceptual Draft Plan for your review.

Please provide utility information for the surrounding area that Bell may have and confirm if you are able to service this development or if any external works would need to be upgraded or extended to the property.

If you have any questions, please let me know.

Thank you,

Pacifique Nicholas, P.Eng., M.Eng., PMP®.
Project Coordinator - Community Development
Direct: 519 585-7484
Mobile: 226 581-2805
Fax: 519 579-6733
Pacifique.nicholas@stantec.com

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Nicholas, Pacifique

From: Nicholas, Pacifique
Sent: Tuesday, August 15, 2023 4:57 PM
To: Sahil Singh Sidhu
Subject: RE: 161414214- 2509 Cedar Creek Road - Utility

We can have this information late this Fall.

Thanks,

Pacifique Nicholas, P.Eng., M.Eng., PMP®.
Project Coordinator - Community Development
Direct: 519 585-7484
Mobile: 226 581-2805
Fax: 519 579-6733
Pacifique.nicholas@stantec.com

Stantec
100-300 Hagey Boulevard
Waterloo ON N2L 0A4

From: Sahil Singh Sidhu <sahilsingh.sidhu@enbridge.com>
Sent: Tuesday, August 15, 2023 4:30 PM
To: Nicholas, Pacifique <Pacifique.Nicholas@stantec.com>
Subject: RE: 161414214- 2509 Cedar Creek Road - Utility

Hi Nicholas,

I will need that info for me to see if the load Gas main can support it. When do you think you can provide me with this info.

Thanks

Sahil Singh Sidhu
Sr Analyst New Business Projects
Construction Brantford

CELL: (519) 209-8538 | sahilsingh.sidhu@enbridge.com
101 Carter St, Brantford, ON N3S 0K6
enbridge.com
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Service Abandonments 1-877-362-7434
Natural Gas Inquiries - Inquiry Form
Customer Attachment - Residential enbridgegas.com/connect-to-gas
Customer Attachment - Developers enbridgegas.com/connect-to-gas/developers
Customer Attachment - Builders & HVAC's enbridgegas.com/connect-to-gas/builders-hvacs

---

From: Nicholas, Pacifique <Pacifique.Nicholas@stantec.com>
Sent: Tuesday, August 15, 2023 4:25 PM
To: Sahil Singh Sidhu <sahilsingh.sidhu@enbridge.com>
Subject: [External] RE: 161414214- 2509 Cedar Creek Road - Utility

Hi Sahil,

We do not have this information yet.

Once we advance to detailed design, we can then provide you with more information.

Thanks,

Pacifique Nicholas, P.Eng., M.Eng., PMP®.
Project Coordinator - Community Development
Direct: 519 585-7484
Mobile: 226 581-2805
Fax: 519 579-6733
Pacifique.nicholas@stantec.com

Stantec
100-300 Hagey Boulevard
Waterloo ON N2L 0A4

From: Sahil Singh Sidhu <sahilsingh.sidhu@enbridge.com>
Sent: Tuesday, August 15, 2023 3:39 PM
To: Nicholas, Pacifique <Pacifique.Nicholas@stantec.com>
Subject: RE: 161414214- 2509 Cedar Creek Road - Utility

Can you please let me know the load for each lot if you have that info available.

Thanks,

Sahil Singh Sidhu
Sr Analyst New Business Projects
Construction Brantford

ENBRIDGE
CELL: (519) 209-8538 | sahilsingh.sidhu@enbridge.com
101 Carter St, Brantford, ON N3S 0K6
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Customer Attachment - Developers enbridgegas.com/connect-to-gas/developers
Customer Attachment - Builders & HVAC's enbridgegas.com/connect-to-gas/builders-hvacs

---

From: Nicholas, Pacifique <Pacifique.Nicholas@stantec.com>
Sent: Tuesday, August 15, 2023 3:32 PM
To: Sahil Singh Sidhu <sahilsingh.sidhu@enbridge.com>
Cc: Brousseau, Kevin <kevin.brousseau@stantec.com>
Subject: [External] RE: 161414214- 2509 Cedar Creek Road - Utility

Hi Sahil,

Thank you very much for getting back to me. As said earlier, we are still in the prelim design stage for Draft Plan approval. All we need currently is an understanding of your existing infrastructure in the area of the subject lands and if you have capacity to support the development.

Thanks,

Pacifique Nicholas, P.Eng., M.Eng., PMP®.
Project Coordinator - Community Development
Direct: 519 585-7484
Mobile: 226 581-2805
Fax: 519 579-6733
Pacifique.nicholas@stantec.com

Stantec
100-300 Hagey Boulevard
Waterloo ON N2L 0A4

From: Sahil Singh Sidhu <sahilsingh.sidhu@enbridge.com>
Sent: Monday, August 14, 2023 10:42 AM
To: Nicholas, Pacifique <Pacifique.Nicholas@stantec.com>

Cc: Brousseau, Kevin <kevin.brousseau@stantec.com>
Subject: FW: 161414214- 2509 Cedar Creek Road - Utility

Hi,

I received this from our department.

Can you please provide me with answers

Thanks,

Sahil Singh Sidhu
Sr Analyst New Business Projects
Construction Brantford

ENBRIDGE
CELL: (519) 209-8538 | sahilsingh.sidhu@enbridge.com
101 Carter St, Brantford, ON N3S 0K6
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Customer Attachment - Developers enbridgegas.com/connect-to-gas/developers
Customer Attachment - Builders & HVAC's enbridgegas.com/connect-to-gas/builders-hvacs

---

From: Ontario Lands <ONTLands@enbridge.com>
Sent: Monday, August 14, 2023 10:39 AM
To: Sahil Singh Sidhu <sahilsingh.sidhu@enbridge.com>
Subject: RE: 161414214- 2509 Cedar Creek Road - Utility

Good morning,
Being from North Dumfries, this is Kelly's area and she is off this week.
I can look into it, but require a bit of info first.

Do you have the Notice of Decision which contains the conditions of Draft Approval? We require the conditions that require the release being the document as issued by the Municipality that sites our conditions.

Thanks,
Barb

Barbara M.J. Baranow
Analyst Land Support
Lands

Enbridge.com
Integrity. Safety. Respect.

From: Sahil Singh Sidhu <sahilsingh.sidhu@enbridge.com>
Sent: Monday, August 14, 2023 10:24 AM
To: Ontario Lands <ONTLands@enbridge.com>; Kelly Buchanan <Kelly.Buchanan@enbridge.com>
Subject: RE: 161414214- 2509 Cedar Creek Road - Utility

Hi,

Can you please advice the customer what to do here.

Thanks,

Sahil Singh Sidhu
Sr Analyst New Business Projects
Construction Brantford

ENBRIDGE
CELL: (519) 209-8538 | sahilsingh.sidhu@enbridge.com
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Customer Attachment - Developers enbridgegas.com/connect-to-gas/developers
Customer Attachment - Builders & HVAC's enbridgegas.com/connect-to-gas/builders-hvacs

---

From: Sahil Singh Sidhu
Sent: Friday, August 4, 2023 8:16 AM
To: Ontario Lands <ONTLands@enbridge.com>
Subject: RE: 161414214- 2509 Cedar Creek Road - Utility

Hi,

I am just following up on this request.

Thanks,

Sahil Singh Sidhu
Sr Analyst New Business Projects
Construction Brantford

ENBRIDGE
CELL: (519) 209-8538 | sahilsingh.sidhu@enbridge.com
101 Carter St, Brantford, ON N3S 0K6
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Customer Attachment - Developers enbridgegas.com/connect-to-gas/developers
Customer Attachment - Builders & HVAC's enbridgegas.com/connect-to-gas/builders-hvacs

---

From: Sahil Singh Sidhu
Sent: Tuesday, July 25, 2023 10:03 AM
To: Ontario Lands <ONTLands@enbridge.com>
Subject: FW: 161414214- 2509 Cedar Creek Road - Utility

Good Morning,

This customer is looking for clearance letter I don't see any issues with this. Please let me know if you need anything.

Thanks,

Sahil Singh Sidhu
Sr Analyst New Business Projects
Construction Brantford

ENBRIDGE
CELL: (519) 209-8538 | sahilsingh.sidhu@enbridge.com
101 Carter St, Brantford, ON N3S 0K6
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Customer Attachment Builder & HVAC Support 1-866-772-1045
Smell Gas? 1-866-763-5427
Service Abandonments 1-877-362-7434
Natural Gas Inquiries - Inquiry Form
Customer Attachment - Residential enbridgegas.com/connect-to-gas
Customer Attachment - Developers enbridgegas.com/connect-to-gas/developers
Customer Attachment - Builders & HVAC's enbridgegas.com/connect-to-gas/builders-hvacs

---

From: Nicholas, Pacifique <Pacifique.Nicholas@stantec.com>
Sent: Monday, July 17, 2023 11:13 AM
To: Sahil Singh Sidhu <sahilsingh.sidhu@enbridge.com>
Cc: Brousseau, Kevin <kevin.brousseau@stantec.com>
Subject: [External] FW: 161414214- 2509 Cedar Creek Road - Utility

Hi Sahil,

We are currently working towards completing the preliminary engineering for the above noted development in support of draft plan approval which will follow with detail design.
Please find attached Conceptual Draft Plan for your review.

Please provide utility information for the surrounding area that Enbridge may have and confirm if you are able to service this development or if any external works would need to be upgraded or extended to the property.

If you have any questions, please let me know.

Thank you,

Pacifique Nicholas, P.Eng., M.Eng., PMP®.
Project Coordinator - Community Development
Direct: 519 585-7484
Mobile: 226 581-2805
Fax: 519 579-6733
Pacifique.nicholas@stantec.com

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