

APPENDIX 5

STORMWATER MANAGEMENT REPORT





Safari Road (Kirkwall Road to Valens Road) Phases 3 & 4 Schedule 'C' Municipal Class Environmental Assessment

Stormwater Management Report Final

City of Hamilton

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**RVA 247372
March 9, 2026**

SAFARI ROAD EA
STORMWATER MANAGEMENT REPORT
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1.0 Introduction

R.V. Anderson Associates Limited (RVA) has been retained by the City of Hamilton (City) to complete a Schedule 'B' Municipal Class Environmental Assessment (MCEA) for Safari Road (the "Study"). The main objective of this Study was to evaluate alternatives to address the flooding/drainage challenges, and other concerns raised by the local community along the stretch of Safari Road from Kirkwall Road to Valens Road. This Study compliments the on-going work being undertaken under the Municipal Drainage Act and assumes that the preferred solution recommended through the Drainage Act process is implemented.

The purpose of this report is to detail the drainage options that were analyzed during the EA process. A preferred stormwater approach was selected with consideration for the preferred road design alternative.

1.1 Background

The Study Area includes Safari Road from Kirkwall Road to Valens Road, within the City of Hamilton. The Study Area is illustrated in Figure 1.1 below.

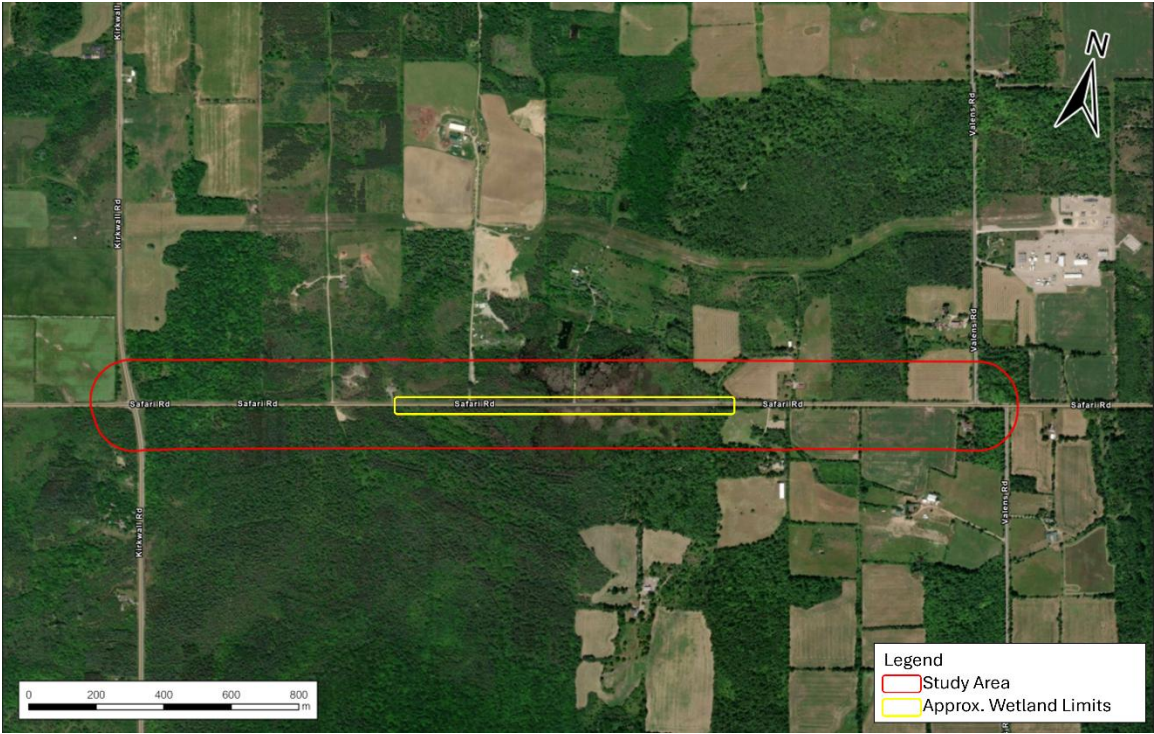


Figure 1.1 Study Area

Safari Road is a 2-lane rural arterial road with no active transportation (AT) facilities and no on-street parking. The road is designated as a full-time truck route and surrounded by agricultural land and low-density residential areas. Between Kirkwall Road and Valens Road, Safari Road is situated in a low-lying area with wetlands on either side of the road, approximately between stations 0+750m and 1+850m, as highlighted in Figure 1.1. Based on a preliminary review and site visits, the adjacent lands consist of significant natural features and terrestrial Species at Risk (SAR).

Safari Road within the Study Area is currently closed to general traffic due to flooding, but access to private properties remains open. In addition to the road drainage issues, abutting properties are also experiencing flooding. The City is currently developing a solution for drainage issues outside of the right-of-way (ROW) through works covered by the Drainage Act (1990), also referred to as the “Municipal Drain Study”. It should be noted that the Municipal Drain Study does not target the ROW challenges, municipal infrastructure, nor future conditions but provides improved/reestablished outlet. The Municipal Drain Study has garnered significant public interest and a desire to explore all possible solutions to protect properties and support the biodiversity of the area.

2.0 Existing Conditions

2.1 Overview

Under existing conditions there are two water feature crossings of Safari Road via two existing culvert crossings within the project study limits. In addition, there is an equalization culvert in the wetland in between the two-watercourse crossing of Safari Road. All existing culverts within the project study limits are corrugated steel pipes (CSP). It is recommended that all existing culverts be replaced as part of any reconstruction of Safari Road.

Additionally, the watercourse that forms the study crosses four private accesses on the north side of the road. These private accesses form the recommendations of the on-going Municipal Drain Study. These private accesses are in varying states of operation (functional to collapsed) or do not exist. Table 2-1 below lists the existing culvert information (private access data is taken from the draft Safari Road Municipal Drain Hydrologic and Hydraulic Analysis Technical Memorandum by Robison Consultants, dated March 2025). Appendix 1 depicts the drainage areas and culvert locations.

Table 2-1 Existing Road Crossing Structures				
Culvert ID	Location	Size	Material	Cumulative Drainage Area
		(mm)		(ha)
CULV-1	Safari Road – culvert crossing at eastern project limit	600	CSP	56.21
CULV-2	North of Safari Road – crosses private driveway	500	CSP	77.47
CULV-3	North of Safari Road – crosses private driveway	600 (collapsed)	CSP	133.18
CULV-4	North of Safari Road – crosses private driveway	Existing blast rock – no culvert	Unknown	173.28
CULV-5	North of Safari Road – crosses private driveway	Bridge (limited opening)	Unknown	183.98
CULV-6	Safari Road – culvert crossing at western project limit	3 x 600	HDPE	189.64
CULV-7	Kirkwall Road – culvert crossing	3000 x 1200	Concrete	223.19
CULV-8	Safari Road – wetland equalization culvert	600	CSP	31.85

3.0 Stormwater Objectives

3.1 Water Quantity and Flood Control

The objective of stormwater management for Safari Road is to develop a plan that will address the following:

- Ensure no increased risk of flooding to downstream and upstream properties and/or infrastructure.
- Prevent flooding of the road under all storm events up to and including 100-year.
- Control post-development peak flows to pre-development levels or better for 2, 5, 10, 25, 50, and 100-year storm events to the maximum extent possible.

3.1 Water Quality, Erosion, and Sediment Control

Water quality targets were selected to provide as much protection as possible for the receiving watercourse. As the wetland abuts the road in the current condition and provides significant habitat to various species, including species-at-risk, no control can be completed in the wetland portion of the project limits as space does not permit. Outside these limits a

maximum extents possible approach has been taken to achieve as much quality control as possible.

3.2 Culvert Crossings

Design criteria for the proposed Safari Road culvert crossing was taken from the MTO's Highway Drainage Design Manual for rural arterial roads. The following design criteria were used for the evaluation of the existing and proposed culverts:

- 25-year design storm for culverts crossings.
- 100-year major system design storm.
- Freeboard Design Criteria:
 - 1.0m from top of hydraulic grade line to edge of traveled lane.

3.3 Water Balance

Water balance targets were not specified for this project. The project study area is a minor contributor to the overall watershed and as such the project has little impact to the water balance of the watershed. The increase in impervious area due to the proposed road widening will not have a significant impact on the watershed water balance. Therefore, groundwater recharge is generally not proposed within the study area. Some infiltration and water balance will be achieved through the enhanced swales, but the amount has not been quantified as part of the design.

4.0 Proposed Conditions

4.1 Overview

Through the EA planning process, several alternative road designs were developed and evaluated for the wetland section and outside the wetland limits with paved shoulders, buffer and two lanes. To address flooding issues a raised road profile through the wetland is proposed. A conceptual cross-section for each portion of Safari Road is depicted in Figures 4.1 and 4.2. In addition to a Do Nothing alternative, the alternatives included a closure of Safari Road with termination of the road with cul-de-sacs outside of the wetland limits.

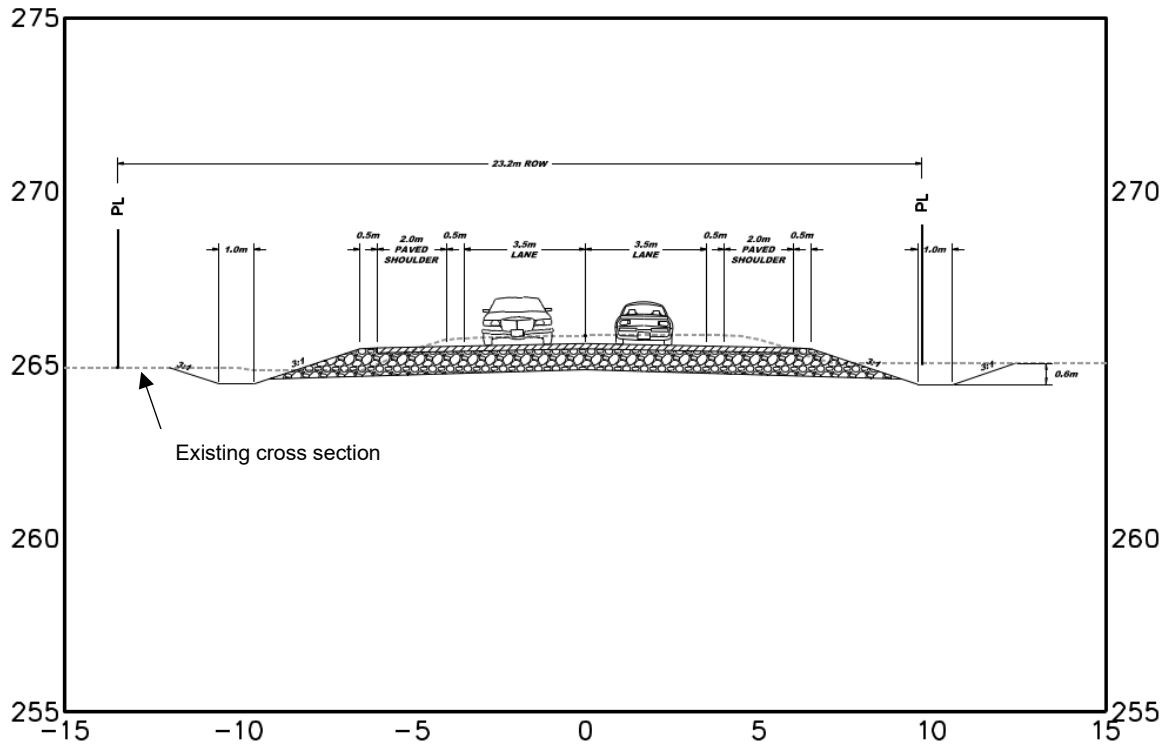


Figure 4.1 Proposed Cross Section – Outside of Wetland Area

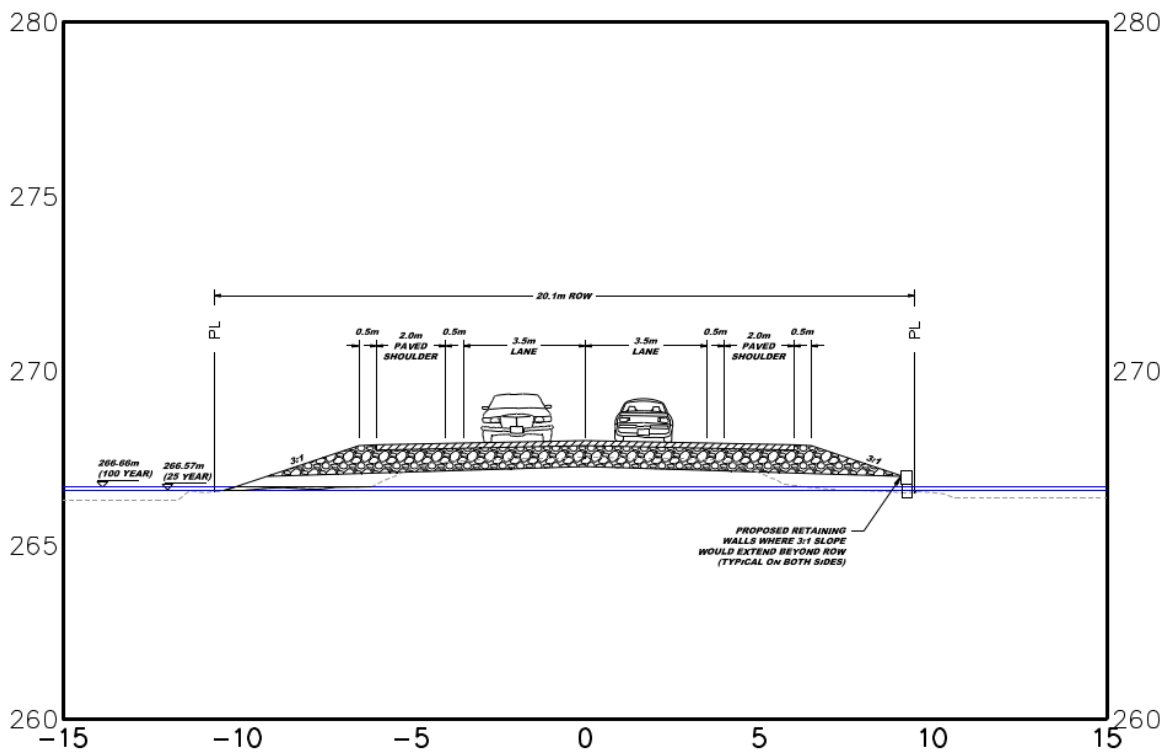


Figure 4.2 Proposed Cross Section – Wetland Area

4.2 Design of Proposed Features

The increase in impervious area is due to the addition of paved shoulders. The rural cross section of the road is not changing, and does not trigger typical regulatory requirements for the implementation of stormwater management. However, in an effort to improve stormwater conveyance and management 1 m wide flat bottomed swales are proposed through the limits of the project outside the wetland as shown in Figure 4.1 above. These are proposed as enhanced swales to slow conveyance and promote infiltration. At the detailed design phase of the project infiltration can be quantified. Through the wetland area the raised platform of the road does not permit the use of swales and flow will sheet flow from the road to the wetland as it does in the existing condition.

New road crossing culverts have been designed at the western (CULV-6) and eastern (CULV- 1) limits of the project where the watercourse crosses the road and a new culvert has been designed in the wetland portion. Through the wetland a concrete box culvert (CULV-8) is embedded 0.3 m below the permanent water elevation in the wetland, set by the elevation of the downstream private culvert (CULV-3) crossing proposed in the Municipal Drain Study. This culvert provides passage for fish and other aquatic species as well as flows from the wetland south of Safari Road. Additionally, four eco passages exist through the wetland but are set higher than the permanent water elevation and are not included in the model.

The proposed Safari Road crossing culverts and proposed road platform have been evaluated assuming implementation of the recommended solution from the Municipal Drain Study.

5.0 Hydrology and Hydraulic Analysis

PCSWMM was used for hydrologic and hydraulic analysis to support the design of the new culverts under Safari Road and the proposed road cross section.

5.1 Existing Conditions

Field observations indicate that Safari Road primarily experiences seasonal flooding during the spring. A Google Earth image dated April 2023 shows overtopping and inundation of Safari Road in the vicinity of CULV-8. However, the road is not known to flood during frequent summer storms.

A PCSWMM model, developed for the Municipal Drain Study, was provided by the City. The model was developed to size the conveyance features of the municipal drain as was

appropriate for that study. The RVA model incorporated the equalization culvert (CULV-8) within the wetland area but did not simulate overtopping at CULV-8, even under the 100-year design event. This discrepancy suggested that, although the model was appropriate for the Municipal Drain Study, it did not accurately represent the existing conditions of the culverts along Safari Road for the current study.

Additionally, the seasonal flooding was considered to result from a combination of:

- Saturated soil conditions during spring thaw
- Backwater effects from the filled-in CULV-3 downstream of CULV-8 and CULV-2, resulting in an excess ponding in the depression/wetland areas abutting Safari Road.

Given these factors, a continuous simulation approach was adopted to better capture the temporal variability in infiltration and storage, which are critical to replicating spring flooding.

5.1.1 Model Setup

The Municipal Drain Study model used the Alternative Runoff Method (ARM), which is suitable only for single-event simulations since ARM does not account for the infiltration capacity recovery during the dry period. This model was appropriate for the design needs of the Municipal Drain. To conduct continuous simulation, a new model was developed. Modified Green-Ampt was used as infiltration method, which allows for time-varying soil moisture and infiltration capacity.

The physical geometry (inverts and dimensions) and conditions (blockage modelled as partially filled pipe) of existing culverts were retained from the original model. Overtopping elevations were revised using high-resolution bare-earth LiDAR Digital Terrain Model (DTM), available from Ontario GeoHub (<https://geohub.lio.gov.on.ca/>). Furthermore, since the observed flooding on Safari Road occurs at the local low point approximately 125m east of CULV-8, at an elevation of 267.0m, the overtopping elevation of CULV-8 was set at 267.0m in the model to assess whether flooding would occur at the observed location.

A number of depression storage and wetland areas are known to be present within the study area, providing significant capacity to retain and detain surface runoff. To identify these features and quantify their storage potential, overland flow and cut-fill analyses were conducted using the DTM. The resulting storage areas were incorporated into the PCSWMM model as storage nodes; each assigned a corresponding storage curve based on the terrain analysis.

Subcatchment boundaries from the Municipal Drain Study Model were revised to reflect the contributing areas to these localized storage areas. Furthermore, the following subcatchment parameters were revised:

- Imperviousness was estimated using GIS layers for road edges and building footprints from the City of Hamilton Open Data Catalogue (<https://open.hamilton.ca/>).
- Slope was derived from the DTM.
- Width was estimated based on the main overland flow path within each subcatchment.
- Infiltration parameters were based on soil characteristics and applied as area-weighted values, determined by overlaying the soil layer with the subcatchment boundaries. Soil Survey Complex GIS data was obtained from the Ontario GeoHub, as shown in Figure 5.1 below.
- Textbook values were used for the rest of the parameters such as Manning's "n", depression storage and percent of impervious area with no depression storage.

Subcatchments were connected using a series of weirs. These were used as conveyance elements to avoid double-counting storage volumes inherent in the geometry of lengthy natural channels, as available storages were explicitly accounted for via storage nodes.

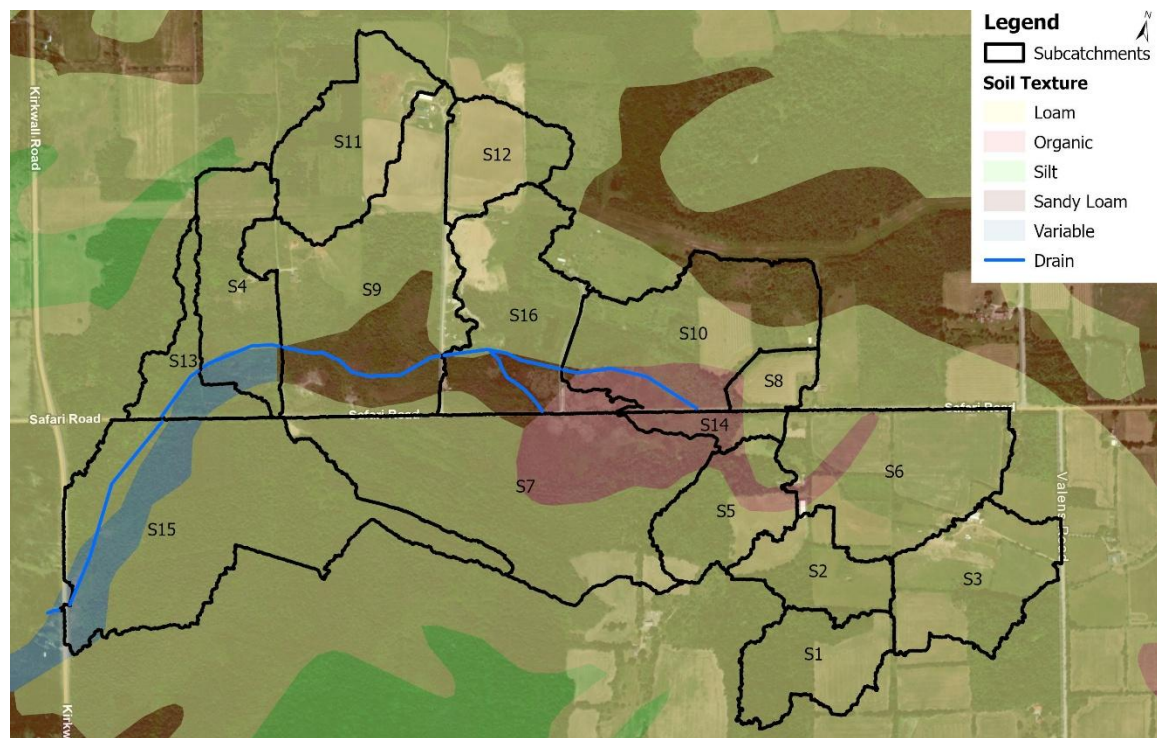


Figure 5.1 Soil Map

5.1.2 Quasi-Calibration

To confirm that the model reflects existing conditions, a quasi-calibration was performed. As previously noted, Google image showed that Safari Road was flooded in April 2023. To support model calibration, historic climate data from 2023 was obtained from Environment Canada. The climate station Hamilton RBG CS, located approximately 15 km southeast of the study area, was selected as the nearest and most representative source of local weather data.

The objectives of model parameters adjustments were:

- To replicate spring flooding near CULV-8; and
- To reflect the absence of flooding during typical summer conditions.

Key calibration adjustments included:

- The initial storage curves were reduced by 50% to account for the dense vegetation cover, which limits effective storage.
- A seasonal infiltration pattern was implemented, with the lowest infiltration rates in April and highest in July.

The quasi-calibrated model demonstrated that, under existing conditions:

- The local ponding areas provide sufficient storage and infiltration capacity to attenuate surface runoff from regular rainfall events. As a result, all culverts in the study area, except CULV-3 and CULV-8, did not experience surcharge.
- CULV-3 and CULV-8 surcharged between March to May, coinciding with the period of lowest infiltration rates.
- CULV-3 lacked adequate conveyance capacity due to being filled in, which contributed to upstream water accumulation.
- CULV-8 overtopped in April, consistent with the field observations. The overtopping of Safari Road is a combination of backwater effect from the filled-in CULV-3 and continued water buildup in the adjacent ponding areas. As the water levels rose, this eventually exceeded the road elevation, resulting in surface flooding.

The existing conditions model has been calibrated using the best available observed data and available for use in culvert design and evaluation of the impacts of the proposed road widening.

5.2 Proposed Conditions

As the model was able to replicate the existing condition flooding the revised model was used to analyze the existing conditions and proposed condition in single event analysis for the 24 hour, 25 year storm and 100 year storm as is needed for culvert and freeboard design. The existing condition analysis used the same existing condition parameters for the private culverts as were used in the Municipal Drain Study.

Under the proposed conditions, it is recommended that the culvert CULV-1, CULV-6 and CULV-8 be replaced as detailed below in Table 5-1 as part of the Safari Road improvements. CULV-2 through CULV-5 are private culverts and have been included in the model per the Municipal Drain Study recommendations. CULV-7 is the existing culvert on Kirkwall Road and is outside the project limit and not proposed to change.

Culvert ID	Size	Material	Length	Culvert Invert		Culvert Slope
	(mm)			U/S	D/S	
CULV-1	600	HDPE	12.33	266.83	266.71	0.97
CULV-2	600	HDPE	9.50	266.58	266.53	0.52
CULV-3	600	HDPE	11.20	266.35	266.28	0.62
CULV-4	600	HDPE	10.63	265.51	265.44	0.65
CULV-5	3x600	HDPE	17.03	264.75	264.73	0.11
CULV-6	3x600	HDPE	14.50	264.45	264.4	0.34
CULV-8	1200x2400	Concrete	20.1	266.38	266.3	0.39

The proposed design was evaluated to determine the impact of the proposed improvements to Safari Road and surrounding properties. Table 5-2 presents the changes in impervious area and resulting peak flows in the catchments for the 25 year and 100 year storms. Refer to Appendix 1 for the drainage plan showing the PCSWMM model schematic layout of the sub-catchments and culverts. The results demonstrate that impervious area increased from 1.49% of the watershed to 1.91% and the total flows increased by 0.09 m³/s and 0.19m³/s for the 25 year and 100 year storms, respectively.

Table 5-2 Impervious area Comparison – Existing Condition VS Proposed Condition							
Sub Catchment ID	Drainage Area (ha)	Existing Condition			Proposed Condition		
		Impervious area (ha)	25-year (m³/s)	100-year (m³/s)	Impervious area (ha)	25-year (m³/s)	100-year (m³/s)
S1	8.48	0.042	0.59	0.87	0.042	0.59	0.87
S2	6.76	0.034	0.29	0.44	0.012	0.29	0.44
S3	5.52	0.249	0.55	0.82	0.245	0.55	0.82
S4	10.70	0.096	0.66	0.98	0.102	0.66	0.99
S5	8.70	0.070	0.49	0.74	0.065	0.49	0.74
S6	17.73	0.372	0.76	1.14	0.529	0.79	1.18
S7	31.85	0.350	1.28	1.95	0.595	1.32	2
S8	2.932	0.062	0.23	0.33	0.102	0.23	0.34
S9	27.85	0.808	0.53	0.78	0.894	0.55	0.8
S10	18.32	0.128	0.61	0.94	0.194	0.63	0.96
S11	12.24	0.110	0.56	0.85	0.110	0.52	0.8
S12	6.97	0.132	0.45	0.66	0.132	0.42	0.63
S13	5.65	0.136	0.21	0.32	0.237	0.23	0.34
S14	2.66	0.165	0.31	0.36	0.265	0.32	0.43
S15	33.55	0.201	2.17	3.21	0.343	2.19	3.24
S16	16.88	0.372	0.68	1.03	0.399	0.68	1.03
Total	223.19	3.328	10.37	15.42	4.265	10.46	15.61

Additionally, the proposed design was evaluated to determine if the design is adequate to improve Safari Roads resiliency to flooding. Table 5-3 presents the existing peak flows, HGLs and freeboard upstream of each outlet and Table 5-4 presents the proposed peak flows, HGLs and freeboard upstream of each outlet.

Table 5-3 Existing Conditions Hydraulic Model Output Summary

Culvert ID	Road Station	Drainage Area (ha)	Size (mm)	Road Surface Elevation (m)	25-year			100-year		
					Max. Flow (m ³ /s)	Freeboard (m)	Max. U/S HGL (m)	Max. Flow (m ³ /s)	Freeboard (m)	Max. U/S HGL (m)
CULV-1	1+639	56.21	600	267.68	0.209	0.41	267.24	0.452	0.16	267.52
CULV-2	Private	77.48	600	Private	0	N/A	266.7	0.058	N/A	266.9
CULV-3	Private	133.19	600	Private	0.001	N/A	266.52	0.002	N/A	266.64
CULV-4	Private	173.28	600	Private	0.064	N/A	265.84	0.119	N/A	265.93
CULV-5	Private	183.98	3 x 600	Private	0.165	N/A	265.07	0.283	N/A	265.14
CULV-6	0+312	189.64	3 x 600	265.80	0.18	1.0	264.8	0.327	0.92	264.88
CULV-7	Kirkwall Road	223.19	3000 x 1200	263.47	1.382	0.87	262.6	2.155	0.8	262.67
CULV-8	1+289	31.86	600	267.62	0.087	0.98	266.64	0.136	0.89	266.73

Table 5-4 Proposed Conditions Hydraulic Model Output Summary

Culvert ID	Station	Drainage Area (ha)	Size (mm)	Road Surface Elevation (m)	25-year			100-year		
					Max. Flow (m ³ /s)	Freeboard (m)	Max. U/S HGL (m)	Max. Flow (m ³ /s)	Freeboard (m)	Max. U/S HGL (m)
CULV-1	1+639	56.21	600	268.846	0.164	1.63	267.22	0.342	1.366	267.48
CULV-2	Private	77.47	600	Private	0.015	N/A	266.69	0.095	N/A	266.85
CULV-3	Private	133.18	600	Private	0.024	N/A	266.55	0.047	N/A	266.65
CULV-4	Private	173.28	600	Private	0.058	N/A	265.82	0.113	N/A	265.92
CULV-5	Private	183.98	3 x 600	Private	0.144	N/A	265.05	0.245	N/A	265.11
CULV-6	0+312	189.64	3 x 600	265.7	0.179	1.03	264.67	0.286	0.96	264.74
CULV-7	Kirkwall Road	223.19	3000 x 1200	263.47	0.872	0.94	262.53	1.277	0.84	262.63
CULV-8	1+289	31.85	1200 x 2400	268.0	0.143	1.43	266.57	0.205	1.34	266.66

The results demonstrate that with the increased impervious surface from the proposed Safari Road improvements are not impactful in the 25 year or 100-year events. Design criteria for the proposed culvert crossing followed the MTO's Highway Drainage Design Manual for rural arterial roads. The following design criteria were used for the evaluation of the existing and proposed culverts:

- 25-year design storm for culvert crossings
- 100-year major system design storm
- Freeboard Design Criteria:
 - 1.0m from top of hydraulic grade line to edge of traveled lane

Table 5.4 demonstrates that the freeboard for all Safari Road crossing culverts freeboard is met. Downstream of the project limits the large 3000 x 1200 mm box culvert on Kirkwall Road realizes improved freeboard from 0.87m to 0.94 m. Critically, at all culvert crossings on Safari Road and the downstream culvert on Kirkwall Road the road does not top and maintains some freeboard during the 100 year storm event.

Additionally, the results show that with the proposed Safari Road improvements there is no impact to private property as the hydraulic grade lines in each storm event remain unchanged or lowered at all culvert crossings, including the private property crossings.

Through the wetland, CULV-8, acts as an equalization culvert between the wetland north and south of Safari Road. This culvert has been upsized for eco-passage needs and the road raised to meet freeboard requirements in the 25 year storm. These changes do not impact the seasonal water fluctuations of the wetland. In the proposed condition the water level in the wetland is controlled by the invert of CULV-3.

The proposed cross section through the wetland does impede on the wetland and occupies approximately 7,260 m² of additional area beyond the existing road cross section as seen in Figure 4.2 above. In the 25 year storm this equates to a loss of storage of 170 m³ and 532 m³ in the 100 year storm. This is due to the hydraulic grade lines being very close in elevation to the existing cross section. From the results of the subcatchment flows and culvert flows this loss does not impact the storage in the wetland.

The Fluvial Geomorphology Crossing Assessment for Safari Road recommends using 3, 1.3 m at the CULV-6 location. This scenario was run and did not produce any significant difference from the proposed 3, 600 mm culverts proposed above. Through detail design the implementation of these culverts can be reviewed in further detail.

The results demonstrate there are no significant flow or hydraulic grade line changes within the subcatchments that contain the wetland (S17, S10, S14 and S16) that would indicate impacts to seasonal water fluctuations in the wetland. Further, the scope of this report is the proposed improvements to Safari Road, a parallel study for a Municipal Drain is ongoing that proposes changes to culverts downstream of the wetland that could have a pronounced impact on the seasonal water fluctuations of the wetland.

6.0 Conclusions

The development of the continuous simulation model provided confirmation that the model could replicate the flooding, like has been documented in recent years. The ongoing flooding of Safari is due to seasonal accumulations of water that do not have adequate conveyance. The proposed improvements to Safari Road are not impactful to the local private properties. The improvements proposed through the Municipal Drain Study, which is assumed to be implemented in this analysis and the improved culverts on Safari Road will eliminate flooding of Safari Road in the design event and the 100 year event. Additional investigations will be completed as part of detailed design to finalize the design.

Report Prepared By:

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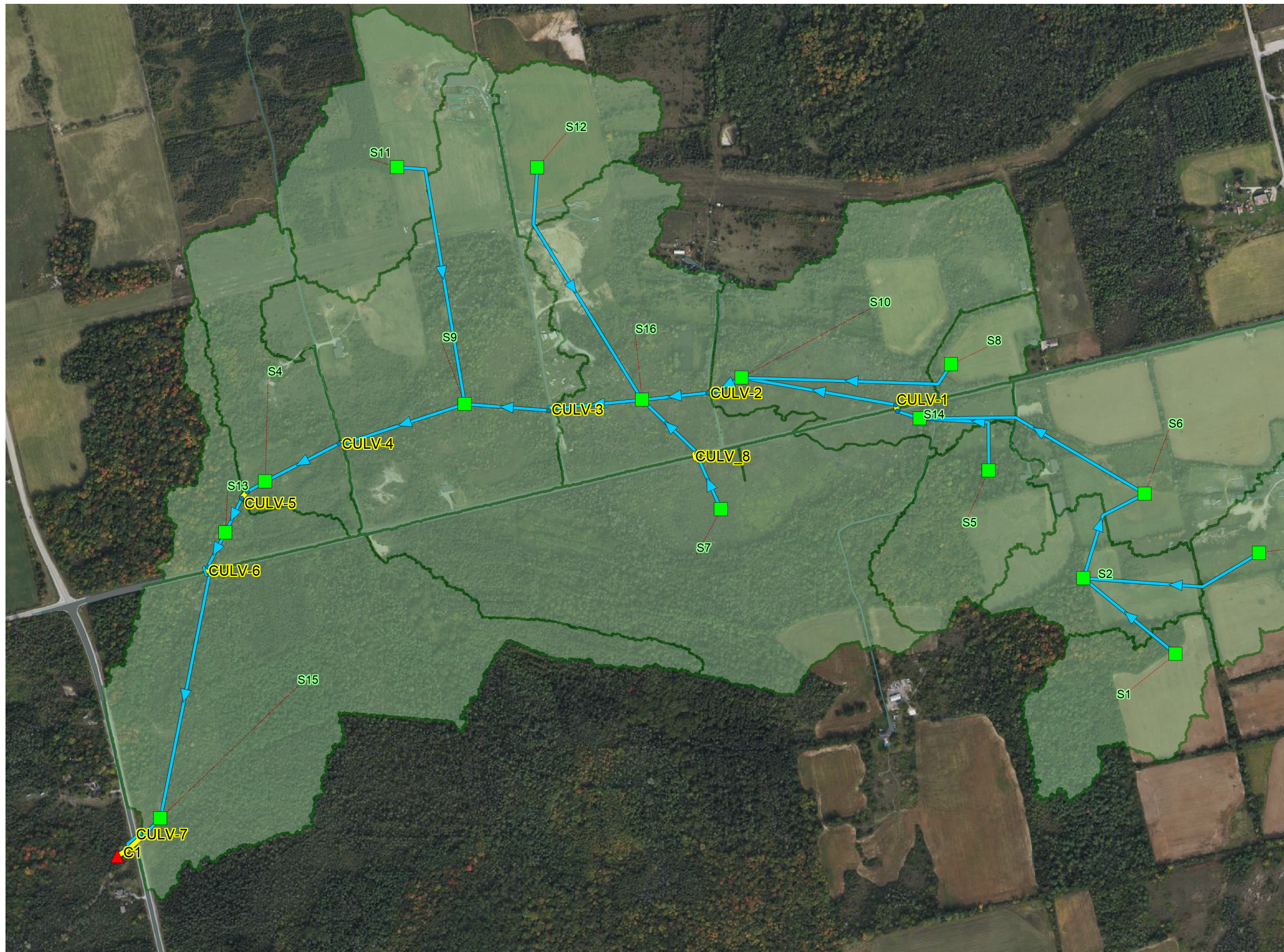
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Associate, Project Manager, Water Resources

APPENDIX 1

Drainage Area Plans





Legend

- Junctions
- ▲ Outfalls
- Storages
- Conduits
- Weirs
- ▭ Subcatchments
- imperv



450 m

APPENDIX 2

Subcatchment Parameters



Subcatchment Parameter														
											Existing Condition		Proposed Condition	
Name	Area (ha)	Width (m)	Slope (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Suction Head (mm)	Conductivity (mm/hr)	Initial Deficit (frac.)	Imperv. (%)	Initial Deficit (frac.) ²	Imperv. (%)
S1	8.49	715	3.72	0.011	0.4	1.0	5	25	88.90	3.30	0.231	0.50	0.231	0.50
S2	6.76	328	3.14	0.011	0.4	1.0	5	25	145.91	4.60	0.209	0.50	0.209	0.50
S3	11.86	523	3.84	0.011	0.4	1.0	5	25	88.90	3.30	0.231	2.10	0.347	2.10
S4	10.70	727	3.99	0.011	0.4	1.0	5	25	88.90	3.30	0.231	0.90	0.347	1.00
S5	8.71	497	4.22	0.011	0.4	1.0	5	25	136.75	2.67	0.203	0.80	0.203	0.80
S6	17.73	715	3.76	0.011	0.4	1.0	5	25	253.31	1.13	0.136	2.10	0.136	3.00
S7	31.86	908	6.71	0.011	0.4	1.0	5	25	133.24	2.71	0.205	1.10	0.205	1.90
S8	2.93	305	2.88	0.011	0.4	1.0	5	25	108.69	4.80	0.229	2.10	0.229	3.50
S9	27.85	448	3.73	0.011	0.4	1.0	5	25	88.90	3.30	0.231	2.90	0.231	3.20
S10	18.33	839	2.82	0.011	0.4	1.0	5	25	88.90	3.30	0.231	0.70	0.231	1.10
S11	12.24	505	4.87	0.011	0.4	1.0	5	25	125.30	2.96	0.211	0.90	0.211	0.90
S12	6.97	411	5.38	0.011	0.4	1.0	5	25	136.70	2.67	0.203	1.90	0.203	1.90
S13	5.66	166	4.72	0.011	0.4	1.0	5	25	110.93	3.01	0.218	2.40	0.218	4.20
S14	2.66	357	3.08	0.011	0.4	1.0	5	25	153.22	2.51	0.194	6.20	0.194	9.90
S15	33.55	1994	5.62	0.011	0.4	1.0	5	25	115.54	2.95	0.216	0.60	0.216	1.00
S16	16.89	865	2.86	0.011	0.4	1.0	5	25	95.34	5.63	0.241	2.20	0.241	2.40

APPENDIX 3
PCSWMM Output



 Continuous Model

WARNING 04: minimum elevation drop used for Conduit W11
 WARNING 04: minimum elevation drop used for Conduit W13
 WARNING 04: minimum elevation drop used for Conduit W15
 WARNING 04: minimum elevation drop used for Conduit W17
 WARNING 04: minimum elevation drop used for Conduit W19
 WARNING 04: minimum elevation drop used for Conduit W22
 WARNING 04: minimum elevation drop used for Conduit W6
 WARNING 04: minimum elevation drop used for Conduit W9
 WARNING 02: maximum depth increased for Node CULV8-DS
 WARNING 02: maximum depth increased for Node CULV8-US
 WARNING 02: maximum depth increased for Node SU1
 WARNING 02: maximum depth increased for Node SU11
 WARNING 02: maximum depth increased for Node SU12
 WARNING 02: maximum depth increased for Node SU14
 WARNING 02: maximum depth increased for Node SU2
 WARNING 02: maximum depth increased for Node SU4
 WARNING 02: maximum depth increased for Node SU5
 WARNING 02: maximum depth increased for Node SU6
 WARNING 02: maximum depth increased for Node SU8

 Element Count

 Number of rain gages 6
 Number of subcatchments ... 16
 Number of nodes 33
 Number of links 40
 Number of pollutants 0
 Number of land uses 0

Raingage Summary

Name	Data Source	Data Type	Recording Interval
12SCS10_30min	12SCS10_30min	INTENSITY	30 min.
24HrSCS25Yr	24HrSCS25Yr	INTENSITY	30 min.
24HrSCS25Yr_30min	24SCS25_30min	INTENSITY	30 min.
Chicago_6h	Chicago_6h	INTENSITY	5 min.
HAMILTON2023	Precipitatioin2023	VOLUME	60 min.
HAMILTON2024	Precipitation2024	VOLUME	60 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage
Outlet					

S1	8.49	715.00	0.50	3.7200	24HrSCS25Yr
SU1					
S10	18.33	839.00	0.70	2.8200	24HrSCS25Yr
SU10					
S11	12.24	505.00	0.90	4.8700	24HrSCS25Yr
SU11					
S12	6.97	411.00	1.90	5.3800	24HrSCS25Yr
SU12					
S13	5.66	166.00	2.40	4.7200	24HrSCS25Yr
SU13					
S14	2.66	357.00	6.20	3.0800	24HrSCS25Yr
SU14					
S15	33.55	1994.00	0.60	5.6200	24HrSCS25Yr
SU15					
S16	16.89	865.00	2.20	2.8600	24HrSCS25Yr
SU16					
S2	6.76	328.00	0.50	3.1400	24HrSCS25Yr
SU2					
S3	11.86	523.00	2.10	3.8400	24HrSCS25Yr
SU3					
S4	10.70	727.00	0.90	3.9900	24HrSCS25Yr
SU4					
S5	8.71	497.00	0.80	4.2200	24HrSCS25Yr
SU5					
S6	17.73	715.00	2.10	3.7600	24HrSCS25Yr
SU6					
S7	31.86	908.00	1.10	6.7100	24HrSCS25Yr
SU7					
S8	2.93	305.00	2.10	2.8800	24HrSCS25Yr
SU8					
S9	27.85	448.00	2.90	3.7300	24HrSCS25Yr
SU9					

Node Summary

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
CULV1-DS	JUNCTION	266.71	1.67	0.0	
CULV1-US	JUNCTION	266.83	1.55	0.0	
CULV2-DS	JUNCTION	266.53	1.61	0.0	
CULV2-US	JUNCTION	266.58	1.56	0.0	
CULV3-DS	JUNCTION	266.28	2.10	0.0	
CULV3-US	JUNCTION	266.35	2.03	0.0	
CULV4-DS	JUNCTION	265.44	1.82	0.0	
CULV4-US	JUNCTION	265.51	1.75	0.0	
CULV5-DS	JUNCTION	264.73	1.65	0.0	
CULV5-US	JUNCTION	264.75	1.63	0.0	
CULV6-DS	JUNCTION	264.40	2.00	0.0	
CULV6-US	JUNCTION	264.45	1.95	0.0	
CULV7-DS	JUNCTION	261.61	2.86	0.0	
CULV7-US	JUNCTION	261.91	2.56	0.0	
CULV8-DS	JUNCTION	266.30	1.00	0.0	
CULV8-US	JUNCTION	266.38	1.86	0.0	
OF1	OUTFALL	261.60	1.00	0.0	
SU1	STORAGE	267.59	1.75	0.0	

SU10	STORAGE	266.11	1.61	0.0
SU11	STORAGE	267.33	1.46	0.0
SU12	STORAGE	267.89	1.98	0.0
SU13	STORAGE	264.21	1.50	0.0
SU14	STORAGE	266.10	1.73	0.0
SU15	STORAGE	261.78	1.55	0.0
SU16	STORAGE	266.11	2.13	0.0
SU2	STORAGE	267.34	1.60	0.0
SU3	STORAGE	267.13	2.65	0.0
SU4	STORAGE	264.51	1.24	0.0
SU5	STORAGE	266.87	1.54	0.0
SU6	STORAGE	266.83	1.77	0.0
SU7	STORAGE	266.07	1.58	0.0
SU8	STORAGE	266.30	1.83	0.0
SU9	STORAGE	264.97	1.98	0.0

Link Summary

Name	From Node	To Node	Type	Length	%

C1	CULV7-DS	OF1	CONDUIT	30.7	
0.0325 0.0700					
CULV-1	CULV1-US	CULV1-DS	CONDUIT	12.3	
0.9730 0.0240					
CULV-2	CULV2-US	CULV2-DS	CONDUIT	9.5	
0.5261 0.0240					
CULV-3	CULV3-US	CULV3-DS	CONDUIT	11.2	
0.6248 0.0240					
CULV-4	CULV4-US	CULV4-DS	CONDUIT	10.6	
0.6587 0.0240					
CULV-5	CULV5-US	CULV5-DS	CONDUIT	17.0	
0.1174 0.0130					
CULV-6	CULV6-US	CULV6-DS	CONDUIT	14.5	
0.3448 0.0130					
CULV-7	CULV7-US	CULV7-DS	CONDUIT	32.2	
0.9315 0.0130					
CULV-8	CULV8-US	CULV8-DS	CONDUIT	11.8	
0.6760 0.0240					
W11	SU16	CULV3-US	CONDUIT	5.0	
0.0061 0.0100					
W13	SU9	CULV4-US	CONDUIT	5.0	
0.0061 0.0100					
W15	SU4	CULV5-US	CONDUIT	5.0	
0.0061 0.0100					
W17	SU13	CULV6-US	CONDUIT	5.0	
0.0061 0.0100					
W19	SU15	CULV7-US	CONDUIT	5.0	
0.0061 0.0100					
W22	SU7	CULV8-US	CONDUIT	5.0	
0.0061 0.0100					
W6	SU14	CULV1-US	CONDUIT	5.0	
0.0061 0.0100					
W9	SU10	CULV2-US	CONDUIT	5.0	
0.0061 0.0100					
W1	SU1	SU2	WEIR		

W10	CULV2-DS	SU16	WEIR
W12	CULV3-DS	SU9	WEIR
W14	CULV4-DS	SU4	WEIR
W16	CULV5-DS	SU13	WEIR
W18	CULV6-DS	SU15	WEIR
W2	SU2	SU6	WEIR
W20	SU11	SU9	WEIR
W21	SU12	SU16	WEIR
W23	CULV8-DS	SU16	WEIR
W3	SU3	SU2	WEIR
W4	SU5	SU14	WEIR
W5	SU6	SU14	WEIR
W7	CULV1-DS	SU10	WEIR
W8	SU8	SU10	WEIR
W-CULV1	CULV1-US	CULV1-DS	WEIR
W-CULV2	CULV2-US	CULV2-DS	WEIR
W-CULV3	CULV3-US	CULV3-DS	WEIR
W-CULV4	CULV4-US	CULV4-DS	WEIR
W-CULV5	CULV5-US	CULV5-DS	WEIR
W-CULV6	CULV6-US	CULV6-DS	WEIR
W-CULV7	CULV7-US	CULV7-DS	WEIR
W-CULV8	CULV8-US	CULV8-DS	WEIR

Cross Section Summary

Full Conduit Flow	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels

C1	TRAPEZOIDAL	1.00	6.00	0.59	10.00	1
1.08						
CULV-1	CIRCULAR	0.60	0.28	0.15	0.60	1
0.33						
CULV-2	FILLED_CIRCULAR	0.45	0.23	0.12	0.60	1
0.17						
CULV-3	FILLED_CIRCULAR	0.05	0.01	0.02	0.20	1
0.00						
CULV-4	FILLED_CIRCULAR	0.45	0.23	0.12	0.60	1
0.19						
CULV-5	FILLED_CIRCULAR	0.45	0.23	0.12	0.60	3
0.15						
CULV-6	FILLED_CIRCULAR	0.45	0.23	0.12	0.60	3
0.25						
CULV-7	RECT_CLOSED	1.05	3.15	0.39	3.00	1
12.46						
CULV-8	CIRCULAR	0.60	0.28	0.15	0.60	1
0.27						
W11	TRAPEZOIDAL	1.00	6.00	0.59	10.00	1
3.28						
W13	TRAPEZOIDAL	1.00	6.00	0.59	10.00	1
3.28						
W15	TRAPEZOIDAL	1.00	6.00	0.59	10.00	1
3.28						
W17	TRAPEZOIDAL	1.00	6.00	0.59	10.00	1
3.28						

W19	TRAPEZOIDAL	1.00	6.00	0.59	10.00	1
3.28						
W22	TRAPEZOIDAL	1.00	3.00	0.62	4.00	1
1.71						
W6	TRAPEZOIDAL	1.00	6.00	0.59	10.00	1
3.28						
W9	TRAPEZOIDAL	1.00	6.00	0.59	10.00	1
3.28						

Analysis Options

Flow Units CMS

Process Models:

Rainfall/Runoff YES
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO
 Infiltration Method MODIFIED_GREEN_AMPT
 Flow Routing Method DYNWAVE
 Surcharge Method SLOT
 Starting Date 01/01/2000 00:00:00
 Ending Date 01/01/2000 23:30:00
 Antecedent Dry Days 0.0
 Report Time Step 00:05:00
 Wet Time Step 00:05:00
 Dry Time Step 01:00:00
 Routing Time Step 5.00 sec
 Variable Time Step YES
 Maximum Trials 8
 Number of Threads 1
 Head Tolerance 0.001500 m

	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
*****	-----	-----
Total Precipitation	19.558	87.631
Evaporation Loss	0.000	0.000
Infiltration Loss	14.789	66.262
Surface Runoff	4.774	21.388
Final Storage	0.005	0.022
Continuity Error (%)	-0.046	

	Volume	Volume
Flow Routing Continuity	hectare-m	10 ⁶ ltr
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	4.773	47.729
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000

External Outflow	1.179	11.795
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.920	9.203
Initial Stored Volume	0.000	0.000
Final Stored Volume	2.673	26.733
Continuity Error (%)	-0.002	

Highest Continuity Errors

Node CULV2-US (100.00%)

Node CULV3-US (24.05%)

Node SU14 (1.12%)

Time-Step Critical Elements

Link W6 (33.04%)

Link W19 (29.83%)

Link W22 (8.75%)

Highest Flow Instability Indexes

Link W19 (8)

Link CULV-7 (7)

Link CULV-1 (6)

Link W7 (5)

Link W6 (4)

Most Frequent Nonconverging Nodes

Convergence obtained at all time steps.

Routing Time Step Summary

Minimum Time Step	:	1.09 sec
Average Time Step	:	2.93 sec
Maximum Time Step	:	5.00 sec
% of Time in Steady State	:	0.36
Average Iterations per Step	:	2.03
% of Steps Not Converging	:	0.00
Time Step Frequencies	:	
5.000 - 3.155 sec	:	29.15 %
3.155 - 1.991 sec	:	46.25 %
1.991 - 1.256 sec	:	24.59 %
1.256 - 0.792 sec	:	0.01 %
0.792 - 0.500 sec	:	0.00 %

 Subcatchment Runoff Summary

Perv	Total	Total	Total	Total	Total	Total	Imperv
Runoff	Runoff	Precip	Peak	Runoff	Evap	Infil	Runoff
Subcatchment	Runoff	Runoff	Runoff	Runoff	mm	mm	mm
mm	mm	10^6 ltr	mm	mm	mm	mm	mm
			CMS	Coeff			
S1			87.63	0.00	0.00	62.65	0.44
24.61	25.04	2.13	0.59	0.286			
S10			87.63	0.00	0.00	73.06	0.61
13.99	14.60	2.68	0.61	0.167			
S11			87.63	0.00	0.00	64.98	0.78
21.90	22.68	2.78	0.56	0.259			
S12			87.63	0.00	0.00	62.41	1.65
23.61	25.26	1.76	0.45	0.288			
S13			87.63	0.00	0.00	64.30	2.08
21.26	23.34	1.32	0.21	0.266			
S14			87.63	0.00	0.00	45.67	5.39
35.84	41.22	1.10	0.31	0.470			
S15			87.63	0.00	0.00	61.92	0.52
25.24	25.77	8.64	2.17	0.294			
S16			87.63	0.00	0.00	70.79	1.91
14.95	16.86	2.85	0.68	0.192			
S2			87.63	0.00	0.00	65.56	0.43
21.67	22.11	1.49	0.29	0.252			
S3			87.63	0.00	0.00	64.40	1.82
21.43	23.26	2.76	0.55	0.265			
S4			87.63	0.00	0.00	62.98	0.78
23.92	24.70	2.64	0.66	0.282			
S5			87.63	0.00	0.00	62.42	0.70
24.56	25.25	2.20	0.49	0.288			
S6			87.63	0.00	0.00	64.42	1.82
21.40	23.22	4.12	0.76	0.265			
S7			87.63	0.00	0.00	63.93	0.96
22.77	23.73	7.56	1.28	0.271			
S8			87.63	0.00	0.00	60.76	1.82
25.10	26.92	0.79	0.23	0.307			
S9			87.63	0.00	0.00	77.11	2.52
7.99	10.51	2.93	0.53	0.120			

 Node Depth Summary

Node	Type	Average	Maximum	Maximum	Time of Max	Reported
		Depth	Depth	HGL	Occurrence	Max Depth
		Meters	Meters	Meters	days hr:min	Meters
CULV1-DS	JUNCTION	0.09	0.21	266.92	0 16:55	0.21

CULV1-US	JUNCTION	0.17	0.41	267.24	0	16:55	0.41
CULV2-DS	JUNCTION	0.00	0.00	266.53	0	00:00	0.00
CULV2-US	JUNCTION	0.03	0.11	266.69	0	23:29	0.11
CULV3-DS	JUNCTION	0.00	0.00	266.28	0	23:29	0.00
CULV3-US	JUNCTION	0.09	0.17	266.52	0	23:29	0.17
CULV4-DS	JUNCTION	0.05	0.11	265.55	0	14:49	0.11
CULV4-US	JUNCTION	0.19	0.33	265.84	0	14:49	0.33
CULV5-DS	JUNCTION	0.08	0.21	264.94	0	13:40	0.21
CULV5-US	JUNCTION	0.17	0.32	265.07	0	13:31	0.32
CULV6-DS	JUNCTION	0.08	0.21	264.61	0	14:20	0.21
CULV6-US	JUNCTION	0.19	0.35	264.80	0	14:20	0.35
CULV7-DS	JUNCTION	0.34	0.97	262.58	0	12:45	0.97
CULV7-US	JUNCTION	0.17	0.69	262.60	0	12:50	0.69
CULV8-DS	JUNCTION	0.13	0.22	266.52	0	22:43	0.22
CULV8-US	JUNCTION	0.15	0.26	266.64	0	15:30	0.26
OF1	OUTFALL	0.34	0.97	262.57	0	12:45	0.97
SU1	STORAGE	0.64	0.96	268.55	0	12:59	0.96
SU10	STORAGE	0.36	0.58	266.69	0	23:29	0.58
SU11	STORAGE	0.39	0.66	267.99	0	13:03	0.66
SU12	STORAGE	0.52	0.74	268.63	0	14:55	0.74
SU13	STORAGE	0.40	0.59	264.80	0	14:20	0.59
SU14	STORAGE	0.71	1.14	267.24	0	16:55	1.14
SU15	STORAGE	0.30	0.81	262.59	0	12:45	0.81
SU16	STORAGE	0.26	0.41	266.52	0	23:29	0.41
SU2	STORAGE	0.58	0.85	268.19	0	13:40	0.85
SU3	STORAGE	0.90	1.27	268.40	0	14:39	1.27
SU4	STORAGE	0.36	0.56	265.07	0	13:31	0.56
SU5	STORAGE	0.46	0.70	267.57	0	13:26	0.70
SU6	STORAGE	0.74	1.04	267.87	0	14:32	1.04
SU7	STORAGE	0.40	0.57	266.64	0	15:30	0.57
SU8	STORAGE	0.44	0.62	266.92	0	14:37	0.62
SU9	STORAGE	0.66	0.87	265.84	0	14:49	0.87

Node Inflow Summary

Total Inflow Volume Node	Flow Balance Error Percent	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr

4.16	0.007	JUNCTION	0.000	0.176	0 16:55	0
4.16	0.052	JUNCTION	0.000	0.209	0 15:00	0
0	0.000 ltr	JUNCTION	0.000	0.000	0 00:00	0
0.000703	703.200 ltr	JUNCTION	0.000	0.000	0 16:42	0

CULV3-DS		JUNCTION	0.000	0.000	0	23:29	0
0.00358	0.100						
CULV3-US		JUNCTION	0.000	0.001	0	12:16	0
0.00472	31.663						
CULV4-DS		JUNCTION	0.000	0.064	0	14:49	0
1.46	0.002						
CULV4-US		JUNCTION	0.000	0.064	0	14:48	0
1.46	0.121						
CULV5-DS		JUNCTION	0.000	0.165	0	13:31	0
2.76	0.001						
CULV5-US		JUNCTION	0.000	0.165	0	13:31	0
2.77	0.081						
CULV6-DS		JUNCTION	0.000	0.180	0	14:20	0
3.28	0.002						
CULV6-US		JUNCTION	0.000	0.180	0	14:20	0
3.28	0.081						
CULV7-DS		JUNCTION	0.000	1.030	0	12:49	0
11.8	0.072						
CULV7-US		JUNCTION	0.000	1.382	0	13:05	0
11.8	-0.019						
CULV8-DS		JUNCTION	0.000	0.082	0	15:30	0
2.62	0.022						
CULV8-US		JUNCTION	0.000	0.087	0	14:49	0
2.62	0.058						
OF1		OUTFALL	0.000	1.016	0	12:45	0
11.8	0.000						
SU1		STORAGE	0.594	0.594	0	12:00	2.13
2.13	-0.895						
SU10		STORAGE	0.613	0.613	0	12:00	2.68
6.83	0.517						
SU11		STORAGE	0.561	0.561	0	12:00	2.78
2.78	-0.642						
SU12		STORAGE	0.448	0.448	0	12:00	1.76
1.76	0.179						
SU13		STORAGE	0.214	0.267	0	13:00	1.32
4.09	-0.057						
SU14		STORAGE	0.305	0.385	0	13:59	1.1
7.22	1.133						
SU15		STORAGE	2.165	2.165	0	12:00	8.64
11.9	-0.606						
SU16		STORAGE	0.679	0.679	0	12:00	2.85
5.47	0.352						
SU2		STORAGE	0.291	0.346	0	12:31	1.49
3.31	-0.490						
SU3		STORAGE	0.547	0.547	0	12:00	2.76
2.76	0.077						
SU4		STORAGE	0.664	0.664	0	12:00	2.64
4.11	-0.347						
SU5		STORAGE	0.494	0.494	0	12:00	2.2
2.2	-0.748						
SU6		STORAGE	0.761	0.761	0	12:00	4.12
6.88	-0.004						
SU7		STORAGE	1.281	1.281	0	12:00	7.56
7.56	0.484						
SU8		STORAGE	0.226	0.226	0	12:00	0.789
0.789	0.036						
SU9		STORAGE	0.533	0.533	0	12:00	2.93
4.88	0.249						

Node Surcharge Summary

No nodes were surcharged.

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

Max Occurrence	Maximum Storage Unit Outflow CMS	Average Volume 1000 m ³	Avg Pcmt Full	Evap Pcmt Loss	Exfil Pcmt Loss	Maximum Volume 1000 m ³	Max Pcmt Full	Time of days
12:59	0.180	0.473	11.2	0.0	14.5	1.222	28.8	0
23:29	0.008	2.743	6.0	0.0	4.6	6.486	14.2	0
13:03	0.248	0.572	13.3	0.0	10.1	1.337	31.1	0
14:55	0.012	0.979	7.5	0.0	24.2	1.602	12.2	0
14:20	0.190	0.560	6.3	0.0	8.2	1.224	13.7	0
16:55	0.216	2.039	26.0	0.0	3.8	4.022	51.2	0
12:45	1.398	0.474	5.3	0.0	1.6	2.664	29.6	0
23:29	0.046	2.042	2.8	0.0	34.1	3.578	4.8	0
13:40	0.234	0.452	11.4	0.0	8.5	1.184	29.9	0
14:39	0.052	1.319	9.4	0.0	25.5	2.293	16.4	0
13:31	0.180	0.874	11.0	0.0	11.1	1.742	21.9	0
13:26	0.129	0.619	11.5	0.0	14.5	1.374	25.4	0
14:32	0.288	1.646	15.1	0.0	11.7	3.570	32.7	0
15:30	0.099	3.634	7.0	0.0	5.5	6.361	12.3	0
14:37	0.006	0.430	6.0	0.0	29.3	0.711	9.9	0
14:49	0.129	1.644	3.2	0.0	41.1	3.362	6.6	0

 Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	89.71	0.256	1.016	11.795
System	89.71	0.256	1.016	11.795

 Link Flow Summary

Link	Type	Maximum Flow CMS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	1.016	0 12:45	0.18	0.94	0.97
CULV-1	CONDUIT	0.176	0 16:55	1.34	0.54	0.51
CULV-2	CONDUIT	0.000	0 00:00	0.00	0.00	0.00
CULV-3	CONDUIT	0.000	0 23:29	0.17	0.23	0.22
CULV-4	CONDUIT	0.064	0 14:49	0.78	0.34	0.32
CULV-5	CONDUIT	0.165	0 13:31	0.72	0.37	0.30
CULV-6	CONDUIT	0.180	0 14:20	0.68	0.24	0.34
CULV-7	CONDUIT	1.030	0 12:49	0.42	0.08	0.79
CULV-8	CONDUIT	0.082	0 15:30	0.83	0.30	0.39
W11	CONDUIT	0.001	0 12:16	0.06	0.00	0.17
W13	CONDUIT	0.064	0 14:48	0.08	0.02	0.33
W15	CONDUIT	0.165	0 13:31	0.16	0.05	0.32
W17	CONDUIT	0.180	0 14:20	0.15	0.05	0.35
W19	CONDUIT	1.382	0 13:05	0.73	0.42	0.68
W22	CONDUIT	0.087	0 14:49	0.15	0.05	0.26
W6	CONDUIT	0.209	0 15:00	0.22	0.06	0.41
W9	CONDUIT	0.000	0 16:42	0.01	0.00	0.11
W1	WEIR	0.171	0 12:59			0.21
W10	WEIR	0.000	0 00:00			0.00
W12	WEIR	0.000	0 23:29			0.00
W14	WEIR	0.064	0 14:49			0.11
W16	WEIR	0.165	0 13:32			0.21
W18	WEIR	0.180	0 14:21			0.21
W2	WEIR	0.226	0 13:40			0.25
W20	WEIR	0.239	0 13:03			0.20
W21	WEIR	0.000	0 00:00			0.00
W23	WEIR	0.082	0 15:30			0.22
W3	WEIR	0.031	0 14:39			0.07
W4	WEIR	0.120	0 13:26			0.16
W5	WEIR	0.265	0 14:32			0.27
W7	WEIR	0.176	0 16:55			0.21
W8	WEIR	0.000	0 00:00			0.00

Conduit Surcharge Summary

No conduits were surcharged.

Analysis begun on: Thu Mar 5 13:31:19 2026
Analysis ended on: Thu Mar 5 13:31:20 2026
Total elapsed time: 00:00:01

 Continuous Model

WARNING 04: minimum elevation drop used for Conduit W11
 WARNING 04: minimum elevation drop used for Conduit W13
 WARNING 04: minimum elevation drop used for Conduit W15
 WARNING 04: minimum elevation drop used for Conduit W17
 WARNING 04: minimum elevation drop used for Conduit W19
 WARNING 04: minimum elevation drop used for Conduit W22
 WARNING 04: minimum elevation drop used for Conduit W6
 WARNING 04: minimum elevation drop used for Conduit W9
 WARNING 02: maximum depth increased for Node CULV8-DS
 WARNING 02: maximum depth increased for Node CULV8-US
 WARNING 02: maximum depth increased for Node SU1
 WARNING 02: maximum depth increased for Node SU11
 WARNING 02: maximum depth increased for Node SU12
 WARNING 02: maximum depth increased for Node SU14
 WARNING 02: maximum depth increased for Node SU2
 WARNING 02: maximum depth increased for Node SU4
 WARNING 02: maximum depth increased for Node SU5
 WARNING 02: maximum depth increased for Node SU6
 WARNING 02: maximum depth increased for Node SU8

 Element Count

 Number of rain gages 5
 Number of subcatchments ... 16
 Number of nodes 33
 Number of links 40
 Number of pollutants 0
 Number of land uses 0

 Raingage Summary

Name	Data Source	Data Type	Recording Interval
24HrSCS100Yr_30min	24SCS100_30min	INTENSITY	30 min.
24HrSCS25Yr	24HrSCS25Yr	INTENSITY	30 min.
24HrSCS25Yr_30min	24SCS25_30min	INTENSITY	30 min.
HAMILTON2023	Precipitatioin2023	VOLUME	60 min.
HAMILTON2024	Precipitation2024	VOLUME	60 min.

 Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage
Outlet					
S1	8.49	715.00	0.50	3.7200	24HrSCS100Yr_30min
SU1					

S10	18.33	839.00	0.70	2.8200	24HrSCS100Yr_30min
SU10					
S11	12.24	505.00	0.90	4.8700	24HrSCS100Yr_30min
SU11					
S12	6.97	411.00	1.90	5.3800	24HrSCS100Yr_30min
SU12					
S13	5.66	166.00	2.40	4.7200	24HrSCS100Yr_30min
SU13					
S14	2.66	357.00	6.20	3.0800	24HrSCS25Yr_30min
SU14					
S15	33.55	1994.00	0.60	5.6200	24HrSCS100Yr_30min
SU15					
S16	16.89	865.00	2.20	2.8600	24HrSCS100Yr_30min
SU16					
S2	6.76	328.00	0.50	3.1400	24HrSCS100Yr_30min
SU2					
S3	11.86	523.00	2.10	3.8400	24HrSCS100Yr_30min
SU3					
S4	10.70	727.00	0.90	3.9900	24HrSCS100Yr_30min
SU4					
S5	8.71	497.00	0.80	4.2200	24HrSCS100Yr_30min
SU5					
S6	17.73	715.00	2.10	3.7600	24HrSCS100Yr_30min
SU6					
S7	31.86	908.00	1.10	6.7100	24HrSCS100Yr_30min
SU7					
S8	2.93	305.00	2.10	2.8800	24HrSCS100Yr_30min
SU8					
S9	27.85	448.00	2.90	3.7300	24HrSCS100Yr_30min
SU9					

Node Summary

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
CULV1-DS	JUNCTION	266.71	1.67	0.0	
CULV1-US	JUNCTION	266.83	1.55	0.0	
CULV2-DS	JUNCTION	266.53	1.61	0.0	
CULV2-US	JUNCTION	266.58	1.56	0.0	
CULV3-DS	JUNCTION	266.28	2.10	0.0	
CULV3-US	JUNCTION	266.35	2.03	0.0	
CULV4-DS	JUNCTION	265.44	1.82	0.0	
CULV4-US	JUNCTION	265.51	1.75	0.0	
CULV5-DS	JUNCTION	264.73	1.65	0.0	
CULV5-US	JUNCTION	264.75	1.63	0.0	
CULV6-DS	JUNCTION	264.40	2.00	0.0	
CULV6-US	JUNCTION	264.45	1.95	0.0	
CULV7-DS	JUNCTION	261.61	2.86	0.0	
CULV7-US	JUNCTION	261.91	2.56	0.0	
CULV8-DS	JUNCTION	266.30	1.00	0.0	
CULV8-US	JUNCTION	266.38	1.86	0.0	
OF1	OUTFALL	261.60	1.00	0.0	
SU1	STORAGE	267.59	1.75	0.0	
SU10	STORAGE	266.11	1.61	0.0	
SU11	STORAGE	267.33	1.46	0.0	

SU12	STORAGE	267.89	1.98	0.0
SU13	STORAGE	264.21	1.50	0.0
SU14	STORAGE	266.10	1.73	0.0
SU15	STORAGE	261.78	1.55	0.0
SU16	STORAGE	266.11	2.13	0.0
SU2	STORAGE	267.34	1.60	0.0
SU3	STORAGE	267.13	2.65	0.0
SU4	STORAGE	264.51	1.24	0.0
SU5	STORAGE	266.87	1.54	0.0
SU6	STORAGE	266.83	1.77	0.0
SU7	STORAGE	266.07	1.58	0.0
SU8	STORAGE	266.30	1.83	0.0
SU9	STORAGE	264.97	1.98	0.0

Link Summary

Name	From Node	To Node	Type	Length	%

C1	CULV7-DS	OF1	CONDUIT	30.7	
0.0325	0.0700				
CULV-1	CULV1-US	CULV1-DS	CONDUIT	12.3	
0.9730	0.0240				
CULV-2	CULV2-US	CULV2-DS	CONDUIT	9.5	
0.5261	0.0240				
CULV-3	CULV3-US	CULV3-DS	CONDUIT	11.2	
0.6248	0.0240				
CULV-4	CULV4-US	CULV4-DS	CONDUIT	10.6	
0.6587	0.0240				
CULV-5	CULV5-US	CULV5-DS	CONDUIT	17.0	
0.1174	0.0130				
CULV-6	CULV6-US	CULV6-DS	CONDUIT	14.5	
0.3448	0.0130				
CULV-7	CULV7-US	CULV7-DS	CONDUIT	32.2	
0.9315	0.0130				
CULV-8	CULV8-US	CULV8-DS	CONDUIT	11.8	
0.6760	0.0240				
W11	SU16	CULV3-US	CONDUIT	5.0	
0.0061	0.0100				
W13	SU9	CULV4-US	CONDUIT	5.0	
0.0061	0.0100				
W15	SU4	CULV5-US	CONDUIT	5.0	
0.0061	0.0100				
W17	SU13	CULV6-US	CONDUIT	5.0	
0.0061	0.0100				
W19	SU15	CULV7-US	CONDUIT	5.0	
0.0061	0.0100				
W22	SU7	CULV8-US	CONDUIT	5.0	
0.0061	0.0100				
W6	SU14	CULV1-US	CONDUIT	5.0	
0.0061	0.0100				
W9	SU10	CULV2-US	CONDUIT	5.0	
0.0061	0.0100				
W1	SU1	SU2	WEIR		
W10	CULV2-DS	SU16	WEIR		
W12	CULV3-DS	SU9	WEIR		

W14	CULV4-DS	SU4	WEIR
W16	CULV5-DS	SU13	WEIR
W18	CULV6-DS	SU15	WEIR
W2	SU2	SU6	WEIR
W20	SU11	SU9	WEIR
W21	SU12	SU16	WEIR
W23	CULV8-DS	SU16	WEIR
W3	SU3	SU2	WEIR
W4	SU5	SU14	WEIR
W5	SU6	SU14	WEIR
W7	CULV1-DS	SU10	WEIR
W8	SU8	SU10	WEIR
W-CULV1	CULV1-US	CULV1-DS	WEIR
W-CULV2	CULV2-US	CULV2-DS	WEIR
W-CULV3	CULV3-US	CULV3-DS	WEIR
W-CULV4	CULV4-US	CULV4-DS	WEIR
W-CULV5	CULV5-US	CULV5-DS	WEIR
W-CULV6	CULV6-US	CULV6-DS	WEIR
W-CULV7	CULV7-US	CULV7-DS	WEIR
W-CULV8	CULV8-US	CULV8-DS	WEIR

Cross Section Summary

Full Conduit Flow	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels

C1	TRAPEZOIDAL	1.00	6.00	0.59	10.00	1
1.08						
CULV-1	CIRCULAR	0.60	0.28	0.15	0.60	1
0.33						
CULV-2	FILLED_CIRCULAR	0.45	0.23	0.12	0.60	1
0.17						
CULV-3	FILLED_CIRCULAR	0.05	0.01	0.02	0.20	1
0.00						
CULV-4	FILLED_CIRCULAR	0.45	0.23	0.12	0.60	1
0.19						
CULV-5	FILLED_CIRCULAR	0.45	0.23	0.12	0.60	3
0.15						
CULV-6	FILLED_CIRCULAR	0.45	0.23	0.12	0.60	3
0.25						
CULV-7	RECT_CLOSED	1.05	3.15	0.39	3.00	1
12.46						
CULV-8	CIRCULAR	0.60	0.28	0.15	0.60	1
0.27						
W11	TRAPEZOIDAL	1.00	6.00	0.59	10.00	1
3.28						
W13	TRAPEZOIDAL	1.00	6.00	0.59	10.00	1
3.28						
W15	TRAPEZOIDAL	1.00	6.00	0.59	10.00	1
3.28						
W17	TRAPEZOIDAL	1.00	6.00	0.59	10.00	1
3.28						
W19	TRAPEZOIDAL	1.00	6.00	0.59	10.00	1
3.28						

W22	TRAPEZOIDAL	1.00	3.00	0.62	4.00	1
1.71						
W6	TRAPEZOIDAL	1.00	6.00	0.59	10.00	1
3.28						
W9	TRAPEZOIDAL	1.00	6.00	0.59	10.00	1
3.28						

Analysis Options

Flow Units CMS
Process Models:
 Rainfall/Runoff YES
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO
Infiltration Method MODIFIED_GREEN_AMPT
Flow Routing Method DYNWAVE
Surcharge Method SLOT
Starting Date 01/01/2000 00:00:00
Ending Date 01/02/2000 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Wet Time Step 00:05:00
Dry Time Step 01:00:00
Routing Time Step 5.00 sec
Variable Time Step YES
Maximum Trials 8
Number of Threads 1
Head Tolerance 0.001500 m

*****	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
*****	-----	-----
Total Precipitation	23.716	106.259
Evaporation Loss	0.000	0.000
Infiltration Loss	16.476	73.820
Surface Runoff	7.236	32.420
Final Storage	0.018	0.079
Continuity Error (%)	-0.057	

*****	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	7.235	72.349
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	1.908	19.084
Flooding Loss	0.000	0.000

Evaporation Loss	0.000	0.000
Exfiltration Loss	1.189	11.894
Initial Stored Volume	0.000	0.000
Final Stored Volume	4.137	41.372
Continuity Error (%)	-0.003	

Highest Continuity Errors

Node CULV3-US (3.21%)
Node SU10 (1.08%)

Time-Step Critical Elements

Link W6 (43.11%)
Link W19 (24.55%)
Link W22 (6.98%)

Highest Flow Instability Indexes

Link W10 (26)
Link W23 (20)
Link CULV-8 (14)
Link W19 (10)
Link CULV-7 (9)

Most Frequent Nonconverging Nodes

Node CULV8-DS (0.10%)
Node OF1 (0.10%)

Routing Time Step Summary

Minimum Time Step : 0.56 sec
Average Time Step : 2.64 sec
Maximum Time Step : 5.00 sec
% of Time in Steady State : 0.44
Average Iterations per Step : 2.31
% of Steps Not Converging : 0.10
Time Step Frequencies :
5.000 - 3.155 sec : 25.62 %
3.155 - 1.991 sec : 20.05 %
1.991 - 1.256 sec : 54.00 %
1.256 - 0.792 sec : 0.22 %
0.792 - 0.500 sec : 0.11 %

Subcatchment Runoff Summary

Perv	Total	Total	Total	Total	Total	Total	Imperv
Runoff	Runoff	Precip	Peak	Runoff	Evap	Infil	Runoff
Subcatchment	mm	Runoff	Runoff	Coeff	mm	mm	mm
mm	mm	10^6 ltr	mm	mm	mm	mm	mm
		CMS					
S1		106.48		0.00	0.00	69.89	0.53
36.16	36.69	3.11	0.87	0.345			
S10		106.48		0.00	0.00	82.57	0.74
23.21	23.95	4.39	0.94	0.225			
S11		106.48		0.00	0.00	72.30	0.95
33.28	34.23	4.19	0.85	0.322			
S12		106.48		0.00	0.00	69.55	2.01
35.00	37.01	2.58	0.66	0.348			
S13		106.48		0.00	0.00	71.11	2.54
32.86	35.40	2.00	0.32	0.332			
S14		87.90		0.00	0.00	24.29	5.40
52.58	57.98	1.54	0.36	0.660			
S15		106.48		0.00	0.00	68.68	0.63
37.25	37.88	12.71	3.21	0.356			
S16		106.48		0.00	0.00	79.84	2.33
24.34	26.67	4.50	1.03	0.250			
S2		106.48		0.00	0.00	72.94	0.53
33.07	33.60	2.27	0.44	0.316			
S3		106.48		0.00	0.00	71.64	2.22
32.66	34.88	4.14	0.82	0.328			
S4		106.48		0.00	0.00	70.05	0.95
35.56	36.51	3.91	0.98	0.343			
S5		106.48		0.00	0.00	69.15	0.85
36.56	37.40	3.26	0.74	0.351			
S6		106.48		0.00	0.00	71.51	2.22
32.79	35.01	6.21	1.14	0.329			
S7		106.48		0.00	0.00	70.58	1.16
34.78	35.95	11.45	1.95	0.338			
S8		106.48		0.00	0.00	67.66	2.22
36.69	38.91	1.14	0.33	0.365			
S9		106.48		0.00	0.00	88.69	3.07
14.72	17.78	4.95	0.78	0.167			

Node Depth Summary

Node	Type	Average	Maximum	Maximum	Time of Max	Reported
		Depth	Depth	HGL	Occurrence	Max Depth
		Meters	Meters	Meters	days hr:min	Meters
CULV1-DS	JUNCTION	0.18	0.39	267.10	0 16:01	0.39
CULV1-US	JUNCTION	0.32	0.69	267.52	0 16:00	0.69
CULV2-DS	JUNCTION	0.05	0.14	266.67	1 00:00	0.14

CULV2-US	JUNCTION	0.13	0.32	266.90	1	00:00	0.32
CULV3-DS	JUNCTION	0.01	0.01	266.29	1	00:00	0.01
CULV3-US	JUNCTION	0.16	0.29	266.64	1	00:00	0.29
CULV4-DS	JUNCTION	0.09	0.16	265.60	0	15:01	0.16
CULV4-US	JUNCTION	0.25	0.42	265.93	0	15:01	0.42
CULV5-DS	JUNCTION	0.13	0.31	265.04	0	13:33	0.31
CULV5-US	JUNCTION	0.21	0.39	265.14	0	13:24	0.39
CULV6-DS	JUNCTION	0.14	0.32	264.72	0	14:08	0.32
CULV6-US	JUNCTION	0.24	0.43	264.88	0	14:08	0.43
CULV7-DS	JUNCTION	0.43	1.02	262.63	0	12:25	1.02
CULV7-US	JUNCTION	0.23	0.76	262.67	0	12:25	0.76
CULV8-DS	JUNCTION	0.21	0.35	266.65	0	23:17	0.35
CULV8-US	JUNCTION	0.22	0.35	266.73	0	15:39	0.35
OF1	OUTFALL	0.43	1.00	262.60	0	13:16	1.00
SU1	STORAGE	0.68	1.05	268.64	0	12:48	1.05
SU10	STORAGE	0.49	0.79	266.90	1	00:00	0.79
SU11	STORAGE	0.42	0.74	268.07	0	12:50	0.74
SU12	STORAGE	0.63	0.87	268.76	0	15:19	0.87
SU13	STORAGE	0.46	0.67	264.88	0	14:08	0.67
SU14	STORAGE	0.88	1.42	267.52	0	16:00	1.42
SU15	STORAGE	0.36	0.89	262.67	0	12:25	0.89
SU16	STORAGE	0.35	0.53	266.64	1	00:00	0.53
SU2	STORAGE	0.64	0.99	268.33	0	13:34	0.99
SU3	STORAGE	0.98	1.36	268.49	0	14:08	1.35
SU4	STORAGE	0.41	0.63	265.14	0	13:24	0.63
SU5	STORAGE	0.50	0.78	267.65	0	13:10	0.78
SU6	STORAGE	0.83	1.20	268.03	0	14:21	1.20
SU7	STORAGE	0.48	0.66	266.73	0	15:39	0.66
SU8	STORAGE	0.52	0.71	267.01	0	15:00	0.71
SU9	STORAGE	0.74	0.96	265.93	0	15:01	0.96

Node Inflow Summary

Total Flow		Maximum Lateral Inflow	Maximum Total Inflow	Time of Max Occurrence	Lateral Inflow Volume	
Inflow Volume	Balance Error	lateral Inflow	Total Inflow	days hr:min	10^6 ltr	
Node	Percent	Type	CMS		10^6	
CULV1-DS		JUNCTION	0.000	0.452	0 16:00	0
9.95	0.006					
CULV1-US		JUNCTION	0.000	0.452	0 16:00	0
9.96	0.033					
CULV2-DS		JUNCTION	0.000	0.058	1 00:00	0
0.956	0.081					
CULV2-US		JUNCTION	0.000	0.058	0 23:59	0
0.959	0.379					
CULV3-DS		JUNCTION	0.000	0.002	1 00:00	0
0.0732	0.018					

CULV3-US		JUNCTION	0.000	0.002	0	23:59	0
0.076	3.317						
CULV4-DS		JUNCTION	0.000	0.119	0	15:01	0
3.27	0.002						
CULV4-US		JUNCTION	0.000	0.119	0	14:53	0
3.27	0.080						
CULV5-DS		JUNCTION	0.000	0.283	0	13:18	0
5.59	-0.003						
CULV5-US		JUNCTION	0.000	0.283	0	13:18	0
5.59	0.067						
CULV6-DS		JUNCTION	0.000	0.327	0	14:08	0
6.57	0.001						
CULV6-US		JUNCTION	0.000	0.327	0	14:07	0
6.57	0.059						
CULV7-DS		JUNCTION	0.000	2.027	0	12:25	0
19.1	0.090						
CULV7-US		JUNCTION	0.000	2.155	0	12:25	0
19.1	-0.183						
CULV8-DS		JUNCTION	0.000	0.136	0	15:39	0
4.1	0.019						
CULV8-US		JUNCTION	0.000	0.136	0	15:39	0
4.1	0.060						
OF1		OUTFALL	0.000	2.020	0	12:25	0
19.1	0.000						
SU1		STORAGE	0.873	0.873	0	12:00	3.11
3.12	-0.853						
SU10		STORAGE	0.942	0.942	0	12:00	4.39
14.3	1.088						
SU11		STORAGE	0.845	0.845	0	12:00	4.19
4.19	-0.579						
SU12		STORAGE	0.659	0.659	0	12:00	2.58
2.58	0.159						
SU13		STORAGE	0.321	0.454	0	12:52	2
7.59	-0.204						
SU14		STORAGE	0.356	0.728	0	13:54	1.54
13.5	0.770						
SU15		STORAGE	3.209	3.209	0	12:00	12.7
19.3	-0.308						
SU16		STORAGE	1.027	1.030	0	12:00	4.5
9.56	0.454						
SU2		STORAGE	0.441	0.579	0	12:30	2.27
6.27	-0.526						
SU3		STORAGE	0.817	0.817	0	12:00	4.14
4.14	-0.497						
SU4		STORAGE	0.984	0.984	0	12:00	3.91
7.18	-0.394						
SU5		STORAGE	0.739	0.739	0	12:00	3.26
3.26	-0.808						
SU6		STORAGE	1.142	1.144	0	12:00	6.21
11.9	-0.347						
SU7		STORAGE	1.945	1.945	0	12:00	11.5
11.5	0.354						
SU8		STORAGE	0.329	0.329	0	12:00	1.14
1.14	0.031						
SU9		STORAGE	0.783	0.938	0	12:30	4.95
8.38	0.093						

Node Surcharge Summary

No nodes were surcharged.

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

Max Occurrence	Maximum Storage Unit	Average Volume	Avg Pcmt	Evap Pcmt	Exfil Pcmt	Maximum Volume	Max Pcmt	Time of days
hr:min	Outflow CMS	1000 m ³	Full	Loss	Loss	1000 m ³	Full	
SU1		0.555	13.1	0.0	10.5	1.564	36.9	0
12:48	0.306							
SU10		5.937	13.0	0.0	3.2	12.772	27.9	1
00:00	0.069							
SU11		0.659	15.3	0.0	7.2	1.656	38.5	0
12:50	0.425							
SU12		1.529	11.7	0.0	22.0	2.350	17.9	0
15:19	0.015							
SU13		0.815	9.1	0.0	5.3	1.725	19.3	0
14:08	0.339							
SU14		3.053	38.9	0.0	2.4	5.819	74.1	0
16:00	0.461							
SU15		0.696	7.7	0.0	1.3	3.291	36.5	0
12:25	2.174							
SU16		3.728	5.0	0.0	27.4	6.823	9.2	1
00:00	0.066							
SU2		0.640	16.1	0.0	5.0	1.709	43.1	0
13:34	0.447							
SU3		1.662	11.9	0.0	19.3	2.996	21.4	0
14:08	0.136							
SU4		1.168	14.6	0.0	7.5	2.322	29.1	0
13:24	0.301							
SU5		0.772	14.3	0.0	10.6	1.759	32.6	0
13:10	0.230							
SU6		2.349	21.5	0.0	7.4	5.183	47.5	0
14:21	0.551							
SU7		5.658	10.9	0.0	4.6	9.347	18.0	0
15:39	0.150							
SU8		0.668	9.3	0.0	25.9	1.031	14.3	0
15:00	0.008							
SU9		2.884	5.7	0.0	35.1	5.694	11.2	0
15:01	0.211							

 Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	92.43	0.391	2.020	19.084
System	92.43	0.391	2.020	19.084

 Link Flow Summary

Link	Type	Maximum Flow CMS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	2.020	0 12:25	0.34	1.87	1.00
CULV-1	CONDUIT	0.368	0 16:00	1.38	1.12	0.90
CULV-2	CONDUIT	0.058	1 00:00	0.73	0.34	0.31
CULV-3	CONDUIT	0.002	1 00:00	0.36	1.60	1.00
CULV-4	CONDUIT	0.119	0 15:01	0.94	0.62	0.48
CULV-5	CONDUIT	0.283	0 13:18	0.85	0.64	0.44
CULV-6	CONDUIT	0.327	0 14:08	0.85	0.43	0.49
CULV-7	CONDUIT	2.027	0 12:25	0.76	0.16	0.85
CULV-8	CONDUIT	0.136	0 15:39	0.89	0.50	0.54
W11	CONDUIT	0.002	0 23:59	0.08	0.00	0.29
W13	CONDUIT	0.119	0 14:53	0.09	0.04	0.42
W15	CONDUIT	0.283	0 13:18	0.21	0.09	0.39
W17	CONDUIT	0.327	0 14:07	0.21	0.10	0.43
W19	CONDUIT	2.155	0 12:25	0.75	0.66	0.76
W22	CONDUIT	0.136	0 15:39	0.17	0.08	0.35
W6	CONDUIT	0.452	0 16:00	0.21	0.14	0.69
W9	CONDUIT	0.058	0 23:59	0.05	0.02	0.32
W1	WEIR	0.295	0 12:48			0.30
W10	WEIR	0.058	1 00:00			0.14
W12	WEIR	0.002	1 00:00			0.01
W14	WEIR	0.119	0 15:01			0.16
W16	WEIR	0.283	0 13:18			0.31
W18	WEIR	0.327	0 14:08			0.32
W2	WEIR	0.438	0 13:29			0.39
W20	WEIR	0.415	0 12:50			0.28
W21	WEIR	0.000	0 00:00			0.00
W23	WEIR	0.136	0 15:39			0.35
W3	WEIR	0.112	0 14:08			0.16
W4	WEIR	0.220	0 13:10			0.24
W5	WEIR	0.526	0 14:21			0.43
W7	WEIR	0.452	0 16:00			0.39
W8	WEIR	0.000	0 00:00			0.00
W-CULV1	WEIR	0.084	0 16:00			0.14

 Conduit Surcharge Summary

Conduit	Hours Full			Hours	Hours
	Both Ends	Upstream	Dnstream	Above Full Normal Flow	Capacity Limited
C1	0.01	1.08	0.01	1.09	1.08
CULV-1	0.01	3.42	0.01	2.61	0.01
CULV-3	0.01	9.86	0.01	9.95	7.93

Analysis begun on: Thu Mar 5 13:25:15 2026
 Analysis ended on: Thu Mar 5 13:25:16 2026
 Total elapsed time: 00:00:01

 Single event simulation, 24SCS25yr

WARNING 02: maximum depth increased for Node CULV1-US
 WARNING 02: maximum depth increased for Node CULV6-US
 WARNING 02: maximum depth increased for Node CULV8-DS
 WARNING 02: maximum depth increased for Node CULV8-US
 WARNING 02: maximum depth increased for Node SU1
 WARNING 02: maximum depth increased for Node SU10
 WARNING 02: maximum depth increased for Node SU11
 WARNING 02: maximum depth increased for Node SU12
 WARNING 02: maximum depth increased for Node SU13
 WARNING 02: maximum depth increased for Node SU14
 WARNING 02: maximum depth increased for Node SU15
 WARNING 02: maximum depth increased for Node SU16
 WARNING 02: maximum depth increased for Node SU2
 WARNING 02: maximum depth increased for Node SU3
 WARNING 02: maximum depth increased for Node SU4
 WARNING 02: maximum depth increased for Node SU5
 WARNING 02: maximum depth increased for Node SU6
 WARNING 02: maximum depth increased for Node SU7
 WARNING 02: maximum depth increased for Node SU8
 WARNING 02: maximum depth increased for Node SU9

 Element Count

Number of rain gages 5
 Number of subcatchments ... 16
 Number of nodes 33
 Number of links 40
 Number of pollutants 0
 Number of land uses 0

 Raingage Summary

Name	Data Source	Data Type	Recording Interval
24HrSCS25Yr	24HrSCS25Yr	INTENSITY	30 min.
24HrSCS25yr_30min	24SCS25_30min	INTENSITY	30 min.
Chicago_6h	Chicago_6h	INTENSITY	5 min.
HAMILTON2023	Precipitatioin2023	VOLUME	60 min.
HAMILTON2024	Precipitation2024	VOLUME	60 min.

 Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage
Outlet					

S1	8.49	715.00	0.50	3.7200	24HrSCS25yr_30min
SU1					
S10	18.33	839.00	1.06	2.8200	24HrSCS25yr_30min
SU10					
S11	12.24	505.00	0.90	4.8700	24HrSCS25yr_30min
SU11					
S12	6.97	411.00	1.89	5.3800	24HrSCS25yr_30min
SU12					
S13	5.66	166.00	4.18	4.7200	24HrSCS25yr_30min
SU13					
S14	2.66	357.00	9.95	3.0800	24HrSCS25yr_30min
SU14					
S15	33.55	1994.00	1.02	5.6200	24HrSCS25yr_30min
SU15					
S16	16.89	865.00	2.36	2.8600	24HrSCS25yr_30min
SU16					
S2	6.76	328.00	0.17	3.1400	24HrSCS25yr_30min
SU2					
S3	11.86	523.00	2.07	3.8400	24HrSCS25yr_30min
SU3					
S4	10.70	727.00	0.96	3.9900	24HrSCS25yr_30min
SU4					
S5	8.71	497.00	0.75	4.2200	24HrSCS25yr_30min
SU5					
S6	17.73	715.00	2.98	3.7600	24HrSCS25yr_30min
SU6					
S7	31.86	908.00	1.87	6.7100	24HrSCS25yr_30min
SU7					
S8	2.93	305.00	3.50	2.8800	24HrSCS25yr_30min
SU8					
S9	27.85	448.00	3.21	3.7300	24HrSCS25yr_30min
SU9					

Node Summary

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
CULV1-DS	JUNCTION	266.71	1.67	0.0	
CULV1-US	JUNCTION	266.83	2.17	0.0	
CULV2-DS	JUNCTION	266.53	1.61	0.0	
CULV2-US	JUNCTION	266.58	1.56	0.0	
CULV3-DS	JUNCTION	266.28	2.10	0.0	
CULV3-US	JUNCTION	266.35	2.03	0.0	
CULV4-DS	JUNCTION	265.44	1.82	0.0	
CULV4-US	JUNCTION	265.51	1.75	0.0	
CULV5-DS	JUNCTION	264.73	1.65	0.0	
CULV5-US	JUNCTION	264.75	1.63	0.0	
CULV6-DS	JUNCTION	264.40	2.00	0.0	
CULV6-US	JUNCTION	264.45	2.16	0.0	
CULV7-DS	JUNCTION	261.61	2.86	0.0	
CULV7-US	JUNCTION	261.91	2.56	0.0	
CULV8-DS	JUNCTION	266.30	1.00	0.0	
CULV8-US	JUNCTION	266.38	2.62	0.0	
OF1	OUTFALL	261.60	1.00	0.0	
SU1	STORAGE	267.59	1.75	0.0	

SU10	STORAGE	266.11	1.47	0.0
SU11	STORAGE	267.33	1.46	0.0
SU12	STORAGE	267.89	1.98	0.0
SU13	STORAGE	264.21	1.24	0.0
SU14	STORAGE	266.10	1.73	0.0
SU15	STORAGE	261.78	1.13	0.0
SU16	STORAGE	266.11	1.24	0.0
SU2	STORAGE	267.34	1.60	0.0
SU3	STORAGE	267.13	2.20	0.0
SU4	STORAGE	264.51	1.24	0.0
SU5	STORAGE	266.87	1.54	0.0
SU6	STORAGE	266.83	1.77	0.0
SU7	STORAGE	266.07	1.31	0.0
SU8	STORAGE	266.30	1.83	0.0
SU9	STORAGE	264.97	1.54	0.0

Link Summary

Name	From Node	To Node	Type	Length	%

C1	CULV7-DS	OF1	CONDUIT	30.7	
0.0325 0.0700					
CULV-1	CULV1-US	CULV1-DS	CONDUIT	12.3	
0.9730 0.0240					
CULV-2	CULV2-US	CULV2-DS	CONDUIT	9.5	
0.5261 0.0240					
CULV-3	CULV3-US	CULV3-DS	CONDUIT	11.2	
0.6248 0.0240					
CULV-4	CULV4-US	CULV4-DS	CONDUIT	10.6	
0.6587 0.0240					
CULV-5	CULV5-US	CULV5-DS	CONDUIT	17.0	
0.1174 0.0130					
CULV-6	CULV6-US	CULV6-DS	CONDUIT	14.5	
0.3448 0.0130					
CULV-7	CULV7-US	CULV7-DS	CONDUIT	32.2	
0.9315 0.0130					
CULV8_Proposed	CULV8-US	CULV8-DS	CONDUIT	19.1	
0.4196 0.0240					
W1	SU1	SU2	WEIR		
W10	CULV2-DS	SU16	WEIR		
W11	SU16	CULV3-US	WEIR		
W12	CULV3-DS	SU9	WEIR		
W13	SU9	CULV4-US	WEIR		
W14	CULV4-DS	SU4	WEIR		
W15	SU4	CULV5-US	WEIR		
W16	CULV5-DS	SU13	WEIR		
W17	SU13	CULV6-US	WEIR		
W18	CULV6-DS	SU15	WEIR		
W19	SU15	CULV7-US	WEIR		
W2	SU2	SU6	WEIR		
W20	SU11	SU9	WEIR		
W21	SU12	SU16	WEIR		
W22	SU7	CULV8-US	WEIR		
W23	CULV8-DS	SU16	WEIR		

W3	SU3	SU2	WEIR
W4	SU5	SU14	WEIR
W5	SU6	SU14	WEIR
W6	SU14	CULV1-US	WEIR
W7	CULV1-DS	SU10	WEIR
W8	SU8	SU10	WEIR
W9	SU10	CULV2-US	WEIR
W-CULV1	CULV1-US	CULV1-DS	WEIR
W-CULV2	CULV2-US	CULV2-DS	WEIR
W-CULV3	CULV3-US	CULV3-DS	WEIR
W-CULV4	CULV4-US	CULV4-DS	WEIR
W-CULV5	CULV5-US	CULV5-DS	WEIR
W-CULV6	CULV6-US	CULV6-DS	WEIR
W-CULV7	CULV7-US	CULV7-DS	WEIR
W-CULV8	CULV8-US	CULV8-DS	WEIR

Cross Section Summary

Full Conduit Flow	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels

1.08	C1	1.00	6.00	0.59	10.00	1
0.33	CULV-1	0.60	0.28	0.15	0.60	1
0.24	CULV-2	0.60	0.28	0.15	0.60	1
0.19	CULV-3	0.45	0.23	0.12	0.60	1
0.19	CULV-4	0.45	0.23	0.12	0.60	1
0.15	CULV-5	0.45	0.23	0.12	0.60	3
0.36	CULV-6	0.60	0.28	0.15	0.60	3
12.46	CULV-7	1.05	3.15	0.39	3.00	1
2.77	CULV8_Proposed	0.90	2.16	0.33	2.40	1

Analysis Options

Flow Units CMS
Process Models:
 Rainfall/Runoff YES
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO

Infiltration Method MODIFIED_GREEN_AMPT
 Flow Routing Method DYNWAVE
 Surcharge Method SLOT
 Starting Date 01/01/2000 00:00:00
 Ending Date 01/01/2000 23:30:00
 Antecedent Dry Days 0.0
 Report Time Step 00:05:00
 Wet Time Step 00:05:00
 Dry Time Step 01:00:00
 Routing Time Step 1.00 sec
 Variable Time Step YES
 Maximum Trials 8
 Number of Threads 1
 Head Tolerance 0.001500 m

	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
*****	-----	-----
Total Precipitation	19.559	87.631
Evaporation Loss	0.000	0.000
Infiltration Loss	14.781	66.227
Surface Runoff	4.781	21.420
Final Storage	0.005	0.024
Continuity Error (%)	-0.046	

	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	4.781	47.807
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	1.223	12.233
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.939	9.393
Initial Stored Volume	0.000	0.000
Final Stored Volume	2.618	26.179
Continuity Error (%)	0.004	

 Highest Continuity Errors

 Node CULV3-US (-37.23%)
 Node CULV2-US (-10.06%)
 Node CULV4-US (-1.34%)
 Node SU16 (1.27%)
 Node SU14 (1.12%)

 Time-Step Critical Elements

None

Highest Flow Instability Indexes

Link W9 (32)
Link W11 (31)
Link CULV-2 (27)
Link CULV-3 (27)
Link W13 (17)

Most Frequent Nonconverging Nodes

Convergence obtained at all time steps.

Routing Time Step Summary

Minimum Time Step : 0.50 sec
Average Time Step : 1.00 sec
Maximum Time Step : 1.00 sec
% of Time in Steady State : 0.35
Average Iterations per Step : 2.18
% of Steps Not Converging : 0.00
Time Step Frequencies :
1.000 - 0.871 sec : 100.00 %
0.871 - 0.758 sec : 0.00 %
0.758 - 0.660 sec : 0.00 %
0.660 - 0.574 sec : 0.00 %
0.574 - 0.500 sec : 0.00 %

Subcatchment Runoff Summary

Perv	Total	Total	Total	Total	Total	Total	Imperv
Runoff	Runoff	Total	Peak	Runoff	Evap	Infil	Runoff
Subcatchment	Runoff	Runoff	Precip	Runoff	mm	mm	mm
mm	mm	10^6 ltr	mm	Coeff	mm	mm	mm

S1	24.61	25.04	87.63	0.00	0.00	62.65	0.44
			0.59	0.286			
S10	13.96	14.88	87.63	0.00	0.00	72.78	0.92
			0.63	0.170			
S11	18.86	19.64	87.63	0.00	0.00	68.02	0.78
			0.52	0.224			
S12	20.69	22.33	87.63	0.00	0.00	65.33	1.64
			0.42	0.255			

S13		87.63	0.00	0.00	63.03	3.63
20.97	24.60	1.39	0.23	0.281		
S14		87.63	0.00	0.00	43.84	8.64
34.46	43.10	1.15	0.32	0.492		
S15		87.63	0.00	0.00	61.64	0.89
25.15	26.04	8.74	2.19	0.297		
S16		87.63	0.00	0.00	70.66	2.05
14.93	16.99	2.87	0.68	0.194		
S2		87.63	0.00	0.00	65.80	0.15
21.72	21.87	1.48	0.29	0.250		
S3		87.63	0.00	0.00	64.42	1.80
21.44	23.24	2.76	0.55	0.265		
S4		87.63	0.00	0.00	62.94	0.83
23.90	24.73	2.65	0.66	0.282		
S5		87.63	0.00	0.00	62.46	0.65
24.57	25.22	2.20	0.49	0.288		
S6		87.63	0.00	0.00	63.80	2.59
21.25	23.84	4.23	0.79	0.272		
S7		87.63	0.00	0.00	63.39	1.62
22.64	24.26	7.73	1.32	0.277		
S8		87.63	0.00	0.00	59.85	3.04
24.79	27.83	0.82	0.23	0.318		
S9		87.63	0.00	0.00	76.85	2.79
7.98	10.77	3.00	0.55	0.123		

Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
CULV1-DS	JUNCTION	0.06	0.20	266.91	0 17:19	0.20
CULV1-US	JUNCTION	0.13	0.39	267.22	0 17:19	0.39
CULV2-DS	JUNCTION	0.01	0.04	266.57	0 23:29	0.04
CULV2-US	JUNCTION	0.02	0.11	266.69	0 23:29	0.11
CULV3-DS	JUNCTION	0.01	0.03	266.31	0 20:35	0.03
CULV3-US	JUNCTION	0.08	0.20	266.55	0 20:35	0.20
CULV4-DS	JUNCTION	0.03	0.10	265.54	0 14:46	0.10
CULV4-US	JUNCTION	0.13	0.31	265.82	0 14:46	0.31
CULV5-DS	JUNCTION	0.05	0.18	264.91	0 13:40	0.18
CULV5-US	JUNCTION	0.12	0.30	265.05	0 13:40	0.30
CULV6-DS	JUNCTION	0.06	0.21	264.61	0 14:13	0.21
CULV6-US	JUNCTION	0.07	0.22	264.67	0 14:12	0.22
CULV7-DS	JUNCTION	0.24	0.91	262.52	0 13:01	0.91
CULV7-US	JUNCTION	0.11	0.62	262.53	0 13:01	0.62
CULV8-DS	JUNCTION	0.12	0.26	266.56	0 16:13	0.26
CULV8-US	JUNCTION	0.08	0.19	266.57	0 15:46	0.19
OF1	OUTFALL	0.24	0.91	262.51	0 13:01	0.91
SU1	STORAGE	0.52	0.93	268.52	0 13:07	0.93
SU10	STORAGE	0.29	0.58	266.69	0 23:29	0.58
SU11	STORAGE	0.29	0.63	267.96	0 13:07	0.63
SU12	STORAGE	0.38	0.71	268.60	0 14:37	0.71
SU13	STORAGE	0.29	0.52	264.73	0 14:12	0.52
SU14	STORAGE	0.57	1.14	267.24	0 17:19	1.14

SU15	STORAGE	0.29	0.94	262.72	0	13:00	0.94
SU16	STORAGE	0.21	0.44	266.55	0	20:35	0.44
SU2	STORAGE	0.45	0.81	268.15	0	14:06	0.81
SU3	STORAGE	0.69	1.27	268.40	0	14:39	1.27
SU4	STORAGE	0.28	0.57	265.08	0	13:40	0.57
SU5	STORAGE	0.35	0.69	267.56	0	13:33	0.69
SU6	STORAGE	0.62	1.02	267.85	0	14:43	1.02
SU7	STORAGE	0.32	0.55	266.62	0	14:55	0.55
SU8	STORAGE	0.36	0.62	266.92	0	14:36	0.62
SU9	STORAGE	0.57	0.86	265.83	0	14:46	0.86

Node Inflow Summary

Total Inflow Volume Node ltr	Flow Balance Error Percent	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	10^6
4.05	0.006		0.000	0.164	0 17:19	0	
4.06	0.021	JUNCTION	0.000	0.164	0 17:19	0	
0.135	0.163		0.000	0.012	0 23:29	0	
0.122	-9.140	JUNCTION	0.000	0.015	0 22:42	0	
0.167	0.098		0.000	0.008	0 20:35	0	
0.123	-27.130	JUNCTION	0.000	0.024	0 14:21	0	
1.34	0.010		0.000	0.058	0 14:46	0	
1.32	-1.326	JUNCTION	0.000	0.058	0 14:46	0	
2.64	0.001		0.000	0.144	0 13:40	0	
2.64	0.036	JUNCTION	0.000	0.144	0 13:39	0	
3.7	0.005		0.000	0.179	0 14:12	0	
3.7	0.007	JUNCTION	0.000	0.179	0 14:12	0	
12.2	0.072		0.000	0.872	0 13:00	0	
12.2	0.005	JUNCTION	0.000	0.872	0 12:59	0	
3.53	0.160		0.000	0.143	0 14:34	0	
3.53	0.107	JUNCTION	0.000	0.143	0 14:34	0	

OF1		OUTFALL	0.000	0.872	0	13:01	0
12.2	0.000						
SU1		STORAGE	0.594	0.594	0	12:00	2.13
2.13	-1.024						
SU10		STORAGE	0.625	0.625	0	12:00	2.73
6.78	0.577						
SU11		STORAGE	0.521	0.521	0	12:00	2.4
2.41	-0.781						
SU12		STORAGE	0.418	0.418	0	12:00	1.56
1.56	0.121						
SU13		STORAGE	0.232	0.246	0	12:57	1.39
4.03	-0.087						
SU14		STORAGE	0.319	0.345	0	14:00	1.15
7.22	1.133						
SU15		STORAGE	2.189	2.232	0	12:00	8.74
12.4	-0.764						
SU16		STORAGE	0.684	0.684	0	12:00	2.87
6.53	1.289						
SU2		STORAGE	0.287	0.323	0	12:30	1.48
3.28	-0.241						
SU3		STORAGE	0.546	0.546	0	12:00	2.76
2.76	0.175						
SU4		STORAGE	0.665	0.665	0	12:00	2.65
3.99	-0.347						
SU5		STORAGE	0.493	0.493	0	12:00	2.2
2.2	-0.710						
SU6		STORAGE	0.789	0.789	0	12:00	4.23
6.93	0.147						
SU7		STORAGE	1.325	1.325	0	12:00	7.73
7.73	0.303						
SU8		STORAGE	0.233	0.233	0	12:00	0.816
0.816	0.099						
SU9		STORAGE	0.549	0.549	0	12:00	3
4.76	0.682						

Node Surcharge Summary

No nodes were surcharged.

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

Max Maximum Average Avg Evap Exfil Maximum Max Time of
Occ Outflo Volume Pcnt Pcnt Pcnt Volume Pcnt

Storage Unit hr:min	Unit CMS	1000 m ³	Full	Loss	Loss	1000 m ³	Full	days
SU1		0.336	3.3	0.0	14.9	1.292	12.6	0
13:07	0.154							
SU10		2.031	4.7	0.0	4.6	6.311	14.5	0
23:29	0.023							
SU11		0.380	5.8	0.0	11.6	1.284	19.7	0
13:07	0.204							
SU12		0.620	4.7	0.0	25.2	1.422	10.8	0
14:37	0.011							
SU13		0.210	3.1	0.0	5.8	0.845	12.3	0
14:12	0.187							
SU14		1.515	17.7	0.0	3.9	3.981	46.4	0
17:19	0.171							
SU15		0.489	8.9	0.0	2.2	3.665	66.9	0
13:00	0.892							
SU16		1.828	5.3	0.0	32.1	4.351	12.7	0
20:35	0.074							
SU2		0.336	3.1	0.0	9.0	1.287	11.8	0
14:06	0.190							
SU3		0.942	6.7	0.0	25.5	2.290	16.3	0
14:39	0.052							
SU4		0.626	6.4	0.0	11.6	1.820	18.7	0
13:40	0.159							
SU5		0.437	3.9	0.0	14.8	1.414	12.6	0
13:33	0.117							
SU6		1.176	6.7	0.0	11.9	3.472	19.8	0
14:43	0.255							
SU7		2.302	5.8	0.0	5.2	5.857	14.8	0
14:55	0.154							
SU8		0.318	5.1	0.0	29.0	0.729	11.6	0
14:36	0.007							
SU9		1.127	3.7	0.0	41.2	3.185	10.5	0
14:46	0.121							

 Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10 ⁶ ltr
OF1	88.35	0.164	0.872	12.233
System	88.35	0.164	0.872	12.233

 Link Flow Summary

Maximum Flow	Time of Max Occurrence	Maximum Veloc	Max/ Full	Max/ Full
------------------	---------------------------	-------------------	--------------	--------------

C1	1.00	0.11	0.00	0.00	0.89	0.00	0.00	0.00	0.04
0.00									
CULV-1	1.00	0.57	0.00	0.00	0.37	0.06	0.00	0.00	0.00
0.39									
CULV-2	1.00	0.70	0.01	0.00	0.29	0.00	0.00	0.00	0.00
0.19									
CULV-3	1.00	0.61	0.00	0.00	0.00	0.00	0.00	0.39	0.00
0.00									
CULV-4	1.00	0.52	0.00	0.00	0.00	0.00	0.00	0.48	0.00
0.00									
CULV-5	1.00	0.52	0.00	0.00	0.00	0.00	0.00	0.48	0.00
0.00									
CULV-6	1.00	0.49	0.00	0.00	0.51	0.00	0.00	0.00	0.00
0.50									
CULV-7	1.00	0.11	0.00	0.00	0.89	0.00	0.00	0.00	0.00
0.64									
CULV8_Proposed	1.00	0.51	0.00	0.00	0.49	0.00	0.00	0.00	0.00
0.00									

 Conduit Surcharge Summary

No conduits were surcharged.

Analysis begun on: Wed Mar 4 14:07:23 2026
 Analysis ended on: Wed Mar 4 14:07:25 2026
 Total elapsed time: 00:00:02

 Single event simulation, 24SCS100 yr

WARNING 02: maximum depth increased for Node CULV1-US
 WARNING 02: maximum depth increased for Node CULV6-US
 WARNING 02: maximum depth increased for Node CULV8-DS
 WARNING 02: maximum depth increased for Node CULV8-US
 WARNING 02: maximum depth increased for Node SU1
 WARNING 02: maximum depth increased for Node SU10
 WARNING 02: maximum depth increased for Node SU11
 WARNING 02: maximum depth increased for Node SU12
 WARNING 02: maximum depth increased for Node SU13
 WARNING 02: maximum depth increased for Node SU14
 WARNING 02: maximum depth increased for Node SU15
 WARNING 02: maximum depth increased for Node SU16
 WARNING 02: maximum depth increased for Node SU2
 WARNING 02: maximum depth increased for Node SU3
 WARNING 02: maximum depth increased for Node SU4
 WARNING 02: maximum depth increased for Node SU5
 WARNING 02: maximum depth increased for Node SU6
 WARNING 02: maximum depth increased for Node SU7
 WARNING 02: maximum depth increased for Node SU8
 WARNING 02: maximum depth increased for Node SU9

 Element Count

Number of rain gages 4
 Number of subcatchments ... 16
 Number of nodes 33
 Number of links 40
 Number of pollutants 0
 Number of land uses 0

 Raingage Summary

Name	Data Source	Data Type	Recording Interval
24HrSCS100yr	24SCS100_30min	INTENSITY	30 min.
24HrSCS25Yr	24HrSCS25Yr	INTENSITY	30 min.
HAMILTON2023	Precipitatioin2023	VOLUME	60 min.
HAMILTON2024	Precipitation2024	VOLUME	60 min.

 Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage
Outlet					
S1	8.49	715.00	0.50	3.7200	24HrSCS100yr
SU1					

S10	18.33	839.00	1.06	2.8200	24HrSCS100yr
SU10					
S11	12.24	505.00	0.90	4.8700	24HrSCS100yr
SU11					
S12	6.97	411.00	1.89	5.3800	24HrSCS100yr
SU12					
S13	5.66	166.00	4.18	4.7200	24HrSCS100yr
SU13					
S14	2.66	357.00	9.95	3.0800	24HrSCS100yr
SU14					
S15	33.55	1994.00	1.02	5.6200	24HrSCS100yr
SU15					
S16	16.89	865.00	2.36	2.8600	24HrSCS100yr
SU16					
S2	6.76	328.00	0.17	3.1400	24HrSCS100yr
SU2					
S3	11.86	523.00	2.07	3.8400	24HrSCS100yr
SU3					
S4	10.70	727.00	0.96	3.9900	24HrSCS100yr
SU4					
S5	8.71	497.00	0.75	4.2200	24HrSCS100yr
SU5					
S6	17.73	715.00	2.98	3.7600	24HrSCS100yr
SU6					
S7	31.86	908.00	1.87	6.7100	24HrSCS100yr
SU7					
S8	2.93	305.00	3.50	2.8800	24HrSCS100yr
SU8					
S9	27.85	448.00	3.21	3.7300	24HrSCS100yr
SU9					

Node Summary

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
CULV1-DS	JUNCTION	266.71	1.67	0.0	
CULV1-US	JUNCTION	266.83	2.17	0.0	
CULV2-DS	JUNCTION	266.53	1.61	0.0	
CULV2-US	JUNCTION	266.58	1.56	0.0	
CULV3-DS	JUNCTION	266.28	2.10	0.0	
CULV3-US	JUNCTION	266.35	2.03	0.0	
CULV4-DS	JUNCTION	265.44	1.82	0.0	
CULV4-US	JUNCTION	265.51	1.75	0.0	
CULV5-DS	JUNCTION	264.73	1.65	0.0	
CULV5-US	JUNCTION	264.75	1.63	0.0	
CULV6-DS	JUNCTION	264.40	2.00	0.0	
CULV6-US	JUNCTION	264.45	2.11	0.0	
CULV7-DS	JUNCTION	261.61	2.86	0.0	
CULV7-US	JUNCTION	261.91	2.56	0.0	
CULV8-DS	JUNCTION	266.30	1.00	0.0	
CULV8-US	JUNCTION	266.38	2.62	0.0	
OF1	OUTFALL	261.60	1.00	0.0	
SU1	STORAGE	267.59	1.75	0.0	
SU10	STORAGE	266.11	1.47	0.0	
SU11	STORAGE	267.33	1.46	0.0	

SU12	STORAGE	267.89	1.98	0.0
SU13	STORAGE	264.21	1.24	0.0
SU14	STORAGE	266.10	1.73	0.0
SU15	STORAGE	261.78	1.13	0.0
SU16	STORAGE	266.11	1.24	0.0
SU2	STORAGE	267.34	1.60	0.0
SU3	STORAGE	267.13	2.20	0.0
SU4	STORAGE	264.51	1.24	0.0
SU5	STORAGE	266.87	1.54	0.0
SU6	STORAGE	266.83	1.77	0.0
SU7	STORAGE	266.07	1.31	0.0
SU8	STORAGE	266.30	1.83	0.0
SU9	STORAGE	264.97	1.54	0.0

Link Summary

Name	From Node	To Node	Type	Length	%

C1	CULV7-DS	OF1	CONDUIT	30.7	
0.0325 0.0700					
CULV_Proposed	CULV8-US	CULV8-DS	CONDUIT	20.1	
0.3980 0.0240					
CULV-1	CULV1-US	CULV1-DS	CONDUIT	12.3	
0.9730 0.0240					
CULV-2	CULV2-US	CULV2-DS	CONDUIT	9.5	
0.5261 0.0240					
CULV-3	CULV3-US	CULV3-DS	CONDUIT	11.2	
0.6248 0.0240					
CULV-4	CULV4-US	CULV4-DS	CONDUIT	10.6	
0.6587 0.0240					
CULV-5	CULV5-US	CULV5-DS	CONDUIT	17.0	
0.1174 0.0130					
CULV-6	CULV6-US	CULV6-DS	CONDUIT	14.5	
0.3448 0.0130					
CULV-7	CULV7-US	CULV7-DS	CONDUIT	32.2	
0.9315 0.0130					
W1	SU1	SU2	WEIR		
W10	CULV2-DS	SU16	WEIR		
W11	SU16	CULV3-US	WEIR		
W12	CULV3-DS	SU9	WEIR		
W13	SU9	CULV4-US	WEIR		
W14	CULV4-DS	SU4	WEIR		
W15	SU4	CULV5-US	WEIR		
W16	CULV5-DS	SU13	WEIR		
W17	SU13	CULV6-US	WEIR		
W18	CULV6-DS	SU15	WEIR		
W19	SU15	CULV7-US	WEIR		
W2	SU2	SU6	WEIR		
W20	SU11	SU9	WEIR		
W21	SU12	SU16	WEIR		
W22	SU7	CULV8-US	WEIR		
W23	CULV8-DS	SU16	WEIR		
W3	SU3	SU2	WEIR		
W4	SU5	SU14	WEIR		

W5	SU6	SU14	WEIR
W6	SU14	CULV1-US	WEIR
W7	CULV1-DS	SU10	WEIR
W8	SU8	SU10	WEIR
W9	SU10	CULV2-US	WEIR
W-CULV1	CULV1-US	CULV1-DS	WEIR
W-CULV2	CULV2-US	CULV2-DS	WEIR
W-CULV3	CULV3-US	CULV3-DS	WEIR
W-CULV4	CULV4-US	CULV4-DS	WEIR
W-CULV5	CULV5-US	CULV5-DS	WEIR
W-CULV6	CULV6-US	CULV6-DS	WEIR
W-CULV7	CULV7-US	CULV7-DS	WEIR
W-CULV8	CULV8-US	CULV8-DS	WEIR

Cross Section Summary

Full Conduit Flow	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels

C1	TRAPEZOIDAL	1.00	6.00	0.59	10.00	1
1.08						
CULV_Proposed	RECT_CLOSED	0.90	2.16	0.33	2.40	1
2.70						
CULV-1	CIRCULAR	0.60	0.28	0.15	0.60	1
0.33						
CULV-2	CIRCULAR	0.60	0.28	0.15	0.60	1
0.24						
CULV-3	FILLED_CIRCULAR	0.45	0.23	0.12	0.60	1
0.19						
CULV-4	FILLED_CIRCULAR	0.45	0.23	0.12	0.60	1
0.19						
CULV-5	FILLED_CIRCULAR	0.45	0.23	0.12	0.60	3
0.15						
CULV-6	CIRCULAR	0.60	0.28	0.15	0.60	3
0.36						
CULV-7	RECT_CLOSED	1.05	3.15	0.39	3.00	1
12.46						

Analysis Options

Flow Units CMS
Process Models:
 Rainfall/Runoff YES
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO
Infiltration Method MODIFIED_GREEN_AMPT
Flow Routing Method DYNWAVE

Surcharge Method SLOT
 Starting Date 01/01/2000 00:00:00
 Ending Date 01/02/2000 00:00:00
 Antecedent Dry Days 0.0
 Report Time Step 00:05:00
 Wet Time Step 00:05:00
 Dry Time Step 01:00:00
 Routing Time Step 1.00 sec
 Variable Time Step YES
 Maximum Trials 8
 Number of Threads 1
 Head Tolerance 0.001500 m

	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm

Total Precipitation	23.766	106.480
Evaporation Loss	0.000	0.000
Infiltration Loss	16.533	74.074
Surface Runoff	7.237	32.427
Final Storage	0.009	0.041
Continuity Error (%)	-0.057	

	Volume	Volume
Flow Routing Continuity	hectare-m	10 ⁶ ltr

Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	7.237	72.373
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	1.955	19.552
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	1.229	12.285
Initial Stored Volume	0.000	0.000
Final Stored Volume	4.054	40.537
Continuity Error (%)	-0.001	

 Highest Continuity Errors

 Node CULV3-US (-1.18%)

 Time-Step Critical Elements

 None

 Highest Flow Instability Indexes

Link W22 (15)
 Link W11 (14)
 Link W9 (14)
 Link W10 (13)
 Link CULV-3 (12)

 Most Frequent Nonconverging Nodes

 Convergence obtained at all time steps.

 Routing Time Step Summary

 Minimum Time Step : 0.50 sec
 Average Time Step : 1.00 sec
 Maximum Time Step : 1.00 sec
 % of Time in Steady State : 0.44
 Average Iterations per Step : 2.07
 % of Steps Not Converging : 0.00
 Time Step Frequencies :
 1.000 - 0.871 sec : 100.00 %
 0.871 - 0.758 sec : 0.00 %
 0.758 - 0.660 sec : 0.00 %
 0.660 - 0.574 sec : 0.00 %
 0.574 - 0.500 sec : 0.00 %

 Subcatchment Runoff Summary

Perv	Total	Total	Total	Total	Total	Total	Imperv
Runoff	Runoff	Runoff	Peak	Runoff	Evap	Infil	Runoff
Subcatchment	Subcatchment	Precip	Runoff	Runoff	mm	mm	mm
mm	mm	10^6 ltr	mm	mm	mm	mm	mm

S1		106.48		0.00	0.00	69.89	0.53
36.16	36.69	3.11	0.87	0.345			
S10		106.48		0.00	0.00	82.25	1.12
23.15	24.27	4.45	0.96	0.228			
S11		106.48		0.00	0.00	75.76	0.95
29.82	30.77	3.77	0.80	0.289			
S12		106.48		0.00	0.00	72.84	2.00
31.71	33.71	2.35	0.63	0.317			
S13		106.48		0.00	0.00	69.70	4.42
32.37	36.79	2.08	0.34	0.346			
S14		106.48		0.00	0.00	46.34	10.52
47.53	58.05	1.55	0.43	0.545			
S15		106.48		0.00	0.00	68.37	1.08
37.11	38.19	12.81	3.24	0.359			

S16		106.48	0.00	0.00	79.70	2.50
24.31	26.81	4.53	1.03	0.252		
S2		106.48	0.00	0.00	73.20	0.18
33.16	33.34	2.25	0.44	0.313		
S3		106.48	0.00	0.00	71.67	2.19
32.67	34.85	4.13	0.82	0.327		
S4		106.48	0.00	0.00	70.01	1.01
35.54	36.55	3.91	0.99	0.343		
S5		106.48	0.00	0.00	69.19	0.79
36.57	37.36	3.25	0.74	0.351		
S6		106.48	0.00	0.00	70.81	3.15
32.54	35.70	6.33	1.18	0.335		
S7		106.48	0.00	0.00	69.99	1.97
34.56	36.53	11.64	2.00	0.343		
S8		106.48	0.00	0.00	66.65	3.70
36.21	39.91	1.17	0.34	0.375		
S9		106.48	0.00	0.00	88.39	3.40
14.69	18.09	5.04	0.80	0.170		

Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
CULV1-DS	JUNCTION	0.12	0.33	267.04	0 17:08	0.33
CULV1-US	JUNCTION	0.23	0.65	267.48	0 16:55	0.65
CULV2-DS	JUNCTION	0.05	0.17	266.70	1 00:00	0.17
CULV2-US	JUNCTION	0.08	0.27	266.85	1 00:00	0.27
CULV3-DS	JUNCTION	0.03	0.09	266.37	0 20:49	0.09
CULV3-US	JUNCTION	0.13	0.30	266.65	0 20:49	0.30
CULV4-DS	JUNCTION	0.06	0.16	265.60	0 15:08	0.16
CULV4-US	JUNCTION	0.18	0.41	265.92	0 15:08	0.41
CULV5-DS	JUNCTION	0.08	0.28	265.01	0 13:47	0.28
CULV5-US	JUNCTION	0.15	0.36	265.11	0 13:36	0.36
CULV6-DS	JUNCTION	0.10	0.29	264.69	0 14:20	0.29
CULV6-US	JUNCTION	0.10	0.29	264.74	0 14:20	0.29
CULV7-DS	JUNCTION	0.31	1.00	262.61	0 12:56	1.00
CULV7-US	JUNCTION	0.16	0.72	262.63	0 12:56	0.72
CULV8-DS	JUNCTION	0.16	0.35	266.65	0 16:50	0.35
CULV8-US	JUNCTION	0.13	0.28	266.66	0 16:12	0.28
OF1	OUTFALL	0.31	1.00	262.60	0 12:29	1.00
SU1	STORAGE	0.55	1.00	268.59	0 13:00	1.00
SU10	STORAGE	0.37	0.75	266.86	1 00:00	0.75
SU11	STORAGE	0.31	0.71	268.04	0 12:56	0.71
SU12	STORAGE	0.46	0.84	268.73	0 15:00	0.84
SU13	STORAGE	0.34	0.62	264.83	0 14:20	0.62
SU14	STORAGE	0.69	1.41	267.51	0 16:55	1.41
SU15	STORAGE	0.36	1.13	262.91	0 12:57	1.13
SU16	STORAGE	0.26	0.54	266.65	0 20:49	0.54
SU2	STORAGE	0.50	0.92	268.26	0 14:12	0.92
SU3	STORAGE	0.74	1.35	268.48	0 14:08	1.35
SU4	STORAGE	0.32	0.65	265.16	0 13:36	0.65
SU5	STORAGE	0.38	0.76	267.63	0 13:20	0.76

SU6	STORAGE	0.68	1.14	267.97	0	14:49	1.14
SU7	STORAGE	0.37	0.64	266.71	0	15:05	0.64
SU8	STORAGE	0.41	0.71	267.01	0	14:58	0.71
SU9	STORAGE	0.63	0.96	265.93	0	15:08	0.96

Node Inflow Summary

Total Inflow Volume Node ltr	Flow Balance Error Percent	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	10^6
9.39	0.006	JUNCTION	0.000	0.342	0 16:55	0	
9.39	0.010	JUNCTION	0.000	0.342	0 16:55	0	
1.85	0.065	JUNCTION	0.000	0.095	1 00:00	0	
1.85	-0.257	JUNCTION	0.000	0.095	1 00:00	0	
1.4	0.011	JUNCTION	0.000	0.047	0 20:49	0	
1.38	-1.166	JUNCTION	0.000	0.047	0 20:48	0	
3.43	0.004	JUNCTION	0.000	0.113	0 15:08	0	
3.42	-0.062	JUNCTION	0.000	0.113	0 15:08	0	
5.59	0.002	JUNCTION	0.000	0.245	0 13:36	0	
5.59	0.041	JUNCTION	0.000	0.245	0 13:36	0	
7.07	0.010	JUNCTION	0.000	0.286	0 14:20	0	
7.08	0.011	JUNCTION	0.000	0.286	0 14:20	0	
19.6	0.107	JUNCTION	0.000	1.277	0 12:57	0	
19.6	0.010	JUNCTION	0.000	1.277	0 12:57	0	
4.62	0.491	JUNCTION	0.000	0.205	0 14:32	0	
4.62	-0.042	JUNCTION	0.000	0.205	0 14:31	0	
19.6	0.000	OUTFALL	0.000	1.277	0 12:57	0	
3.12	-1.168	STORAGE	0.873	0.873	0 12:00	3.11	
13.8	0.829	STORAGE	0.956	0.956	0 12:00	4.45	

SU11		STORAGE	0.800	0.800	0	12:00	3.77
3.77	-0.770						
SU12		STORAGE	0.627	0.627	0	12:00	2.35
2.35	0.138						
SU13		STORAGE	0.343	0.402	0	12:30	2.08
7.68	-0.122						
SU14		STORAGE	0.432	0.597	0	14:00	1.55
13.3	0.916						
SU15		STORAGE	3.237	3.300	0	12:00	12.8
19.9	-0.722						
SU16		STORAGE	1.033	1.052	0	12:00	4.53
11	0.619						
SU2		STORAGE	0.437	0.513	0	12:30	2.25
6.23	-0.366						
SU3		STORAGE	0.817	0.817	0	12:00	4.13
4.13	-0.413						
SU4		STORAGE	0.985	0.985	0	12:00	3.91
7.34	-0.360						
SU5		STORAGE	0.738	0.738	0	12:00	3.25
3.26	-0.984						
SU6		STORAGE	1.176	1.176	0	12:00	6.33
11.9	0.039						
SU7		STORAGE	1.998	1.998	0	12:00	11.6
11.6	0.278						
SU8		STORAGE	0.336	0.336	0	12:00	1.17
1.17	0.106						
SU9		STORAGE	0.802	0.873	0	12:30	5.04
9.37	0.316						

Node Surcharge Summary

No nodes were surcharged.

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

Max Occurrence	Maximum Storage Unit	Average Volume	Avg Pcmt	Evap Loss	Exfil Loss	Maximum Volume	Max Pcmt	Time of days
hr:min	Outflow CMS	1000 m ³	Full	Loss	Loss	1000 m ³	Full	
SU1 13:00	0.244	0.400	3.9	0.0	10.8	1.723	16.9	0

SU10		3.909	9.0	0.0	3.2	11.441	26.3	1
00:00	0.106							
SU11		0.433	6.6	0.0	8.0	1.653	25.3	0
12:56	0.361							
SU12		0.971	7.4	0.0	22.8	2.150	16.4	0
15:00	0.014							
SU13		0.398	5.8	0.0	4.5	1.431	20.8	0
14:20	0.297							
SU14		2.241	26.1	0.0	2.5	5.905	68.8	0
16:55	0.351							
SU15		0.824	15.0	0.0	2.0	5.458	99.6	0
12:57	1.300							
SU16		2.948	8.6	0.0	25.0	6.905	20.1	0
20:49	0.111							
SU2		0.513	4.7	0.0	5.3	2.079	19.0	0
14:12	0.346							
SU3		1.140	8.1	0.0	19.3	2.996	21.4	0
14:08	0.136							
SU4		0.867	8.9	0.0	7.8	2.509	25.8	0
13:36	0.263							
SU5		0.550	4.9	0.0	10.9	1.865	16.7	0
13:20	0.197							
SU6		1.684	9.6	0.0	7.8	5.096	29.1	0
14:49	0.445							
SU7		3.612	9.2	0.0	4.4	8.663	22.0	0
15:05	0.219							
SU8		0.477	7.6	0.0	25.7	1.051	16.7	0
14:58	0.008							
SU9		2.079	6.8	0.0	32.6	5.564	18.3	0
15:08	0.203							

 Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	90.33	0.251	1.277	19.552
System	90.33	0.251	1.277	19.552

 Link Flow Summary

Link	Type	Maximum Flow CMS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	1.277	0 12:57	0.21	1.18	1.00
CULV_Proposed	CONDUIT	0.205	0 14:32	0.29	0.08	0.35
CULV-1	CONDUIT	0.342	0 16:55	1.39	1.04	0.81

CULV-2	CONDUIT	0.095	1	00:00	1.01	0.40	0.37
CULV-3	CONDUIT	0.047	0	20:49	0.70	0.25	0.26
CULV-4	CONDUIT	0.113	0	15:08	0.93	0.59	0.47
CULV-5	CONDUIT	0.245	0	13:36	0.83	0.55	0.38
CULV-6	CONDUIT	0.286	0	14:20	0.70	0.26	0.48
CULV-7	CONDUIT	1.277	0	12:57	0.49	0.10	0.82
W1	WEIR	0.233	0	13:00			0.25
W10	WEIR	0.095	1	00:00			0.17
W11	WEIR	0.047	0	20:48			0.30
W12	WEIR	0.047	0	20:49			0.09
W13	WEIR	0.113	0	15:08			0.42
W14	WEIR	0.113	0	15:08			0.16
W15	WEIR	0.245	0	13:36			0.41
W16	WEIR	0.245	0	13:36			0.28
W17	WEIR	0.286	0	14:20			0.38
W18	WEIR	0.286	0	14:20			0.29
W19	WEIR	1.277	0	12:57			1.00
W2	WEIR	0.336	0	14:09			0.32
W20	WEIR	0.351	0	12:56			0.25
W21	WEIR	0.000	0	00:00			0.00
W22	WEIR	0.205	0	14:31			0.33
W23	WEIR	0.205	0	14:32			0.35
W3	WEIR	0.112	0	14:08			0.15
W4	WEIR	0.186	0	13:20			0.22
W5	WEIR	0.420	0	14:49			0.37
W6	WEIR	0.342	0	16:55			0.68
W7	WEIR	0.342	0	16:55			0.33
W8	WEIR	0.000	0	00:00			0.00
W9	WEIR	0.095	1	00:00			0.28
W-CULV1	WEIR	0.000	0	00:00			0.00
W-CULV2	WEIR	0.000	0	00:00			0.00
W-CULV3	WEIR	0.000	0	00:00			0.00
W-CULV4	WEIR	0.000	0	00:00			0.00
W-CULV5	WEIR	0.000	0	00:00			0.00
W-CULV6	WEIR	0.000	0	00:00			0.00
W-CULV7	WEIR	0.000	0	00:00			0.00
W-CULV8	WEIR	0.000	0	00:00			0.00

Flow Classification Summary

Inlet Conduit Ctrl	Adjusted Length	Fraction of Time in Flow Class							
		Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	
C1	1.00	0.09	0.00	0.00	0.91	0.00	0.00	0.00	0.02
0.00 CULV_Proposed	1.00	0.49	0.00	0.00	0.51	0.00	0.00	0.00	0.01
0.00 CULV-1	1.00	0.53	0.00	0.00	0.45	0.02	0.00	0.00	0.00 0.

CULV-2	1.00	0.55	0.01	0.00	0.44	0.00	0.00	0.00	0.00
0.20									
CULV-3	1.00	0.54	0.00	0.00	0.00	0.00	0.00	0.46	0.00
0.00									
CULV-4	1.00	0.50	0.00	0.00	0.00	0.00	0.00	0.50	0.00
0.23									
CULV-5	1.00	0.50	0.00	0.00	0.00	0.00	0.00	0.50	0.00
0.00									
CULV-6	1.00	0.46	0.00	0.00	0.53	0.00	0.00	0.00	0.00
0.35									
CULV-7	1.00	0.09	0.00	0.00	0.91	0.00	0.00	0.00	0.00
0.58									

 Conduit Surcharge Summary

Conduit	Hours Full			Hours	
	Both Ends	Upstream	Dnstream	Above Full Normal Flow	Capacity Limited
C1	0.01	1.24	0.01	1.25	1.24
CULV-1	0.01	3.17	0.01	1.96	0.01

Analysis begun on: Thu Mar 5 13:42:12 2026
 Analysis ended on: Thu Mar 5 13:42:14 2026
 Total elapsed time: 00:00:02