FUNCTIONAL SERVICING AND PRELIMINARY STORMWATER MANAGEMENT REPORT

7723 HIGHWAY 89
TOWNSHIP OF ADJALA-TOSORONTIO

PILLA INVESTMENTS INCORPORATED

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1.0 INTRODUCTION

CF Crozier & Associates Inc. (Crozier) was retained by Pilla Investments Incorporated (Pilla) to complete a Functional Servicing and Preliminary Stormwater Management Report in support of a Draft Plan of Subdivision Application for a proposed 22 lot commercial/industrial development located at 7723 Highway 89 in the Township of Adjala-Tosorontio (Township) within the County of Simcoe (County). The proposed development will herein be referred to as the Subject Development/Subject Lands.

The Subject Lands are approximately 29.1 ha and are bounded by Highway 89 and existing commercial properties to the north, Concession Road 7 to the east, residential and agricultural lands to the west, and agricultural lands to the south. An existing Headwater Drainage Feature (HDF) is also in the northern portion of the Subject Lands and a tributary to Spring Creek is south of the Subject Lands. Refer to **Figure 1** for the Site Location Plan.

The Subject Development, per the attached Draft Plan (March 2022), consists of 22 lots and 20 m Right-Of-Way (ROW) and 30 m ROW allowances. Refer to the Draft Plan, submitted under separate cover, for additional details.

This Functional Servicing and Preliminary Stormwater Management Report has been prepared to outline the proposed servicing, grading and stormwater management strategy for the Subject Lands.

2.0 SITE DESCRIPTION

The Subject Lands are currently characterized by active agricultural fields, existing residential and agricultural structures and an asphalt road off Concession Road 7. The existing buildings are located along the north property line and are accessible via a gravel driveway off Highway 89. These buildings and the gravel driveway are planned for removal. The asphalt road serves as an access to the Home Hardware adjacent to the northeast corner of the property.

There is an existing HDF in the northern portion of the Subject Lands that discharges to Spring Creek. In 2017, the HDF was relocated from its original position following a headwater drainage assessment by Tarandus Associates Ltd. Additionally, a tributary to the Spring Creek exists south of the Subject Lands.

The existing soil is comprised of Schomberg Silty Clay Loam and Smithfield Silt Loam, both of which are Hydrologic Soil Group C (Soil Survey Complex, 2019).

A topographical survey was completed for the Subject Development by J.D. Barnes Ltd. on March 11, 2021. The topographical survey is referenced within the provided figures. There is approximately a 26 m difference in elevation across the Subject Lands, with the high point located at the northwest corner of the Subject Lands and the low point located in the southeast corner.

A Hydrogeologic Report to assess soil and groundwater conditions of the Subject Lands was completed by Crozier in (March 2022). A total of five monitoring wells were advanced across the Subject Lands. This investigation revealed that the Subject Lands is underlain by a stratum of sandy silt, silty clay and sand (Crozier, 2022). Additionally, groundwater was encountered at depths ranging between 1.0 m to 5.3 m below ground surface (Crozier, 2022). Please refer to the Hydrogeologic Report, submitted under separate cover, for additional details.

3.0 BACKGROUND

In April 2017, a portion of the Subject Lands were severed and Site Plan Approval for the severed parcel was granted for a Home Hardware Building Centre. The Home Hardware has since been constructed and is accessed via an asphalt road off Concession Road 7 on the Subject Lands. As part of the Home Hardware Building Center Site Plan Approval, servicing and stormwater management for the severed parcel was constructed. This report focuses on the remaining portion of the Subject Lands.

A Headwater Drainage Feature Assessment for the existing HDF was completed by Tarandus Associates Ltd in April 2016. Following the HDF Assessment, Crozier prepared a letter supporting the relocation of the HDF and accompanying detailed design drawings in May 2017. Following NVCA approval of the proposed relocation, the HDF was relocated.

The assessment of the Subject Development has been based on pre-consultation meetings and discussions as well as a review of material acquired from the Township. In addition, we have relied on previous reports completed for the Subject Lands. They include:

- Design Criteria Manual for the Township of Adjala-Tosorontio (R.J. Burnside & Associates Limited, January 2006).
- Headwater Drainage Assessment (Tarandus Associates Limited, April 2016).
- Headwater Drainage Feature Relocation (Crozier, May 2017).
- D-5-4 & D-5-5 Investigation Report (Crozier, March 2022).

4.0 ROAD NETWORK

Access to the Subject Development will be provided via the existing asphalt road off Concession Road 7 and one connection to Highway 89. Within the Subject Development, there are four proposed roadways – Streets A to D. Street A will have a 30 m ROW and extend west from the existing asphalt road and the remaining streets will have a 20 m ROW. Street B will terminate in a cul-de-sac near the southwest corner of the Subject Development. The proposed roadways will be constructed to a rural cross-section per Township standards and have an asphalt width of 7.2 m. Ditches will be provided on both sides of the road to convey stormwater drainage.

5.0 SITE GRADING

The site grading will be influenced by the existing and proposed drainage systems within the Subject Development. Grading will tie into the elevations along the property limits and match the pre-development overland stormwater flow patterns where possible.

Two stormwater management (SWM) ponds, located in the east and west portion of the Subject Development, have been designed to service the Subject Development. The internal roads will be rural cross sections complete with roadside ditches and will possess a longitudinal gradient as an overland flow route to the SWM Facilities. The road network will have slopes at or greater than 0.5% and less than 6%, in accordance with Township standards. Detailed grading will be provided at the Site Plan/detailed design stage. Refer to **Figure 2** for the Preliminary Site Grading Plan.

6.0 SANITARY SERVICING

6.1 Existing Sanitary System Infrastructure

Based on a review of the Township's available mapping there is no municipal sanitary infrastructure available in the area of the Subject Lands.

The existing buildings on the Subject Lands are currently serviced with a private onsite sewage system located along the north property line. The location and extent of the existing onsite sewage system will be confirmed during detailed design. It is expected that the existing onsite sewage system will be removed.

6.2 Design Sanitary Flow

According to the Concept Plan prepared by MHBC (March 2022), 22 lots are proposed for the Subject Development. For sanitary design purposes, each building area is proposed to be 2,000 m^2 maximum with 50 employees.

The total daily design sewage flow was calculated in accordance with Table 8.2.1.3.B of the Ontario Building Code (OBC), Part 8, as shown in **Table 1**. Detailed sanitary calculations are included in **Appendix A**.

Table 1: Total Maximum Daily Sanitary Sewage Design Flows

Proposed Facility Description	Area (m^2)	Unit	Unit Flow	Number of Units	Total Flow Per Unit (L/day)
Stores	n/a	per employee	75	50	**3,750**
				Total Daily Design Sanitary Sewage Flow:	**3,750**

In accordance with the OBC, it was determined that the total maximum day sanitary sewage flow for the proposed individual lots is 3,750 L/day. Refer to **Figure 3** for the Water and Sanitary Servicing Plan and layout of the onsite sewage systems.

Properties with a total daily design sanitary sewage flow exceeding 10,000 L/day are subject to Section 53 of the Ontario Water Resources Act and require an Environmental Compliance Approval (ECA) issued by the Ministry of Environment, Conservation and Parks (MECP). Given the estimated sanitary sewage design flow is less than 10,000 L/day for each lot, an ECA application is not required. A building permit will be required for each sewage system at the detailed design stage.

6.3 Soils Evaluation

According to regional soils mapping, the Subject Lands consists of clay to silt-textured till with gravel deposits. The findings of the geotechnical report and Crozier's experience with the design of other sewage systems indicate that design T-times for these soils range from 20 min/cm to 50 min/cm.

Test pits were not completed for the Subject Development at the time of this report; therefore, a conservative T-time of 50 min/cm was assigned for design purposes. This will be verified by each lot owner upon the time of installing their private onsite sewage system. A filter bed constructed with imported sand is proposed. The filter bed is designed in accordance with the OBC.

6.4 Proposed Individual Sewage Servicing Strategy

Sanitary servicing for the Subject Development will be provided through individual onsite sewage systems. A conventional onsite sewage system consisting of a septic tank and a filter bed is proposed to service each lot. Based on the design sewage flow of 3,750 L/day, the minimum required septic tank size is 11,250 L. An 11,250 L two-compartment septic tank is proposed. The tank shall be equipped with an effluent filter on the outlet of the tank, in accordance with OBC requirements. The tank should also be equipped with risers and access lids that are accessible at finished grade. All tanks will be designed and supplied by New Market Precast or approved equivalent.

A leaching bed constructed as a filter bed is proposed for the treatment and dispersal of septic tank effluent. The proposed filter bed will include a sand and stone layer as sized and described as per OBC 8.7.5., as well as a loading area as required by Sentence 8.7.4.1.

A stone layer composed of septic stone meeting the criteria outlined in Table 8.7.3.3.A., Division B of the OBC will be installed to accommodate the distribution piping. The minimum stone area is calculated using the following equation.

$$A = \frac{Q}{50}$$

Where: A = Contact area between the base of the stone layer and the imported sand layer
Q = Total design sewage flow in L

Given a design sewage flow of 3,750 L/day, the minimum stone area is calculated to be 75 m^2. An area of 84 m^2 has been provided. The stone area will be equipped with six runs of 75 mm diameter perforated pipe, each pipe 6 m long and spaced 1 m apart.

Below the stone layer, the minimum extended contact area of the filter sand is calculated using the formula below:

$$A = \frac{QT}{850}$$

Where: A = Contact area in m^2 between the base of the sand layer and the native soil
Q = Total design sewage flow in L
T = Percolation time of the underlying soil in min/cm

Given a design sewage flow of 3,750 L/day and a T-time of 50 min/cm, the minimum size of the extended contact area is calculated to be 221 m^2. An area of 224 m^2 is proposed.

The extended contact area will consist of filter sand meeting the grading requirements of OBC 8.7.5.3 (3) and will be a minimum of 750 mm thick below the stone layer.

A filter bed is a fill-based system, therefore a loading area meeting the criteria outlined in Table 8.7.4.1 is required. The loading area is calculated using the following equation.

$$A = \frac{Q}{Max\ Loading\ Rate}$$

Where: A = Contact area in m^2 between the base of the sand layer and native soil
Q = Total design sewage flow in L
Loading Rate = 6 L/m^2/day for a T-time of $35 < T \leq 50$

Given a design sewage flow of 3,750 L/day and a T-time of 50 min/cm, the minimum loading area is calculated to be 625 m^2. An area of 630 m^2 is proposed, which includes a 19 m mantle extension in the direction water is expected to flow. The loading area will be constructed of clean imported sand with a T-time of 6 – 10 min/cm.

The combined extended contact area and loading area will be a minimum of 900 mm thick below the stone layer to the high groundwater table and taper to a minimum of 300 mm thick in all other areas. All minimum separation distances as described in Section 8.2.1.6 of the OBC have been respected.

The above sewage system design details are based on a conservative scenario to demonstrate that appropriate conditions exist for onsite sewage servicing on the proposed lots. Detailed onsite sewage system design will be completed at the site plan and building permit stage.

6.5 Proximity to Existing Wells

Part 8 of the OBC requires a minimum horizontal separation distance of 15 m (50 ft) between wells with a watertight casing extended to 6 m below grade and onsite sewage system components. The proposed water wells have been located to meet the 15 m setback requirement and are typically found at the front of the proposed lots. Refer to **Figure 3** for the Water and Sanitary Servicing Plan and location of the proposed wells.

7.0 WATER SERVICING

7.1 Existing Water Servicing

A review of the Township's available mapping indicates that municipal water services are not available at or near the Subject Lands. A review of the MECP Well Records database shows that developments within the vicinity of the Subject Lands are serviced by private onsite water supply wells. The existing farm dwelling and associated buildings on the Subject Lands are currently serviced with a private drilled well, located at the rear end of the dwelling along the north property line (identified as Well 5738137).

7.2 Water Quality

Groundwater samples were collected from monitoring wells MW21-1 to MW21-5 for chemical analysis to determine the concentration of nitrate as nitrogen on the Subject Lands. It was determined the average concentration of nitrate found in the groundwater in the Subject Lands was in the order of 3.24 mg/L and is well below the Ontario Drinking Water Quality Standard of 10 mg/L. While all samples analyzed for E. coli came back with non-detect levels, there were some counts for total coliform at some locations. Prior to use, the wells should be chlorinated and resampled for E. coli and total coliform and the water supplies should be equipped with filters and UV disinfection if bacteria continues to be present at these locations.

7.3 Pumping Tests

Six-hour rate pumping tests were completed at TW21-1 to TW21-5 on the Subject Lands to assess yield, potential well interference and to obtain samples for laboratory water quality analysis. It was determined the existing aquifers can provide adequate yield to meet the demands of the Subject Development given supplemental water storage is provided to meet peak demand flow requirements. Given the existing aquifer conditions, water servicing can be provided to the Subject Development by private individual wells.

7.4 Design Domestic Water Demand

The MECP Drinking-Water Systems Guidelines (2008) were referenced to calculate the water demand for the proposed Subject Development. The design water demand for the Subject Development can be expected to be of a similar scale to the sanitary design flow, as summarized in Section 6.2. The daily existing sewage flows were determined as shown in **Table 1** (Section 6.2) using OBC (Table 8.2.1.3.B). The daily sewage design flow was determined to be 3,750 L/day and it can be assumed that the total water use of the existing facilities is approximately 3,750 L/day. **Table 2** summarizes the calculated maximum day and hour demand and **Appendix B** includes detailed water demand calculations.

Table 2: Estimated Domestic Water Demand

Total Daily Design Flow (L/day)	Average Day Demand Flow (L/s)	Maximum Hour Peak Factor	Maximum Hour Demand Flow (L/s)
3,750	0.04	12.06	0.52

The estimated average day water demand and peak hourly demand for each lot unit will be 0.04 L/s and 0.52 L/s, respectively.

7.5 Proposed Onsite Water Supply System

The Subject Development will be serviced by onsite water supply wells for each lot. A Hydrogeological Study (Crozier, July 2022) determined the required water demand for the Subject Development. Refer to the Hydrogeologic Study, submitted under separate cover, for additional calculations and details.

Each proposed unit will be serviced by an individual water supply well and storage, if required. The capacity and location of the water supply well and storage will be determined through coordination with the hydrogeological consultant and the mechanical engineer during detailed design. As noted in Section 7.1, water quality analyses have determined it is feasible to provide domestic water servicing to the Subject Development given the onsite aquifer conditions.

The water quality treatment system and domestic water storage will be specified during detailed design to ensure potable water is provided. Refer to **Figure 3** for additional details regarding the conceptual location of the water supply wells to service the Subject Development.

8.0 STORMWATER MANAGEMENT

Stormwater Management Design Criteria

The stormwater management and drainage conditions for the Subject Development must comply with the policies and standards of the following agencies:

- The Township of Adjala-Tosorontio
- The Nottawasaga Valley Conservation Authority (NVCA)
- The Ministry of the Environment, Conservation and Parks (MECP)

A stormwater management strategy and accompanying recommendations regarding the Subject Development have been included below:

- Water Quantity Control
  - Control of the post-development peak flows to pre-development levels for all storms up to and including the 100-year at the selected point of interest.

- Water Quality Control
  - "Enhanced Protection" per the MECP.

- Erosion Control
  - 48-hour detention of the 25 mm event runoff.

- Development Standard
  - Rural cross section.
  - Lot grading at 2% optimum.
  - Drainage system to convey frequent and infrequent rainfall/runoff events.

- External Drainage Management
  - An external drainage area of 5.4 ha is conveyed across the Subject Lands under existing conditions. The stormwater management strategy for the Subject Development must accommodate these external flows to ensure safe conveyance.

8.1 Existing Drainage Conditions

The Subject Lands are currently characterized by an existing residential dwelling, active agricultural fields, asphalt road and an HDF. Runoff from the Subject Development ultimately drains to the Spring Creek. However, based on existing topography runoff from the Subject Lands currently drains to one of three outlets prior to draining to Spring Creek:

- Outlet 1: An existing 600 mm dia. culvert at the northeast corner of the Subject Lands that crosses Concession Road 7 and continues draining east.
- Outlet 2: The existing ditch along Concession Road 7 which drains south.
- Outlet 3: The Spring Creek tributary southwest of the property.

To facilitate the pre-development stormwater analysis, the following six catchments have been discretized based on the existing drainage conditions.

- **Catchment PRE-1**: This catchment area is approximately 8.8 ha and is located along the north property line. It consists of the existing buildings, active agricultural fields and the HDF. Stormwater from this catchment drains to Outlet 1.
- **Catchment PRE-2**: This catchment area is approximately 9.4 ha and is located in the east portion of the Subject Lands. It consists of active agricultural fields. Stormwater from this catchment drains to Outlet 2 via the adjacent property to the south.
- **Catchment PRE-3**: This catchment area is approximately 8.5 ha and is located in the west portion of the Subject Lands. It consists of active agricultural fields. Stormwater from this catchment drains to Outlet 2 via the adjacent property to the south.
- **Catchment PRE-4**: This catchment area is approximately 2.4 ha and is located in the southwest corner of the Subject Lands. It consists of active agricultural fields. Stormwater from this catchment drains south to Outlet 3.
- **Catchment EXT-1**: This catchment area is approximately 4.0 ha and represents a portion of the external drainage area. It is located northwest of the Subject Lands and consists of existing residential and industrial buildings. Stormwater from this catchment drains through the Subject Lands to Outlet 2.
- **Catchment EXT-2**: This catchment area is approximately 1.4 ha and represents a portion of the external drainage area. It is located west of the Subject Lands and consists of open space and existing industrial areas. Stormwater from this catchment drains through the Subject Lands to Outlet 3.

The pre-development drainage conditions have been presented in **Figure 4**.

8.2 Proposed Drainage Conditions

The Subject Development will be constructed to a rural system complete with ditches with 3:1 side slopes. The ditches will provide overland flow routes for stormwater runoff.

To meet the SWM criteria, the minor and major storms will be conveyed to a SWM wet pond (SWM Facility 1) or a SWM dry pond (SWM Facility 2) to be treated and controlled. SWM Facility 1 is located in the southeast corner of the Subject Development and SWM Facility 2 is located in the southwest corner of the Subject Development.

Preliminary site grading and storm sewer routing have been completed to ensure that the provided minor and major storm drainage systems to the SWM Facilities are feasible. A small portion of Street A as well as the Home Hardware Building Center Property will drain uncontrolled to Outlet 1, SWM Facility 1 will discharge to Outlet 2 and SWM Facility 2 will discharge to Outlet 3. The outlet details will be confirmed at the detailed design stage.

To facilitate the post-development stormwater analysis, the following six catchments have been discretized based on the proposed drainage conditions.

- **Catchment POST-1**: This catchment area is approximately 19.3 ha and is located in the east portion of the Subject Lands. It consists of industrial area and a portion of the roads. Runoff from this catchment will be conveyed to SWM Facility 1.
- **Catchment POST-2**: This catchment area is approximately 6.5 ha and is located in the west portion of the Subject Lands. It consists of the remainder of industrial area and a portion of the roads. Runoff from this catchment will be conveyed to SWM Facility 2.
- **Catchment POST-3**: This catchment area is approximately 0.5 ha and is located in the northeast corner of the Subject Lands. It consists of a portion of Street A. Runoff from this catchment will drain uncontrolled to Outlet 1.

- **Catchment EXT-1**: This catchment area is approximately 4.0 ha and represents a portion of the external drainage area. It is located northwest of the Subject Lands and consists of existing residential and industrial buildings. Stormwater from this catchment will be conveyed to SWM Facility 1.
- **Catchment EXT-2**: This catchment area is approximately 1.4 ha and represents a portion of the external drainage area. It is located west of the Subject Lands and consists of open space and existing industrial areas. Stormwater from this catchment will be conveyed to SWM Facility 2.
- **SWMF 1:** This catchment represents the proposed SWM Facility 1 block. Runoff from this catchment will be directed to SWM Facility 1. SWM Facility 1 will discharge to Outlet 2.
- **SWMF 2**: This catchment represents the proposed SWM Facility 1 block. Runoff from this catchment will be directed to SWM Facility 2. SWM Facility 2 will outlet to Outlet 3.

The post-development drainage conditions and catchment areas have been presented in the **Figure 5**.

8.3 Hydrologic Analysis

Hydrologic modelling was prepared for the pre-development and post-development scenarios using the stormwater management hydrologic computer program Visual OTTHYMO 6.1 (VO). The purpose of the modelling was to determine the detention storage volumes and corresponding SWM block sizing required for the Subject Lands to ensure post-development peak flow rates do not exceed the pre-development target flows (i.e., quantity control).

To accurately assess the peak flows from the individual catchments, the NASHYD command in VO was used to model rural conditions, whereas the STANHYD command was used to model urban development conditions. 2, 5, 10, 25, 50 and 100-year rainfall was simulated using a four-hour Chicago and 24-hour SCS Type II consistent with municipal design standards and NVCA requirements.

8.3.1 Pre-Development Model Setup

To establish pre-development flows, the contributing drainage areas to the Subject Development were divided into Outlet 1, 2 and 3 drainage areas. The Outlet 1 drainage area consists of catchment PRE-1, the Outlet 2 drainage area consists of catchments PRE-2, PRE-3 and EXT-1 and the Outlet 3 drainage area consists of catchments PRE-4 and EXT-2. Catchment delineations have been presented in **Figure 4** and hydrologic parameter sheets have been provided in **Appendix C**.

Table 3 summarizes the pre-development peak flows rates obtained from the VO model.

Table 3: Summary of Pre-Development Flow Rates

Return Period (Years)	Pre-Development Flow Rates (m^3/s)			
	Outlet 1 (8.8 ha)	Outlet 2 (21.9 ha)	Outlet 3 (3.8 ha)	Total (34.5 ha)
4 Hour Chicago				
2	0.13	0.57	0.08	0.66
5	0.23	0.95	0.16	1.23
10	0.32	1.30	0.21	1.66
25	0.44	1.72	0.29	2.25
50	0.53	2.06	0.35	2.72
100	0.62	2.43	0.41	3.21
24 Hour SCS Type II				
2	0.35	1.44	0.24	1.88
5	0.56	2.29	0.37	3.01
10	0.72	2.89	0.47	3.81
25	0.91	3.66	0.60	4.84
50	1.06	4.23	0.69	5.61
100	1.21	4.82	0.79	6.40
Regional (Timmins)	0.86	2.28	0.39	3.54

Pre-Development VO input and output files have been provided in **Appendix D.**

8.3.2 Post-Development Model Setup

The post-development model was prepared by replacing the pre-development catchments with the post-development catchments identified in Section 8.2. Catchments EXT-1 and EXT-2 and associated hydrologic parameters from the pre-development model were maintained. The contributing drainage areas to the Subject Development were again divided into the Outlet 1, 2 and 3 drainage areas. Catchment POST-3 drains to Outlet 1, catchments POST-1, SWMF1 and EXT-1 drain to Outlet 2 and catchments POST-2, SWMF2 and EXT-2 drain to Outlet 3. Refer to **Figure 5** for the Post-Development Drainage Plan and **Appendix C** for hydrologic parameter sheets.

The proposed SWM Facilities will provide the required stormwater quantity, quality and erosion controls.

The preliminary outlet structure for SWM Facility 1 has been designed as a multi-stage outlet to address both quality and quantity control requirements. The outlet structure will consist of a 160 mm diameter extended detention orifice positioned at the permanent pool elevation. A secondary rectangular weir structure has been included above the extended detention storage elevation to control effluent from the pond for storms exceeding the 25 mm event.

The preliminary outlet structure for SWM Facility 2 has been designed as a multi-stage outlet to address both quality and quantity control requirements. The outlet structure will consist of an 85 mm diameter extended detention orifice positioned at the bottom of pond elevation. A secondary rectangular weir structure has been included above the extended detention storage elevation to control effluent from the pond for storms exceeding the 25 mm event.

Using the ROUTE RESERVOIR command in VO, the volume of detention storage required to attenuate the post-development peak flows from the Subject Development to target peak flow levels was determined based on a storage – discharge relationship. The ROUTE RESERVOIR command was used

to model both the wet ponds and underground storage systems. A summary of storage volumes required for each SWM Facility can be found in **Table 4.**

Table 4: Summary of SWM Facility Storage Volumes

Return Period (Years)	Storage Volume (m^3)	
	4 Hour Chicago	24 Hour SCS Type II
SWM Facility 1 (18,432 m^3) (Wet Pond)		
2	5271	6907
5	6618	8566
10	7092	9773
25	7795	11224
50	8380	12309
100	9006	13355
SWM Facility 2 (6,328 m^3) (Dry Pond)		
2	1611	2262
5	2152	2899
10	2348	3331
25	2627	3856
50	2852	4250
100	3091	4644

The results of the post-development model are summarized in **Table 5** below.

Table 5: Summary of Post-Development Peak Flow Rates

Return Period (Years)	Outlet 1		Outlet 2		Outlet 3		Total	
	Pre-Development (m^3/s) (8.8 ha)	Post-Development (m^3/s) (0.5 ha)	Pre-Development (m^3/s) (21.9 ha)	Post-Development (m^3/s) (25.1 ha)	Pre-Development (m^3/s) (3.8 ha)	Post-Development (m^3/s) (8.9 ha)	Pre-Development (m^3/s) (34.5 ha)	Post-Development (m^3/s) (34.5 ha)
4 Hour Chicago								
2	0.13	0.04	0.57	0.07	0.08	0.03	0.66	0.10
5	0.23	0.06	0.95	0.22	0.16	0.07	1.23	0.29
10	0.32	0.07	1.30	0.37	0.21	0.11	1.66	0.48
25	0.44	0.09	1.72	0.59	0.29	0.17	2.25	0.76
50	0.53	0.10	2.06	0.77	0.35	0.22	2.72	1.00
100	0.62	0.12	2.43	0.97	0.41	0.27	3.21	1.25
24 Hour SCS Type II								
2	0.35	0.06	1.44	0.31	0.24	0.09	1.88	0.40
5	0.56	0.08	2.29	0.83	0.37	0.23	3.01	1.07
10	0.72	0.10	2.89	1.22	0.47	0.34	3.81	1.57
25	0.91	0.13	3.66	1.87	0.60	0.49	4.84	2.38
50	1.06	0.15	4.23	2.33	0.69	0.61	5.61	2.97
100	1.21	0.16	4.82	2.80	0.79	0.72	6.40	3.56
Regional (Hazel)	0.86	0.06	2.28	2.35	0.39	0.72	3.54	3.11

As evidenced by **Table 5**, 'Post-to-Pre' quantity control has been provided for all storm events at each outlet up to and including the 100-year events. Post-development input and output files have been provided in **Appendix D.** Refer to **Appendix E** for relevant SWM Facility calculations.

8.4 Quality and Erosion Control Analysis

8.4.1 SWM Facility 1

Stormwater quality to an Enhanced Protection Level (Stormwater Management and Design Manual, MECP, 2003) and erosion control for the eastern portion of the Subject Development will be provided by SWM Facility 1.

Erosion control will be principally achieved by incorporating the erosion control requirements into the extended detention operation of SWM Facility 1. Sizing was based on providing 48-hour drawdown of the runoff volume produced during a 25 mm design storm event, per Township requirements.

Water quality control will also be provided by SWM Facility 1. Based on a contributing drainage area of 23.3 ha, the required water quality volume for SWM Facility 1 is 237 m^3/ha to provide enhanced level of treatment (Stormwater Management and Design Manual, MECP, 2003). This water quality volume consists of 197 m^3/ha for permanent pool and 40 m^3/ha for extended detention.

A comparison between the provided and required volumes for permanent pool and extended detention have been provided in **Table 6**.

Table 6: SWM Facility 1 Quality and Erosion Control Characteristics

	Required Volume (m^3)	Provided Volume (m^3)
Permanent Pool	4590	5990
MECP Extended Detention	4171	4945
Erosion Control	932	4945

8.4.2 SWM Facility 2

Stormwater quality to an Enhanced Protection Level (Stormwater Management and Design Manual, MECP, 2003) and erosion control for the eastern portion of the Subject Development will be provided by an Oil and Grit Separator (OGS), sand filter or other low impact development (LID) within the SWM block.

Erosion control will be principally achieved by incorporating the erosion control requirements into the extended detention operation of SWM Facility 2. Sizing was based on providing 48-hour drawdown of the runoff volume produced during a 25 mm design storm event, per Township requirements. A comparison between the provided and required volumes for extended detention have been provided in **Table 7**.

Table 7: SWM Facility 2 Quality and Erosion Control Characteristics

	Required Volume (m^3)	Provided Volume (m^3)
MECP Extended Detention	1252	1513
Erosion Control	316	1513

Water quality control for the eastern portion of the Subject Development will primarily be provided by an OGS, sand filter or other LID within the SWM block. The OGS, sand filter or LID will be located upstream or at the inlet of the SWM Facility and will be sized to provide 80% total suspended solids removal in accordance with MECP standards. The dry pond element of SWM Facility 2 will provide additional quality control polishing.

8.5 Stormwater Management Facility Operating Characteristics

A preliminary design for the SWM Facilities has been completed to demonstrate that the SWM blocks are adequately sized for water quantity and quality storage requirements. Preliminary operating profiles of the SWM Facilities are presented in **Table 8** below.

Table 8: SWM Facility 1 and 2 Operating Characteristics

Component	Elevation (m)	Storage Required (m^3)	Storage Provided (m^3)
SWM Facility 1			
Bottom	224.12	-	-
Permanent Pool	225.62	4590	5990
Extended Detention	226.42	4171	4945
100-Year High Water Level	227.62	13355	15281
Top of Berm	227.92	-	18432
SWM Facility 2			
Bottom	232.89	-	-
Permanent Pool	N/A	N/A	N/A
Extended Detention	233.29	1252	1513
100-Year High Water Level	234.89	4644	5153
Top of Berm	235.19	-	6328

As evidenced by **Table 8,** the SWM Facilities are sufficiently sized to provide the required stormwater quantity and quality controls. Permits and other regulatory instruments such as an Environmental Compliance Approval (MECP) and Fill Permit (TRCA) will be secured at the detailed design stage.

A preliminary design of SWM Facility 1 and 2 have been presented in **Figure 6** and **Figure 7,** respectively.

8.6 Headwater Drainage Feature

In April 2016 a headwater drainage assessment was completed by Tarandus Associates Limited. The report determined that the HDF is not a valued fish habitat and concluded that the "mitigation" management option was the most appropriate. The recommended mitigation strategy would maintain or improve the infiltration characteristics of the existing HDF.

In post-development conditions, runoff from the Subject Lands will drain to either open channels or roadside ditches. These open channels or ditches will allow for conveyed runoff to infiltrate, maintaining the infiltration provided by the existing HDF.

9.0 UTILITIES

The Subject Development will be serviced with natural gas, telephone, cable TV and hydro. The design of such utilities will be coordinated with the local utility companies servicing the Township. Utilities are proposed to follow the alignment of the internal road network, with individual service connections to each lot.

10.0 EROSION & SEDIMENT CONTROLS

All sediment and erosion controls will be installed prior to the commencement of any earthworks and maintained throughout until the Subject Lands are stabilized or as directed by the Engineer, NVCA and/or Township. Controls are to be inspected regularly, after each significant rainfall, and maintained in proper working condition. Erosion and sediment controls measures to be considered include, but are not limited to, the following:

- Silt Fence

Silt fence will be installed where required to intercept sheet flow. Heavy duty silt fence will be located around the perimeter of the work zone limits. It should be noted that additional silt fencing may be added based on field decisions by the Site Engineer and Owner prior to, during and following construction.

- Mud Mat

Mud mats will be installed at the main access points to the Subject Development on Concession Road 7 and Highway 89 to reduce the amount of mud tracking onto existing paved roadways during site servicing operations.

- Flow Check Dams

Temporary check dams will be utilized on-site to prevent any silt mitigation off site during and after construction activities. These dams will promote settling of suspended solids and will reduce flow velocities. Sediment accumulation will be monitored and removed as necessary.

- Dust Suppression

During earthwork activities, the Contractor will ensure that measures for dust suppression are provided as required, such as the application of water or lime.

11.0 CONCLUSIONS & RECOMMENDATIONS

Based on the foregoing it is concluded that the Subject Development can be adequately serviced.

1. Access to the Subject Development will be provided via the existing access to Concession Road 7 and a proposed connection to Highway 89. Internal roads will be designed in accordance with Township standards.
2. Preliminary site grading has been completed to demonstrate that overland flow routes to the SWM Facilities are feasible.
3. The Subject Development will be serviced via individual sewage systems and wells. Preliminary onsite sewage system design has been completed to demonstrate that each of the lots can be serviced with an individual onsite sewage system and private well.
4. The Subject Development will be designed with rural storm system. The rural storm system will outlet to one of the two SWM Facilities.
5. Two SWM Facilities within the Subject Development are proposed to meet the stormwater quantity, quality and erosion control objectives. The SWM Facilities will outlet to either Outlet 2 or 3, with a small portion of the drainage conveyed uncontrolled to Outlet 1.
6. Stormwater quantity control up to and including the 100-year storm event will be provided to meet the 'post-to-pre' peak flow objectives.
7. Water quantity control to an 'enhanced' level of protection will be provided via the SWM Facilities along with 48 hour extended detention of the 25 mm event runoff volume and an OGS, sand filter or LID unit.
8. The SWM Facilities controls shown of the Draft Plan are sufficiently sized to meet the SWM objectives.
9. Utilities are available to service the Subject Development.
10. Sediment and erosion controls as specified, will be effective in preventing and controlling sediment from migrating into nearby swales, ditches and watercourses.

Therefore, we recommend approval of the Planning Applications for the Subject Lands from the perspective of engineering servicing requirements.

Respectfully Submitted,

C.F. CROZIER & ASSOCIATES INC.

Katherine Rentsch, P.Eng.
Senior Project Manager

C.F. CROZIER & ASSOCIATES INC.

Brendan Hummelen, P.Eng.
Project Engineer

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APPENDIX A

Sanitary Calculations

ONSITE SEWAGE SYSTEM NON-RESIDENTIAL CALCULATION SHEET

Project Name: Pilla Alliston Hwy 89
Project Number: 353-6017
Date: 3/17/2022
Designed By: AL
Checked By: KR

PRELIMINARY FLOW ESTIMATES

Typical Lot	Area (m^2)	Unit	Unit Flow	Number of Units	Total Flow (L/day)	References/Notes
Buidling	-	per person	75	50	3,750	OBC T8.2.1.3B.10 Factory (no shower) Assume 50 staff
				SUBTOTAL COMMERCIAL AREA 4	**3,750**	
				Total Maximum Day Sewage Flow:	**3,750**	

Pre-Treatment Options

Required septic tank size =	11250	L minimum
Propose Level IV Treatment (Y/N):	N	
Native Percolation time, T =	50	min/cm
Imported Percolation time =	10	min/cm

Option #3 - Filter Bed

	Required		Provided		
Minimum required contact area =	75	m^2	(6x7) x 2	84 m^2	2 stone beds, 5m apart
Required extended contact area =	221	m^2	17x13	224 m^2	
Maximum loading rate =	6	$L/m^2/day$		$L/m^2/day$	
Minimum loading area =	625	m^2	30x21	630 m^2	

APPENDIX B

Water Demand Calculations

CROZIER CONSULTING ENGINEERS

Project Name: Pilla Alliston Hwy 89
Project Number: 353-6017

Date: 1101-4125
Designed By: AL
Checked By: KR

Pilla Alliston - Design Water Demand

	Value	Unit	Note/References
Lot Daily Volume	3,750.00	L/day/unit	The Total Daily Water Design Volume can be anticipated to be of similar scale to the Total Daily Sanitary Design Volume.
Total Number of Units	22	units	
Site Total Daily Volume	82,500.00	L/day	
Total Domestic Water Design Flows			
Average Design Flow	0.04	L/sec	
Max Day Peak Factor	8.05		Table 3-3 MOE Design Guidelines for Drinking Water Systems - 2008
Max Day Demand Flow	**0.35**	L/sec	
Max Day Demand Volume	30	m^3/day	
Peak Hour Factor	12.06		Table 3-3 MOE Design Guidelines for Drinking Water Systems - 2008
Peak Hour Flow	**0.52**	L/sec	

APPENDIX C

Hydrologic Parameter Sheets

CROZIER & ASSOCIATES Consulting Engineers

Project Name: Pilla Lands
Project Number: 1101-4125
Date: 2022-03-25
By: MT/ZH

D.A. NAME **PRE-1**
D.A. AREA (ha) **8.8**

Hydrologic Parameters: CALIB NASHYD Command
Pre Development Drainage Area: Catchment PRE-1

Curve Number Calculation

Soil Types Present:				
Type	ID	Hydrologic Group	% Area	Area
Schomberg Silty Clay Loam	Shsc	C	69.0%	6.1
Smithfield Silt Loam	Sms	C	31.0%	2.7
				0
				0
Total Area Check				8.8

Impervious Landuses Present:

	Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area	CN	Area	CN	Area	CN	Area (ha)	CN	Area	CN	Area	A*CN
Shsc		98		98	0.34	98	0.07	98		98	0.41	40.08
Sms		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
		98		98		98		98		98	0	0
Subtotal Area	0		0		0.34		0.07		0			

Pervious Landuses Present:

	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area	CN	Area	CN	Area	CN	Area (ha)	CN	Area	CN	Area	A*CN
Shsc	0.00	73	0.00	76	0.00	50	0.00	79	5.7	82	5.66	464.37
Sms	0.00	73	0.00	76	0.00	50	0.00	79	2.73	82	2.73	223.70
0	0.00		0.00		0.00		0.00		0.00		0.00	0.00
0	0.00		0.00		0.00		0.00		0.00		0.00	0.00
Subtotal Area	0.00		0.00		0.00		0.00		8.4			

Composite Area Calculations		
	Total Pervious Area	8.4
	Total Impervious Area	0.4
	% Impervious	4.6%
	Composite Curve Number	82.7
	Total Area Check	8.8

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Curve Number								
				Schomberg Silty Clay		Smithfield Silt Loam		0		0		
Landuse	IA (mm)	Area (ha)	A * IA	RC	Area	RC	Area	RC	Area	RC	Area	A*RC
Woodland	10	0	0	0.35	0	0.35	0		0		0	0
Meadow	8	0	0	0.40	0	0.40	0		0		0	0
Wetland	16	0	0	0.05	0	0.05	0		0		0	0
Lawn	5	0	0	0.22	0	0.22	0		0		0	0
Cultivated	7	8.4	58.7	0.55	5.66	0.55	2.73		0		0	4.62
Impervious	2	0.4	0.8	0.95	0.41	0.95	0.00		0		0	0.39
Composite IA		8.8	6.8	Composite Runoff Coefficient								0.6

Time to Peak Inputs						Uplands			Bransby Williams		Airport	
Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Tc (hr)	Tp(hr)	TOTAL Tp (hr)	Tc (hr)	Tp(hr)	Tc (hr)	Tp(hr)
Overland	100	5.5	5.50%	2.7	0.63	0.04	0.03	0.03	0.54	0.37	0.61	0.41
Channel	780	19.7	2.53%	2.7	0.43							

Appropriate calculated time to peak:	0.37	Appropriate Method:	Bransby Williams

CROZIER & ASSOCIATES Consulting Engineers

Project Name: Pilla Lands
Project Number: 1101-4125
Date: 2022-03-25
By: MT/ZH

D.A. NAME **PRE-2**
D.A. AREA (ha) **9.4**

Hydrologic Parameters: CALIB NASHYD Command
Pre Development Drainage Area: Catchment PRE-2

Curve Number Calculation

Soil Types Present:				
Type	ID	Hydrologic Group	% Area	Area
Schomberg Silty Clay Loam	Shsc	C	38.0%	3.6
Smithfield Silt Loam	Sms	C	62.0%	5.8
				0
				0
Total Area Check				9.4

Impervious Landuses Present:

	Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area	CN	Area	CN	Area	CN	Area (ha)	CN	Area	CN	Area	A*CN
Shsc		98		98		98		98		98	0	0
Sms		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
Subtotal Area	0		0		0		0		0			

Pervious Landuses Present:

	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area	CN	Area	CN	Area	CN	Area (ha)	CN	Area	CN	Area	A*CN
Shsc	0.00	73	0.00	76	0.00	50	0.00	79	3.6	82	3.57	292.90
Sms	0.00	73	0.00	76	0.00	50	0.00	79	5.83	82	5.83	477.90
0	0.00		0.00		0.00		0.00		0.00		0.00	0.00
0	0.00		0.00		0.00		0.00		0.00		0.00	0.00
Subtotal Area	0.00		0.00		0.00		0.00		9.4			

Composite Area Calculations		
	Total Pervious Area	9.4
	Total Impervious Area	0.0
	% Impervious	0.0%
	Composite Curve Number	82.0
	Total Area Check	9.4

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Curve Number								
				Schomberg Silty Clay		Smithfield Silt Loam		0		0		
Landuse	IA (mm)	Area (ha)	A * IA	RC	Area	RC	Area	RC	Area	RC	Area	A*RC
Woodland	10	0.00	0	0.35	0	0.35	0		0		0	0
Meadow	8	0	0	0.40	0	0.40	0		0		0	0
Wetland	16	0	0	0.05	0	0.05	0		0		0	0
Lawn	5	0	0	0.22	0	0.22	0		0		0	0
Cultivated	7	9	65.80	0.55	3.57	0.55	5.83		0		0	5.17
Impervious	2	0	0	0.95	0	0.95	0		0		0	0
Composite IA		9.4	7.0	Composite Runoff Coefficient								0.55

Time to Peak Inputs						Uplands			Bransby Williams		Airport	
Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Tc (hr)	Tp(hr)	TOTAL Tp (hr)	Tc (hr)	Tp(hr)	Tc (hr)	Tp(hr)
Overland	530	20.3	3.83%	2.7	0.53	0.28	0.19	0.19	0.31	0.21	0.44	0.30

Appropriate calculated time to peak:	0.21	Appropriate Method:	Bransby Williams

CROZIER & ASSOCIATES Consulting Engineers

Project Name: Pilla Lands
Project Number: 1101-4125
Date: 2022-03-25
By: MT/ZH

D.A. NAME **PRE-3**
D.A. AREA (ha) **8.5**

Hydrologic Parameters: CALIB NASHYD Command
Pre Development Drainage Area: Catchment PRE-3

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic Group	% Area	Area
Schomberg Silty Clay Loam	Shsc	C	100.0%	8.5
				0
				0
				0
Total Area Check				8.5

Impervious Landuses Present:

Soils	Roadway Area	Roadway CN	Sidewalk Area	Sidewalk CN	Driveway Area	Driveway CN	Building Area (ha)	Building CN	SWMF Area	SWMF CN	Subtotals Area	Subtotals A*CN
Shsc		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
Subtotal Area	0		0		0		0		0			

Pervious Landuses Present:

Soils	Woodland Area	Woodland CN	Meadow Area	Meadow CN	Wetland Area	Wetland CN	Lawn Area (ha)	Lawn CN	Cultivated Area	Cultivated CN	Subtotals Area	Subtotals A*CN
Shsc	0.00	73	0.00	76	0.00	50	0.00	79	8.50	82	8.50	697.00
0	0.00		0.00		0.00		0.00		0.00		0.00	0.00
0	0.00		0.00		0.00		0.00		0.00		0.00	0.00
0	0.00		0.00		0.00		0.00		0.00		0.00	0.00
Subtotal Area	0.00		0.00		0.00		0.00		8.50			

Composite Area Calculations		
	Total Pervious Area	8.5
	Total Impervious Area	0.0
	% Impervious	0.0%
	Composite Curve Number	82.0
	Total Area Check	8.5

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Curve Number								
Landuse	IA (mm)	Area (ha)	A * IA	Schomberg Silty Clay RC	Schomberg Silty Clay Area	0 RC	0 Area	0 RC	0 Area	0 RC	0 Area	A*RC
Woodland	10	0.00	0	0.35	0		0		0		0	0
Meadow	8	0	0	0.40	0		0		0		0	0
Wetland	16	0	0	0.05	0		0		0		0	0
Lawn	5	0	0	0.22	0		0		0		0	0
Cultivated	7	9	59.50	0.55	8.50		0		0		0	4.68
Impervious	2	0	0	0.95	0		0		0		0	0
Composite IA		8.5	7.0	Composite Runoff Coefficient								0.55

Time to Peak Inputs						Uplands			Bransby Williams		Airport	
Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Tc (hr)	Tp(hr)	TOTAL Tp (hr)	Tc (hr)	Tp(hr)	Tc (hr)	Tp(hr)
Overland	450	14.4	3.20%	2.7	0.48	0.26	0.17	0.17	0.27	0.18	0.43	0.29

Appropriate calculated time to peak:	0.18	Appropriate Method:	Bransby Williams

CROZIER & ASSOCIATES Consulting Engineers

Project Name: Pilla Lands
Project Number: 1101-4125
Date: 202203-25
By: 2022-03-25

D.A. NAME **PRE-4**
D.A. AREA (ha) **2.4**

Hydrologic Parameters: CALIB NASHYD Command
Pre Development Drainage Area: Catchment PRE-4

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic Group	% Area	Area
Schomberg Silty Clay Loam	Shsc	C	100.0%	2.4
				0
				0
				0
Total Area Check				2.4

Impervious Landuses Present:

	Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area	CN	Area	CN	Area	CN	Area (ha)	CN	Area	CN	Area	A*CN
Shsc		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
Subtotal Area	0		0		0		0		0			

Pervious Landuses Present:

	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area	CN	Area	CN	Area	CN	Area (ha)	CN	Area	CN	Area	A*CN
Shsc	0.00	73	0.00	76	0.00	50	0.00	79	2.4	82	2.40	196.80
0	0.00		0.00		0.00		0.00		0.00		0.00	0.00
0	0.00		0.00		0.00		0.00		0.00		0.00	0.00
0	0.00		0.00		0.00		0.00		0.00		0.00	0.00
Subtotal Area	0.00		0.00		0.00		0.00		2.4			

Composite Area Calculations		
	Total Pervious Area	2.4
	Total Impervious Area	0.0
	% Impervious	0.0%
	Composite Curve Number	82.0
	Total Area Check	2.4

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Curve Number								
				Schomberg Silty Clay		0		0		0		
Landuse	IA (mm)	Area (ha)	A * IA	RC	Area	RC	Area	RC	Area	RC	Area	A*RC
Woodland	10	0.00	0	0.35	0		0		0		0	0
Meadow	8	0	0	0.40	0		0		0		0	0
Wetland	16	0	0	0.05	0		0		0		0	0
Lawn	5	0	0	0.22	0		0		0		0	0
Cultivated	7	2	16.80	0.55	2.40		0		0		0	1.32
Impervious	2	0	0	0.95	0		0		0		0	0
Composite IA		2.4	7.0	Composite Runoff Coefficient								0.55

Time to Peak Inputs						Uplands			Bransby Williams		Airport	
Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Tc (hr)	Tp(hr)	TOTAL Tp (hr)	Tc (hr)	Tp(hr)	Tc (hr)	Tp(hr)
Overland	330	12.1	3.67%	2.7	0.52	0.18	0.12	0.12	0.22	0.15	0.35	0.24

Appropriate calculated time to peak:	0.17	Appropriate Method:	Bransby Williams

*Time to peak increased to minimum 10 min

CROZIER & ASSOCIATES Consulting Engineers

Project Name:	Pilla Lands	**D.A. NAME**	**EXT-1**
Project No.:	1101-4125	**D.A. AREA (ha)**	**4.0**
Date:	2022-03-25		
By:	Z. Holland		
Checked By:	B. Hummelen		

Hydrologic Parameters: CALIB STANDHYD Command
Post Development Drainage Area: Catchment EXT-1

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic Group	% Area	Area
Schomberg Silty Clay	Shsc	C	100	4
				0
				0
				0
Total Area Check				4

Impervious Landuses Present:

	Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
Shsc	1.82	98		98		98		98		98	1.82	178
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
Subtotal Area	1.82		0.00		0		0.00		0		1.82	

Pervious Landuses Present:

	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
Shsc	0		0		0		2.18	79	0		2.18	172.22
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
Subtotal Area	0		0		0		2.18		0			

Pervious Area Calculations	Total Pervious Area	2.18
	Composite Pervious Curve Number	79.00
Impervious Area Calculations	Total Directly Connected Area	1.82
	Total Indirectly Connected Area	0.00
	Total Impervious Area*	1.82
	% X imp	45.5
	% T imp	45.5
	Total Area Check	4.00

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	2.18	10.90
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	2	20	0.25
Impervious	2.0	1	163	0.013

CROZIER & ASSOCIATES Consulting Engineers

Project Name: Pilla Lands
Project Number: 1101-4125
Date: 2022-03-25
By: MT/ZH

D.A. NAME **EXT-2**
D.A. AREA (ha) **1.4**

Hydrologic Parameters: CALIB NASHYD Command
Pre Development Drainage Area: Catchment EXT-2

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic Group	% Area	Area
Schomberg Silty Clay Loam	Shsc	C	100.0%	1.4
				0
				0
				0
Total Area Check				1.4

Impervious Landuses Present:

	Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area	CN	Area	CN	Area	CN	Area (ha)	CN	Area	CN	Area	A*CN
Shsc	0.27	98		98		98		98		98	0.27	26.46
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
Subtotal Area	0.27		0		0		0		0			

Pervious Landuses Present:

	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area	CN	Area	CN	Area	CN	Area (ha)	CN	Area	CN	Area	A*CN
Shsc	0.00	73	0.00	76	0.00	50	1.13	79	0.0	82	1.13	89.27
0	0.00		0.00		0.00		0.00		0.00		0.00	0.00
0	0.00		0.00		0.00		0.00		0.00		0.00	0.00
0	0.00		0.00		0.00		0.00		0.00		0.00	0.00
Subtotal Area	0.00		0.00		0.00		1.13		0.0			

Composite Area Calculations		
	Total Pervious Area	1.1
	Total Impervious Area	0.3
	% Impervious	19.3%
	Composite Curve Number	82.7
	Total Area Check	1.4

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Curve Number								
				Schomberg Silty Clay		0		0		0		
Landuse	IA (mm)	Area (ha)	A * IA	RC	Area	RC	Area	RC	Area	RC	Area	A*RC
Woodland	10	0	0	0.35	0		0		0		0	0
Meadow	8	0	0	0.40	0		0		0		0	0
Wetland	16	0	0	0.05	0		0		0		0	0
Lawn	5	1.13	5.65	0.22	1.13		0		0		0	0.25
Cultivated	7	0	0	0.55	0		0		0		0	0
Impervious	2	0.27	0.54	0.95	0		0		0		0	0.26
Composite IA		1.4	4.4	Composite Runoff Coefficient								0.36

Time to Peak Inputs						Uplands			Bransby Williams		Airport	
Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Tc (hr)	Tp(hr)	TOTAL Tp (hr)	Tc (hr)	Tp(hr)	Tc (hr)	Tp(hr)
Overland	195	8	4.10%	2.7	0.55	0.10	0.07	0.07	0.14	0.09	0.35	0.24

Appropriate calculated time to peak:	0.24	Appropriate Method:	Airport

CROZIER & ASSOCIATES Consulting Engineers

Project Name:	Pilla Lands	**D.A. NAME**	**POST-1**
Project No.:	1101-4125	**D.A. AREA (ha)**	**19.3**
Date:	2022-03-25		
By:	Z. Holland		
Checked By:	B. Hummelen		

Hydrologic Parameters: CALIB STANDHYD Command
Post Development Drainage Area: Catchment POST-1

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic Group	% Area	Area
Schomberg Silty Clay	Shsc	C	73	14.1
Smithfield Silt Loam	Sms	C	27	5.2
				0
				0
Total Area Check				19.3

Impervious Landuses Present:

Soils	Roadway Area (ha)	CN	Sidewalk Area (ha)	CN	Driveway Area (ha)	CN	Building Area (ha)	CN	SWMF Area (ha)	CN	Subtotals Area	A*CN
Shsc	6.08	98	0.00	98		98	5.45	98		98	11.53	1129
Sms	2.40	98	0.00	98		98	2.07	98		98	4.47	438
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
Subtotal Area	8.48		0.00		0		7.52		0		16.00	

Pervious Landuses Present:

Soils	Woodland Area (ha)	CN	Meadow Area (ha)	CN	Wetland Area (ha)	CN	Lawn Area (ha)	CN	Cultivated Area (ha)	CN	Subtotals Area	A*CN
Shsc	0		0		0		2.57	79	0		2.57	203.39
Sms	0		0		0		0.73	79	0		0.73	57.58
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
Subtotal Area	0		0		0		3.30		0			

Pervious Area Calculations	Total Pervious Area	3.30	
	Composite Pervious Curve Number	79.00	
Impervious Area Calculations	Total Directly Connected Area	8.48	
	Total Indirectly Connected Area	7.52	
	Total Impervious Area*	16.00	
	% X imp	43.9	
	% T imp	82.9	
	Total Area Check	19.30	

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	3.30	16.52
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	2	20	0.25
Impervious	2.0	1	359	0.013

*Impervious percentages for Industrial Area taken from NVCA Standards

CROZIER & ASSOCIATES Consulting Engineers

Project Name:	Pilla Lands	**D.A. NAME**	**POST-2**
Project No.:	1101-4125	**D.A. AREA (ha)**	**6.5**
Date:	2022-03-25		
By:	Z. Holland		
Checked By:	B. Hummelen		

Hydrologic Parameters: CALIB STANDHYD Command
Post Development Drainage Area: Catchment POST-2

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic Group	% Area	Area
Schomberg Silty Clay	Shsc	C	100	6.5
				0
				0
				0
Total Area Check				6.5

Impervious Landuses Present:

	Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
Shsc	2.68	98	0.00	98		98	2.52	98		98	5.20	510
0		98		98		98		98		98	0.00	0
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
Subtotal Area	2.68		0.00		0		2.52		0		5.20	

Pervious Landuses Present:

	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
Shsc	0		0		0		1.30	79	0		1.30	102.40
0	0		0		0		0		0		0.00	0.00
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
Subtotal Area	0		0		0		1.30		0			

Pervious Area Calculations	Total Pervious Area	1.30
	Composite Pervious Curve Number	79.00
Impervious Area Calculations	Total Directly Connected Area	2.68
	Total Indirectly Connected Area	2.52
	Total Impervious Area*	5.20
	% X imp	41.3
	% T imp	80.1
	Total Area Check	6.50

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	1.30	6.48
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	2	20	0.25
Impervious	2.0	1	208	0.013

*Impervious percentages for Industrial Area taken from NVCA Standards

CROZIER & ASSOCIATES Consulting Engineers

Project Name:	Pilla Lands	**D.A. NAME**	**POST-3**
Project No.:	1101-4125	**D.A. AREA (ha)**	**0.5**
Date:	2022-03-25		
By:	Z. Holland		
Checked By:	B. Hummelen		

Hydrologic Parameters: CALIB STANDHYD Command
Post Development Drainage Area: Catchment POST-3

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic Group	% Area	Area
Smithfield Silt Loam	Sms	C	100	0.5
				0
				0
				0
Total Area Check				0.5

Impervious Landuses Present:

Soils	Roadway Area (ha)	CN	Sidewalk Area (ha)	CN	Driveway Area (ha)	CN	Building Area (ha)	CN	SWMF Area (ha)	CN	Subtotals Area	A*CN
Sms	0.11	98		98		98		98		98	0.11	11
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
Subtotal Area	0.11		0		0		0		0		0.11	

Pervious Landuses Present:

Soils	Woodland Area (ha)	CN	Meadow Area (ha)	CN	Wetland Area (ha)	CN	Lawn Area (ha)	CN	Cultivated Area (ha)	CN	Subtotals Area	A*CN
Sms	0		0		0		0.39	79	0		0.39	30.68
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
Subtotal Area	0		0		0		0.39		0			

Pervious Area Calculations	Total Pervious Area	0.39
	Composite Pervious Curve Number	79.00
Impervious Area Calculations	Total Directly Connected Area	0.11
	Total Indirectly Connected Area	0.00
	Total Impervious Area*	0.11
	% X imp	22.3
	% T imp	22.3
	Total Area Check	0.50

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	0.39	1.94
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	2	20	0.25
Impervious	2.0	1	58	0.013

CROZIER & ASSOCIATES Consulting Engineers

Project Name:	Pilla Lands	**D.A. NAME**	**SWMF 1**
Project No.:	1101-4125	**D.A. AREA (ha)**	**1.8**
Date:	2022-03-25		
By:	Z. Holland		
Checked By:	B. Hummelen		

Hydrologic Parameters: CALIB STANDHYD Command
Post Development Drainage Area: Catchment SWMF 1

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic	% Area	Area
Smithfield Silt Loam	Sms	C	100.0	1.80
				0
				0
				0
Total Area Check				1.80

Impervious Landuses Present:

	Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
Sms		98		98		98		98	0.90	98	0.9	88.20
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
Subtotal Area	0		0		0		0		0.90			

Pervious Landuses Present:

	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
Sms	0		0		0		0.90	79	0		0.90	71.10
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
Subtotal Area	0		0		0		0.90		0			

Pervious Area Calculations	Total Pervious Area	0.90
	Composite Pervious Curve Number	79
Impervious Area Calculations	Total Directly Connected Area	0.90
	Total Indirectly Connected Area	0
	Total Impervious Area	0.90
	% X imp	50.0
	% T imp	50.0
	Total Area Check	1.80

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	0.9	4.50
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	2	20	0.25
Impervious	2.0	2	110	0.013

CROZIER & ASSOCIATES Consulting Engineers

Project Name:	Pilla Lands	**D.A. NAME**	**SWMF 2**
Project No.:	1101-4125	**D.A. AREA (ha)**	**1.0**
Date:	2022-03-25		
By:	Z. Holland		
Checked By:	B. Hummelen		

Hydrologic Parameters: CALIB STANDHYD Command
Post Development Drainage Area: Catchment SWMF 2

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic	% Area	Area
Schomberg Silty Clay	Shsc	C	100.0	1.00
				0
				0
				0
Total Area Check				1.00

Impervious Landuses Present:

	Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
Shsc		98		98		98		98	0.50	98	0.50	49.00
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
Subtotal Area	0		0		0		0		0.50			

Pervious Landuses Present:

	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
Shsc	0		0		0		0.50	79	0		0.50	39.50
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
Subtotal Area	0		0		0		0.50		0			

Pervious Area Calculations	Total Pervious Area	0.50
	Composite Pervious Curve Number	79
Impervious Area Calculations	Total Directly Connected Area	0.50
	Total Indirectly Connected Area	0
	Total Impervious Area	0.50
	% X imp	50.0
	% T imp	50.0
	Total Area Check	1.00

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	0.5	2.50
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	2	20	0.25
Impervious	2.0	2	82	0.013

CROZIER & ASSOCIATES Consulting Engineers

Project Name:	Pilla Lands	**D.A. NAME**	**EXT-1**
Project No.:	1101-4125	**D.A. AREA (ha)**	**4.0**
Date:	2022-01-05		
By:	Z. Holland		
Checked By:	B. Hummelen		

Hydrologic Parameters: CALIB STANDHYD Command
Post Development Drainage Area: Catchment EXT-1

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic Group	% Area	Area
Schomberg Silty Clay	Shsc	C	100	4
				0
				0
				0
Total Area Check				4

Impervious Landuses Present:

	Roadway		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
Shsc	1.82	98		98		98		98		98	1.82	178
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
Subtotal Area	1.82		0.00		0		0.00		0		1.82	

Pervious Landuses Present:

	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
Shsc	0		0		0		2.18	79	0		2.18	172.22
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
0	0		0		0		0		0		0	0
Subtotal Area	0		0		0		2.18		0			

Pervious Area Calculations	Total Pervious Area	2.18
	Composite Pervious Curve Number	79.00
Impervious Area Calculations	Total Directly Connected Area	1.82
	Total Indirectly Connected Area	0.00
	Total Impervious Area*	1.82
	% X imp	45.5
	% T imp	45.5
	Total Area Check	4.00

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	2.18	10.90
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	2	20	0.25
Impervious	2.0	1	163	0.013

CROZIER & ASSOCIATES Consulting Engineers

Project Name: Pilla Lands
Project Number: 1101-4125
Date: 2021-01-05
By: MT/ZH

D.A. NAME **EXT-2**
D.A. AREA (ha) **1.4**

Hydrologic Parameters: CALIB NASHYD Command
Pre Development Drainage Area: Catchment EXT-2

Curve Number Calculation

Soil Types Present:

Type	ID	Hydrologic Group	% Area	Area
Schomberg Silty Clay Loam	Shsc	C	100.0%	1.4
				0
				0
				0
Total Area Check				1.4

Impervious Landuses Present:

Soils	Roadway Area	Roadway CN	Sidewalk Area	Sidewalk CN	Driveway Area	Driveway CN	Building Area (ha)	Building CN	SWMF Area	SWMF CN	Subtotals Area	Subtotals A*CN
Shsc	0.27	98		98		98		98		98	0.27	26.46
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
0		98		98		98		98		98	0	0
Subtotal Area	0.27		0		0		0		0			

Pervious Landuses Present:

Soils	Woodland Area	Woodland CN	Meadow Area	Meadow CN	Wetland Area	Wetland CN	Lawn Area (ha)	Lawn CN	Cultivated Area	Cultivated CN	Subtotals Area	Subtotals A*CN
Shsc	0.00	73	0.00	76	0.00	50	1.13	79	0.0	82	1.13	89.27
0	0.00		0.00		0.00		0.00		0.00		0.00	0.00
0	0.00		0.00		0.00		0.00		0.00		0.00	0.00
0	0.00		0.00		0.00		0.00		0.00		0.00	0.00
Subtotal Area	0.00		0.00		0.00		1.13		0.0			

Composite Area Calculations		
	Total Pervious Area	1.1
	Total Impervious Area	0.3
	% Impervious	19.3%
	Composite Curve Number	82.7
	Total Area Check	1.4

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Curve Number								
Landuse	IA (mm)	Area (ha)	A * IA	Schomberg Silty Clay RC	Schomberg Silty Clay Area	0 RC	0 Area	0 RC	0 Area	0 RC	0 Area	A*RC
Woodland	10	0.00	0	0.35	0		0		0		0	0
Meadow	8	0	0	0.40	0		0		0		0	0
Wetland	16	0	0	0.05	0		0		0		0	0
Lawn	5	1.13	5.65	0.22	1.13		0		0		0	0.25
Cultivated	7	0	0.00	0.55	0		0		0		0	0.00
Impervious	2	0.27	0.54	0.95	0		0		0		0	0.26
Composite IA		1.4	4.4	Composite Runoff Coefficient								0.36

Time to Peak Inputs						Uplands			Bransby Williams		Airport	
Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Tc (hr)	Tp(hr)	TOTAL Tp (hr)	Tc (hr)	Tp(hr)	Tc (hr)	Tp(hr)
Overland	195	8	4.10%	2.7	0.55	0.10	0.07	0.07	0.14	0.09	0.35	0.24

Appropriate calculated time to peak:	0.24	Appropriate Method:	Airport

APPENDIX D

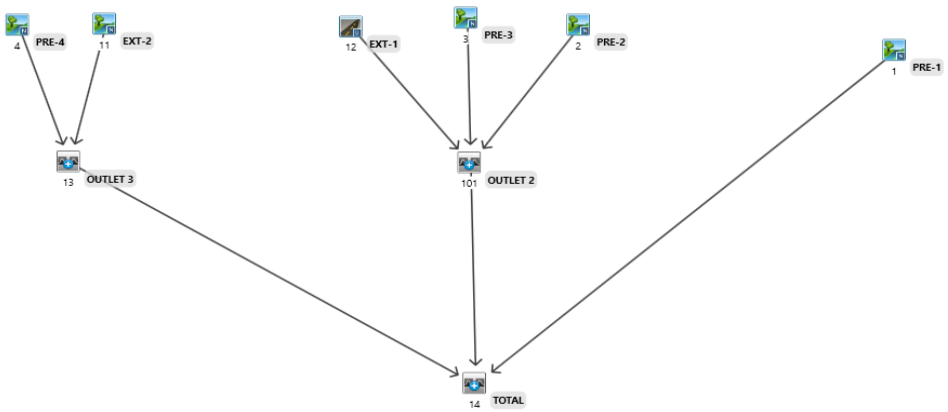
Visual OTTHYMO Output Files

CROZIER & ASSOCIATES
Consulting Engineers

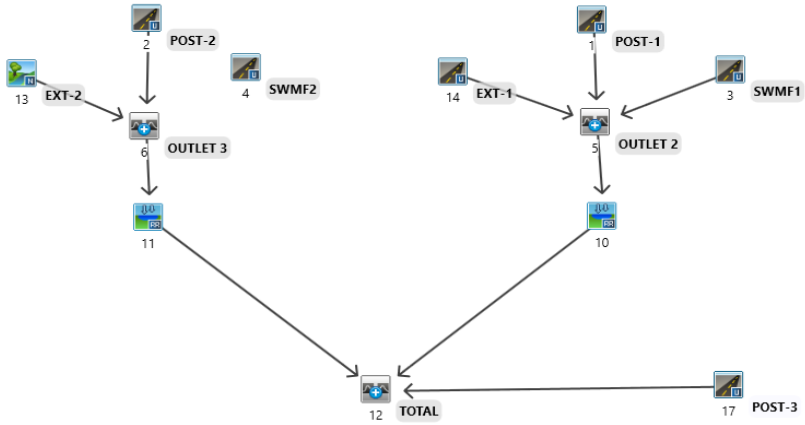
Project: Pilla Lands
Project No.: 1101-4125
File: Model Schematic
Design by: Z. Holland
Date: 2022-03-25

Visual OTTHYMO 6.0 Model Schematic

Pre-Development



Post-Development



```
*******************************
** SIMULATION:A - CHI 2yr     **
*******************************
    CHIC STORM                 10.0
    [ Ptot= 32.62 mm ]
*
 ** CALIB NASHYD         0001  1  5.0    8.80    0.12  1.75   8.44 0.26   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.37]
*
    CHIC STORM                 10.0
    [ Ptot= 32.62 mm ]
*
 ** CALIB NASHYD         0002  1  5.0    9.40    0.18  1.50   8.05 0.25   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.21]
*
    CHIC STORM                 10.0
    [ Ptot= 32.62 mm ]
*
 ** CALIB NASHYD         0003  1  5.0    8.50    0.18  1.50   8.04 0.25   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.18]
*
    CHIC STORM                 10.0
    [ Ptot= 32.62 mm ]
*
 *  CALIB STANDHYD       0012  1  5.0    4.00    0.37  1.33  18.76 0.57   0.000
    [I%=45.5:S%= 2.00]
*
    ADD [  0012+  0002]  0101  3  5.0   13.40    0.46  1.33  11.25  n/a   0.000
*
    ADD [  0101+  0003]  0101  1  5.0   21.90    0.57  1.33  10.00  n/a   0.000
*
    CHIC STORM                 10.0
    [ Ptot= 32.62 mm ]
*
 *  CALIB NASHYD         0004  1  5.0    2.40    0.05  1.50   8.04 0.25   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.17]
*
    CHIC STORM                 10.0
    [ Ptot= 32.62 mm ]
*
 *  CALIB NASHYD         0011  1  5.0    1.40    0.03  1.58   9.78 0.30   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.24]
*
```



```
    ADD [  0011+  0004]  0013  3  5.0    3.80    0.08  1.50   8.68  n/a   0.000
*
    ADD [  0001+  0101]  0014  3  5.0   30.70    0.59  1.33   9.56  n/a   0.000
*
    ADD [  0014+  0013]  0014  1  5.0   34.50    0.66  1.50   9.46  n/a   0.000
*
*******************************
** SIMULATION:B - CHI 5yr     **
*******************************
    CHIC STORM                 10.0
    [ Ptot= 42.94 mm ]
*
 ** CALIB NASHYD         0001  1  5.0    8.80    0.23  1.75  14.63 0.34   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.37]
*
    CHIC STORM                 10.0
    [ Ptot= 42.94 mm ]
*
 ** CALIB NASHYD         0002  1  5.0    9.40    0.34  1.50  14.06 0.33   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.21]
*
    CHIC STORM                 10.0
    [ Ptot= 42.94 mm ]
*
 ** CALIB NASHYD         0003  1  5.0    8.50    0.34  1.50  14.05 0.33   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.18]
*
    CHIC STORM                 10.0
    [ Ptot= 42.94 mm ]
*
 *  CALIB STANDHYD       0012  1  5.0    4.00    0.52  1.33  26.52 0.62   0.000
    [I%=45.5:S%= 2.00]
*
    ADD [  0012+  0002]  0101  3  5.0   13.40    0.71  1.33  17.78  n/a   0.000
*
    ADD [  0101+  0003]  0101  1  5.0   21.90    0.95  1.33  16.33  n/a   0.000
*
    CHIC STORM                 10.0
    [ Ptot= 42.94 mm ]
*
 *  CALIB NASHYD         0004  1  5.0    2.40    0.10  1.42  14.04 0.33   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.17]
*
    CHIC STORM                 10.0
```

```
    [ Ptot= 42.94 mm ]
*
 *  CALIB NASHYD         0011  1  5.0    1.40    0.06  1.50  16.19 0.38   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.24]
*
    ADD [  0011+  0004]  0013  3  5.0    3.80    0.15  1.50  14.83  n/a   0.000
*
    ADD [  0001+  0101]  0014  3  5.0   30.70    1.07  1.50  15.84  n/a   0.000
*
    ADD [  0014+  0013]  0014  1  5.0   34.50    1.23  1.50  15.73  n/a   0.000
*
*******************************
** SIMULATION:C - CHI 10yr    **
*******************************
    CHIC STORM                10.0
    [ Ptot= 49.92 mm ]
*
 ** CALIB NASHYD         0001  1  5.0    8.80    0.32  1.75  19.31 0.39   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.37]
*
    CHIC STORM                10.0
    [ Ptot= 49.92 mm ]
*
 ** CALIB NASHYD         0002  1  5.0    9.40    0.48  1.50  18.64 0.37   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.21]
*
    CHIC STORM                10.0
    [ Ptot= 49.92 mm ]
*
 ** CALIB NASHYD         0003  1  5.0    8.50    0.47  1.50  18.61 0.37   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.18]
*
    CHIC STORM                10.0
    [ Ptot= 49.92 mm ]
*
 *  CALIB STANDHYD       0012  1  5.0    4.00    0.68  1.33  32.04 0.64   0.000
    [I%=45.5:S%= 2.00]
*
    ADD [  0012+  0002]  0101  3  5.0   13.40    0.96  1.33  22.64  n/a   0.000
*
    ADD [  0101+  0003]  0101  1  5.0   21.90    1.30  1.33  21.08  n/a   0.000
*
    CHIC STORM                10.0
    [ Ptot= 49.92 mm ]
```



```
*
 *  CALIB NASHYD         0004  1  5.0    2.40    0.14  1.42  18.60 0.37   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.17]
*
    CHIC STORM                10.0
    [ Ptot= 49.92 mm ]
*
 *  CALIB NASHYD         0011  1  5.0    1.40    0.08  1.50  20.98 0.42   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.24]
*
    ADD [  0011+  0004]  0013  3  5.0    3.80    0.21  1.50  19.48  n/a   0.000
*
    ADD [  0001+  0101]  0014  3  5.0   30.70    1.45  1.50  20.57  n/a   0.000
*
    ADD [  0014+  0013]  0014  1  5.0   34.50    1.66  1.50  20.45  n/a   0.000
*
*******************************
** SIMULATION:D- CHI 25yr     **
*******************************
    CHIC STORM                10.0
    [ Ptot= 58.57 mm ]
*
 ** CALIB NASHYD         0001  1  5.0    8.80    0.43  1.75  25.54 0.44   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.37]
*
    CHIC STORM                10.0
    [ Ptot= 58.57 mm ]
*
 ** CALIB NASHYD         0002  1  5.0    9.40    0.66  1.50  24.74 0.42   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.21]
*
    CHIC STORM                10.0
    [ Ptot= 58.57 mm ]
*
 ** CALIB NASHYD         0003  1  5.0    8.50    0.65  1.42  24.71 0.42   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.18]
*
    CHIC STORM                10.0
    [ Ptot= 58.57 mm ]
*
 *  CALIB STANDHYD       0012  1  5.0    4.00    0.83  1.33  39.11 0.67   0.000
    [I%=45.5:S%= 2.00]
*
```

```
    ADD [  0012+  0002]  0101  3  5.0   13.40    1.24  1.33  29.03  n/a   0.000
*
    ADD [  0101+  0003]  0101  1  5.0   21.90    1.72  1.33  27.35  n/a   0.000
*
    CHIC STORM                 10.0
    [ Ptot= 58.57 mm ]
*
 *  CALIB NASHYD         0004  1  5.0    2.40    0.19  1.42  24.69 0.42   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.17]
*
    CHIC STORM                 10.0
    [ Ptot= 58.57 mm ]
*
 *  CALIB NASHYD         0011  1  5.0    1.40    0.10  1.50  27.32 0.47   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.24]
*
    ADD [  0011+  0004]  0013  3  5.0    3.80    0.29  1.50  25.66  n/a   0.000
*
    ADD [  0001+  0101]  0014  3  5.0   30.70    1.96  1.42  26.83  n/a   0.000
*
    ADD [  0014+  0013]  0014  1  5.0   34.50    2.24  1.50  26.70  n/a   0.000
*
********************************
** SIMULATION:E - CHI 50yr    **
********************************
    CHIC STORM                 10.0
    [ Ptot= 64.94 mm ]
*
 ** CALIB NASHYD         0001  1  5.0    8.80    0.53  1.67  30.37 0.47   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.37]
*
    CHIC STORM                 10.0
    [ Ptot= 64.94 mm ]
*
 ** CALIB NASHYD         0002  1  5.0    9.40    0.80  1.50  29.48 0.45   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.21]
*
    CHIC STORM                 10.0
    [ Ptot= 64.94 mm ]
*
 ** CALIB NASHYD         0003  1  5.0    8.50    0.79  1.42  29.44 0.45   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.18]
*
```



```
    CHIC STORM                 10.0
    [ Ptot= 64.94 mm ]
*
 *  CALIB STANDHYD       0012  1  5.0    4.00    0.94  1.33  44.45 0.68   0.000
    [I%=45.5:S%= 2.00]
*
    ADD [  0012+  0002]  0101  3  5.0   13.40    1.46  1.33  33.95  n/a   0.000
*
    ADD [  0101+  0003]  0101  1  5.0   21.90    2.06  1.42  32.20  n/a   0.000
*
    CHIC STORM                 10.0
    [ Ptot= 64.94 mm ]
*
 *  CALIB NASHYD         0004  1  5.0    2.40    0.23  1.42  29.42 0.45   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.17]
*
    CHIC STORM                 10.0
    [ Ptot= 64.94 mm ]
*
 *  CALIB NASHYD         0011  1  5.0    1.40    0.12  1.50  32.21 0.50   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.24]
*
    ADD [  0011+  0004]  0013  3  5.0    3.80    0.34  1.50  30.45  n/a   0.000
*
    ADD [  0001+  0101]  0014  3  5.0   30.70    2.37  1.42  31.68  n/a   0.000
*
    ADD [  0014+  0013]  0014  1  5.0   34.50    2.72  1.42  31.54  n/a   0.000
*
********************************
** SIMULATION:F- CHI 100yr    **
********************************
    CHIC STORM                 10.0
    [ Ptot= 71.31 mm ]
*
 ** CALIB NASHYD         0001  1  5.0    8.80    0.62  1.67  35.37 0.50   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.37]
*
    CHIC STORM                 10.0
    [ Ptot= 71.31 mm ]
*
 ** CALIB NASHYD         0002  1  5.0    9.40    0.95  1.50  34.39 0.48   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.21]
*
    CHIC STORM                 10.0
```

```
    [ Ptot= 71.31 mm ]
*
 ** CALIB NASHYD         0003  1  5.0    8.50    0.94  1.42  34.35 0.48   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.18]
*
    CHIC STORM                 10.0
    [ Ptot= 71.31 mm ]
*
 *  CALIB STANDHYD       0012  1  5.0    4.00    1.06  1.33  49.90 0.70   0.000
    [I%=45.5:S%= 2.00]
*
    ADD [  0012+  0002]  0101  3  5.0   13.40    1.69  1.33  39.02  n/a   0.000
*
    ADD [  0101+  0003]  0101  1  5.0   21.90    2.43  1.42  37.21  n/a   0.000
*
    CHIC STORM                 10.0
    [ Ptot= 71.31 mm ]
*
 *  CALIB NASHYD         0004  1  5.0    2.40    0.28  1.42  34.32 0.48   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.17]
*
    CHIC STORM                 10.0
    [ Ptot= 71.31 mm ]
*
 *  CALIB NASHYD         0011  1  5.0    1.40    0.14  1.50  37.26 0.52   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.24]
*
    ADD [  0011+  0004]  0013  3  5.0    3.80    0.41  1.42  35.41  n/a   0.000
*
    ADD [  0001+  0101]  0014  3  5.0   30.70    2.80  1.42  36.68  n/a   0.000
*
    ADD [  0014+  0013]  0014  1  5.0   34.50    3.21  1.42  36.54  n/a   0.000
*
*******************************
** SIMULATION:G - SCS 2yr     **
*******************************
    READ STORM                  5.0
    [ Ptot= 55.96 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\8613a693-
ca8e-4336-9a5c-6b
    remark: 2yr 24hr 5min SCS

*
 ** CALIB NASHYD         0001  1  5.0    8.80    0.35 12.33  23.62 0.42   0.000
```



```
    [CN=82.7         ]
    [ N = 3.0:Tp 0.37]
*
    READ STORM                  5.0
    [ Ptot= 55.96 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\8613a693-
ca8e-4336-9a5c-6b
    remark: 2yr 24hr 5min SCS

*
 ** CALIB NASHYD         0002  1  5.0    9.40    0.54 12.17  22.86 0.41   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.21]
*
    READ STORM                  5.0
    [ Ptot= 55.96 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\8613a693-
ca8e-4336-9a5c-6b
    remark: 2yr 24hr 5min SCS

*
 ** CALIB NASHYD         0003  1  5.0    8.50    0.53 12.17  22.83 0.41   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.18]
*
    READ STORM                  5.0
    [ Ptot= 55.96 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\8613a693-
ca8e-4336-9a5c-6b
    remark: 2yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0012  1  5.0    4.00    0.44 12.08  36.95 0.66   0.000
    [I%=45.5:S%= 2.00]
*
    ADD [  0012+  0002]  0101  3  5.0   13.40    0.93 12.08  27.06  n/a   0.000
*
    ADD [  0101+  0003]  0101  1  5.0   21.90    1.44 12.08  25.42  n/a   0.000
*
    READ STORM                  5.0
    [ Ptot= 55.96 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\8613a693-
ca8e-4336-9a5c-6b
    remark: 2yr 24hr 5min SCS
```

```
*
 *  CALIB NASHYD         0004  1  5.0    2.40    0.15 12.17  22.81 0.41   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.17]
*
    READ STORM                  5.0
    [ Ptot= 55.96 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\8613a693-
ca8e-4336-9a5c-6b
    remark: 2yr 24hr 5min SCS

*
 *  CALIB NASHYD         0011  1  5.0    1.40    0.08 12.17  25.37 0.45   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.24]
*
    ADD [  0011+  0004]  0013  3  5.0    3.80    0.23 12.17  23.75  n/a   0.000
*
    ADD [  0001+  0101]  0014  3  5.0   30.70    1.66 12.08  24.90  n/a   0.000
*
    ADD [  0014+  0013]  0014  1  5.0   34.50    1.88 12.08  24.78  n/a   0.000
*
*******************************
** SIMULATION:H - SCS 5yr     **
*******************************
    READ STORM                  5.0
    [ Ptot= 73.66 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\f310377e-
22db-4469-9336-5b
    remark: 5yr 24hr 5min SCS

*
 ** CALIB NASHYD         0001  1  5.0    8.80    0.56 12.33  37.25 0.51   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.37]
*
    READ STORM                  5.0
    [ Ptot= 73.66 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\f310377e-
22db-4469-9336-5b
    remark: 5yr 24hr 5min SCS

*
 ** CALIB NASHYD         0002  1  5.0    9.40    0.87 12.17  36.24 0.49   0.000
```



```
    [CN=82.0         ]
    [ N = 3.0:Tp 0.21]
*
    READ STORM                  5.0
    [ Ptot= 73.66 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\f310377e-
22db-4469-9336-5b
    remark: 5yr 24hr 5min SCS

*
 ** CALIB NASHYD         0003  1  5.0    8.50    0.85 12.17  36.19 0.49   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.18]
*
    READ STORM                  5.0
    [ Ptot= 73.66 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\f310377e-
22db-4469-9336-5b
    remark: 5yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0012  1  5.0    4.00    0.67 12.08  51.93 0.70   0.000
    [I%=45.5:S%= 2.00]
*
    ADD [  0012+  0002]  0101  3  5.0   13.40    1.46 12.08  40.92  n/a   0.000
*
    ADD [  0101+  0003]  0101  1  5.0   21.90    2.29 12.08  39.09  n/a   0.000
*
    READ STORM                  5.0
    [ Ptot= 73.66 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\f310377e-
22db-4469-9336-5b
    remark: 5yr 24hr 5min SCS

*
 *  CALIB NASHYD         0004  1  5.0    2.40    0.25 12.08  36.17 0.49   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.17]
*
    READ STORM                  5.0
    [ Ptot= 73.66 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\f310377e-
22db-4469-9336-5b
    remark: 5yr 24hr 5min SCS
```

```
*
 *  CALIB NASHYD         0011  1  5.0    1.40    0.13 12.17  39.16 0.53   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.24]
*
    ADD [  0011+  0004]  0013  3  5.0    3.80    0.37 12.17  37.27  n/a   0.000
*
    ADD [  0001+  0101]  0014  3  5.0   30.70    2.65 12.08  38.56  n/a   0.000
*
    ADD [  0014+  0013]  0014  1  5.0   34.50    3.01 12.08  38.42  n/a   0.000
*
*********************************
** SIMULATION:I - SCS 10yr    **
*********************************
    READ STORM                  5.0
    [ Ptot= 85.63 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\6568698a-
3b64-4aca-acd6-7b
    remark: 10yr 24hr 5min SCS

*
 ** CALIB NASHYD         0001  1  5.0    8.80    0.71 12.33  47.08 0.55   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.37]
*
    READ STORM                  5.0
    [ Ptot= 85.63 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\6568698a-
3b64-4aca-acd6-7b
    remark: 10yr 24hr 5min SCS

*
 ** CALIB NASHYD         0002  1  5.0    9.40    1.11 12.17  45.93 0.54   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.21]
*
    READ STORM                  5.0
    [ Ptot= 85.63 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\6568698a-
3b64-4aca-acd6-7b
    remark: 10yr 24hr 5min SCS

*
 ** CALIB NASHYD         0003  1  5.0    8.50    1.08 12.17  45.87 0.54   0.000
```



```
    [CN=82.0         ]
    [ N = 3.0:Tp 0.18]
*
    READ STORM                  5.0
    [ Ptot= 85.63 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\6568698a-
3b64-4aca-acd6-7b
    remark: 10yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0012  1  5.0    4.00    0.82 12.08  62.42 0.73   0.000
    [I%=45.5:S%= 2.00]
*
    ADD [  0012+  0002]  0101  3  5.0   13.40    1.83 12.08  50.86  n/a   0.000
*
    ADD [  0101+  0003]  0101  1  5.0   21.90    2.89 12.08  48.92  n/a   0.000
*
    READ STORM                  5.0
    [ Ptot= 85.63 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\6568698a-
3b64-4aca-acd6-7b
    remark: 10yr 24hr 5min SCS

*
 *  CALIB NASHYD         0004  1  5.0    2.40    0.31 12.08  45.84 0.54   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.17]
*
    READ STORM                  5.0
    [ Ptot= 85.63 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\6568698a-
3b64-4aca-acd6-7b
    remark: 10yr 24hr 5min SCS

*
 *  CALIB NASHYD         0011  1  5.0    1.40    0.16 12.17  49.06 0.57   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.24]
*
    ADD [  0011+  0004]  0013  3  5.0    3.80    0.47 12.17  47.03  n/a   0.000
*
    ADD [  0001+  0101]  0014  3  5.0   30.70    3.36 12.08  48.39  n/a   0.000
*
    ADD [  0014+  0013]  0014  1  5.0   34.50    3.81 12.08  48.24  n/a   0.000
*
```

```
*******************************
** SIMULATION:J - SCS 25yr    **
*******************************
    READ STORM                  5.0
    [ Ptot=100.47 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\d393fc61-
ea1d-4006-a82d-68
    remark: 25yr 24hr 5min SCS

*
 ** CALIB NASHYD         0001  1  5.0    8.80    0.91 12.33  59.76 0.59   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.37]
*
    READ STORM                  5.0
    [ Ptot=100.47 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\d393fc61-
ea1d-4006-a82d-68
    remark: 25yr 24hr 5min SCS

*
 ** CALIB NASHYD         0002  1  5.0    9.40    1.42 12.17  58.45 0.58   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.21]
*
    READ STORM                  5.0
    [ Ptot=100.47 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\d393fc61-
ea1d-4006-a82d-68
    remark: 25yr 24hr 5min SCS

*
 ** CALIB NASHYD         0003  1  5.0    8.50    1.37 12.17  58.38 0.58   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.18]
*
    READ STORM                  5.0
    [ Ptot=100.47 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\d393fc61-
ea1d-4006-a82d-68
    remark: 25yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0012  1  5.0    4.00    1.01 12.08  75.74 0.75   0.000
```



```
    [I%=45.5:S%= 2.00]
*
    ADD [  0012+  0002]  0101  3  5.0   13.40    2.30 12.08  63.61  n/a   0.000
*
    ADD [  0101+  0003]  0101  1  5.0   21.90    3.65 12.08  61.58  n/a   0.000
*
    READ STORM                  5.0
    [ Ptot=100.47 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\d393fc61-
ea1d-4006-a82d-68
    remark: 25yr 24hr 5min SCS

*
 *  CALIB NASHYD         0004  1  5.0    2.40    0.40 12.08  58.34 0.58   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.17]
*
    READ STORM                  5.0
    [ Ptot=100.47 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\d393fc61-
ea1d-4006-a82d-68
    remark: 25yr 24hr 5min SCS

*
 *  CALIB NASHYD         0011  1  5.0    1.40    0.20 12.17  61.80 0.62   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.24]
*
    ADD [  0011+  0004]  0013  3  5.0    3.80    0.60 12.17  59.61  n/a   0.000
*
    ADD [  0001+  0101]  0014  3  5.0   30.70    4.26 12.08  61.06  n/a   0.000
*
    ADD [  0014+  0013]  0014  1  5.0   34.50    4.84 12.08  60.90  n/a   0.000
*
*******************************
** SIMULATION:K - SCS 50yr    **
*******************************
    READ STORM                  5.0
    [ Ptot=111.40 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\7676a897-
43ac-43d1-9637-6c
    remark: 50yr 24hr 5min SCS

*
 ** CALIB NASHYD         0001  1  5.0    8.80    1.06 12.33  69.35 0.62   0.000
```

```
    [CN=82.7         ]
    [ N = 3.0:Tp 0.37]
*
    READ STORM                  5.0
    [ Ptot=111.40 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\7676a897-
43ac-43d1-9637-6c
    remark: 50yr 24hr 5min SCS

*
 ** CALIB NASHYD         0002  1  5.0    9.40    1.65 12.17  67.95 0.61   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.21]
*
    READ STORM                  5.0
    [ Ptot=111.40 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\7676a897-
43ac-43d1-9637-6c
    remark: 50yr 24hr 5min SCS

*
 ** CALIB NASHYD         0003  1  5.0    8.50    1.59 12.17  67.86 0.61   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.18]
*
    READ STORM                  5.0
    [ Ptot=111.40 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\7676a897-
43ac-43d1-9637-6c
    remark: 50yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0012  1  5.0    4.00    1.15 12.08  85.71 0.77   0.000
    [I%=45.5:S%= 2.00]
*
    ADD [  0012+  0002]  0101  3  5.0   13.40    2.65 12.08  73.25  n/a   0.000
*
    ADD [  0101+  0003]  0101  1  5.0   21.90    4.23 12.08  71.16  n/a   0.000
*
    READ STORM                  5.0
    [ Ptot=111.40 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\7676a897-
43ac-43d1-9637-6c
    remark: 50yr 24hr 5min SCS
```



```
*
 *  CALIB NASHYD         0004  1  5.0    2.40    0.47 12.08  67.81 0.61   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.17]
*
    READ STORM                  5.0
    [ Ptot=111.40 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\7676a897-
43ac-43d1-9637-6c
    remark: 50yr 24hr 5min SCS

*
 *  CALIB NASHYD         0011  1  5.0    1.40    0.23 12.17  71.43 0.64   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.24]
*
    ADD [  0011+  0004]  0013  3  5.0    3.80    0.69 12.17  69.14  n/a   0.000
*
    ADD [  0001+  0101]  0014  3  5.0   30.70    4.94 12.08  70.64  n/a   0.000
*
    ADD [  0014+  0013]  0014  1  5.0   34.50    5.61 12.08  70.48  n/a   0.000
*
*******************************
** SIMULATION:L - SCS 100yr   **
*******************************
    READ STORM                  5.0
    [ Ptot=122.33 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\0536c2c6-
dc4d-4f7a-93d0-2a
    remark: 100yr 24hr 5min SCS

*
 ** CALIB NASHYD         0001  1  5.0    8.80    1.21 12.33  79.12 0.65   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.37]
*
    READ STORM                  5.0
    [ Ptot=122.33 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\0536c2c6-
dc4d-4f7a-93d0-2a
    remark: 100yr 24hr 5min SCS

*
 ** CALIB NASHYD         0002  1  5.0    9.40    1.88 12.17  77.62 0.63   0.000
```

```
    [CN=82.0         ]
    [ N = 3.0:Tp 0.21]
*
    READ STORM                  5.0
    [ Ptot=122.33 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\0536c2c6-
dc4d-4f7a-93d0-2a
    remark: 100yr 24hr 5min SCS

*
 ** CALIB NASHYD         0003  1  5.0    8.50    1.82 12.17  77.52 0.63   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.18]
*
    READ STORM                  5.0
    [ Ptot=122.33 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\0536c2c6-
dc4d-4f7a-93d0-2a
    remark: 100yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0012  1  5.0    4.00    1.29 12.08  95.79 0.78   0.000
    [I%=45.5:S%= 2.00]
*
    ADD [  0012+  0002]  0101  3  5.0   13.40    3.01 12.08  83.05  n/a   0.000
*
    ADD [  0101+  0003]  0101  1  5.0   21.90    4.82 12.08  80.90  n/a   0.000
*
    READ STORM                  5.0
    [ Ptot=122.33 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\0536c2c6-
dc4d-4f7a-93d0-2a
    remark: 100yr 24hr 5min SCS

*
 *  CALIB NASHYD         0004  1  5.0    2.40    0.53 12.08  77.47 0.63   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.17]
*
    READ STORM                  5.0
    [ Ptot=122.33 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\0536c2c6-
dc4d-4f7a-93d0-2a
    remark: 100yr 24hr 5min SCS
```



```
*
 *  CALIB NASHYD         0011  1  5.0    1.40    0.27 12.17  81.22 0.66   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.24]
*
    ADD [  0011+  0004]  0013  3  5.0    3.80    0.79 12.17  78.85  n/a   0.000
*
    ADD [  0001+  0101]  0014  3  5.0   30.70    5.63 12.08  80.39  n/a   0.000
*
    ADD [  0014+  0013]  0014  1  5.0   34.50    6.40 12.08  80.22  n/a   0.000
*
********************************
** SIMULATION:M - 25mm        **
********************************
    READ STORM                  5.0
    [ Ptot= 26.26 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\8525347f-
0202-4c68-a087-72
    remark: 25mm

*
 ** CALIB NASHYD         0001  1  5.0    8.80    0.09  1.58   5.21 0.20   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.37]
*
    READ STORM                  5.0
    [ Ptot= 26.26 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\8525347f-
0202-4c68-a087-72
    remark: 25mm

*
 ** CALIB NASHYD         0002  1  5.0    9.40    0.12  1.33   4.94 0.19   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.21]
*
    READ STORM                  5.0
    [ Ptot= 26.26 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\8525347f-
0202-4c68-a087-72
    remark: 25mm

*
 ** CALIB NASHYD         0003  1  5.0    8.50    0.12  1.25   4.93 0.19   0.000
```

```
    [CN=82.0         ]
    [ N = 3.0:Tp 0.18]
*
    READ STORM                  5.0
    [ Ptot= 26.26 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\8525347f-
0202-4c68-a087-72
    remark: 25mm

*
 *  CALIB STANDHYD       0012  1  5.0    4.00    0.34  1.00  14.26 0.54   0.000
    [I%=45.5:S%= 2.00]
*
    ADD [  0012+  0002]  0101  3  5.0   13.40    0.36  1.00   7.72  n/a   0.000
*
    ADD [  0101+  0003]  0101  1  5.0   21.90    0.38  1.00   6.64  n/a   0.000
*
    READ STORM                  5.0
    [ Ptot= 26.26 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\8525347f-
0202-4c68-a087-72
    remark: 25mm

*
 *  CALIB NASHYD         0004  1  5.0    2.40    0.03  1.25   4.93 0.19   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.17]
*
    READ STORM                  5.0
    [ Ptot= 26.26 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\8525347f-
0202-4c68-a087-72
    remark: 25mm

*
 *  CALIB NASHYD         0011  1  5.0    1.40    0.02  1.33   6.36 0.24   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.24]
*
    ADD [  0011+  0004]  0013  3  5.0    3.80    0.06  1.25   5.46  n/a   0.000
*
    ADD [  0001+  0101]  0014  3  5.0   30.70    0.40  1.25   6.23  n/a   0.000
*
    ADD [  0014+  0013]  0014  1  5.0   34.50    0.46  1.25   6.14  n/a   0.000
*
```



```
*******************************
** SIMULATION:N - Timmins     **
*******************************
    READ STORM                 60.0
    [ Ptot=193.00 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\645d6042-
ab15-4a35-8d2d-f2
    remark: tim

*
 ** CALIB NASHYD         0001  1  5.0    8.80    0.86  7.08 144.84 0.75   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.37]
*
    READ STORM                 60.0
    [ Ptot=193.00 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\645d6042-
ab15-4a35-8d2d-f2
    remark: tim

*
 ** CALIB NASHYD         0002  1  5.0    9.40    0.97  7.00 142.88 0.74   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.21]
*
    READ STORM                 60.0
    [ Ptot=193.00 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\645d6042-
ab15-4a35-8d2d-f2
    remark: tim

*
 ** CALIB NASHYD         0003  1  5.0    8.50    0.88  7.00 142.69 0.74   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.18]
*
    READ STORM                 60.0
    [ Ptot=193.00 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\645d6042-
ab15-4a35-8d2d-f2
    remark: tim

*
 *  CALIB STANDHYD       0012  1  5.0    4.00    0.43  7.00 162.74 0.84   0.000
```

```
 2022.03.24_Pre Dev VO Files
    [I%=45.5:S%= 2.00]
*
    ADD [  0012+  0002]  0101  3  5.0   13.40    1.40  7.00 148.81  n/a   0.000
*
    ADD [  0101+  0003]  0101  1  5.0   21.90    2.28  7.00 146.43  n/a   0.000
*
    READ STORM                 60.0
    [ Ptot=193.00 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\645d6042-
ab15-4a35-8d2d-f2
    remark: tim

*
 *  CALIB NASHYD         0004  1  5.0    2.40    0.25  7.00 142.59 0.74   0.000
    [CN=82.0         ]
    [ N = 3.0:Tp 0.17]
*
    READ STORM                 60.0
    [ Ptot=193.00 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\69bd3668-928e-4b5a-9d3c-7559e309faab\645d6042-
ab15-4a35-8d2d-f2
    remark: tim

*
 *  CALIB NASHYD         0011  1  5.0    1.40    0.15  7.00 147.01 0.76   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.24]
*
    ADD [  0011+  0004]  0013  3  5.0    3.80    0.39  7.00 144.22  n/a   0.000
*
    ADD [  0001+  0101]  0014  3  5.0   30.70    3.14  7.00 145.98  n/a   0.000
*
    ADD [  0014+  0013]  0014  1  5.0   34.50    3.54  7.00 145.78  n/a   0.000
*
```

```
*******************************
** SIMULATION:A - CHI 2Yr     **
*******************************
    CHIC STORM                 10.0
    [ Ptot= 32.62 mm ]
*
 ** CALIB NASHYD         0013  1  5.0    1.40    0.03  1.58   9.78 0.30   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.24]
*
    CHIC STORM                 10.0
    [ Ptot= 32.62 mm ]
*
 *  CALIB STANDHYD       0002  1  5.0    6.50    0.74  1.33  23.49 0.72   0.000
    [I%=41.3:S%= 2.00]
*
    CHIC STORM                 10.0
    [ Ptot= 32.62 mm ]
*
 *  CALIB STANDHYD       0004  1  5.0    1.00    0.11  1.33  19.81 0.61   0.000
    [I%=50.0:S%= 2.00]
*
    ADD [  0013+  0002]  0006  3  5.0    7.90    0.76  1.33  21.06  n/a   0.000
*
    ADD [  0006+  0004]  0006  1  5.0    8.90    0.87  1.33  20.92  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0011  1  5.0    8.90    0.03  4.08  20.70  n/a   0.000
*
    CHIC STORM                 10.0
    [ Ptot= 32.62 mm ]
*
 *  CALIB STANDHYD       0001  1  5.0   19.30    2.12  1.33  24.38 0.75   0.000
    [I%=43.9:S%= 2.00]
*
    CHIC STORM                 10.0
    [ Ptot= 32.62 mm ]
*
 *  CALIB STANDHYD       0003  1  5.0    1.80    0.19  1.33  19.82 0.61   0.000
    [I%=50.0:S%= 2.00]
*
    CHIC STORM                 10.0
    [ Ptot= 32.62 mm ]
*
 *  CALIB STANDHYD       0014  1  5.0    4.00    0.37  1.33  18.76 0.57   0.000
    [I%=45.5:S%= 2.00]
*
    ADD [  0001+  0014]  0005  3  5.0   23.30    2.49  1.33  23.41  n/a   0.000
```



```
*
    ADD [  0005+  0003]  0005  1  5.0   25.10    2.68  1.33  23.16  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0010  1  5.0   25.10    0.07  4.17  23.08  n/a   0.000
*
    CHIC STORM                 10.0
    [ Ptot= 32.62 mm ]
*
 *  CALIB STANDHYD       0017  1  5.0    0.50    0.04  1.33  16.95 0.52   0.000
    [I%=22.3:S%= 2.00]
*
    ADD [  0010+  0011]  0012  3  5.0   34.00    0.10  4.17  22.45  n/a   0.000
*
    ADD [  0012+  0017]  0012  1  5.0   34.50    0.10  4.08  22.37  n/a   0.000
*
*******************************
** SIMULATION:B - CHI 5Yr     **
*******************************
    CHIC STORM                 10.0
    [ Ptot= 42.94 mm ]
*
 ** CALIB NASHYD         0013  1  5.0    1.40    0.06  1.50  16.19 0.38   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.24]
*
    CHIC STORM                 10.0
    [ Ptot= 42.94 mm ]
*
 *  CALIB STANDHYD       0002  1  5.0    6.50    1.07  1.33  32.89 0.77   0.000
    [I%=41.3:S%= 2.00]
*
    CHIC STORM                 10.0
    [ Ptot= 42.94 mm ]
*
 *  CALIB STANDHYD       0004  1  5.0    1.00    0.16  1.33  27.79 0.65   0.000
    [I%=50.0:S%= 2.00]
*
    ADD [  0013+  0002]  0006  3  5.0    7.90    1.10  1.33  29.93  n/a   0.000
*
    ADD [  0006+  0004]  0006  1  5.0    8.90    1.26  1.33  29.69  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0011  1  5.0    8.90    0.07  4.00  29.47  n/a   0.000
*
    CHIC STORM                 10.0
    [ Ptot= 42.94 mm ]
*
```

```
 *  CALIB STANDHYD       0001  1  5.0   19.30    3.08  1.33  33.93 0.79   0.000
    [I%=43.9:S%= 2.00]
*
    CHIC STORM                10.0
    [ Ptot= 42.94 mm ]
*
 *  CALIB STANDHYD       0003  1  5.0    1.80    0.28  1.33  27.79 0.65   0.000
    [I%=50.0:S%= 2.00]
*
    CHIC STORM                10.0
    [ Ptot= 42.94 mm ]
*
 *  CALIB STANDHYD       0014  1  5.0    4.00    0.52  1.33  26.52 0.62   0.000
    [I%=45.5:S%= 2.00]
*
    ADD [  0001+  0014]  0005  3  5.0   23.30    3.60  1.33  32.66  n/a   0.000
*
    ADD [  0005+  0003]  0005  1  5.0   25.10    3.87  1.33  32.31  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0010  1  5.0   25.10    0.22  3.83  32.23  n/a   0.000
*
    CHIC STORM                10.0
    [ Ptot= 42.94 mm ]
*
 *  CALIB STANDHYD       0017  1  5.0    0.50    0.06  1.33  24.81 0.58   0.000
    [I%=22.3:S%= 2.00]
*
    ADD [  0010+  0011]  0012  3  5.0   34.00    0.29  3.83  31.51  n/a   0.000
*
    ADD [  0012+  0017]  0012  1  5.0   34.50    0.29  3.83  31.41  n/a   0.000
*
*********************************
** SIMULATION:C - CHI 10Yr    **
*********************************
    CHIC STORM                10.0
    [ Ptot= 49.92 mm ]
*
 ** CALIB NASHYD         0013  1  5.0    1.40    0.08  1.50  20.98 0.42   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.24]
*
    CHIC STORM                10.0
    [ Ptot= 49.92 mm ]
*
 *  CALIB STANDHYD       0002  1  5.0    6.50    1.31  1.33  39.40 0.79   0.000
    [I%=41.3:S%= 2.00]
*
```



```
    CHIC STORM                10.0
    [ Ptot= 49.92 mm ]
*
 *  CALIB STANDHYD       0004  1  5.0    1.00    0.19  1.33  33.43 0.67   0.000
    [I%=50.0:S%= 2.00]
*
    ADD [  0013+  0002]  0006  3  5.0    7.90    1.35  1.33  36.13  n/a   0.000
*
    ADD [  0006+  0004]  0006  1  5.0    8.90    1.54  1.33  35.83  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0011  1  5.0    8.90    0.11  3.08  35.61  n/a   0.000
*
    CHIC STORM                10.0
    [ Ptot= 49.92 mm ]
*
 *  CALIB STANDHYD       0001  1  5.0   19.30    3.76  1.33  40.52 0.81   0.000
    [I%=43.9:S%= 2.00]
*
    CHIC STORM                10.0
    [ Ptot= 49.92 mm ]
*
 *  CALIB STANDHYD       0003  1  5.0    1.80    0.33  1.33  33.43 0.67   0.000
    [I%=50.0:S%= 2.00]
*
    CHIC STORM                10.0
    [ Ptot= 49.92 mm ]
*
 *  CALIB STANDHYD       0014  1  5.0    4.00    0.68  1.33  32.04 0.64   0.000
    [I%=45.5:S%= 2.00]
*
    ADD [  0001+  0014]  0005  3  5.0   23.30    4.44  1.33  39.07  n/a   0.000
*
    ADD [  0005+  0003]  0005  1  5.0   25.10    4.77  1.33  38.66  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0010  1  5.0   25.10    0.36  2.83  38.58  n/a   0.000
*
    CHIC STORM                10.0
    [ Ptot= 49.92 mm ]
*
 *  CALIB STANDHYD       0017  1  5.0    0.50    0.07  1.33  30.43 0.61   0.000
    [I%=22.3:S%= 2.00]
*
    ADD [  0010+  0011]  0012  3  5.0   34.00    0.48  2.83  37.80  n/a   0.000
*
    ADD [  0012+  0017]  0012  1  5.0   34.50    0.48  2.83  37.70  n/a   0.000
*
```

```
*******************************
** SIMULATION:D - CHI 25Yr    **
*******************************
    CHIC STORM                 10.0
    [ Ptot= 58.57 mm ]
*
 ** CALIB NASHYD         0013  1  5.0    1.40    0.10  1.50  27.32 0.47   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.24]
*
    CHIC STORM                 10.0
    [ Ptot= 58.57 mm ]
*
 *  CALIB STANDHYD       0002  1  5.0    6.50    1.61  1.33  47.58 0.81   0.000
    [I%=41.3:S%= 2.00]
*
    CHIC STORM                 10.0
    [ Ptot= 58.57 mm ]
*
 *  CALIB STANDHYD       0004  1  5.0    1.00    0.23  1.33  40.63 0.69   0.000
    [I%=50.0:S%= 2.00]
*
    ADD [  0013+  0002]  0006  3  5.0    7.90    1.67  1.33  43.99  n/a   0.000
*
    ADD [  0006+  0004]  0006  1  5.0    8.90    1.90  1.33  43.61  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0011  1  5.0    8.90    0.17  2.58  43.39  n/a   0.000
*
    CHIC STORM                 10.0
    [ Ptot= 58.57 mm ]
*
 *  CALIB STANDHYD       0001  1  5.0   19.30    4.64  1.33  48.79 0.83   0.000
    [I%=43.9:S%= 2.00]
*
    CHIC STORM                 10.0
    [ Ptot= 58.57 mm ]
*
 *  CALIB STANDHYD       0003  1  5.0    1.80    0.41  1.33  40.63 0.69   0.000
    [I%=50.0:S%= 2.00]
*
    CHIC STORM                 10.0
    [ Ptot= 58.57 mm ]
*
 *  CALIB STANDHYD       0014  1  5.0    4.00    0.83  1.33  39.11 0.67   0.000
    [I%=45.5:S%= 2.00]
*
    ADD [  0001+  0014]  0005  3  5.0   23.30    5.46  1.33  47.13  n/a   0.000
```



```
*
    ADD [  0005+  0003]  0005  1  5.0   25.10    5.87  1.33  46.66  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0010  1  5.0   25.10    0.59  2.33  46.58  n/a   0.000
*
    CHIC STORM                 10.0
    [ Ptot= 58.57 mm ]
*
 *  CALIB STANDHYD       0017  1  5.0    0.50    0.09  1.33  37.66 0.64   0.000
    [I%=22.3:S%= 2.00]
*
    ADD [  0010+  0011]  0012  3  5.0   34.00    0.75  2.33  45.74  n/a   0.000
*
    ADD [  0012+  0017]  0012  1  5.0   34.50    0.76  2.33  45.63  n/a   0.000
*
*******************************
** SIMULATION:E - CHI 50Yr    **
*******************************
    CHIC STORM                 10.0
    [ Ptot= 64.94 mm ]
*
 ** CALIB NASHYD         0013  1  5.0    1.40    0.12  1.50  32.21 0.50   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.24]
*
    CHIC STORM                 10.0
    [ Ptot= 64.94 mm ]
*
 *  CALIB STANDHYD       0002  1  5.0    6.50    1.84  1.33  53.66 0.83   0.000
    [I%=41.3:S%= 2.00]
*
    CHIC STORM                 10.0
    [ Ptot= 64.94 mm ]
*
 *  CALIB STANDHYD       0004  1  5.0    1.00    0.26  1.33  46.06 0.71   0.000
    [I%=50.0:S%= 2.00]
*
    ADD [  0013+  0002]  0006  3  5.0    7.90    1.91  1.33  49.86  n/a   0.000
*
    ADD [  0006+  0004]  0006  1  5.0    8.90    2.17  1.33  49.44  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0011  1  5.0    8.90    0.22  2.33  49.21  n/a   0.000
*
    CHIC STORM                 10.0
    [ Ptot= 64.94 mm ]
*
```

```
 *  CALIB STANDHYD       0001  1  5.0   19.30    5.30  1.33  54.93 0.85   0.000
    [I%=43.9:S%= 2.00]
*
    CHIC STORM                10.0
    [ Ptot= 64.94 mm ]
*
 *  CALIB STANDHYD       0003  1  5.0    1.80    0.46  1.33  46.06 0.71   0.000
    [I%=50.0:S%= 2.00]
*
    CHIC STORM                10.0
    [ Ptot= 64.94 mm ]
*
 *  CALIB STANDHYD       0014  1  5.0    4.00    0.94  1.33  44.45 0.68   0.000
    [I%=45.5:S%= 2.00]
*
    ADD [  0001+  0014]  0005  3  5.0   23.30    6.24  1.33  53.13  n/a   0.000
*
    ADD [  0005+  0003]  0005  1  5.0   25.10    6.70  1.33  52.62  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0010  1  5.0   25.10    0.77  2.08  52.54  n/a   0.000
*
    CHIC STORM                10.0
    [ Ptot= 64.94 mm ]
*
 *  CALIB STANDHYD       0017  1  5.0    0.50    0.10  1.33  43.13 0.66   0.000
    [I%=22.3:S%= 2.00]
*
    ADD [  0010+  0011]  0012  3  5.0   34.00    0.98  2.17  51.67  n/a   0.000
*
    ADD [  0012+  0017]  0012  1  5.0   34.50    1.00  2.17  51.55  n/a   0.000
*
*******************************
** SIMULATION:F - CHI 100Yr   **
*******************************
    CHIC STORM                10.0
    [ Ptot= 71.31 mm ]
*
 ** CALIB NASHYD         0013  1  5.0    1.40    0.14  1.50  37.26 0.52   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.24]
*
    CHIC STORM                10.0
    [ Ptot= 71.31 mm ]
*
 *  CALIB STANDHYD       0002  1  5.0    6.50    2.07  1.33  59.79 0.84   0.000
    [I%=41.3:S%= 2.00]
*
```



```
    CHIC STORM                10.0
    [ Ptot= 71.31 mm ]
*
 *  CALIB STANDHYD       0004  1  5.0    1.00    0.29  1.33  51.58 0.72   0.000
    [I%=50.0:S%= 2.00]
*
    ADD [  0013+  0002]  0006  3  5.0    7.90    2.16  1.33  55.80  n/a   0.000
*
    ADD [  0006+  0004]  0006  1  5.0    8.90    2.45  1.33  55.32  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0011  1  5.0    8.90    0.27  2.25  55.10  n/a   0.000
*
    CHIC STORM                10.0
    [ Ptot= 71.31 mm ]
*
 *  CALIB STANDHYD       0001  1  5.0   19.30    5.97  1.33  61.10 0.86   0.000
    [I%=43.9:S%= 2.00]
*
    CHIC STORM                10.0
    [ Ptot= 71.31 mm ]
*
 *  CALIB STANDHYD       0003  1  5.0    1.80    0.52  1.33  51.58 0.72   0.000
    [I%=50.0:S%= 2.00]
*
    CHIC STORM                10.0
    [ Ptot= 71.31 mm ]
*
 *  CALIB STANDHYD       0014  1  5.0    4.00    1.06  1.33  49.90 0.70   0.000
    [I%=45.5:S%= 2.00]
*
    ADD [  0001+  0014]  0005  3  5.0   23.30    7.04  1.33  59.18  n/a   0.000
*
    ADD [  0005+  0003]  0005  1  5.0   25.10    7.56  1.33  58.63  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0010  1  5.0   25.10    0.97  2.00  58.55  n/a   0.000
*
    CHIC STORM                10.0
    [ Ptot= 71.31 mm ]
*
 *  CALIB STANDHYD       0017  1  5.0    0.50    0.12  1.33  48.71 0.68   0.000
    [I%=22.3:S%= 2.00]
*
    ADD [  0010+  0011]  0012  3  5.0   34.00    1.23  2.08  57.65  n/a   0.000
*
    ADD [  0012+  0017]  0012  1  5.0   34.50    1.25  2.00  57.52  n/a   0.000
*
```

```
*******************************
** SIMULATION:G - SCS 2Yr     **
*******************************
    READ STORM                  5.0
    [ Ptot= 55.96 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\8613a693-
ca8e-4336-9a5c-6b
    remark: 2yr 24hr 5min SCS

*
 ** CALIB NASHYD         0013  1  5.0    1.40    0.08 12.17  25.37 0.45   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.24]
*
    READ STORM                  5.0
    [ Ptot= 55.96 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\8613a693-
ca8e-4336-9a5c-6b
    remark: 2yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0002  1  5.0    6.50    0.94 12.08  45.10 0.81   0.000
    [I%=41.3:S%= 2.00]
*
    READ STORM                  5.0
    [ Ptot= 55.96 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\8613a693-
ca8e-4336-9a5c-6b
    remark: 2yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0004  1  5.0    1.00    0.13 12.08  38.43 0.69   0.000
    [I%=50.0:S%= 2.00]
*
    ADD [  0013+  0002]  0006  3  5.0    7.90    1.01 12.08  41.60  n/a   0.000
*
    ADD [  0006+  0004]  0006  1  5.0    8.90    1.14 12.08  41.25  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0011  1  5.0    8.90    0.09 13.08  41.02  n/a   0.000
*
    READ STORM                  5.0
    [ Ptot= 55.96 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\8613a693-
```



```
ca8e-4336-9a5c-6b
    remark: 2yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0001  1  5.0   19.30    2.54 12.08  46.29 0.83   0.000
    [I%=43.9:S%= 2.00]
*
    READ STORM                  5.0
    [ Ptot= 55.96 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\8613a693-
ca8e-4336-9a5c-6b
    remark: 2yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0003  1  5.0    1.80    0.21 12.08  38.44 0.69   0.000
    [I%=50.0:S%= 2.00]
*
    READ STORM                  5.0
    [ Ptot= 55.96 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\8613a693-
ca8e-4336-9a5c-6b
    remark: 2yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0014  1  5.0    4.00    0.44 12.08  36.95 0.66   0.000
    [I%=45.5:S%= 2.00]
*
    ADD [  0001+  0014]  0005  3  5.0   23.30    2.98 12.08  44.68  n/a   0.000
*
    ADD [  0005+  0003]  0005  1  5.0   25.10    3.19 12.08  44.24  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0010  1  5.0   25.10    0.31 12.92  44.16  n/a   0.000
*
    READ STORM                  5.0
    [ Ptot= 55.96 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\8613a693-
ca8e-4336-9a5c-6b
    remark: 2yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0017  1  5.0    0.50    0.06 12.08  35.46 0.63   0.000
    [I%=22.3:S%= 2.00]
*
    ADD [  0010+  0011]  0012  3  5.0   34.00    0.40 13.00  43.34  n/a   0.000
```

```
*
    ADD [  0012+  0017]  0012  1  5.0   34.50    0.40 13.00  43.22  n/a   0.000
*
*******************************
** SIMULATION:H - SCS 5Yr     **
*******************************
    READ STORM                 5.0
    [ Ptot= 73.66 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\f310377e-
22db-4469-9336-5b
    remark: 5yr 24hr 5min SCS

*
 ** CALIB NASHYD         0013  1  5.0    1.40    0.13 12.17  39.16 0.53   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.24]
*
    READ STORM                 5.0
    [ Ptot= 73.66 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\f310377e-
22db-4469-9336-5b
    remark: 5yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0002  1  5.0    6.50    1.32 12.08  62.06 0.84   0.000
    [I%=41.3:S%= 2.00]
*
    READ STORM                 5.0
    [ Ptot= 73.66 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\f310377e-
22db-4469-9336-5b
    remark: 5yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0004  1  5.0    1.00    0.18 12.08  53.63 0.73   0.000
    [I%=50.0:S%= 2.00]
*
    ADD [  0013+  0002]  0006  3  5.0    7.90    1.43 12.08  58.00  n/a   0.000
*
    ADD [  0006+  0004]  0006  1  5.0    8.90    1.61 12.08  57.51  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0011  1  5.0    8.90    0.23 12.67  57.29  n/a   0.000
*
    READ STORM                 5.0
```



```
    [ Ptot= 73.66 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\f310377e-
22db-4469-9336-5b
    remark: 5yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0001  1  5.0   19.30    3.82 12.08  63.38 0.86   0.000
    [I%=43.9:S%= 2.00]
*
    READ STORM                 5.0
    [ Ptot= 73.66 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\f310377e-
22db-4469-9336-5b
    remark: 5yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0003  1  5.0    1.80    0.32 12.08  53.64 0.73   0.000
    [I%=50.0:S%= 2.00]
*
    READ STORM                 5.0
    [ Ptot= 73.66 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\f310377e-
22db-4469-9336-5b
    remark: 5yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0014  1  5.0    4.00    0.67 12.08  51.93 0.70   0.000
    [I%=45.5:S%= 2.00]
*
    ADD [  0001+  0014]  0005  3  5.0   23.30    4.49 12.08  61.42  n/a   0.000
*
    ADD [  0005+  0003]  0005  1  5.0   25.10    4.82 12.08  60.86  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0010  1  5.0   25.10    0.83 12.58  60.78  n/a   0.000
*
    READ STORM                 5.0
    [ Ptot= 73.66 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\f310377e-
22db-4469-9336-5b
    remark: 5yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0017  1  5.0    0.50    0.08 12.08  50.78 0.69   0.000
```

```
    [I%=22.3:S%= 2.00]
*
    ADD [  0010+  0011]  0012  3  5.0   34.00    1.05 12.58  59.86  n/a   0.000
*
    ADD [  0012+  0017]  0012  1  5.0   34.50    1.07 12.58  59.73  n/a   0.000
*
*******************************
** SIMULATION:I - SCS 10Yr    **
*******************************
    READ STORM                  5.0
    [ Ptot= 85.63 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\6568698a-
3b64-4aca-acd6-7b
    remark: 10yr 24hr 5min SCS

*
 ** CALIB NASHYD         0013  1  5.0    1.40    0.16 12.17  49.06 0.57   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.24]
*
    READ STORM                  5.0
    [ Ptot= 85.63 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\6568698a-
3b64-4aca-acd6-7b
    remark: 10yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0002  1  5.0    6.50    1.58 12.08  73.66 0.86   0.000
    [I%=41.3:S%= 2.00]
*
    READ STORM                  5.0
    [ Ptot= 85.63 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\6568698a-
3b64-4aca-acd6-7b
    remark: 10yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0004  1  5.0    1.00    0.22 12.08  64.25 0.75   0.000
    [I%=50.0:S%= 2.00]
*
    ADD [  0013+  0002]  0006  3  5.0    7.90    1.72 12.08  69.30  n/a   0.000
*
    ADD [  0006+  0004]  0006  1  5.0    8.90    1.94 12.08  68.74  n/a   0.000
*
 ** Reservoir
```



```
    OUTFLOW:             0011  1  5.0    8.90    0.34 12.58  68.51  n/a   0.000
*
    READ STORM                  5.0
    [ Ptot= 85.63 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\6568698a-
3b64-4aca-acd6-7b
    remark: 10yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0001  1  5.0   19.30    4.58 12.08  75.06 0.88   0.000
    [I%=43.9:S%= 2.00]
*
    READ STORM                  5.0
    [ Ptot= 85.63 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\6568698a-
3b64-4aca-acd6-7b
    remark: 10yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0003  1  5.0    1.80    0.39 12.08  64.25 0.75   0.000
    [I%=50.0:S%= 2.00]
*
    READ STORM                  5.0
    [ Ptot= 85.63 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\6568698a-
3b64-4aca-acd6-7b
    remark: 10yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0014  1  5.0    4.00    0.82 12.08  62.42 0.73   0.000
    [I%=45.5:S%= 2.00]
*
    ADD [  0001+  0014]  0005  3  5.0   23.30    5.40 12.08  72.89  n/a   0.000
*
    ADD [  0005+  0003]  0005  1  5.0   25.10    5.79 12.08  72.27  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0010  1  5.0   25.10    1.22 12.42  72.19  n/a   0.000
*
    READ STORM                  5.0
    [ Ptot= 85.63 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\6568698a-
3b64-4aca-acd6-7b
    remark: 10yr 24hr 5min SCS
```

```
*
 *  CALIB STANDHYD       0017  1  5.0    0.50    0.10 12.08  61.51 0.72   0.000
    [I%=22.3:S%= 2.00]
*
    ADD [  0010+  0011]  0012  3  5.0   34.00    1.55 12.42  71.23  n/a   0.000
*
    ADD [  0012+  0017]  0012  1  5.0   34.50    1.57 12.42  71.09  n/a   0.000
*
*******************************
** SIMULATION:J - SCS 25Yr    **
*******************************
    READ STORM                 5.0
    [ Ptot=100.47 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\d393fc61-
ea1d-4006-a82d-68
    remark: 25yr 24hr 5min SCS

*
 ** CALIB NASHYD         0013  1  5.0    1.40    0.20 12.17  61.80 0.62   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.24]
*
    READ STORM                 5.0
    [ Ptot=100.47 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\d393fc61-
ea1d-4006-a82d-68
    remark: 25yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0002  1  5.0    6.50    1.90 12.08  88.15 0.88   0.000
    [I%=41.3:S%= 2.00]
*
    READ STORM                 5.0
    [ Ptot=100.47 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\d393fc61-
ea1d-4006-a82d-68
    remark: 25yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0004  1  5.0    1.00    0.27 12.08  77.69 0.77   0.000
    [I%=50.0:S%= 2.00]
*
    ADD [  0013+  0002]  0006  3  5.0    7.90    2.08 12.08  83.48  n/a   0.000
*
```



```
    ADD [  0006+  0004]  0006  1  5.0    8.90    2.34 12.08  82.83  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0011  1  5.0    8.90    0.49 12.42  82.61  n/a   0.000
*
    READ STORM                 5.0
    [ Ptot=100.47 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\d393fc61-
ea1d-4006-a82d-68
    remark: 25yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0001  1  5.0   19.30    5.52 12.08  89.62 0.89   0.000
    [I%=43.9:S%= 2.00]
*
    READ STORM                 5.0
    [ Ptot=100.47 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\d393fc61-
ea1d-4006-a82d-68
    remark: 25yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0003  1  5.0    1.80    0.48 12.08  77.69 0.77   0.000
    [I%=50.0:S%= 2.00]
*
    READ STORM                 5.0
    [ Ptot=100.47 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\d393fc61-
ea1d-4006-a82d-68
    remark: 25yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0014  1  5.0    4.00    1.01 12.08  75.74 0.75   0.000
    [I%=45.5:S%= 2.00]
*
    ADD [  0001+  0014]  0005  3  5.0   23.30    6.53 12.08  87.23  n/a   0.000
*
    ADD [  0005+  0003]  0005  1  5.0   25.10    7.00 12.08  86.55  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0010  1  5.0   25.10    1.87 12.33  86.47  n/a   0.000
*
    READ STORM                 5.0
    [ Ptot=100.47 mm ]
    fname :
```

C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\d393fc61-ea1d-4006-a82d-68
    remark: 25yr 24hr 5min SCS

*
 * CALIB STANDHYD   0017 1 5.0   0.50   0.13 12.08 75.10 0.75   0.000
    [I%=22.3:S%= 2.00]
*
    ADD [0010+ 0011] 0012 3 5.0   34.00   2.35 12.33 85.46 n/a   0.000
*
    ADD [0012+ 0017] 0012 1 5.0   34.50   2.38 12.33 85.31 n/a   0.000
*
****
** SIMULATION:K - SCS 50Yr   **
****
    READ STORM   5.0
    [Ptot=111.40 mm]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\7676a897-43ac-43d1-9637-6c
    remark: 50yr 24hr 5min SCS

*
 ** CALIB NASHYD   0013 1 5.0   1.40   0.23 12.17 71.43 0.64   0.000
    [CN=82.7   ]
    [N = 3.0:Tp 0.24]
*
    READ STORM   5.0
    [Ptot=111.40 mm]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\7676a897-43ac-43d1-9637-6c
    remark: 50yr 24hr 5min SCS

*
 * CALIB STANDHYD   0002 1 5.0   6.50   2.14 12.08 98.87 0.89   0.000
    [I%=41.3:S%= 2.00]
*
    READ STORM   5.0
    [Ptot=111.40 mm]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\7676a897-43ac-43d1-9637-6c
    remark: 50yr 24hr 5min SCS

*
 * CALIB STANDHYD   0004 1 5.0   1.00   0.30 12.08 87.74 0.79   0.000
    [I%=50.0:S%= 2.00]

*
    ADD [0013+ 0002] 0006 3 5.0   7.90   2.35 12.08 94.01 n/a   0.000
*
    ADD [0006+ 0004] 0006 1 5.0   8.90   2.65 12.08 93.31 n/a   0.000
*
 ** Reservoir
    OUTFLOW: 0011 1 5.0   8.90   0.61 12.42 93.08 n/a   0.000
*
    READ STORM   5.0
    [Ptot=111.40 mm]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\7676a897-43ac-43d1-9637-6c
    remark: 50yr 24hr 5min SCS

*
 * CALIB STANDHYD   0001 1 5.0   19.30   6.22 12.08 100.38 0.90   0.000
    [I%=43.9:S%= 2.00]
*
    READ STORM   5.0
    [Ptot=111.40 mm]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\7676a897-43ac-43d1-9637-6c
    remark: 50yr 24hr 5min SCS

*
 * CALIB STANDHYD   0003 1 5.0   1.80   0.54 12.08 87.75 0.79   0.000
    [I%=50.0:S%= 2.00]
*
    READ STORM   5.0
    [Ptot=111.40 mm]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\7676a897-43ac-43d1-9637-6c
    remark: 50yr 24hr 5min SCS

*
 * CALIB STANDHYD   0014 1 5.0   4.00   1.15 12.08 85.71 0.77   0.000
    [I%=45.5:S%= 2.00]
*
    ADD [0001+ 0014] 0005 3 5.0   23.30   7.37 12.08 97.86 n/a   0.000
*
    ADD [0005+ 0003] 0005 1 5.0   25.10   7.91 12.08 97.14 n/a   0.000
*
 ** Reservoir
    OUTFLOW: 0010 1 5.0   25.10   2.33 12.33 97.06 n/a   0.000
*

```
    READ STORM                  5.0
    [ Ptot=111.40 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\7676a897-
43ac-43d1-9637-6c
    remark: 50yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0017  1  5.0    0.50    0.15 12.08  85.26 0.77   0.000
    [I%=22.3:S%= 2.00]
*
    ADD [  0010+  0011]  0012  3  5.0   34.00    2.93 12.33  96.02  n/a   0.000
*
    ADD [  0012+  0017]  0012  1  5.0   34.50    2.97 12.33  95.86  n/a   0.000
*
*******************************
** SIMULATION:L - SCS 100Yr   **
*******************************
    READ STORM                  5.0
    [ Ptot=122.33 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\0536c2c6-
dc4d-4f7a-93d0-2a
    remark: 100yr 24hr 5min SCS

*
 ** CALIB NASHYD         0013  1  5.0    1.40    0.27 12.17  81.22 0.66   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.24]
*
    READ STORM                  5.0
    [ Ptot=122.33 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\0536c2c6-
dc4d-4f7a-93d0-2a
    remark: 100yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0002  1  5.0    6.50    2.38 12.08 109.63 0.90   0.000
    [I%=41.3:S%= 2.00]
*
    READ STORM                  5.0
    [ Ptot=122.33 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\0536c2c6-
dc4d-4f7a-93d0-2a
    remark: 100yr 24hr 5min SCS
```



```
*
 *  CALIB STANDHYD       0004  1  5.0    1.00    0.34 12.08  97.90 0.80   0.000
    [I%=50.0:S%= 2.00]
*
    ADD [  0013+  0002]  0006  3  5.0    7.90    2.62 12.08 104.59  n/a   0.000
*
    ADD [  0006+  0004]  0006  1  5.0    8.90    2.95 12.08 103.84  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0011  1  5.0    8.90    0.72 12.33 103.62  n/a   0.000
*
    READ STORM                  5.0
    [ Ptot=122.33 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\0536c2c6-
dc4d-4f7a-93d0-2a
    remark: 100yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0001  1  5.0   19.30    6.93 12.08 111.17 0.91   0.000
    [I%=43.9:S%= 2.00]
*
    READ STORM                  5.0
    [ Ptot=122.33 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\0536c2c6-
dc4d-4f7a-93d0-2a
    remark: 100yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0003  1  5.0    1.80    0.60 12.08  97.90 0.80   0.000
    [I%=50.0:S%= 2.00]
*
    READ STORM                  5.0
    [ Ptot=122.33 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\0536c2c6-
dc4d-4f7a-93d0-2a
    remark: 100yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0014  1  5.0    4.00    1.29 12.08  95.79 0.78   0.000
    [I%=45.5:S%= 2.00]
*
    ADD [  0001+  0014]  0005  3  5.0   23.30    8.21 12.08 108.53  n/a   0.000
*
    ADD [  0005+  0003]  0005  1  5.0   25.10    8.82 12.08 107.77  n/a   0.000
*
```

```
 ** Reservoir
    OUTFLOW:             0010  1  5.0   25.10    2.80 12.25 107.69  n/a   0.000
*
    READ STORM                  5.0
    [ Ptot=122.33 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\0536c2c6-
dc4d-4f7a-93d0-2a
    remark: 100yr 24hr 5min SCS

*
 *  CALIB STANDHYD       0017  1  5.0    0.50    0.16 12.08  95.53 0.78   0.000
    [I%=22.3:S%= 2.00]
*
    ADD [  0010+  0011]  0012  3  5.0   34.00    3.50 12.33 106.62  n/a   0.000
*
    ADD [  0012+  0017]  0012  1  5.0   34.50    3.56 12.25 106.46  n/a   0.000
*
*******************************
** SIMULATION:M - 25mm        **
*******************************
    READ STORM                  5.0
    [ Ptot= 26.26 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\8525347f-
0202-4c68-a087-72
    remark: 25mm

*
 ** CALIB NASHYD         0013  1  5.0    1.40    0.02  1.33   6.36 0.24   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.24]
*
    READ STORM                  5.0
    [ Ptot= 26.26 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\8525347f-
0202-4c68-a087-72
    remark: 25mm

*
 *  CALIB STANDHYD       0002  1  5.0    6.50    0.57  1.00  17.89 0.68   0.000
    [I%=41.3:S%= 2.00]
*
    READ STORM                  5.0
    [ Ptot= 26.26 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\8525347f-
```



```
0202-4c68-a087-72
    remark: 25mm

*
 *  CALIB STANDHYD       0004  1  5.0    1.00    0.10  1.00  15.16 0.58   0.000
    [I%=50.0:S%= 2.00]
*
    ADD [  0013+  0002]  0006  3  5.0    7.90    0.58  1.00  15.85  n/a   0.000
*
    ADD [  0006+  0004]  0006  1  5.0    8.90    0.68  1.00  15.77  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0011  1  5.0    8.90    0.02  3.33  15.55  n/a   0.000
*
    READ STORM                  5.0
    [ Ptot= 26.26 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\8525347f-
0202-4c68-a087-72
    remark: 25mm

*
 *  CALIB STANDHYD       0001  1  5.0   19.30    1.62  1.08  18.66 0.71   0.000
    [I%=43.9:S%= 2.00]
*
    READ STORM                  5.0
    [ Ptot= 26.26 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\8525347f-
0202-4c68-a087-72
    remark: 25mm

*
 *  CALIB STANDHYD       0003  1  5.0    1.80    0.18  1.00  15.17 0.58   0.000
    [I%=50.0:S%= 2.00]
*
    READ STORM                  5.0
    [ Ptot= 26.26 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\8525347f-
0202-4c68-a087-72
    remark: 25mm

*
 *  CALIB STANDHYD       0014  1  5.0    4.00    0.34  1.00  14.26 0.54   0.000
    [I%=45.5:S%= 2.00]
*
    ADD [  0001+  0014]  0005  3  5.0   23.30    1.92  1.00  17.90  n/a   0.000
```

```
*
    ADD [  0005+  0003]  0005  1  5.0   25.10    2.10  1.00  17.71  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0010  1  5.0   25.10    0.04  3.42  17.63  n/a   0.000
*
    READ STORM                5.0
    [ Ptot= 26.26 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\8525347f-
0202-4c68-a087-72
    remark: 25mm

*
 *  CALIB STANDHYD       0017  1  5.0    0.50    0.03  1.00  12.46 0.47   0.000
    [I%=22.3:S%= 2.00]
*
    ADD [  0010+  0011]  0012  3  5.0   34.00    0.06  3.33  17.08  n/a   0.000
*
    ADD [  0012+  0017]  0012  1  5.0   34.50    0.07  3.25  17.02  n/a   0.000
*
*******************************
** SIMULATION:N - Timmins     **
*******************************
    READ STORM               60.0
    [ Ptot=193.00 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\645d6042-
ab15-4a35-8d2d-f2
    remark: tim

*
 ** CALIB NASHYD         0013  1  5.0    1.40    0.15  7.00 147.01 0.76   0.000
    [CN=82.7         ]
    [ N = 3.0:Tp 0.24]
*
    READ STORM               60.0
    [ Ptot=193.00 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\645d6042-
ab15-4a35-8d2d-f2
    remark: tim

*
 ** CALIB STANDHYD       0002  1  5.0    6.50    0.76  7.00 179.59 0.93   0.000
    [I%=41.3:S%= 2.00]
*
    READ STORM               60.0
```



```
    [ Ptot=193.00 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\645d6042-
ab15-4a35-8d2d-f2
    remark: tim

*
 *  CALIB STANDHYD       0004  1  5.0    1.00    0.11  7.00 165.15 0.86   0.000
    [I%=50.0:S%= 2.00]
*
    ADD [  0013+  0002]  0006  3  5.0    7.90    0.91  7.00 173.82  n/a   0.000
*
    ADD [  0006+  0004]  0006  1  5.0    8.90    1.01  7.00 172.84  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0011  1  5.0    8.90    0.72  7.17 172.62  n/a   0.000
*
    READ STORM               60.0
    [ Ptot=193.00 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\645d6042-
ab15-4a35-8d2d-f2
    remark: tim

*
 *  CALIB STANDHYD       0001  1  5.0   19.30    2.26  7.00 181.28 0.94   0.000
    [I%=43.9:S%= 2.00]
*
    READ STORM               60.0
    [ Ptot=193.00 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\645d6042-
ab15-4a35-8d2d-f2
    remark: tim

*
 *  CALIB STANDHYD       0003  1  5.0    1.80    0.20  7.00 165.16 0.86   0.000
    [I%=50.0:S%= 2.00]
*
    READ STORM               60.0
    [ Ptot=193.00 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\645d6042-
ab15-4a35-8d2d-f2
    remark: tim

*
 *  CALIB STANDHYD       0014  1  5.0    4.00    0.43  7.00 162.74 0.84   0.000
```

```
 2022.03.24_Post Dev VO Files
    [I%=45.5:S%= 2.00]
*
    ADD [  0001+  0014]  0005  3  5.0   23.30    2.69  7.00 178.10  n/a   0.000
*
    ADD [  0005+  0003]  0005  1  5.0   25.10    2.89  7.00 177.17  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0010  1  5.0   25.10    2.35  7.17 177.09  n/a   0.000
*
    READ STORM                60.0
    [ Ptot=193.00 mm ]
    fname :
C:\Users\zholland\AppData\Local\Temp\2d927811-ad2b-4aca-89b0-f9c1423f619e\645d6042-
ab15-4a35-8d2d-f2
    remark: tim

*
 *  CALIB STANDHYD       0017  1  5.0    0.50    0.06  7.00 163.38 0.85   0.000
    [I%=22.3:S%= 2.00]
*
    ADD [  0010+  0011]  0012  3  5.0   34.00    3.07  7.17 175.92  n/a   0.000
*
    ADD [  0012+  0017]  0012  1  5.0   34.50    3.10  7.17 175.74  n/a   0.000
*
```

APPENDIX E

Stormwater Management Facility Calculations

Project No: 1101-4125
Project: Pilla Lands
File: Water Quality
Design by: Z. Holland
Checked by: B. Hummelen
Date: 2022-03-25

Post-Development Scenario Water Quality Requirements for SWM Facility 1

Areas Contributing	Area (ha)	% Imp	25mm RV (mm)	25mm RV (m^3)
POST-1, EXT-1	23.30	77	17.90	4171
Total	**23.30**	**77**		**4171**

MOE Total WQ Volume (m^3/ha)	237
MOE ED Volume (m^3/ha)	40
MOE ED Volume (m^3)	932
MOE PP Volume (m^3/ha)	197
MOE PP Volume (m^3)	4590
Pond Required PP Volume (m^3)	4590
Pond Required ED Volume (m^3)	4171
Pond Required AS Volume (m^3)	13355
Provided PP Volume (m^3)	5990
Provided ED Volume (m^3)	4945
Provided AS Volume (m^3)	15281

Project:	1101-4125
Project No.:	Pilla Lands
File:	Extended Detention
Design by:	Z. Holland
Checked by:	B. Hummelen
Date:	2022-03-25

EXTENDED DETENTION SPECIFICATIONS - SWM FACILITY 1

(Per MECP)

Extended Detention Volume (Area x runoff from 25mm event)		4171
t (drawdown time - seconds, *hours in italics*)	*48.0*	172800
Ao (cross section area of orifice - sqm)		0.0201
h (maximum water elevation above orifice for extended detention- m)		0.69
C (discharge coefficient)		0.64
Ap (average surface area for extended detention - sqm)		6065

t = 2*Ap*(h^0.5)/(C*Ao*(g*2)^0.5)

Ao = 0.020567891 sqm d = 162 mm

Extended Detention Orifice Diameter (as designed) d = **160** mm

ACTUAL DRAWDOWN TIME

* Neglecting tailwater conditions*

Extended Detention Volume Used	4945
d (orifice diameter, mm)	160
h (maximum head acting on orifice for extended detention, m)	0.80
Ao (cross section area of orifice, m^2)	0.0201
C (discharge coefficient)	0.64
Ap (average surface area for extended detention, m^2)	6182

t = 2*Ap*(h^0.5)/(C*Ao*(g*2)^0.5)

t (hours) 54

CROZIER CONSULTING ENGINEERS

Project:	1101-4125
Project No.:	Pilla Lands
File:	Stage Storage Discharge
Design by:	Z. Holland
Checked by:	B. Hummelen
Date:	2022-03-25

STAGE STORAGE DISCHARGE - SWMF1

SWM Facility 1 Storage - Outflow Calculations

Outlet Structure		
E.D. Orifice Diameter:	0.160	m
E.D. Orifice Invert Elevation:	225.62	m
V-notch angle	0	degrees
V-notch constant	0.00	const
V-notch invert	0.00	m
Rect weir length	1.7	m
Rect weir invert	226.52	m
Extended Detention Depth:	0.50	m

Main Cell Spillway		
Emergency Spill Elev.	227.72	
Emerg Spill Bot. Width	10	
Trap. Side Slopes	7	:1

	Pond Dimensions				Outlet Structure			Cell Spillway			
	Elev.	Depth Above PP	Area	Volume	ED Orifice Discharge	V-notch Discharge	Rect. Weir Discharge	Emerg. Weir Ave. Width	Emerg. Weir Discharge	Total Discharge	Storage
	(m)	(m)	(sqm)	(cu.m)	(cu.m/s)	(cu.m/s)	(cu.m/s)	(m)	(cu.m/s)	(cu.m/s)	(ha-m)
PP	225.62	0.00	5247	0	0.0000	0.0000	0.000	0.00	0.000	0.000	0.000
	225.72	0.10	5481	536	0.0081	0.0000	0.000	0.00	0.000	0.008	0.054
	225.82	0.20	5714	1096	0.0197	0.0000	0.000	0.00	0.000	0.020	0.110
	225.92	0.30	5948	1679	0.0267	0.0000	0.000	0.00	0.000	0.027	0.168
	226.02	0.40	6182	2286	0.0322	0.0000	0.000	0.00	0.000	0.032	0.229
	226.12	0.50	6415	2916	0.0369	0.0000	0.000	0.00	0.000	0.037	0.292
	226.22	0.60	6649	3569	0.0411	0.0000	0.000	0.00	0.000	0.041	0.357
	226.32	0.70	6882	4245	0.0449	0.0000	0.000	0.00	0.000	0.045	0.425
ED	226.42	0.80	7116	4945	0.0484	0.0000	0.000	0.00	0.000	0.048	0.495
	226.52	0.90	7366	5669	0.0516	0.0000	0.000	0.00	0.000	0.052	0.567
	226.62	1.00	7615	6418	0.0547	0.0000	0.099	0.00	0.000	0.154	0.642
	226.72	1.10	7865	7192	0.0576	0.0000	0.280	0.00	0.000	0.337	0.719
	226.82	1.20	8114	7991	0.0603	0.0000	0.514	0.00	0.000	0.574	0.799
	226.92	1.30	8364	8815	0.0630	0.0000	0.791	0.00	0.000	0.854	0.882
	227.02	1.40	8614	9664	0.0655	0.0000	1.106	0.00	0.000	1.171	0.966
	227.12	1.50	8863	10538	0.0679	0.0000	1.454	0.00	0.000	1.522	1.054
	227.22	1.60	9113	11437	0.0703	0.0000	1.832	0.00	0.000	1.902	1.144
	227.32	1.70	9362	12360	0.0725	0.0000	2.238	0.00	0.000	2.311	1.236
	227.42	1.80	9612	13309	0.0748	0.0000	2.671	0.00	0.000	2.745	1.331
	227.52	1.90	9861	14283	0.0769	0.0000	3.128	0.00	0.000	3.205	1.428
HWL	227.62	2.00	10111	15281	0.0790	0.0000	3.609	0.00	0.000	3.688	1.528
	227.72	2.10	10372	16306	0.0810	0.0000	4.112	10.000	0.000	4.193	1.631
	227.82	2.20	10634	17356	0.0830	0.0000	4.636	11.400	0.663	5.383	1.736
TOB	227.92	2.30	10895	18432	0.0849	0.0000	5.182	12.800	2.107	7.373	1.843

Project No: 1101-4125
Project: Pilla Lands
File: Water Quality
Design by: Z. Holland
Checked by: B. Hummelen
Date: 2022-03-15

Post-Development Scenario Water Quality Requirements for SWM Facility 2

Areas Contributing	Area (ha)	% Imp	25mm RV (mm)	25mm RV (m^3)
POST-1	7.90	69	15.85	1252
Total	**7.90**	**69**		**1252**

MOE ED Volume (m^3/ha)	40
MOE ED Volume (m^3)	316
Pond Required ED Volume (m^3)	1252
Pond Required AS Volume (m^3)	4644
Provided ED Volume (m^3)	1513
Provided AS Volume (m^3)	5153

Project:	1101-4125
Project No.:	Pilla Lands
File:	Extended Detention
Design by:	Z. Holland
Checked by:	B. Hummelen
Date:	2022-03-15

EXTENDED DETENTION SPECIFICATIONS - SWM FACILITY 2

(Per MECP)

Extended Detention Volume (Area x runoff from 25mm event)		1252
t (drawdown time - seconds, *hours in italics*)	*48.0*	172800
Ao (cross section area of orifice - sqm)		0.0057
h (maximum water elevation above orifice for extended detention- m)		0.69
C (discharge coefficient)		0.64
Ap (average surface area for extended detention - sqm)		1835

t = 2*Ap*(h^0.5)/(C*Ao*(g*2)^0.5)

Ao = 0.006221641 sqm d = 89 mm

Extended Detention Orifice Diameter (as designed) d = **85** mm

ACTUAL DRAWDOWN TIME

* Neglecting tailwater conditions*

Extended Detention Volume Used	1513
d (orifice diameter, mm)	85
h (maximum head acting on orifice for extended detention, m)	0.80
Ao (cross section area of orifice, m^2)	0.0057
C (discharge coefficient)	0.64
Ap (average surface area for extended detention, m^2)	1892

t = 2*Ap*(h^0.5)/(C*Ao*(g*2)^0.5)

t (hours) 58

CROZIER CONSULTING ENGINEERS

Project:	1101-4125
Project No.:	Pilla Lands
File:	Stage Storage Discharge
Design by:	Z. Holland
Checked by:	B. Hummelen
Date:	2022-03-21

STAGE STORAGE DISCHARGE - SWMF2

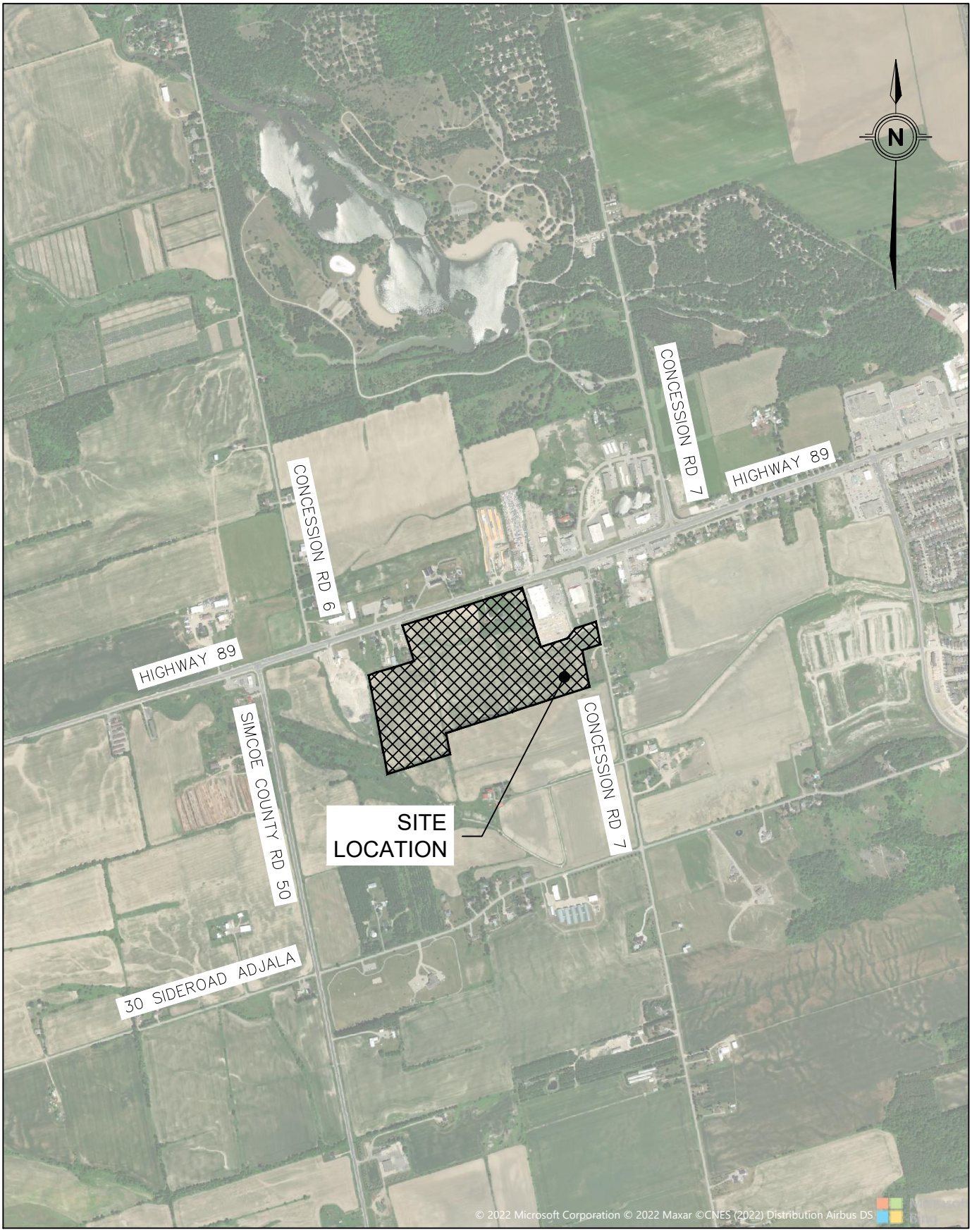
SWM Facility 2 Storage - Outflow Calculations

Outlet Structure		
E.D. Orifice Diameter:	0.085	m
E.D. Orifice Invert Elevation:	232.89	m
V-notch angle	0	degrees
V-notch constant	0.00	const
V-notch invert	0.00	m
Rect weir length	0.40	m
Rect weir invert	233.79	m
Extended Detention Depth:	0.50	m

Main Cell Spillway		
Emergency Spill Elev.	234.99	
Emerg Spill Bot. Width	10	
Trap. Side Slopes	7	:1

	Pond Dimensions				Outlet Structure			Cell Spillway			
	Elev.	Depth Above PP	Area	Volume	ED Orifice Discharge	V-notch Discharge	Rect. Weir Discharge	Emerg. Weir Ave. Width	Emerg. Weir Discharge	Total Discharge	Storage
	(m)	(m)	(sqm)	(cu.m)	(cu.m/s)	(cu.m/s)	(cu.m/s)	(m)	(cu.m/s)	(cu.m/s)	(ha-m)
BOP	232.89	0.00	1435	0	0.0000	0.0000	0.000	0.00	0.000	0.000	0.000
	232.99	0.10	1549	149	0.0039	0.0000	0.000	0.00	0.000	0.004	0.015
	233.09	0.20	1663	310	0.0064	0.0000	0.000	0.00	0.000	0.006	0.031
	233.19	0.30	1777	482	0.0082	0.0000	0.000	0.00	0.000	0.008	0.048
	233.29	0.40	1892	665	0.0096	0.0000	0.000	0.00	0.000	0.010	0.067
	233.39	0.50	2006	860	0.0109	0.0000	0.000	0.00	0.000	0.011	0.086
	233.49	0.60	2120	1066	0.0120	0.0000	0.000	0.00	0.000	0.012	0.107
	233.59	0.70	2234	1284	0.0130	0.0000	0.000	0.00	0.000	0.013	0.128
ED	233.69	0.80	2348	1513	0.0140	0.0000	0.000	0.00	0.000	0.014	0.151
	233.79	0.90	2462	1754	0.0149	0.0000	0.000	0.00	0.000	0.015	0.175
	233.89	1.00	2576	2006	0.0157	0.0000	0.023	0.00	0.000	0.039	0.201
	233.99	1.10	2691	2269	0.0165	0.0000	0.066	0.00	0.000	0.082	0.227
	234.09	1.20	2805	2544	0.0173	0.0000	0.121	0.00	0.000	0.138	0.254
	234.19	1.30	2919	2830	0.0180	0.0000	0.186	0.00	0.000	0.204	0.283
	234.29	1.40	3033	3128	0.0187	0.0000	0.260	0.00	0.000	0.279	0.313
	234.39	1.50	3147	3437	0.0194	0.0000	0.342	0.00	0.000	0.361	0.344
	234.49	1.60	3261	3757	0.0201	0.0000	0.431	0.00	0.000	0.451	0.376
	234.59	1.70	3376	4089	0.0207	0.0000	0.527	0.00	0.000	0.547	0.409
	234.69	1.80	3490	4432	0.0213	0.0000	0.628	0.00	0.000	0.650	0.443
	234.79	1.90	3604	4787	0.0219	0.0000	0.736	0.00	0.000	0.758	0.479
HWL	234.89	2.00	3718	5153	0.0225	0.0000	0.849	0.00	0.000	0.872	0.515
	234.99	2.10	3850	5531	0.0231	0.0000	0.967	10.000	0.000	0.991	0.553
	235.09	2.20	3983	5923	0.0236	0.0000	1.091	11.400	0.663	1.778	0.592
TOB	235.19	2.30	4115	6328	0.0242	0.0000	1.219	12.800	2.107	3.350	0.633

FIGURES



Legend

= SUBJECT LANDS

Project

7723 HIGHWAY 89
TOWNSHIP OF ADJALA–TOSORONTIO

Drawing

SITE LOCATION PLAN

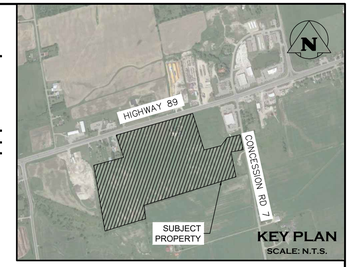
CROZIER CONSULTING ENGINEERS
ADMIRAL BUILDING
1 FIRST STREET, SUITE 200
COLLINGWOOD, ON, L9Y 1A1
705-446-3510 T
705-446-3520 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

Drawn By	Design By	Project
M.T.	M.T.	1101–4125

Scale	Date	Check By	Drawing
N.T.S.	03/25/2022	B.H.	FIG. 1

LEGEND

- EX. CONTOURS (246)
- EX. ELEVATIONS (246.75+)
- PR. ELEVATIONS (×245.00)
- PR. ELEVATIONS (MATCH TO EXISTING) (×245.00)
- PR. ROAD GRADES (2.0%)
- PR. DITCH (2.0%)
- PR. SWALE (2.0%)
- PR. CULVERT
- PR. CHANNEL
- PR. SWM BLOCK
- PR. RIPRAP
- PR. HEADWALL AND PIPE



KEY PLAN
SCALE: N.T.S.

MATCH TO EXISTING ALONG P/L 3:1 MAX SLOPE

HIGHWAY 89

TIE INTO EXISTING ROAD AND DITCH ALONG HIGHWAY 89

MATCH TO EXISTING ALONG P/L 3:1 MAX SLOPE

EX. HOME HARDWARE

EX. PEAVEY MART

OUTLET 1

CONCESSION ROAD 7

EX. 750mmØ CULVERT

EX. 600mmØ CULVERT

EX. 600mmØ CULVERT

TIE INTO EXISTING DRIVEWAY AND DITCH

EX. 300mmØ CULVERT TO BE REMOVED

INSTALL CULVERT ON EX. DRIVEWAY

REGRADE DITCH AS NEEDED & RESTORE TO EX. CONDITIONS OR BETTER

MATCH TO EXISTING ALONG P/L 3:1 MAX SLOPE

OUTLET 2

MATCH TO EXISTING ALONG P/L 3:1 MAX SLOPE

APPROXIMATE AREA OF SWM BLOCK: 0.91 ha

OUTER EDGE OF ACCESS ROAD 235.27
TOP OF POND 235.19
HIGH WATER LEVEL 234.89
BOTTOM OF POND 232.89

APPROXIMATE AREA OF SWM BLOCK: 1.79 ha

OUTER EDGE OF ACCESS ROAD 228.00
TOP OF POND 227.62
HIGH WATER LEVEL 227.62
EXTENDED DETENTION 226.42
PERMANENT POOL 225.62
BOTTOM OF POND 224.12

OUTLET 3

SCALE: 1:1250

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3. THIS DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WITH ALL OTHER PLANS AND DOCUMENTS APPLICABLE TO THIS PROJECT.
4. DO NOT SCALE THE DRAWINGS.
5. ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

BENCHMARKS

EXISTING ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM AND ARE DERIVED FROM BENCHMARK NO. 00819798415 HAVING A PUBLISHED ELEVATION OF 229.368 METRES (CGVD28:78)

TOPOGRAPHIC SURVEY COMPLETED ON MARCH 4, 2021 BY J.D. BARNES LTD.

Township of Adjala-Tosorontio

No.	ISSUE	DATE: MMM/DD/YYYY
1	ISSUED FOR FIRST SUBMISSION	10/20/2022

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Project: 7723 HIGHWAY 89
TOWNSHIP OF ADJALA-TOSORONTIO

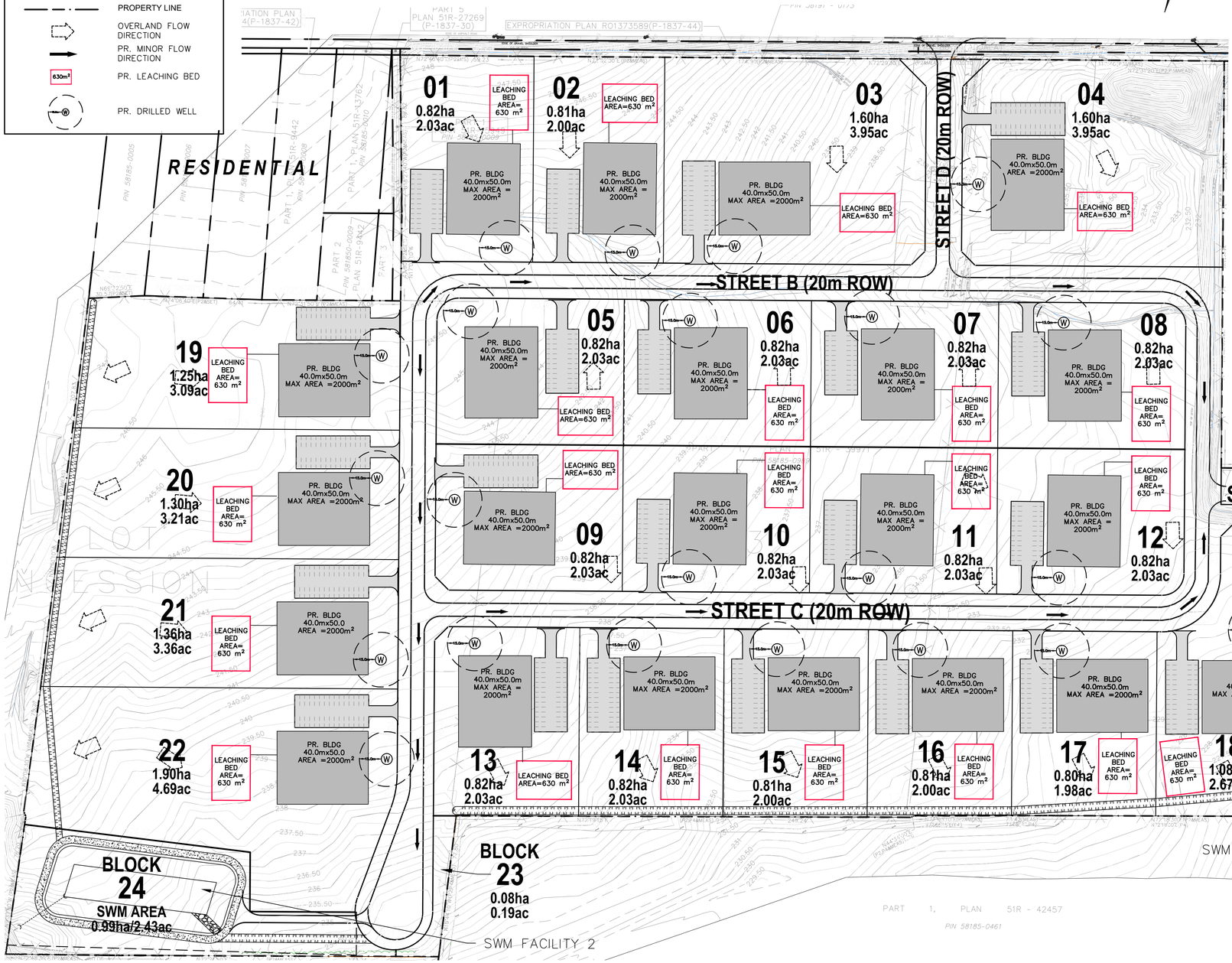
Drawing: PRELIMINARY GRADING PLAN

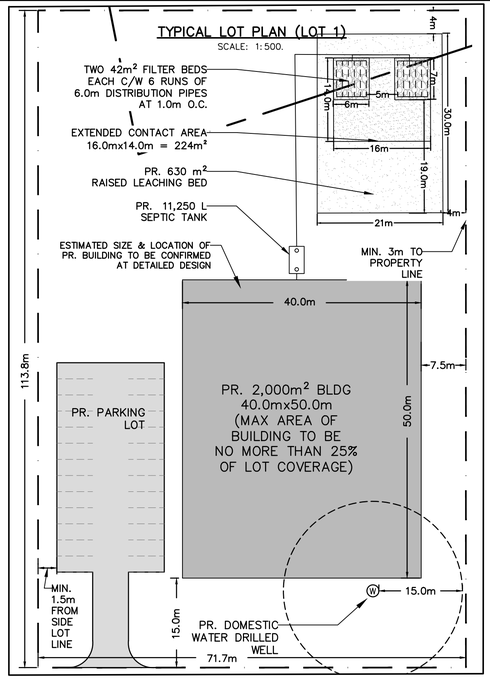
CROZIER CONSULTING ENGINEERS
ADMIRAL BUILDING
1 FIRST STREET, SUITE 200
COLLINGWOOD, ON, L9Y 1A1
705-446-3510 T
705-446-3520 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

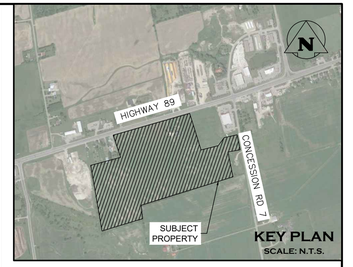
Drawn By	Design By	Project
M.T./R.D.M.	M.T./R.D.M.	1101-4125
Check By	**Check By**	**Scale** / **Drawing**
Z.H.	B.H.	1:1250 / FIG. 2

LEGEND

- EX. CONTOURS (1.0m)
- EX. ELEVATIONS
- PROPERTY LINE
- OVERLAND FLOW DIRECTION
- PR. MINOR FLOW DIRECTION
- PR. LEACHING BED
- PR. DRILLED WELL







ON-SITE SEWAGE SYSTEM DESIGN NOTES

DAILY DESIGN FLOW	AS PER OBC TABLE 8.2.1.3.B FACTORY (NO SHOWER) ASSUME 50 STAFF Q=3,750 L/DAY
SOIL PERCOLATION RATE	T = 50 min/cm (ASSUMED BY C.F. CROZIER)
PROPOSED SEPTIC TANK SIZE	MIN. SIZE =QX3 = 11,250 L PROPOSED TANK = 11,250 L
FILTER BED STONE AREA	Q/50 =3,750/50 75 m² REQUIRED 84 m² PROVIDED
FILTER BED EXTENDED CONTACT AREA	QT/850= 3,750*50/850 221 m² REQUIRED 224 m² PROVIDED
RAISED BED AREA	Q/6= 3,750/6 625 m² REQUIRED 630 m² PROVIDED

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BENCHMARKS

EXISTING ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM AND ARE DERIVED FROM BENCHMARK NO. 00819798415 HAVING A PUBLISHED ELEVATION OF 229.368 METRES (CGVD28: 78)

TOPOGRAPHIC SURVEY COMPLETED ON MARCH 4, 2021 BY J.D. BARNES LTD.

Township of Adjala-Tosorontio

No.	ISSUE	DATE: MMM/DD/YYYY
1	ISSUED FOR FIRST SUBMISSION	10/20/2022

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Project: 7723 HIGHWAY 89
TOWNSHIP OF ADJALA-TOSORONTIO

Drawing: WATER AND SANITARY SERVICING PLAN

CROZIER CONSULTING ENGINEERS
ADMIRAL BUILDING
1 FIRST STREET, SUITE 200
COLLINGWOOD, ON, L9Y 1A1
705-446-3510 T
705-446-3520 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

Drawn By	A.L.	Design By	A.L.	Project	1101-4125
Check By	K.R.	Check By	K.R.	Scale 1:1250	Drawing FIG. 3

LEGEND

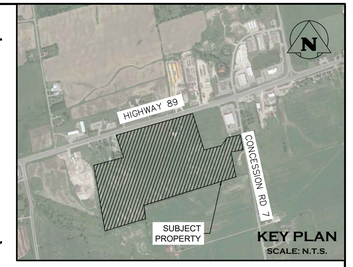
CATCHMENT ID — PRE–1

AREA (HA) — 9.1 | 82.7

PERCENT IMPERVIOUS (STANDHYD)
COMPOSITE CURVE NUMBER (NASHYD)

FLOW DIRECTION

CATCHMENT DELINEATION



KEY PLAN
SCALE: N.T.S.

HIGHWAY 89

EXT–1 | 4.0 | 45.5%

PRE–1 | 8.8 | 82.7

PRE–3 | 8.5 | 82.0

PRE–2 | 9.4 | 82.0

EXT–2 | 1.4 | 82.7

PRE–4 | 2.4 | 82.0

EX. HOME HARDWARE

EX. PEAVEY MART

EX. 600mmø CULVERT

EX. 600mmø CULVERT

CONCESSION ROAD 7

OUTLET 1

EX. 750mmø CULVERT

EX. 300mmø CULVERT

OUTLET 2

OUTLET 3

50 0m 50 100
SCALE: 1:1500

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BENCHMARKS

EXISTING ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM AND ARE DERIVED FROM BENCHMARK NO. 00819798415 HAVING A PUBLISHED ELEVATION OF 229.368 METRES (CGVD28: 78)

TOPOGRAPHIC SURVEY COMPLETED ON MARCH 4, 2021 BY J.D. BARNES LTD.

Town: Township of Adjala-Tosorontio

No.	ISSUE	DATE: MMM/DD/YYYY
1	ISSUED FOR FIRST SUBMISSION	10/20/2022

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Project: 7723 HIGHWAY 89
TOWNSHIP OF ADJALA–TOSORONTIO

Drawing: PRE–DEVELOPMENT DRAINAGE PLAN

CROZIER CONSULTING ENGINEERS
ADMIRAL BUILDING
1 FIRST STREET, SUITE 200
COLLINGWOOD, ON, L9Y 1A1
705-446-3510 T
705-446-3520 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

Drawn By	Design By	Project	
M.T./R.D.M.	M.T./R.D.M.		1101–4125
Check By	Check By	Scale	Drawing
Z.H.	B.H.	1:1500	FIG. 4

LEGEND

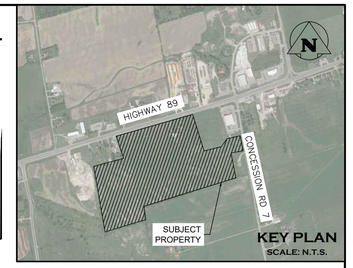
CATCHMENT ID — POST-1

AREA (HA) — 21.9 | 83%

PERCENT IMPERVIOUS (STANDHYD)
COMPOSITE CURVE NUMBER (NASHYD)

FLOW DIRECTION

CATCHMENT DELINEATION



KEY PLAN
SCALE: N.T.S.

HIGHWAY 89

EXT-1 | 4.0 | 45.5%

EXT-2 | 1.4 | 82.7

POST-1 | 19.3 | 82.9%

POST-2 | 6.5 | 80.1%

POST-3 | 0.5 | 22.3%

SWMF-1 | 1.8 | 50%

SWMF-2 | 1.0 | 50%

EX. HOME HARDWARE

EX. PEAVEY MART

CONCESSION ROAD 7

EX. 600mmø CULVERT

EX. 600mmø CULVERT

EX. 750mmø CULVERT

OUTLET 1

EX. 300mmø CULVERT TO BE REMOVED

INSTALL CULVERT ON EX. DRIVEWAY

REGRADE DITCH AS NEEDED & RESTORE TO EX. CONDITIONS OR BETTER

OUTLET 2

OUTLET 3

OUTER EDGE OF ACCESS ROAD 235.27
TOP OF POND 235.19
HIGH WATER LEVEL 234.89
BOTTOM OF POND 232.89

OUTER EDGE OF ACCESS ROAD 228.00
TOP OF POND 227.92
HIGH WATER LEVEL 227.62
EXTENDED DETENTION 226.42
PERMANENT POOL 225.62
BOTTOM OF POND 224.12

3:1 MAX

SCALE: 1:1500

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TOWNSHIP OF ADJALA-TOSORONTIO

Drawing: STORM SERVICING AND POST-DEVELOPMENT DRAINAGE PLAN

CROZIER CONSULTING ENGINEERS
ADMIRAL BUILDING
1 FIRST STREET, SUITE 200
COLLINGWOOD, ON, L9Y 1A1
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705-446-3520 F
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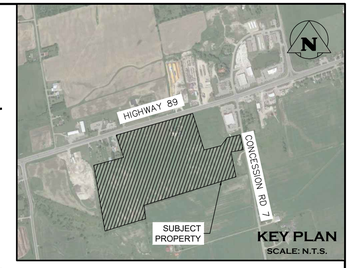
Drawn By	Design By	Project	
M.T./R.D.M.	M.T./R.D.M.	1101-4125	
Check By	Check By	Scale	Drawing
Z.H.	B.H.	1:1500	FIG. 5

LEGEND

- EX. CONTOURS
- EX. ELEVATIONS
- PR. ELEVATIONS
- PR. ELEVATIONS (MATCH TO EXISTING)
- PR. ROAD GRADES
- PR. DITCH
- PR. SWALE
- PR. CULVERT
- PR. CHANNEL
- PR. SWM BLOCK
- PR. RIPRAP
- PR. HEADWALL AND PIPE



EX. 600mmø CULVERT

TIE INTO EXISTING DRIVEWAY AND DITCH

SUBJECT TO EASEMENT AS IN SC1392807

OUTLET 1

EX. 600mmø CULVERT

EX. 750mmø CULVERT

EX. 300mmø CULVERT TO BE REMOVED

INSTALL CULVERT ON EX. DRIVEWAY

REGRADE DITCH AS NEEDED & RESTORE TO EX. CONDITIONS OR BETTER

MATCH TO EXISTING ALONG P/L
3:1 MAX SLOPE

APPROXIMATE AREA OF SWM BLOCK: 1.79 ha

OUTER EDGE OF ACCESS ROAD 228.00
TOP OF POND 227.92
HIGH WATER LEVEL 227.62
EXTENDED DETENTION 226.42
PERMANENT POOL 225.62
BOTTOM OF POND 224.12

3:1 MAX

N72°13'00"E 68.45

66.03

2.42

135.00

SCALE: 1:500

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Project: 7723 HIGHWAY 89
TOWNSHIP OF ADJALA-TOSORONTIO

Drawing: SWM FACILITY 1

CROZIER CONSULTING ENGINEERS
ADMIRAL BUILDING
1 FIRST STREET, SUITE 200
COLLINGWOOD, ON, L9Y 1A1
705-446-3510 T
705-446-3520 F
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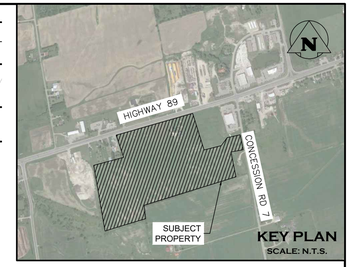
Drawn By	Design By	Project	
M.T./R.D.M.	M.T./R.D.M.		1101-4125
Check By	Check By	Scale	Drawing
Z.H.	B.H.	1:500	FIG. 6

LEGEND

- EX. CONTOURS
- EX. ELEVATIONS
- PR. ELEVATIONS
- PR. ELEVATIONS (MATCH TO EXISTING)
- PR. ROAD GRADES
- PR. DITCH
- PR. SWALE
- PR. CULVERT
- PR. CHANNEL
- PR. SWM BLOCK
- PR. RIPRAP
- PR. HEADWALL AND PIPE



KEY PLAN
SCALE: N.T.S.

MATCH TO EXISTING ALONG P/L
3:1 MAX SLOPE

APPROXIMATE AREA OF SWM BLOCK: 0.91 ha

OUTER EDGE OF ACCESS ROAD 235.27
TOP OF POND 235.19
HIGH WATER LEVEL 234.89
BOTTOM OF POND 232.89

3:1 MAX

OUTLET 3

SCALE: 1:500

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TOWNSHIP OF ADJALA-TOSORONTIO

Drawing: SWM FACILITY 2

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Drawn By	Design By	Project	
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Check By	Check By	Scale	Drawing
Z.H.	B.H.	1:500	FIG. 7