SUNVALE HOMES

FUNCTIONAL SERVICING REPORT

DEY DRIVE TOWNHOUSES

TOWN OF COLLINGWOOD

JUNE 2026

COBIDE Engineering Inc
517 10th Street
Hanover, ON N4N 1R4
TEL: 519-506-5959
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COBIDE ENGINEERING INC

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1. INTRODUCTION

Cobide Engineering Inc. was retained by Sunvale Homes to provide engineering services in support of a Draft Plan of Subdivision Approval Application. The application will be to develop the property into a 33-unit street townhouse development.

A copy of the proposed Site Plan has been included in Appendix A as Drawing SP1.

1.1 LOCATION

The proposed development is located on Block 183, Registered Plan 51M-945, Geographic Township of Nottawasaga, Town of Collingwood, County of Simcoe (described herein as the “site”). A Site Location Map is included as Figure 1. The subject property is approximately 1.918 hectares in area.

1.2 DEVELOPMENT PROPOSAL

The proposed development consists of 1.918 hectares of land within the Collingwood settlement area.

The proposed plan is to develop the site into a residential subdivision. The subdivision will involve the extension of Dey Drive from Kirby Avenue.

A single road access point to Kirby Avenue will be provided. There will be a number of pedestrian linkages to the nearby trail network.

The proposed development is within the Collingwood Settlement Boundary of the current Official Plan and thus is intended for servicing from municipal water and sewage systems.

SCALE 1:500,000

5000 0 2500 5000 1000 15000 metre

20000 10000 0 20000 50000 feet

MAP SOURCE - MTO ROAD MAP

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Client/Project

PROPOSED TOWNHOUSE DEVELOPMENT
TOWN OF COLLINGWOOD
DEY DRIVE TOWNHOUSES
FUNCTIONAL SERVICING REPORT

Figure No.

1

Title

REGIONAL LOCATION MAP

ORIGINAL SHEET – 8 x 11

H:\Sunvale Homes\00704 Dey Drive Townhouses\Drawings\Submissions\2025-10-15 Regional Location\00704 Regional Location – FSR.dwg Oct 15, 2025 – 11:33am

2. WATER DISTRIBUTION SYSTEM

The water distribution system will be sized based on the existing conditions at the connection to the municipal system and the subdivisions demands which are determined by the Ministry of the Environment (MOE) Design Guidelines for Drinking-Water Systems (2008).

2.1 DESIGN CRITERIA

The water distribution system will be design in accordance MOE guidelines which state the system *"should be designed to satisfy the greater of the following demands:*

- *Maximum day demand plus fire flow; or,*
- *Peak hour demand*

The maximum day demand and peak hour demand are based on the projected water consumption from the development and the fire flow is based on the type of the development.

The system will require modelling during the detailed design stage to ensure the water pressure throughout the system is within the requirements of the MOE.

Based on MOE guidelines, the minimum pressure at ground level at all points in the distribution system under maximum day demand plus fire flow conditions are to be 140 kPa (20 psi). The normal operation pressure should be between 350 kPa (50 psi) to 480 kPa (70 psi). There shall be no point in the distribution system that has a normal operating pressure of less than 275 kPa (40 psi). The maximum pressure in the pipe cannot exceed 700 kPa (100 psi).

2.2 WATER CONSUMPTION

The system will be designed based on a domestic water demand of 260 L/cap/day as per the Town of Collingwood Development Standards. The peaking factors will be derived from the Town of Collingwood Development Standards. The peaking factor for the maximum day demand will be 1.77 and the peaking factor for the peak hour demand will be 2.7. This population estimate is based on 2.4 people per townhouse as per the Town of Collingwood Development Standards.

Table 1 below summarizes the projected maximum day and peak hour demands for the proposed development.

Table 1 - Proposed Water Demands

Demand	Population	Consumption (L/cap/day)	Peaking Factor	Peak Rate (L/day)	Peak Rate (L/s)
Maximum Day	80	260	1.77	36,816	0.43
Peak Hour	80	260	2.7	56,160	0.65

2.3 FIRE FLOW

The AWWA *Manual of Water Supply Practices M31 – Distribution System Requirements for Fire Protection* and the Fire Underwriters Survey document *Water Supply for Public Fire Protection* will determine the required fire flows.

The fire flows are dependent upon many factors including the type of construction materials, building height and density of the development.

The fire flow requirements for a typical townhouse within the development are expected to 8000 L/min which would need to be sustained for 1.5 hours.

2.4 DESIGN FLOW RATES

The watermain within the subdivision will be required to maintain the aforementioned pressure while supplying 133.8 L/s (MDD + Fire Flow). The pipes should be designed with a pipe roughness C-value of 110 which is typically used to represent PVC pipe.

2.5 WATERMAIN CONFIGURATION

The proposed watermain will be connected to the municipal system at the proposed intersection with Kirby Avenue. There is currently a 200mm diameter Ductile Iron watermain on the south side of Kirby Avenue. This watermain will provide service to the proposed development. It is proposed to connect to the main at the Dey Drive and Kirby Avenue intersection. An easement has been negotiated with the adjacent developer for storm sewer servicing.

A 200mm diameter Ductile Iron watermain is proposed within the development. There will be no irrigation systems within the development.

A single connection will be provided to each residential lot using 19mm diameter copper water services. Each unit will be individually metered.

2.6 AVERAGE DAY DEMAND (ICBL)

As per the Town's ICBL, Public Works has identified water servicing based on a standard unit of measure as an SDU (Single Detached Unit). A Townhouse unit is equivalent to 0.83 SDU's. Therefore, this development will require **27.4 SDU**'s of water and wastewater capacity.

3. SANITARY SEWER SYSTEM

The sanitary sewer system will be sized based on the existing conditions at the connection to the municipal system and the subdivisions demands which are determined by the Ministry of the Environment (MOE) Design Guidelines for Sewage Works (2008).

3.1 DESIGN CRITERIA

The sanitary sewer system will be design in accordance MOE guidelines.

The sanitary sewer will be designed to convey the projected peak flow based upon the projected population of the development, flows from future development to the north as well as extraneous flows.

3.2 DESIGN FLOW RATES

The sanitary sewer will be designed based on a peak flow of 260 L/cap/day and a peaking factor of 4.0 for the size of the development. Based on a population of 80 the projected residential flow is 0.96 L/s. The development will contribute 1.918 ha of extraneous flows to the sanitary sewer. This will contribute 0.44 L/s to the flow. Therefore, the peak flow from the development is 1.40 L/s.

The average daily domestic sanitary sewer flows will be designed based on a peak flow of 260 L/cap/day as per the latest Town of Collingwood Development Standards. Based on a population of 80 the projected residential flow is 20,800 L/day. The development will contribute 1.918 ha of extraneous flows to the sanitary sewer. This will contribute 38,114 L/day to the flow. Therefore, the average daily flow from the development is expected to be 58,914 L/day as per the Town of Collingwood's latest Development Standards.

3.3 SANITARY SEWER CONFIGURATION

There will be a sanitary sewer on the proposed streets with a single connection to the existing sanitary sewer at Dey Drive and Kirby Avenue. A single connection will be provided to each residential lot.

All sanitary sewers are proposed to be 200mm diameter PVC pipe. The minimum slope considered will be 0.40% to maintain a minimum velocity at full flow to prevent sediment deposition and blockages. The furthest section upstream will be installed at 1.0% for that same reason where possible.

4. STORM SEWER SYSTEM

The storm sewer system will be design in accordance with the municipal and conservation authority guidelines including the Ministry of the Environment (MOE) Design Guidelines. The storm sewer system will use the rationale method to size the storm sewer to accommodate the 100 year peak flow from the development. This will ensure that all runoff from the development reaches the SWM Pond. The runoff from the back of the proposed lots will drain towards the storm water system along grass swales and ditch inlet catchbasins.

The existing pond north of Kirby Avenue will be used to provide quality and quantity control. The use of the existing pond and the easement required has been worked out between the two developers.

The previously completed Pretty River Floodplain Analysis determined the regulatory floodplain in the area of this development required that the lowest opening of all dwelling units would need to be at a minimum elevation of 194.50m. The Tatham response to NVCA has been included in Appendix D outlining this requirement. The grading of the site has ensured that the lowest grade at the buildings is at minimum 194.80m.

As per the SWM report from the Eden Oak development, there is approximately 800 m3 extra quality control volume which will adequately treat the runoff from the proposed development. The development will require 76 m^3. The existing development and the proposed development have been modelled using PCSWMM to ensure the existing pond can control the additional flows. As shown in Table 2, below during both the SCS and Chicago design storm events there is very little increase in peak flows. The combined outflows are still significantly lower than pre-development conditions.

Table 2 – Stormwater Flows

Storm Event	Pre Development Flow (m^3/s)	Eden Oak Only Flow (m^3/s)	Combined Post Development Flow (m^3/s)
SCS 2 Year	0.148	0.024	0.029
SCS 5 Year	0.208	0.027	0.033
SCS 25 Year	0.485	0.035	0.040
SCS 100 Year	0.641	0.039	0.059
Chicago 2 Year	0.121	0.023	0.028
Chicago 5 Year	0.226	0.027	0.031
Chicago 25 Year	0.426	0.032	0.037
Chicago 50 Year	0.524	0.034	0.039
Chicago 100 Year	0.624	0.036	0.041

As seen in the table above, the combined post development peak flows remain considerably lower than pre-development peak flows.

5. GRADING & EROSION AND SEDIMENT CONTROL

Erosion and sediment controls shall meet the requirements of the most recent version of the MOE *Stormwater Management Planning and Design Manual* at the time of construction.

5.1 CONSTRUCTION STAGE

Prior to the start of construction, appropriate sediment control facilities are to be in place. Following are details regarding erosion and sediment control that are to be implemented:

- Placement of heavy duty siltation fencing is required along the east, west and south sides of the site to intercept sediment that could potentially be transported by sheet flow across the site.
- Placement of temporary straw check dams within swales and any other locations where a concentrated flow of runoff may occur. All proposed drainage swales are to be seeded during construction;
- Installation of filter cloth under all new and existing catchbasin grates until paving of the subdivision streets is completed;
- Mud mats will be placed at construction accesses to keep public roadways free from debris during the construction period.
- Re-vegetate all disturbed areas after underground and surface works have been constructed.

Prior to removal of sediment control facilities, ensure that sediment that may have accumulated has been removed. Once the area has been stabilized, the silt fencing can be removed.

5.2 LOT DEVELOPMENT

During individual construction of units within the development, silt barriers are to be constructed, as appropriate, to prevent the eroding of materials into the roadside drainage system. The sedimentation control can be in the form of siltation fences placed in the direction of flow from the construction site and shallow excavated sediment traps (moats) should be constructed around any stockpiled materials.

The responsibility for the individual lot sediment control is the landowner/builder constructing the dwelling.

The proposed grading design will match all existing grades at the property lines and will not alter or affect the drainage patterns of the neighbouring properties. The proposed site grading will drain the stormwater through side yard swales and a storm sewer system. The majority of the slopes found on site are proposed to be between 2.0% and 6.0%.

Sincerely,

Cobide Engineering Inc.

Travis Burnside, P. Eng.

Appendix A

DRAWINGS

FUNCTIONAL SERVICING REPORT

DEY DRIVE TOWNHOUSES
TOWN OF COLLINGWOOD

LEGEND

PROPERTY BOUNDARY	SANMH — PROPOSED SANITARY MANHOLE	CB — PROPOSED CATCH BASIN		PROPOSED TEE c/w RESTRAINTS
EDGE OF EXISTING PAVEMENT	SANMH — EXISTING SANITARY MANHOLE	CB — EXISTING CATCH BASIN		PROPOSED CAP c/w THRUST BLOCK
EDGE OF EXISTING GRAVEL	STMMH — PROPOSED STORM MANHOLE	DICB — PROPOSED DITCH INLET CATCHBASIN		PROPOSED BLOWOFF
PROPOSED SANITARY SEWER	STMMH — EXISTING STORM MANHOLE	PROPOSED HYDRANT SET	BM — BENCHMARK	
EXISTING SANITARY SEWER	CBMH — PROPOSED CATCHBASIN MANHOLE	HYD — EXISTING FIRE HYDRANT	486.21 / 486.21 — PROPOSED ELEVATION / EXISTING ELEVATION	
PROPOSED STORM SEWER	PROPOSED TRANSFORMER	PROPOSED GATE VALVE		
EXISTING STORM SEWER	TICBMH — PROPOSED TWIN INLET CATCHBASIN MANHOLE	EXISTING GATE VALVE	194.0 — EXISTING CONTOUR LINE	
PROPOSED SUBDRAIN	TICB — PROPOSED TWIN INLET CATCHBASIN	PROPOSED BEND c/w RESTRAINTS	PROPOSED TACTILE PLATES	
PROPOSED WATERMAIN	PROPOSED LIGHT POLE			
EXISTING WATERMAIN				

CAUTION:
THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE DRAWINGS, AND, WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

Notes

1. PROPERTY BOUNDARY DERIVED FROM PLAN OF SURVEY BY ZUBEK, EMO, PATTEN AND THOMSEN LTD.
2. SEE SHEET 00704-DET1 FOR TYPICAL CROSS SECTION AND PAVEMENT DESIGN.
3. ALL ORGANIC MATERIAL WITHIN 1.2m OF FINISHED PROFILE GRADE TO BE REMOVED FROM ALL AREAS UNDER THE TRAVELLED PORTION OF THE ROAD.
4. COVER OVER WATERMAIN 1.7m MINIMUM AT ALL POINTS.
5. SANITARY SEWER TO BE PVC SDR35.
6. ALL JOINTS OF SANITARY MANHOLES TO BE CAULKED WITH MIN. 15mm BEAD, INSTALLED ON THE TOP OF JOINT OF EACH SECTION PRIOR TO SECTION ABOVE BEING INSTALLED. CAULKING TO BE SIKAFLEX 1A OR APPROVED EQUIVALENT.
7. ALL HYDRANT SETS REQUIRE TEST POINT AND HYDRANT MARKER.
8. ALL STORM CATCHBASINS TO HAVE A MINIMUM SUMP OF 600mm AND ALL STORM MANHOLES TO HAVE A MINIMUM SUMP OF 300mm.
9. STORM SEWERS TO BE HDPE.
10. ALL DITCH INLET CATCHBASINS TO HAVE 3:1 GRATE (UNLESS OTHERWISE INDICATED)
11. ALL CATCHBASIN MANHOLE STRUCTURES TO BE 1200mmØ UNLESS OTHERWISE SHOWN.
12. ALL WATERMAINS TO BE PVC WITH 20mmØ MUNICIPEX WATER SERVICES.
13. THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION PURPOSES UNTIL STAMPED 'ISSUED FOR CONSTRUCTION'
14. ALL CONSTRUCTION TO BE COMPLETED TO MUNICIPAL SERVICING STANDARDS FOR THE TOWN OF COLLINGWOOD.

SCALE 1:500

5 0 2.5 5 10 15 25 METRES
30 20 10 0 25 50 100 FEET

Benchmark Information

BM1
TOP OF STANDARD IRON BAR LOCATED AT THE WESTERLY CORNER OF THE PROPERTY (AS SHOWN ON DRAWINGS)
ELEVATION 194.413m

BM2
TOP OF STANDARD IRON BAR LOCATED AT THE SOUTH-EASTERLY CORNER OF THE PROPERTY (AS SHOWN ON DRAWINGS)
ELEVATION 194.002m

BM3
TOP OF STANDARD IRON BAR LOCATED AT THE NORTHERLY CORNER OF THE PROPERTY (AS SHOWN ON DRAWINGS)
ELEVATION 192.931m

No.	DATE	DESCRIPTION	BY	APPD
4	JUN 02/26	THIRD SUBMISSION	TLB	SJC
3	APR 08/26	SECOND SUBMISSION	TLB	SJC
2	DEC 08/25	REVISED FIRST SUBMISSION	TLB	SJC
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PROPOSED TOWNHOUSE DEVELOPMENT
TOWN OF COLLINGWOOD
PRETTY RIVER ESTATES

SITE DEVELOPMENT PLAN

Client:	SUNVALE HOMES LTD.		
Design:	TLB	Scale:	1:500
Drawn:	ID	Approved:	
Checked:	TLB		
Date:	JUNE 2026		Design Engineer
DRAWING No.	00704-C3		

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LEGEND

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EXISTING SANITARY SEWER	CBMH	PROPOSED CATCHBASIN MANHOLE		EXISTING FIRE HYDRANT	486.21 PROPOSED ELEVATION
PROPOSED STORM SEWER		PROPOSED TRANSFORMER		PROPOSED GATE VALVE	486.21 EXISTING ELEVATION
EXISTING STORM SEWER	TICBMH	PROPOSED TWIN INLET CATCHBASIN MANHOLE	INV	EXISTING GATE VALVE	194.0 EXISTING CONTOUR LINE
PROPOSED SUBDRAIN	TICB	PROPOSED TWIN INLET CATCHBASIN		PROPOSED BEND c/w RESTRAINTS	PROPOSED TACTILE PLATES
PROPOSED WATERMAIN		PROPOSED LIGHT POLE			
EXISTING WATERMAIN					

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PROPOSED TOWNHOUSE DEVELOPMENT
TOWN OF COLLINGWOOD
PRETTY RIVER ESTATES

SITE SERVICING PLAN

Client: SUNVALE HOMES LTD.

Design:	TLB	Scale:	1:500
Drawn:	ID	Approved:	
Checked:	TLB		
Date:	JUNE 2026		Design Engineer

DRAWING No. 00704-C5

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LEGEND

- PROPERTY BOUNDARY
- EDGE OF EXISTING PAVEMENT
- EDGE OF EXISTING GRAVEL
- PROPOSED SANITARY SEWER
- EXISTING SANITARY SEWER
- PROPOSED STORM SEWER
- EXISTING STORM SEWER
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- PROPOSED WATERMAIN
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- MV — EXISTING GATE VALVE
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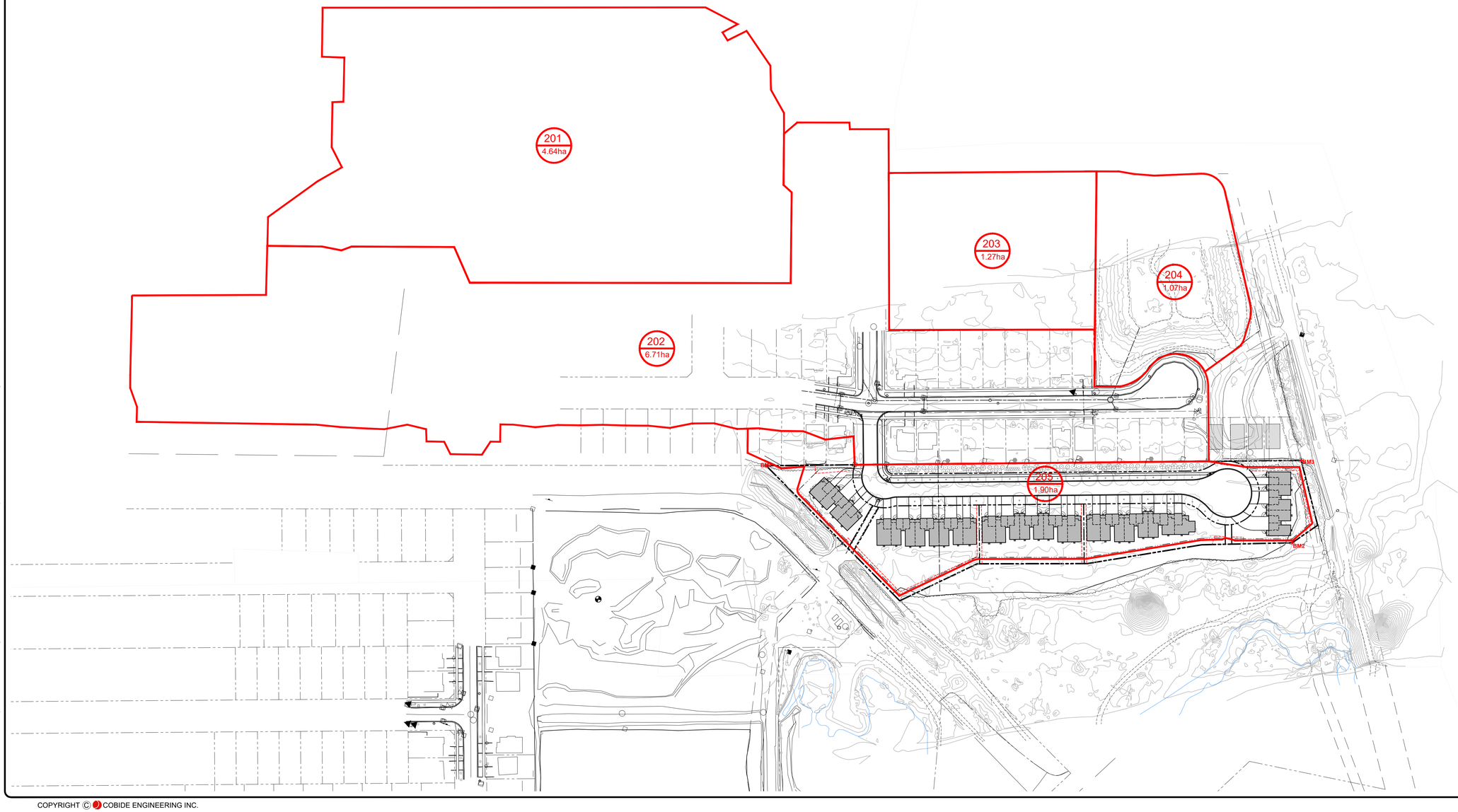
- 486.21 / 486.21 — PROPOSED ELEVATION / EXISTING ELEVATION
- 194.0 — EXISTING CONTOUR LINE
- PROPOSED TACTILE PLATES



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SCALE 1:1250

10 0 5 15 25 50 75 METRES
50 0 25 50 100 250 FEET

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PROPOSED TOWNHOUSE DEVELOPMENT
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PRETTY RIVER ESTATES

POST-DEVELOPMENT CATCHMENT AREAS

Client:	SUNVALE HOMES		
Design:	TLB	Scale:	1:1250
Drawn:	ID	Approved:	
Checked:	TLB		
Date:	JUNE 2026		Design Engineer
DRAWING No.	00704-SWM2		

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Appendix B

DESIGN SHEETS

FUNCTIONAL SERVICING REPORT

DEY DRIVE TOWNHOUSES
TOWN OF COLLINGWOOD

q = average daily per capita flow (260 L/cap.d)

i = unit of peak extraneous flow (0.23 L/ha.s)

Where M = peaking factor

Q(p) = peak population (L/s)

Q(i) = peak extraneous flow (L/s)

Q(d) = peak design flow (L/s)

Residential Density = 2.4 People per Dwelling Unit

Resdential Flow = 0.003 l/s/capita

260 l/day/ capita

SANITARY SEWER DESIGN SHEET

$Q(p) = \frac{PqM}{86.4}$

Q(i) = iA where A = area in hectares

Q(d) = Q(p) + Q(i) (L/s)

LOCATION			COM, IND, INST,			RESIDENTIAL		CUMULATIVE		Peaking Factor M	Pop. Flow Q(p) (L/s)	Peak Extraneous Q(i) (L/s)	Peak Design Flow (L/s)	PROPOSED SEWER					
Street	From	To	Type	Flow (L/s/ha)	Area (hectares)	Pop.	Area (ha)	Pop.	Area (ha)					Length (m)	Pipe Size (mm)	Type of Pipe	Grade %	Capacity (L/s) n=0.013	Full Flow Velocity (m/s)
DEY DRIVE	SANMH1	SANMH2				12	0.22	12	0.22	4.41	0.16	0.05	0.21	19.3	200	PVC	0.60	25.1	0.80
	SANMH2	SANMH3				22	0.66	34	0.88	4.35	0.44	0.20	0.65	102.1	200	PVC	0.50	22.9	0.73
	SANMH3	SANMH4				36	0.88	70	1.76	4.28	0.90	0.41	1.31	119.5	200	PVC	0.40	20.5	0.65
	SANMH4	EX.SANMH7				10	0.16	80	1.93	4.27	1.02	0.44	1.47	54.5	200	PVC	0.4	20.5	0.65

COBIDE ENGINEERING INC

Date: 2026-06-01

PROJECT NO.: 00704

COBIDE ENGINEERING INC

SUBDIVISION: **Dey Drive Townhouses**

DATE: June 1, 2026
DESIGNED BY: RVA
CHECKED BY: TLB

STORM SEWER DESIGN SHEET
100 YEAR STORM

FILE NUMBER: 00704

DESIGN PARAMETERS

I = a / ((tc + b) ^c)

a= 2193.1
b= 9.04
c= 0.8710

DESIGN STORM 1 in 100 Years

MANNING'S n = 0.013
MINIMUM COVER: 0.9 m
TIME OF ENTRY 10 min

LOCATION	DRAINAGE AREA									PIPE SELECTION						CAPACITY	PROFILE					
	FROM M.H.	TO M.H.	AREA (ha)	C	A x R (ha)	ACCUM. AREA (ha)	T of C (min)	I (mm/h)	Q (m3/s)	LENGTH (m)	PIPE SIZE (mm)	SLOPE %	CAP. (FULL) (m3/s)	VEL. (FULL) (m/S)	TIME OF FLOW (min)	(%)	FALL IN SEWER (m)	UPSTREAM GROUND (m)	DOWNSTREAM INVERT (m)	DOWNSTREAM INVERT (m)	DROP (m)	DEPTH OF COVER m
101	DICB1	CBMH1	0.180	0.280	0.05	0.05	10.00	168.45	0.024	28.8	300	0.50	0.068	0.97	0.50	34.49%	0.14	193.81	193.16	193.02	0.08	0.35
	CBMH1	TICBMH1	0.000	0.000	0.00	0.05	10.50	164.72	0.023	22.7	300	0.50	0.068	0.97	0.39	33.72%	0.11	194.52	192.94	192.82	0.18	1.28
						TOTAL	10.89															
102	TICB1	TICBMH1	0.151	0.710	0.11	0.11	10.00	168.45	0.050	8.5	300	1.00	0.097	1.37	0.10	51.84%	0.09	194.36	192.86	192.78		1.20
						TOTAL	10.10															
103	TICBMH1	TICBMH2	0.041	0.540	0.02	0.18	10.89	161.90	0.081	51.8	375	0.50	0.124	1.12	0.77	65.15%	0.26	194.30	192.66	192.40	0.03	1.27
						TOTAL	11.66															
104	DICB2	DICB3	0.031	0.420	0.01	0.01	10.00	168.45	0.006	8.3	300	0.50	0.068	0.97	0.14	9.02%	0.04	194.15	192.91	192.87		0.94
105	DICB3	DICB4	0.046	0.200	0.01	0.01	10.14	167.35	0.004	37.0	300	0.50	0.068	0.97	0.64	6.31%	0.19	194.01	193.20	193.02	0.05	0.51
106	DICB4	DICB5	0.128	0.420	0.05	0.06	10.78	162.66	0.028	54.7	300	0.50	0.068	0.97	0.94	41.54%	0.27	194.07	192.97	192.69	0.08	0.81
107	DICB5	TICBMH3	0.120	0.490	0.06	0.12	11.72	156.21	0.053	38.7	300	0.50	0.068	0.97	0.67	77.15%	0.19	194.05	192.61	192.42		1.14
108	TICBMH3	TICBMH2	0.143	0.740	0.11	0.23	12.39	151.96	0.096	8.5	375	1.00	0.175	1.59	0.09	54.81%	0.09	194.27	192.77	192.69		1.13
						TOTAL	12.48															
109	TICBMH2	TICBMH5	0.098	0.490	0.05	0.46	12.48	151.42	0.191	65.6	525	0.50	0.304	1.40	0.78	62.97%	0.33	194.27	192.31	191.98	0.03	1.44
						TOTAL	13.26															
110	DICB6	TICBMH4	0.173	0.520	0.09	0.09	10.00	168.45	0.042	39.3	300	0.50	0.068	0.97	0.68	61.52%	0.20	193.75	192.25	192.05		1.20
111	TICBMH4	TICBMH5	0.141	0.700	0.10	0.19	10.68	163.40	0.086	8.5	300	1.20	0.106	1.50	0.09	80.77%	0.10	194.16	192.66	192.56		1.20
						TOTAL	10.77															
112	TICBMH5	TICBMH6	0.101	0.480	0.05	0.69	13.26	146.80	0.282	53.3	600	0.50	0.434	1.54	0.58	65.02%	0.27	194.16	191.95	191.69	0.03	1.61
						TOTAL	13.84															
113	TICB4	TICBMH6	0.219	0.710	0.16	0.16	10.00	168.45	0.073	8.5	300	1.00	0.097	1.37	0.10	75.20%	0.09	194.09	192.59	192.51		1.20
						TOTAL	10.10	167.66														
114	TICBMH6	STMMH1	0.119	0.550	0.07	0.91	13.84	143.57	0.364	38.0	675	0.50	0.594	1.66	0.38	61.26%	0.19	194.09	191.66	191.47	0.08	1.76
						TOTAL	14.22															
115	DICB7	DICB8	0.056	0.450	0.03	0.03	10.00	168.45	0.012	15.1	300	0.50	0.068	0.97	0.26	17.19%	0.08	193.93	192.44	192.36	0.08	1.19
116	DICB8	STMMH1	0.023	0.200	0.00	0.03	10.26	166.47	0.014	38.1	300	0.50	0.068	0.97	0.66	20.04%	0.19	193.70	192.28	192.09		1.12
						TOTAL	10.92															
	STMMH1	CBMH2	0.000	0.000	0.00	0.94	14.22	141.51	0.371	6.7	675	0.50	0.594	1.66	0.07	62.35%	0.03	194.36	191.39	191.35	0.03	2.30
						TOTAL	14.28															
117	DICB9	DICB10	0.045	0.510	0.02	0.02	10.00	168.45	0.011	34.9	300	0.50	0.068	0.97	0.60	15.78%	0.17	194.27	192.77	192.60	0.08	1.20
118	DICB10	DICB11	0.029	0.440	0.01	0.04	10.60	163.95	0.016	31.3	300	0.50	0.068	0.97	0.54	23.98%	0.16	194.23	192.52	192.36	0.03	1.41
119	DICB11	CBMH2	0.012	0.200	0.00	0.04	11.14	160.13	0.017	12.1	300	2.00	0.137	1.93	0.10	12.50%	0.24	194.19	192.33	192.09		1.56
						TOTAL	11.24															
120	CBMH2	STMMH2	0.052	0.730	0.04	1.02	14.28	141.16	0.400	36.6	675	0.50	0.594	1.66	0.37	67.25%	0.18	194.05	191.32	191.14	0.03	2.05
	STMMH2	STMMH3	0.000	0.000	0.00	1.02	14.65	139.25	0.394	37.6	675	0.50	0.594	1.66	0.38	66.34%	0.19	192.61	191.11	190.92	0.08	0.83
	STMMH3	POND	0.000	0.000	0.00	1.02	15.03	137.35	0.389	40.1	675	0.50	0.594	1.66	0.40	65.44%	0.20	193.36	190.84	190.64		1.84
						TOTAL	15.43															

COBIDE ENGINEERING INC

Subdivision: **Dey Drive Townhouses**
Date: June 1, 2026
Designed By: RVA
Checked By: TLB
File Number: 00704

Post Development Runoff Coefficients

	"C"
Impervious Area	0.90
Pervious Area	0.20

AREA ID	Total Area (ha)	Building (m^2)	Sidewalk (m^2)	Road (m^2)	Driveways (m^2)	Pervious (ha)	Impervious (ha)	Balanced 'C'
101	0.180	246.7	0	0	0	0.16	0.02	0.28
102	0.151	361.5	0	266.1	476.5	0.04	0.11	0.71
103	0.041	0	38.0	160.3	0	0.02	0.02	0.54
104	0.031	122.9	0	0	0	0.02	0.01	0.42
105	0.046	31.4	0	0	0	0.05	0.00	0.20
106	0.128	354.6	0	0	0	0.09	0.04	0.42
107	0.120	453.8	0	0	0	0.07	0.05	0.49
108	0.143	323.1	0	287.2	448.8	0.03	0.11	0.74
109	0.098	0	91.9	287.2	0	0.06	0.04	0.49
110	0.173	781.1	0	0	0	0.09	0.08	0.52
111	0.141	339.8	0	295.9	394.3	0.04	0.10	0.70
112	0.101	0	94.7	296.6	0	0.06	0.04	0.48
113	0.219	380.0	41.4	661.1	512.5	0.06	0.16	0.71
114	0.119	0	109.4	453.2	0	0.06	0.06	0.55
115	0.056	167.7	0	0	0	0.04	0.02	0.45
116	0.023	12.9	0	0	0	0.02	0.00	0.20
117	0.045	159.6	0	0	0	0.03	0.02	0.51
118	0.029	114.2	0	0	0	0.02	0.01	0.44
119	0.012	25.7	0	0	0	0.01	0.00	0.20
120	0.052	95.4	46.3	201.5	100.5	0.01	0.04	0.73
Total	1.908	3970.6	421.8	2909.1	1932.5	0.978	0.930	0.54

Notes:

Taken from the Ministry of the Environment - Guidelines for the Design of Storm Sewers

-Based on 250m^2 Semi-Detached unit and 120m^2 townhouse unit

- Pervious area has a runoff coefficient equal to 0.2

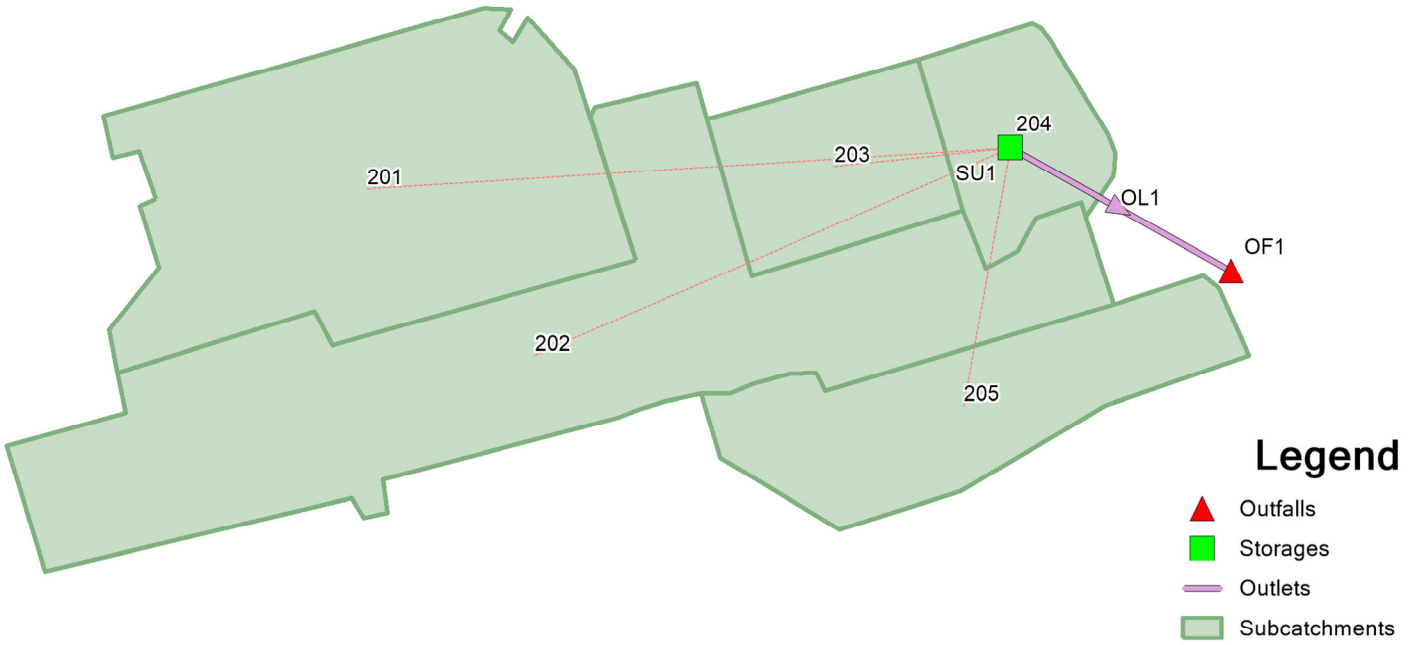
Appendix C

SWM MODELLING

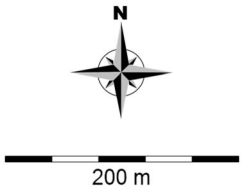
FUNCTIONAL SERVICING REPORT

DEY DRIVE TOWNHOUSES
TOWN OF COLLINGWOOD

DEY DRIVE TOWNHOUSES - SWM MODEL SCHEMATIC



COBIDE ENGINEERING INC



DEY DRIVE TOWNHOUSES – SWM MODELLING – MODEL DETAILS

[TITLE]
;;Project Title/Notes

[OPTIONS]
;;Option Value
FLOW_UNITS CMS
INFILTRATION HORTON
FLOW_ROUTING DYNWAVE
LINK_OFFSETS DEPTH
MIN_SLOPE 0
ALLOW_PONDING NO
SKIP_STEADY_STATE NO

START_DATE 10/13/2025
START_TIME 00:00:00
REPORT_START_DATE 10/13/2025
REPORT_START_TIME 00:00:00
END_DATE 10/14/2025
END_TIME 00:00:00
SWEEP_START 1/1
SWEEP_END 12/31
DRY_DAYS 0
REPORT_STEP 00:01:00
WET_STEP 00:05:00
DRY_STEP 00:05:00
ROUTING_STEP 5
RULE_STEP 00:00:00

INERTIAL_DAMPING PARTIAL
NORMAL_FLOW_LIMITED BOTH
FORCE_MAIN_EQUATION H-W
VARIABLE_STEP 0.75
LENGTHENING_STEP 0
MIN_SURFAREA 0
MAX_TRIALS 8
HEAD_TOLERANCE 0
SYS_FLOW_TOL 5
LAT_FLOW_TOL 5
MINIMUM_STEP 0.5
THREADS 16

[EVAPORATION]
;;Data Source Parameters
;;-------------- ----------------
CONSTANT 0.0
DRY_ONLY NO

[RAINGAGES]
;;Name Format Interval SCF Source
;;-------------- --------- -------- -------- ----------
Chicago_4h_100yr VOLUME 0:05 1.0 TIMESERIES Chicago_4h_100yr
Chicago_4h_25yr VOLUME 0:05 1.0 TIMESERIES Chicago_4h_25yr
Chicago_4h_2yr VOLUME 0:05 1.0 TIMESERIES Chicago_4h_2yr
Chicago_4h_50yr VOLUME 0:05 1.0 TIMESERIES Chicago_4h_50yr
Chicago_4h_5yr VOLUME 0:05 1.0 TIMESERIES Chicago_4h_5yr
SCS_Type_II_46.8mm_2yr_24hr_Collingwood INTENSITY 0:06 1.0 TIMESERIES SCS_Type_II_46.8mm_2yr_24hr_Collingwood
SCS_Type_II_60.3mm_5yr_24hr_Collingwood INTENSITY 0:06 1.0 TIMESERIES SCS_Type_II_60.3mm_5yr_24hr_Collingwood
SCS_Type_II_80.5mm_25yr_24hr_Collingwood INTENSITY 0:06 1.0 TIMESERIES SCS_Type_II_80.5mm_25yr_24hr_Collingwood
SCS_Type_II_88.8mm_50yr_24hr_Collingwood INTENSITY 0:06 1.0 TIMESERIES SCS_Type_II_88.8mm_50yr_24hr_Collingwood
SCS_Type_II_97.1mm_100yr_24hr_Collingwood INTENSITY 0:06 1.0 TIMESERIES SCS_Type_II_97.1mm_100yr_24hr_Collingwood

[SUBCATCHMENTS]
;;Name Rain Gage Outlet Area %Imperv Width %Slope CurbLen SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------------
201 Chicago_4h_100yr SU1 4.64 50 264 2 0
202 Chicago_4h_100yr SU1 6.71 50 314 2 0
203 Chicago_4h_100yr SU1 1.27 0 138 2 0
204 Chicago_4h_100yr SU1 1.07 50 400 2 0
205 Chicago_4h_100yr SU1 1.9 50 750 2 0

[SUBAREAS]
;;Subcatchment N-Imperv N-Perv S-Imperv S-Perv PctZero RouteTo PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------

DEY DRIVE TOWNHOUSES – SWM MODELLING – MODEL DETAILS

```
201              0.013      0.15       0.05       0.05       25         OUTLET
202              0.013      0.15       0.05       0.05       25         OUTLET
203              0.013      0.15       0.05       0.05       25         OUTLET
204              0.013      0.15       0.05       0.05       25         OUTLET
205              0.013      0.15       0.05       0.05       25         OUTLET

[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4     Param5
;;-------------- ---------- ---------- ---------- ---------- ----------
201              68         0.5        7          0          0          CURVE_NUMBER
202              68         0.5        7          0          0          CURVE_NUMBER
203              68         0.5        7          0          0          CURVE_NUMBER
204              68         0.5        7          0          0          CURVE_NUMBER
205              68         0.5        7          0          0          CURVE_NUMBER

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
OF1              0          FREE                        NO

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params            SurDepth Fevap    Psi      Ksat     IMD
;;-------------- -------- ---------- ---------- ---------- ---------------------------- -------- -------- -------- -------- ---
-----
SU1              189.6    3.9        1          TABULAR    Eden_Oak_East_Pond             0      0

[OUTLETS]
;;Name           From Node        To Node          Offset     Type            QTable/Qcoeff    Qexpon     Gated
;;-------------- ---------------- ---------------- ---------- --------------- ---------------- ---------- --------
OL1              SU1              OF1              0          TABULAR/HEAD    Outlet                      NO

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
Outlet           Rating     0          0
Outlet                      1          0
Outlet                      1.1        0.011
Outlet                      1.2        0.016
Outlet                      1.3        0.019
Outlet                      1.4        0.022
Outlet                      1.5        0.0245
Outlet                      1.6        0.0265
Outlet                      1.7        0.0285
Outlet                      1.8        0.03
Outlet                      1.9        0.0315
Outlet                      2          0.033
Outlet                      2.1        0.0345
Outlet                      2.2        0.0365
Outlet                      2.3        0.038
Outlet                      2.4        0.0395
Outlet                      2.5        0.041
Outlet                      2.6        0.0425
Outlet                      2.7        0.044
Outlet                      2.8        0.4019
Outlet                      2.9        0.4687
Outlet                      3          0.5255
Outlet                      3.1        0.5763
Outlet                      3.2        0.6227
Outlet                      3.3        0.6656
Outlet                      3.4        0.7058
Outlet                      3.5        0.905
Outlet                      3.6        1.2359
Outlet                      3.7        1.6521
Outlet                      3.8        2.1372
Outlet                      3.9        2.6817

Eden_Oak_East_Pond Storage    0          1080.56
Eden_Oak_East_Pond            0.3        1266.73
Eden_Oak_East_Pond            0.4        1333.95
Eden_Oak_East_Pond            0.6        1471.19
Eden_Oak_East_Pond            0.7        1541.2
Eden_Oak_East_Pond            0.8        3240.68
Eden_Oak_East_Pond            0.9        3420.18
```

DEY DRIVE TOWNHOUSES – SWM MODELLING – MODEL DETAILS

```
Eden_Oak_East_Pond           1          3551.17
Eden_Oak_East_Pond           1.1        3741.96
Eden_Oak_East_Pond           1.2        3876.5
Eden_Oak_East_Pond           1.3        4019.66
Eden_Oak_East_Pond           1.4        4144.23
Eden_Oak_East_Pond           1.5        4270.48
Eden_Oak_East_Pond           1.6        4398.41
Eden_Oak_East_Pond           1.7        4528.01
Eden_Oak_East_Pond           1.8        4659.3
Eden_Oak_East_Pond           1.9        4792.26
Eden_Oak_East_Pond           2          4926.89
Eden_Oak_East_Pond           2.1        5063.21
Eden_Oak_East_Pond           2.2        5201.2
Eden_Oak_East_Pond           2.3        5340.87
Eden_Oak_East_Pond           2.4        5482.22
Eden_Oak_East_Pond           2.5        5626.49
Eden_Oak_East_Pond           2.6        5773
Eden_Oak_East_Pond           2.7        5922.29
Eden_Oak_East_Pond           2.8        6073.48
Eden_Oak_East_Pond           2.9        6226.85
Eden_Oak_East_Pond           3          6382.42
Eden_Oak_East_Pond           3.1        6541.59
Eden_Oak_East_Pond           3.2        6705.95
Eden_Oak_East_Pond           3.3        6874.6
Eden_Oak_East_Pond           3.4        7047.55
Eden_Oak_East_Pond           3.5        7248.97
Eden_Oak_East_Pond           3.6        7429.63
Eden_Oak_East_Pond           3.7        7592.43
Eden_Oak_East_Pond           3.8        7781.22
Eden_Oak_East_Pond           3.9        7975.04

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
;Chicago design storm, a = 2193.1, b = 9.04, c = 0.871, Duration = 240 minutes, r = 0.35, rain interval = 5 minutes, rain units
= mm.
Chicago_4h_100yr

;Chicago design storm, a = 1676.2, b = 8.3, c = 0.858, Duration = 240 minutes, r = 0.35, rain interval = 5 minutes, rain units =
mm.
Chicago_4h_25yr

;Chicago design storm, a = 807.44, b = 6.75, c = 0.828, Duration = 240 minutes, r = 0.35, rain interval = 5 minutes, rain units
= mm.
Chicago_4h_2yr

;Chicago design storm, a = 1973.1, b = 9, c = 0.868, Duration = 240 minutes, r = 0.35, rain interval = 5 minutes, rain units =
mm.
Chicago_4h_50yr

;Chicago design storm, a = 1135.4, b = 7.5, c = 0.841, Duration = 240 minutes, r = 0.35, rain interval = 5 minutes, rain units =
mm.
Chicago_4h_5yr

;SCS_Type II_46.8mm design storm, total rainfall = 46.8 mm, rain interval = 6 minutes, rain units = mm/hr.
SCS_Type_II_46.8mm_2yr_24hr_Collingwood

;SCS_Type II_60.3mm design storm, total rainfall = 60.3 mm, rain interval = 6 minutes, rain units = mm/hr.
SCS_Type_II_60.3mm_5yr_24hr_Collingwood

;SCS_Type II_80.5mm design storm, total rainfall = 80.5 mm, rain interval = 6 minutes, rain units = mm/hr.
SCS_Type_II_80.5mm_25yr_24hr_Collingwood

;SCS_Type II_88.8mm design storm, total rainfall = 88.8 mm, rain interval = 6 minutes, rain units = mm/hr.
SCS_Type_II_88.8mm_50yr_24hr_Collingwood

;SCS_Type II_97.1mm design storm, total rainfall = 97.1 mm, rain interval = 6 minutes, rain units = mm/hr.
SCS_Type_II_97.1mm_100yr_24hr_Collingwood

[REPORT]
;;Reporting Options
INPUT      YES
CONTROLS   NO
```

DEY DRIVE TOWNHOUSES – SWM MODELLING – MODEL DETAILS

```
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS       -8928805.6335    5540482.45755    -8927641.5145    5541010.26945
UNITS            Meters
```

DEY DRIVE TOWNHOUSES – SWM MODELLING – CHICAGO 2 YEAR STORM EVENT

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)

****
Element Count
****
Number of rain gages 10
Number of subcatchments ... 5
Number of nodes 2
Number of links 1
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Chicago_4h_100yr	Chicago_4h_100yr	VOLUME	5 min.
Chicago_4h_25yr	Chicago_4h_25yr	VOLUME	5 min.
Chicago_4h_2yr	Chicago_4h_2yr	VOLUME	5 min.
Chicago_4h_50yr	Chicago_4h_50yr	VOLUME	5 min.
Chicago_4h_5yr	Chicago_4h_5yr	VOLUME	5 min.
SCS_Type_II_46.8mm_2yr_24hr_Collingwood	SCS_Type_II_46.8mm_2yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_60.3mm_5yr_24hr_Collingwood	SCS_Type_II_60.3mm_5yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_80.5mm_25yr_24hr_Collingwood	SCS_Type_II_80.5mm_25yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_88.8mm_50yr_24hr_Collingwood	SCS_Type_II_88.8mm_50yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_97.1mm_100yr_24hr_Collingwood	SCS_Type_II_97.1mm_100yr_24hr_Collingwood	INTENSITY	6 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
201	4.64	264.00	50.00	2.0000	Chicago_4h_2yr	SU1
202	6.71	314.00	50.00	2.0000	Chicago_4h_2yr	SU1
203	1.27	138.00	0.00	2.0000	Chicago_4h_2yr	SU1
204	1.07	400.00	50.00	2.0000	Chicago_4h_2yr	SU1
205	1.90	750.00	50.00	2.0000	Chicago_4h_2yr	SU1

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
OF1	OUTFALL	0.00	0.00	0.0	
SU1	STORAGE	189.60	3.90	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
OL1	SU1	OF1	OUTLET			

****
Cross Section Summary
****

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

****

DEY DRIVE TOWNHOUSES – SWM MODELLING – CHICAGO 2 YEAR STORM EVENT

```
Analysis Options
****************
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date ..... 10/13/2025 00:00:00
Ending Date ..... 10/14/2025 00:00:00
Antecedent Dry Days ..... 0.0
Report Time Step ..... 00:01:00
Wet Time Step ..... 00:05:00
Dry Time Step ..... 00:05:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials ..... 8
Number of Threads ..... 1
Head Tolerance ..... 0.001524 m
```

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	0.526	33.759
Evaporation Loss	0.000	0.000
Infiltration Loss	0.225	14.459
Surface Runoff	0.302	19.356
Final Storage	0.001	0.081
Continuity Error (%)	-0.405	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.302	3.018
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.194	1.942
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.183	1.834
Final Stored Volume	0.291	2.910
Continuity Error (%)	0.002	

```
**************************
Time-Step Critical Elements
**************************
None


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


*******************************
Most Frequent Nonconverging Nodes
*******************************
Convergence obtained at all time steps.
```

DEY DRIVE TOWNHOUSES – SWM MODELLING – CHICAGO 2 YEAR STORM EVENT

****
Routing Time Step Summary
****

Minimum Time Step	:	4.50 sec
Average Time Step	:	5.00 sec
Maximum Time Step	:	5.00 sec
% of Time in Steady State	:	0.00
Average Iterations per Step	:	2.00
% of Steps Not Converging	:	0.00
Time Step Frequencies	:	
5.000 - 3.155 sec	:	100.00 %
3.155 - 1.991 sec	:	0.00 %
1.991 - 1.256 sec	:	0.00 %
1.256 - 0.792 sec	:	0.00 %
0.792 - 0.500 sec	:	0.00 %

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
201	33.76	0.00	0.00	13.37	17.03	3.45	20.48	0.95	0.58	0.607
202	33.76	0.00	0.00	13.46	17.03	3.36	20.38	1.37	0.80	0.604
203	33.76	0.00	0.00	26.75	0.00	6.90	6.90	0.09	0.01	0.204
204	33.76	0.00	0.00	13.16	16.90	3.71	20.61	0.22	0.16	0.611
205	33.76	0.00	0.00	13.16	16.90	3.71	20.61	0.39	0.29	0.610

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
OF1	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
SU1	STORAGE	1.45	1.65	191.25	0 04:14	1.65

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
OF1	OUTFALL	0.000	0.028	0 04:14	0	1.94	0.000
SU1	STORAGE	1.843	1.843	0 01:25	3.02	4.85	0.002

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

DEY DRIVE TOWNHOUSES – SWM MODELLING – CHICAGO 2 YEAR STORM EVENT

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m³	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SU1	3.618	19.9	0.0	0.0	4.465	24.6	0 04:14	0.028

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	99.55	0.023	0.028	1.942
System	99.55	0.023	0.028	1.942

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
OL1	DUMMY	0.028	0 04:14			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Tue Oct 14 20:46:43 2025
Analysis ended on: Tue Oct 14 20:46:43 2025
Total elapsed time: < 1 sec

DEY DRIVE TOWNHOUSES – SWM MODELLING – CHICAGO 5 YEAR STORM EVENT

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)

****
Element Count
****
Number of rain gages 10
Number of subcatchments ... 5
Number of nodes 2
Number of links 1
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Chicago_4h_100yr	Chicago_4h_100yr	VOLUME	5 min.
Chicago_4h_25yr	Chicago_4h_25yr	VOLUME	5 min.
Chicago_4h_2yr	Chicago_4h_2yr	VOLUME	5 min.
Chicago_4h_50yr	Chicago_4h_50yr	VOLUME	5 min.
Chicago_4h_5yr	Chicago_4h_5yr	VOLUME	5 min.
SCS_Type_II_46.8mm_2yr_24hr_Collingwood	SCS_Type_II_46.8mm_2yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_60.3mm_5yr_24hr_Collingwood	SCS_Type_II_60.3mm_5yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_80.5mm_25yr_24hr_Collingwood	SCS_Type_II_80.5mm_25yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_88.8mm_50yr_24hr_Collingwood	SCS_Type_II_88.8mm_50yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_97.1mm_100yr_24hr_Collingwood	SCS_Type_II_97.1mm_100yr_24hr_Collingwood	INTENSITY	6 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
201	4.64	264.00	50.00	2.0000	Chicago_4h_5yr	SU1
202	6.71	314.00	50.00	2.0000	Chicago_4h_5yr	SU1
203	1.27	138.00	0.00	2.0000	Chicago_4h_5yr	SU1
204	1.07	400.00	50.00	2.0000	Chicago_4h_5yr	SU1
205	1.90	750.00	50.00	2.0000	Chicago_4h_5yr	SU1

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
OF1	OUTFALL	0.00	0.00	0.0	
SU1	STORAGE	189.60	3.90	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
OL1	SU1	OF1	OUTLET			

****
Cross Section Summary
****

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

****

DEY DRIVE TOWNHOUSES – SWM MODELLING – CHICAGO 5 YEAR STORM EVENT

```
Analysis Options
****************
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date ..... 10/13/2025 00:00:00
Ending Date ..... 10/14/2025 00:00:00
Antecedent Dry Days ..... 0.0
Report Time Step ..... 00:01:00
Wet Time Step ..... 00:05:00
Dry Time Step ..... 00:05:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials ..... 8
Number of Threads ..... 1
Head Tolerance ..... 0.001524 m
```

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	0.687	44.079
Evaporation Loss	0.000	0.000
Infiltration Loss	0.277	17.739
Surface Runoff	0.412	26.435
Final Storage	0.001	0.081
Continuity Error (%)	-0.402	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.412	4.121
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.229	2.294
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.183	1.834
Final Stored Volume	0.366	3.661
Continuity Error (%)	0.003	

```
**************************
Time-Step Critical Elements
**************************
None


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


*******************************
Most Frequent Nonconverging Nodes
*******************************
Convergence obtained at all time steps.
```

DEY DRIVE TOWNHOUSES – SWM MODELLING – CHICAGO 5 YEAR STORM EVENT

****
Routing Time Step Summary
****

Minimum Time Step	:	4.50 sec
Average Time Step	:	5.00 sec
Maximum Time Step	:	5.00 sec
% of Time in Steady State	:	0.00
Average Iterations per Step	:	2.00
% of Steps Not Converging	:	0.00
Time Step Frequencies	:	
5.000 - 3.155 sec	:	100.00 %
3.155 - 1.991 sec	:	0.00 %
1.991 - 1.256 sec	:	0.00 %
1.256 - 0.792 sec	:	0.00 %
0.792 - 0.500 sec	:	0.00 %

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
201	44.08	0.00	0.00	16.42	22.23	5.57	27.80	1.29	0.79	0.631
202	44.08	0.00	0.00	16.52	22.23	5.46	27.70	1.86	1.09	0.628
203	44.08	0.00	0.00	32.85	0.00	11.13	11.13	0.14	0.02	0.252
204	44.08	0.00	0.00	16.10	22.06	5.95	28.01	0.30	0.22	0.635
205	44.08	0.00	0.00	16.10	22.06	5.95	28.01	0.53	0.39	0.635

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
OF1	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
SU1	STORAGE	1.65	1.88	191.48	0 04:18	1.88

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
OF1	OUTFALL	0.000	0.031	0 04:18	0	2.29	0.000
SU1	STORAGE	2.494	2.494	0 01:25	4.12	5.96	0.003

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

DEY DRIVE TOWNHOUSES – SWM MODELLING – CHICAGO 5 YEAR STORM EVENT

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m³	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SU1	4.477	24.6	0.0	0.0	5.514	30.3	0 04:18	0.031

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	99.62	0.027	0.031	2.294
System	99.62	0.027	0.031	2.294

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
OL1	DUMMY	0.031	0 04:18			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Tue Oct 14 20:48:37 2025
Analysis ended on: Tue Oct 14 20:48:37 2025
Total elapsed time: < 1 sec

DEY DRIVE TOWNHOUSES – SWM MODELLING – CHICAGO 25 YEAR STORM EVENT

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)

****
Element Count
****
Number of rain gages 10
Number of subcatchments ... 5
Number of nodes 2
Number of links 1
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Chicago_4h_100yr	Chicago_4h_100yr	VOLUME	5 min.
Chicago_4h_25yr	Chicago_4h_25yr	VOLUME	5 min.
Chicago_4h_2yr	Chicago_4h_2yr	VOLUME	5 min.
Chicago_4h_50yr	Chicago_4h_50yr	VOLUME	5 min.
Chicago_4h_5yr	Chicago_4h_5yr	VOLUME	5 min.
SCS_Type_II_46.8mm_2yr_24hr_Collingwood	SCS_Type_II_46.8mm_2yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_60.3mm_5yr_24hr_Collingwood	SCS_Type_II_60.3mm_5yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_80.5mm_25yr_24hr_Collingwood	SCS_Type_II_80.5mm_25yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_88.8mm_50yr_24hr_Collingwood	SCS_Type_II_88.8mm_50yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_97.1mm_100yr_24hr_Collingwood	SCS_Type_II_97.1mm_100yr_24hr_Collingwood	INTENSITY	6 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
201	4.64	264.00	50.00	2.0000	Chicago_4h_25yr	SU1
202	6.71	314.00	50.00	2.0000	Chicago_4h_25yr	SU1
203	1.27	138.00	0.00	2.0000	Chicago_4h_25yr	SU1
204	1.07	400.00	50.00	2.0000	Chicago_4h_25yr	SU1
205	1.90	750.00	50.00	2.0000	Chicago_4h_25yr	SU1

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
OF1	OUTFALL	0.00	0.00	0.0	
SU1	STORAGE	189.60	3.90	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
OL1	SU1	OF1	OUTLET			

****
Cross Section Summary
****

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

****

DEY DRIVE TOWNHOUSES – SWM MODELLING – CHICAGO 25 YEAR STORM EVENT

```
Analysis Options
****************
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date ..... 10/13/2025 00:00:00
Ending Date ..... 10/14/2025 00:00:00
Antecedent Dry Days ..... 0.0
Report Time Step ..... 00:01:00
Wet Time Step ..... 00:05:00
Dry Time Step ..... 00:05:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials ..... 8
Number of Threads ..... 1
Head Tolerance ..... 0.001524 m
```

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	0.921	59.093
Evaporation Loss	0.000	0.000
Infiltration Loss	0.340	21.808
Surface Runoff	0.584	37.442
Final Storage	0.001	0.082
Continuity Error (%)	-0.405	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.584	5.837
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.271	2.712
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.183	1.834
Final Stored Volume	0.496	4.959
Continuity Error (%)	0.004	

```
**************************
Time-Step Critical Elements
**************************
None


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


*******************************
Most Frequent Nonconverging Nodes
*******************************
Convergence obtained at all time steps.
```

DEY DRIVE TOWNHOUSES – SWM MODELLING – CHICAGO 25 YEAR STORM EVENT

****
Routing Time Step Summary
****

Minimum Time Step	:	4.50 sec
Average Time Step	:	5.00 sec
Maximum Time Step	:	5.00 sec
% of Time in Steady State	:	0.00
Average Iterations per Step	:	2.00
% of Steps Not Converging	:	0.00
Time Step Frequencies	:	
5.000 - 3.155 sec	:	100.00 %
3.155 - 1.991 sec	:	0.00 %
1.991 - 1.256 sec	:	0.00 %
1.256 - 0.792 sec	:	0.00 %
0.792 - 0.500 sec	:	0.00 %

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
201	59.09	0.00	0.00	20.20	29.79	9.31	39.10	1.81	1.11	0.662
202	59.09	0.00	0.00	20.30	29.80	9.20	39.00	2.62	1.55	0.660
203	59.09	0.00	0.00	40.41	0.00	18.60	18.60	0.24	0.05	0.315
204	59.09	0.00	0.00	19.77	29.57	9.82	39.39	0.42	0.31	0.667
205	59.09	0.00	0.00	19.77	29.56	9.83	39.39	0.75	0.54	0.667

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
OF1	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
SU1	STORAGE	1.94	2.21	191.81	0 04:20	2.21

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
OF1	OUTFALL	0.000	0.037	0 04:20	0	2.71	0.000
SU1	STORAGE	3.521	3.521	0 01:25	5.84	7.67	0.004

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

DEY DRIVE TOWNHOUSES – SWM MODELLING – CHICAGO 25 YEAR STORM EVENT

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m³	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SU1	5.863	32.3	0.0	0.0	7.161	39.4	0 04:20	0.037

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	99.69	0.031	0.037	2.712
System	99.69	0.031	0.037	2.712

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
OL1	DUMMY	0.037	0 04:20			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Tue Oct 14 20:48:00 2025
Analysis ended on: Tue Oct 14 20:48:00 2025
Total elapsed time: < 1 sec

DEY DRIVE TOWNHOUSES – SWM MODELLING – CHICAGO 50 YEAR STORM EVENT

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)

****
Element Count
****
Number of rain gages 10
Number of subcatchments ... 5
Number of nodes 2
Number of links 1
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Chicago_4h_100yr	Chicago_4h_100yr	VOLUME	5 min.
Chicago_4h_25yr	Chicago_4h_25yr	VOLUME	5 min.
Chicago_4h_2yr	Chicago_4h_2yr	VOLUME	5 min.
Chicago_4h_50yr	Chicago_4h_50yr	VOLUME	5 min.
Chicago_4h_5yr	Chicago_4h_5yr	VOLUME	5 min.
SCS_Type_II_46.8mm_2yr_24hr_Collingwood	SCS_Type_II_46.8mm_2yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_60.3mm_5yr_24hr_Collingwood	SCS_Type_II_60.3mm_5yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_80.5mm_25yr_24hr_Collingwood	SCS_Type_II_80.5mm_25yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_88.8mm_50yr_24hr_Collingwood	SCS_Type_II_88.8mm_50yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_97.1mm_100yr_24hr_Collingwood	SCS_Type_II_97.1mm_100yr_24hr_Collingwood	INTENSITY	6 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
201	4.64	264.00	50.00	2.0000	Chicago_4h_50yr	SU1
202	6.71	314.00	50.00	2.0000	Chicago_4h_50yr	SU1
203	1.27	138.00	0.00	2.0000	Chicago_4h_50yr	SU1
204	1.07	400.00	50.00	2.0000	Chicago_4h_50yr	SU1
205	1.90	750.00	50.00	2.0000	Chicago_4h_50yr	SU1

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
OF1	OUTFALL	0.00	0.00	0.0	
SU1	STORAGE	189.60	3.90	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
OL1	SU1	OF1	OUTLET			

****
Cross Section Summary
****

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

****

DEY DRIVE TOWNHOUSES – SWM MODELLING – CHICAGO 50 YEAR STORM EVENT

```
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 10/13/2025 00:00:00
Ending Date .............. 10/14/2025 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001524 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         1.024        65.662
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.364        23.379
Surface Runoff ...........         0.662        42.460
Final Storage ............         0.001         0.082
Continuity Error (%) .....        -0.395


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.662         6.620
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.289         2.890
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.183         1.834
Final Stored Volume ......         0.556         5.563
Continuity Error (%) .....         0.005


***************************
Time-Step Critical Elements
***************************
None


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


*******************************
Most Frequent Nonconverging Nodes
*******************************
Convergence obtained at all time steps.
```

DEY DRIVE TOWNHOUSES – SWM MODELLING – CHICAGO 50 YEAR STORM EVENT

****
Routing Time Step Summary
****
Minimum Time Step : 4.50 sec
Average Time Step : 5.00 sec
Maximum Time Step : 5.00 sec
% of Time in Steady State : 0.00
Average Iterations per Step : 2.00
% of Steps Not Converging : 0.00
Time Step Frequencies :
5.000 - 3.155 sec : 100.00 %
3.155 - 1.991 sec : 0.00 %
1.991 - 1.256 sec : 0.00 %
1.256 - 0.792 sec : 0.00 %
0.792 - 0.500 sec : 0.00 %

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
201	65.66	0.00	0.00	21.66	33.09	11.14	44.23	2.05	1.24	0.674
202	65.66	0.00	0.00	21.76	33.11	11.03	44.13	2.96	1.73	0.672
203	65.66	0.00	0.00	43.33	0.00	22.27	22.27	0.28	0.06	0.339
204	65.66	0.00	0.00	21.19	32.85	11.71	44.56	0.48	0.34	0.679
205	65.66	0.00	0.00	21.19	32.85	11.71	44.56	0.85	0.61	0.679

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
OF1	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
SU1	STORAGE	2.07	2.35	191.95	0 04:21	2.35

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
OF1	OUTFALL	0.000	0.039	0 04:21	0	2.89	0.000
SU1	STORAGE	3.938	3.938	0 01:25	6.62	8.45	0.005

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

DEY DRIVE TOWNHOUSES – SWM MODELLING – CHICAGO 50 YEAR STORM EVENT

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m³	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SU1	6.498	35.7	0.0	0.0	7.915	43.5	0 04:21	0.039

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	99.71	0.034	0.039	2.890
System	99.71	0.034	0.039	2.890

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
OL1	DUMMY	0.039	0 04:21			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Tue Oct 14 20:49:06 2025
Analysis ended on: Tue Oct 14 20:49:06 2025
Total elapsed time: < 1 sec

DEY DRIVE TOWNHOUSES – SWM MODELLING – CHICAGO 100 YEAR STORM EVENT

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)
------------------------------------------------------------


*************
Element Count
*************
Number of rain gages ...... 10
Number of subcatchments ... 5
Number of nodes ........... 2
Number of links ........... 1
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                  Data       Recording
Name                 Data Source                  Type       Interval
----------------------------------------------------------------------
Chicago_4h_100yr     Chicago_4h_100yr             VOLUME       5 min.
Chicago_4h_25yr      Chicago_4h_25yr              VOLUME       5 min.
Chicago_4h_2yr       Chicago_4h_2yr               VOLUME       5 min.
Chicago_4h_50yr      Chicago_4h_50yr              VOLUME       5 min.
Chicago_4h_5yr       Chicago_4h_5yr               VOLUME       5 min.
SCS_Type_II_46.8mm_2yr_24hr_Collingwood SCS_Type_II_46.8mm_2yr_24hr_Collingwood INTENSITY    6 min.
SCS_Type_II_60.3mm_5yr_24hr_Collingwood SCS_Type_II_60.3mm_5yr_24hr_Collingwood INTENSITY    6 min.
SCS_Type_II_80.5mm_25yr_24hr_Collingwood SCS_Type_II_80.5mm_25yr_24hr_Collingwood INTENSITY    6 min.
SCS_Type_II_88.8mm_50yr_24hr_Collingwood SCS_Type_II_88.8mm_50yr_24hr_Collingwood INTENSITY    6 min.
SCS_Type_II_97.1mm_100yr_24hr_Collingwood SCS_Type_II_97.1mm_100yr_24hr_Collingwood INTENSITY    6 min.


********************
Subcatchment Summary
********************
Name                        Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------------
201                         4.64    264.00     50.00    2.0000 Chicago_4h_100yr     SU1
202                         6.71    314.00     50.00    2.0000 Chicago_4h_100yr     SU1
203                         1.27    138.00      0.00    2.0000 Chicago_4h_100yr     SU1
204                         1.07    400.00     50.00    2.0000 Chicago_4h_100yr     SU1
205                         1.90    750.00     50.00    2.0000 Chicago_4h_100yr     SU1


************
Node Summary
************
                                      Invert      Max.    Ponded    External
Name                 Type              Elev.     Depth      Area    Inflow
----------------------------------------------------------------------------
OF1                  OUTFALL            0.00      0.00       0.0
SU1                  STORAGE          189.60      3.90       0.0


************
Link Summary
************
Name             From Node        To Node          Type            Length    %Slope Roughness
---------------------------------------------------------------------------------------------
OL1              SU1              OF1              OUTLET


*********************
Cross Section Summary
*********************
                                    Full     Full     Hyd.     Max.   No. of     Full
Conduit          Shape             Depth     Area     Rad.    Width  Barrels     Flow
-----------------------------------------------------------------------------------


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

DEY DRIVE TOWNHOUSES – SWM MODELLING – CHICAGO 100 YEAR STORM EVENT

```
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 10/13/2025 00:00:00
Ending Date .............. 10/14/2025 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001524 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         1.119        71.775
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.386        24.744
Surface Runoff ...........         0.736        47.237
Final Storage ............         0.001         0.082
Continuity Error (%) .....        -0.401


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.736         7.364
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.305         3.053
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.183         1.834
Final Stored Volume ......         0.614         6.145
Continuity Error (%) .....         0.005


***************************
Time-Step Critical Elements
***************************
None


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


*********************************
Most Frequent Nonconverging Nodes
*********************************
Convergence obtained at all time steps.
```

DEY DRIVE TOWNHOUSES – SWM MODELLING – CHICAGO 100 YEAR STORM EVENT

****
Routing Time Step Summary
****

Minimum Time Step	:	4.50 sec
Average Time Step	:	5.00 sec
Maximum Time Step	:	5.00 sec
% of Time in Steady State	:	0.00
Average Iterations per Step	:	2.00
% of Steps Not Converging	:	0.00
Time Step Frequencies	:	
5.000 - 3.155 sec	:	100.00 %
3.155 - 1.991 sec	:	0.00 %
1.991 - 1.256 sec	:	0.00 %
1.256 - 0.792 sec	:	0.00 %
0.792 - 0.500 sec	:	0.00 %

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
201	71.78	0.00	0.00	22.90	36.17	12.96	49.13	2.28	1.38	0.685
202	71.78	0.00	0.00	23.04	36.19	12.81	48.99	3.29	1.93	0.683
203	71.77	0.00	0.00	45.90	0.00	25.83	25.83	0.33	0.07	0.360
204	71.78	0.00	0.00	22.42	35.91	13.55	49.46	0.53	0.38	0.689
205	71.77	0.00	0.00	22.42	35.91	13.56	49.46	0.94	0.68	0.689

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
OF1	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
SU1	STORAGE	2.19	2.48	192.08	0 04:22	2.48

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
OF1	OUTFALL	0.000	0.041	0 04:22	0	3.05	0.000
SU1	STORAGE	4.405	4.405	0 01:25	7.36	9.2	0.005

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

DEY DRIVE TOWNHOUSES – SWM MODELLING – CHICAGO 100 YEAR STORM EVENT

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m³	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SU1	7.108	39.1	0.0	0.0	8.633	47.5	0 04:22	0.041

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	99.73	0.035	0.041	3.053
System	99.73	0.035	0.041	3.053

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
OL1	DUMMY	0.041	0 04:22			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Tue Oct 14 20:49:47 2025
Analysis ended on: Tue Oct 14 20:49:47 2025
Total elapsed time: < 1 sec

DEY DRIVE TOWNHOUSES – SWM MODELLING – SCS 2 YEAR STORM EVENT

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)

****
Element Count
****
Number of rain gages 10
Number of subcatchments ... 5
Number of nodes 2
Number of links 1
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Chicago_4h_100yr	Chicago_4h_100yr	VOLUME	5 min.
Chicago_4h_25yr	Chicago_4h_25yr	VOLUME	5 min.
Chicago_4h_2yr	Chicago_4h_2yr	VOLUME	5 min.
Chicago_4h_50yr	Chicago_4h_50yr	VOLUME	5 min.
Chicago_4h_5yr	Chicago_4h_5yr	VOLUME	5 min.
SCS_Type_II_46.8mm_2yr_24hr_Collingwood	SCS_Type_II_46.8mm_2yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_60.3mm_5yr_24hr_Collingwood	SCS_Type_II_60.3mm_5yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_80.5mm_25yr_24hr_Collingwood	SCS_Type_II_80.5mm_25yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_88.8mm_50yr_24hr_Collingwood	SCS_Type_II_88.8mm_50yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_97.1mm_100yr_24hr_Collingwood	SCS_Type_II_97.1mm_100yr_24hr_Collingwood	INTENSITY	6 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
201	4.64	264.00	50.00	2.0000	SCS_Type_II_46.8mm_2yr_24hr_Collingwood	SU1
202	6.71	314.00	50.00	2.0000	SCS_Type_II_46.8mm_2yr_24hr_Collingwood	SU1
203	1.27	138.00	0.00	2.0000	SCS_Type_II_46.8mm_2yr_24hr_Collingwood	SU1
204	1.07	400.00	50.00	2.0000	SCS_Type_II_46.8mm_2yr_24hr_Collingwood	SU1
205	1.90	750.00	50.00	2.0000	SCS_Type_II_46.8mm_2yr_24hr_Collingwood	SU1

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
OF1	OUTFALL	0.00	0.00	0.0	
SU1	STORAGE	189.60	3.90	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
OL1	SU1	OF1	OUTLET			

****
Cross Section Summary
****

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

****

DEY DRIVE TOWNHOUSES – SWM MODELLING – SCS 2 YEAR STORM EVENT

```
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 10/13/2025 00:00:00
Ending Date .............. 10/14/2025 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001524 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.730        46.800
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.284        18.186
Surface Runoff ...........         0.438        28.113
Final Storage ............         0.009         0.569
Continuity Error (%) .....        -0.146


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.438         4.383
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.152         1.516
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.183         1.834
Final Stored Volume ......         0.470         4.701
Continuity Error (%) .....         0.005


***************************
Time-Step Critical Elements
***************************
None


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


*********************************
Most Frequent Nonconverging Nodes
*********************************
Convergence obtained at all time steps.
```

DEY DRIVE TOWNHOUSES – SWM MODELLING – SCS 2 YEAR STORM EVENT

```
*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     4.50 sec
Average Time Step           :     5.00 sec
Maximum Time Step           :     5.00 sec
% of Time in Steady State   :     0.00
Average Iterations per Step :     2.00
% of Steps Not Converging   :     0.00
Time Step Frequencies       :
    5.000 -  3.155 sec      :   100.00 %
    3.155 -  1.991 sec      :     0.00 %
    1.991 -  1.256 sec      :     0.00 %
    1.256 -  0.792 sec      :     0.00 %
    0.792 -  0.500 sec      :     0.00 %


****************************
Subcatchment Runoff Summary
****************************
```

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
201	46.80	0.00	0.00	16.82	23.32	6.16	29.48	1.37	0.41	0.630
202	46.80	0.00	0.00	16.82	23.30	6.11	29.40	1.97	0.57	0.628
203	46.80	0.00	0.00	33.63	0.00	12.30	12.30	0.16	0.02	0.263
204	46.80	0.00	0.00	16.82	23.38	6.44	29.83	0.32	0.11	0.637
205	46.80	0.00	0.00	16.82	23.38	6.45	29.83	0.57	0.20	0.637

```
*******************
Node Depth Summary
*******************
```

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
OF1	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
SU1	STORAGE	1.39	1.74	191.34	0 17:51	1.74

```
*******************
Node Inflow Summary
*******************
```

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
OF1	OUTFALL	0.000	0.029	0 17:51	0	1.52	0.000
SU1	STORAGE	1.307	1.307	0 11:54	4.38	6.22	0.005

```
***********************
Node Surcharge Summary
***********************

No nodes were surcharged.


*********************
Node Flooding Summary
*********************

No nodes were flooded.
```

DEY DRIVE TOWNHOUSES – SWM MODELLING – SCS 2 YEAR STORM EVENT

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m³	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SU1	3.410	18.8	0.0	0.0	4.880	26.8	0 17:51	0.029

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	98.78	0.018	0.029	1.516
System	98.78	0.018	0.029	1.516

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
OL1	DUMMY	0.029	0 17:51			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Tue Oct 14 20:27:48 2025
Analysis ended on: Tue Oct 14 20:27:48 2025
Total elapsed time: < 1 sec

DEY DRIVE TOWNHOUSES – SWM MODELLING – SCS 5 YEAR STORM EVENT

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)

****
Element Count
****
Number of rain gages 10
Number of subcatchments ... 5
Number of nodes 2
Number of links 1
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Chicago_4h_100yr	Chicago_4h_100yr	VOLUME	5 min.
Chicago_4h_25yr	Chicago_4h_25yr	VOLUME	5 min.
Chicago_4h_2yr	Chicago_4h_2yr	VOLUME	5 min.
Chicago_4h_50yr	Chicago_4h_50yr	VOLUME	5 min.
Chicago_4h_5yr	Chicago_4h_5yr	VOLUME	5 min.
SCS_Type_II_46.8mm_2yr_24hr_Collingwood	SCS_Type_II_46.8mm_2yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_60.3mm_5yr_24hr_Collingwood	SCS_Type_II_60.3mm_5yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_80.5mm_25yr_24hr_Collingwood	SCS_Type_II_80.5mm_25yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_88.8mm_50yr_24hr_Collingwood	SCS_Type_II_88.8mm_50yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_97.1mm_100yr_24hr_Collingwood	SCS_Type_II_97.1mm_100yr_24hr_Collingwood	INTENSITY	6 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
201	4.64	264.00	50.00	2.0000	SCS_Type_II_60.3mm_5yr_24hr_Collingwood	SU1
202	6.71	314.00	50.00	2.0000	SCS_Type_II_60.3mm_5yr_24hr_Collingwood	SU1
203	1.27	138.00	0.00	2.0000	SCS_Type_II_60.3mm_5yr_24hr_Collingwood	SU1
204	1.07	400.00	50.00	2.0000	SCS_Type_II_60.3mm_5yr_24hr_Collingwood	SU1
205	1.90	750.00	50.00	2.0000	SCS_Type_II_60.3mm_5yr_24hr_Collingwood	SU1

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
OF1	OUTFALL	0.00	0.00	0.0	
SU1	STORAGE	189.60	3.90	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
OL1	SU1	OF1	OUTLET			

****
Cross Section Summary
****

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

****

DEY DRIVE TOWNHOUSES – SWM MODELLING – SCS 5 YEAR STORM EVENT

```
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 10/13/2025 00:00:00
Ending Date .............. 10/14/2025 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001524 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.940        60.300
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.338        21.673
Surface Runoff ...........         0.593        38.026
Final Storage ............         0.011         0.693
Continuity Error (%) .....        -0.152


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.593         5.928
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.175         1.746
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.183         1.834
Final Stored Volume ......         0.602         6.015
Continuity Error (%) .....         0.006


***************************
Time-Step Critical Elements
***************************
None


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


*********************************
Most Frequent Nonconverging Nodes
*********************************
Convergence obtained at all time steps.
```

DEY DRIVE TOWNHOUSES – SWM MODELLING – SCS 5 YEAR STORM EVENT

****
Routing Time Step Summary
****

Minimum Time Step	:	4.50 sec
Average Time Step	:	5.00 sec
Maximum Time Step	:	5.00 sec
% of Time in Steady State	:	0.00
Average Iterations per Step	:	2.00
% of Steps Not Converging	:	0.00
Time Step Frequencies	:	
5.000 - 3.155 sec	:	100.00 %
3.155 - 1.991 sec	:	0.00 %
1.991 - 1.256 sec	:	0.00 %
1.256 - 0.792 sec	:	0.00 %
0.792 - 0.500 sec	:	0.00 %

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
201	60.30	0.00	0.00	20.04	30.07	9.59	39.66	1.84	0.55	0.658
202	60.30	0.00	0.00	20.04	30.05	9.52	39.57	2.65	0.77	0.656
203	60.30	0.00	0.00	40.08	0.00	19.14	19.14	0.24	0.04	0.317
204	60.30	0.00	0.00	20.04	30.13	9.94	40.07	0.43	0.15	0.665
205	60.30	0.00	0.00	20.04	30.13	9.95	40.08	0.76	0.27	0.665

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
OF1	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
SU1	STORAGE	1.53	2.01	191.61	0 19:03	2.01

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
OF1	OUTFALL	0.000	0.033	0 19:03	0	1.75	0.000
SU1	STORAGE	1.778	1.778	0 11:54	5.93	7.76	0.006

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

DEY DRIVE TOWNHOUSES – SWM MODELLING – SCS 5 YEAR STORM EVENT

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m³	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SU1	4.050	22.3	0.0	0.0	6.138	33.8	0 19:03	0.033

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	98.99	0.020	0.033	1.746
System	98.99	0.020	0.033	1.746

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
OL1	DUMMY	0.033	0 19:03			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Tue Oct 14 20:45:07 2025
Analysis ended on: Tue Oct 14 20:45:07 2025
Total elapsed time: < 1 sec

DEY DRIVE TOWNHOUSES – SWM MODELLING – SCS 25 YEAR STORM EVENT

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)

****
Element Count
****
Number of rain gages 10
Number of subcatchments ... 5
Number of nodes 2
Number of links 1
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Chicago_4h_100yr	Chicago_4h_100yr	VOLUME	5 min.
Chicago_4h_25yr	Chicago_4h_25yr	VOLUME	5 min.
Chicago_4h_2yr	Chicago_4h_2yr	VOLUME	5 min.
Chicago_4h_50yr	Chicago_4h_50yr	VOLUME	5 min.
Chicago_4h_5yr	Chicago_4h_5yr	VOLUME	5 min.
SCS_Type_II_46.8mm_2yr_24hr_Collingwood	SCS_Type_II_46.8mm_2yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_60.3mm_5yr_24hr_Collingwood	SCS_Type_II_60.3mm_5yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_80.5mm_25yr_24hr_Collingwood	SCS_Type_II_80.5mm_25yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_88.8mm_50yr_24hr_Collingwood	SCS_Type_II_88.8mm_50yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_97.1mm_100yr_24hr_Collingwood	SCS_Type_II_97.1mm_100yr_24hr_Collingwood	INTENSITY	6 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
201	4.64	264.00	50.00	2.0000	SCS_Type_II_80.5mm_25yr_24hr_Collingwood	SU1
202	6.71	314.00	50.00	2.0000	SCS_Type_II_80.5mm_25yr_24hr_Collingwood	SU1
203	1.27	138.00	0.00	2.0000	SCS_Type_II_80.5mm_25yr_24hr_Collingwood	SU1
204	1.07	400.00	50.00	2.0000	SCS_Type_II_80.5mm_25yr_24hr_Collingwood	SU1
205	1.90	750.00	50.00	2.0000	SCS_Type_II_80.5mm_25yr_24hr_Collingwood	SU1

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
OF1	OUTFALL	0.00	0.00	0.0	
SU1	STORAGE	189.60	3.90	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
OL1	SU1	OF1	OUTLET			

****
Cross Section Summary
****

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

****

DEY DRIVE TOWNHOUSES – SWM MODELLING – SCS 25 YEAR STORM EVENT

```
Analysis Options
****************
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date ..... 10/13/2025 00:00:00
Ending Date ..... 10/14/2025 00:00:00
Antecedent Dry Days ..... 0.0
Report Time Step ..... 00:01:00
Wet Time Step ..... 00:05:00
Dry Time Step ..... 00:05:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials ..... 8
Number of Threads ..... 1
Head Tolerance ..... 0.001524 m
```

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	1.255	80.500
Evaporation Loss	0.000	0.000
Infiltration Loss	0.406	26.011
Surface Runoff	0.838	53.754
Final Storage	0.013	0.864
Continuity Error (%)	-0.159	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.838	8.380
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.209	2.091
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.183	1.834
Final Stored Volume	0.812	8.122
Continuity Error (%)	0.007	

```
**************************
Time-Step Critical Elements
**************************
None


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


*******************************
Most Frequent Nonconverging Nodes
*******************************
Convergence obtained at all time steps.
```

DEY DRIVE TOWNHOUSES – SWM MODELLING – SCS 25 YEAR STORM EVENT

****
Routing Time Step Summary
****

Minimum Time Step	:	4.50 sec
Average Time Step	:	5.00 sec
Maximum Time Step	:	5.00 sec
% of Time in Steady State	:	0.00
Average Iterations per Step	:	2.00
% of Steps Not Converging	:	0.00
Time Step Frequencies	:	
5.000 - 3.155 sec	:	100.00 %
3.155 - 1.991 sec	:	0.00 %
1.991 - 1.256 sec	:	0.00 %
1.256 - 0.792 sec	:	0.00 %
0.792 - 0.500 sec	:	0.00 %

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
201	80.50	0.00	0.00	24.05	40.18	15.54	55.71	2.59	0.78	0.692
202	80.50	0.00	0.00	24.05	40.15	15.45	55.60	3.73	1.10	0.691
203	80.50	0.00	0.00	48.10	0.00	31.04	31.04	0.39	0.07	0.386
204	80.50	0.00	0.00	24.05	40.23	16.00	56.23	0.60	0.22	0.698
205	80.50	0.00	0.00	24.05	40.23	16.01	56.23	1.07	0.39	0.699

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
OF1	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
SU1	STORAGE	1.73	2.40	192.00	0 20:06	2.40

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
OF1	OUTFALL	0.000	0.040	0 20:06	0	2.09	0.000
SU1	STORAGE	2.544	2.544	0 11:54	8.38	10.2	0.007

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

DEY DRIVE TOWNHOUSES – SWM MODELLING – SCS 25 YEAR STORM EVENT

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m³	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SU1	5.081	27.9	0.0	0.0	8.186	45.0	0 20:06	0.040

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	99.19	0.024	0.040	2.091
System	99.19	0.024	0.040	2.091

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
OL1	DUMMY	0.040	0 20:06			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Tue Oct 14 20:45:43 2025
Analysis ended on: Tue Oct 14 20:45:43 2025
Total elapsed time: < 1 sec

DEY DRIVE TOWNHOUSES – SWM MODELLING – SCS 100 YEAR STORM EVENT

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)

****
Element Count
****
Number of rain gages 10
Number of subcatchments ... 5
Number of nodes 2
Number of links 1
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Chicago_4h_100yr	Chicago_4h_100yr	VOLUME	5 min.
Chicago_4h_25yr	Chicago_4h_25yr	VOLUME	5 min.
Chicago_4h_2yr	Chicago_4h_2yr	VOLUME	5 min.
Chicago_4h_50yr	Chicago_4h_50yr	VOLUME	5 min.
Chicago_4h_5yr	Chicago_4h_5yr	VOLUME	5 min.
SCS_Type_II_46.8mm_2yr_24hr_Collingwood	SCS_Type_II_46.8mm_2yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_60.3mm_5yr_24hr_Collingwood	SCS_Type_II_60.3mm_5yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_80.5mm_25yr_24hr_Collingwood	SCS_Type_II_80.5mm_25yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_88.8mm_50yr_24hr_Collingwood	SCS_Type_II_88.8mm_50yr_24hr_Collingwood	INTENSITY	6 min.
SCS_Type_II_97.1mm_100yr_24hr_Collingwood	SCS_Type_II_97.1mm_100yr_24hr_Collingwood	INTENSITY	6 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
201	4.64	264.00	50.00	2.0000	SCS_Type_II_97.1mm_100yr_24hr_Collingwood	SU1
202	6.71	314.00	50.00	2.0000	SCS_Type_II_97.1mm_100yr_24hr_Collingwood	SU1
203	1.27	138.00	0.00	2.0000	SCS_Type_II_97.1mm_100yr_24hr_Collingwood	SU1
204	1.07	400.00	50.00	2.0000	SCS_Type_II_97.1mm_100yr_24hr_Collingwood	SU1
205	1.90	750.00	50.00	2.0000	SCS_Type_II_97.1mm_100yr_24hr_Collingwood	SU1

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
OF1	OUTFALL	0.00	0.00	0.0	
SU1	STORAGE	189.60	3.90	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
OL1	SU1	OF1	OUTLET			

****
Cross Section Summary
****

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

****

DEY DRIVE TOWNHOUSES – SWM MODELLING – SCS 100 YEAR STORM EVENT

```
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 10/13/2025 00:00:00
Ending Date .............. 10/14/2025 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001524 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         1.514        97.100
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.452        28.971
Surface Runoff ...........         1.049        67.295
Final Storage ............         0.015         0.993
Continuity Error (%) .....        -0.164


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         1.049        10.491
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.245         2.450
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.183         1.834
Final Stored Volume ......         0.987         9.874
Continuity Error (%) .....         0.007


***************************
Time-Step Critical Elements
***************************
None


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


*********************************
Most Frequent Nonconverging Nodes
*********************************
Convergence obtained at all time steps.
```

DEY DRIVE TOWNHOUSES – SWM MODELLING – SCS 100 YEAR STORM EVENT

****
Routing Time Step Summary
****

Minimum Time Step	:	4.50 sec
Average Time Step	:	5.00 sec
Maximum Time Step	:	5.00 sec
% of Time in Steady State	:	0.00
Average Iterations per Step	:	2.00
% of Steps Not Converging	:	0.00
Time Step Frequencies	:	
5.000 - 3.155 sec	:	100.00 %
3.155 - 1.991 sec	:	0.00 %
1.991 - 1.256 sec	:	0.00 %
1.256 - 0.792 sec	:	0.00 %
0.792 - 0.500 sec	:	0.00 %

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
201	97.10	0.00	0.00	26.79	48.48	21.00	69.48	3.22	0.98	0.716
202	97.10	0.00	0.00	26.79	48.45	20.90	69.35	4.65	1.38	0.714
203	97.10	0.00	0.00	53.58	0.00	41.95	41.95	0.53	0.11	0.432
204	97.10	0.00	0.00	26.79	48.52	21.55	70.07	0.75	0.28	0.722
205	97.10	0.00	0.00	26.79	48.52	21.55	70.08	1.33	0.50	0.722

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
OF1	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
SU1	STORAGE	1.89	2.70	192.30	0 18:56	2.70

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
OF1	OUTFALL	0.000	0.059	0 18:56	0	2.45	0.000
SU1	STORAGE	3.222	3.222	0 11:54	10.5	12.3	0.007

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

DEY DRIVE TOWNHOUSES – SWM MODELLING – SCS 100 YEAR STORM EVENT

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m³	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SU1	5.965	32.8	0.0	0.0	9.916	54.6	0 18:56	0.059

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	99.30	0.029	0.059	2.450
System	99.30	0.029	0.059	2.450

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
OL1	DUMMY	0.059	0 18:56			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Tue Oct 14 20:46:11 2025
Analysis ended on: Tue Oct 14 20:46:11 2025
Total elapsed time: < 1 sec

Appendix D

BACKGROUND INFORMATION

FUNCTIONAL SERVICING REPORT

DEY DRIVE TOWNHOUSES
TOWN OF COLLINGWOOD

From:	Dan Hurley
To:	Travis Burnside
Cc:	John Welton; Michael Uster
Subject:	RE: Pretty River Estates.
Date:	November 13, 2020 9:01:59 AM
Attachments:	image001.png image002.png image003.png image004.png L - NVCA - Response to Draft Plan of Subdivision Comments.pdf L - NVCA - Response to Parcel 1 and 2 Hydraulic Comments.pdf

---

Hello Travis – received your message thanks.
We were not the engineers for Liberty for Phase 1 of their development. We became involved to sort out floodplain issues associated with Parcels 1 and 2 so the information we have is more focused on the floodplain related matters. That being said.

- I do have some excerpts from a Preliminary SWM Report prepared for the Phase 2 lands that was authored by Exp in 2011. I can send what I have do not have the full copy – might be best to get that from Michael.
- Yes both Parcels 1 and 2 will need to be flood protected to above 194.5 with lowest openings for any dwelling above 194.8. Also for Parcel 2 there is the matter of the small spill from the river that is currently conveyed along the parcels very east limit. This will need to be addressed in the design of Parcel 2 and our letters attached describe 2 ways this can be addressed. The Town/NVCA would have to be consulted to confirm which approach is preferred through the design process.
- I do not have the history with regard to the easement width – sorry.

Hope this helps

Dan Hurley, B.A.Sc., P.Eng., LEED AP
President

Tatham Engineering Limited
115 Sandford Fleming Drive, Suite 200 | Collingwood | Ontario | L9Y 5A6
T 705-444-2565 x2040 | **C** 705-444-7571 | dhurley@tathameng.com | tathameng.com

---

From: Travis Burnside <tburnside@cobideeng.com>
Sent: November 12, 2020 1:43 PM
To: Dan Hurley <dhurley@tathameng.com>
Cc: John Welton <johnzwelton@sunvalehomes.com>
Subject: RE: Pretty River Estates.

Dan
I left you a voicemail and thought I would follow up with an email.
Are you able to provide the following information:

- Pretty River Estates SWM Report
- Regional Flood Elevation that Parcel 1 must stay above? My understanding based on the information provided to John for Parcel 2 is that the south limit of Parcel 2 is be built up to an

elevation of 194.50 m.

- Do you know if there is a reason why the sewer easement though Parcel 1 widens out on an angle when the sewers run straight across the site? Can the easement be modified to allow that land to be used for building purposes?

Thank You

Travis

Travis Burnside, P. Eng.

Cobide Engineering Inc.
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Hanover, ON N4N 1R4
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C +1 519-901-5959
E tburnside@cobideeng.com
www.cobideeng.com

From: John Welton <johnzwelton@sunvalehomes.com>
Sent: November 12, 2020 12:43 PM
To: Travis Burnside <tburnside@cobideeng.com>
Subject: FW: Pretty River Estates.

From: Dan Hurley <dhurley@tathameng.com>
Sent: October 30, 2020 8:29 AM
To: John Welton <johnzwelton@sunvalehomes.com>
Subject: RE: Pretty River Estates.

Hello John – following up on these parcels to see if you were still proceeding. Happy to assist where and when necessary.

Thanks – hope all is well.

Regards,

Dan Hurley, B.A.Sc., P.Eng., LEED AP
President

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TATHAM ENGINEERING

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File 117003

May 16, 2019 'WITHOUT PREJUDICE'

Amy Knapp
Planner II
Nottawasaga Valley Conservation Authority
8195 8th Line
Utopia, Ontario L0M 1T0
aknapp@nvca.on.ca

Re: Proposed Draft Plan of Condominium and Part Lot Control
Proposed Official Plan Amendment and Zoning By-law Amendment
Phase II of Pretty River Estates, Liberty Draft Plan of Subdivision
Town of Collingwood, Part Lot 40, Concession 8
Town of Collingwood – File No. CW-T-0101
NVCA ID # 19723

Dear Amy:

This letter has been prepared in response to the NVCA comments letter dated March 25, 2019 regarding the above noted project. Specifically, it will address the engineering questions contained therein in the order they were presented as follows.

ENGINEERING

1. *NVCA staff accept the findings of the flood study and erosion hazard delineation for the site.*
   Noted.
2. *In order to finalize the limits of development and lot configuration we will require the following information:*
   a. *An updated lot fabric showing all parcels are located outside of the 100-year flood extents, erosion hazard (including 6 metre access allowance), and spill area extents.*

      Specific to the limits of development we have attached the line work showing the limit of Parcels 1 and 2 and can confirm they respect the identified setbacks (see Figure 1.0 attached). Fill is proposed for the south-east corner of Parcel 2 and preliminary grades are illustrated that will eliminate the spill to the north and ensure it will flow over the rail trail and back into the Pretty River main channel. The updated spill model is included with this submission. We have not shown the internal lot fabric for Parcel 1 and 2 as that is still being developed and will be subject to the site plan approval process along with detailed grading.

We note Parcel 3 is not included on this plan as development on this parcel is proposed to be deferred for the time being.

b. *The status of the outcome of any further discussions with the Town on their requirements for a cumulative impact assessment and the potential for improving or eliminating the existing spill to the north.*

Tatham Engineering has consulted with the Town specific to cumulative impact and can confirm the following:

- The Town is not aware of any other applications proposing to develop in the flood fringe downstream of the PRE Phase 2 site.
- The PRE Phase 2 site is at the upstream limit of the special policy (2-Zone) area. Upstream is Township of Clearview and a 1-Zone policy area.
- The flood fringe downstream of the PRE Phase 2 site (downstream of the rail crossing) is small as there is no structure that causes the backwater condition experienced at the PRE Phase 2 site. In fact, the flood level difference between the 1:100 year and Regulatory flows is only +/- 0.3 – 0.5 m thus creating a small flood fringe with limited storage capacity.
- The Town confirmed they have reviewed and approved many development proposals in the flood spill downstream of the PRE Phase 2 site (as has the NVCA) and have never required or been requested to provide a cumulative impact assessment.

c. *Preliminary lot grading plans demonstrating that safe access / egress and flood-proofing to and within all parcels as per NVCA criteria is achievable.*

Fill will be required to bring Parcels 1 and 2 above the Regulatory Storm Event flood elevations. Internal roads shall be graded above 194.20 m, which is the maximum Regulatory Storm Event flood elevation. The minimum opening elevation for all proposed dwellings shall be 194.50 m, which is at 0.30 m above the Regulatory Storm Event flood elevation for the entire development. The lot grading detail will be dealt with at the site plan stage.

Spill through Parcel 2 is proposed to be eliminated through the raising of the grade across the parcel and along the south limit of the property. Under the Regulatory Storm Event, there is still potential for spill to occur over the rail crossing up to an elevation of approximately 194.15 m. All Parcel 2 lots will be graded above the spill elevation as depicted on Figure 2.0.

As previously indicated, development on Parcel 3 is proposed to be deferred for now.

d. *Preliminary stormwater management calculations and supporting information. In cases where a lot will drain to an existing pond, information that confirms the proposed drainage area characteristics are consistent with the original pond design are sufficient. However, it is noted that the Eden Oak SWM pond design did not consider external drainage from Parcel 2 and it would*

need to be demonstrated that this pond can accommodate the additional drainage area. The locations of any proposed outlets and emergency overland flow routes should also be indicated. Stormwater management will be dealt with the site plan stage within the parcels identified on within the approved subdivision plans (PRE Phase 1 or Eden Oak).

We trust that this response addresses the outstanding engineering concerns as it relates to the proposal to amend the Town's Official plan and Zoning By-law in support of Phase II of the Pretty River Estates.

Yours truly,
Tatham Engineering Limited

Dan Hurley B.A.Sc., P.Eng., LEED AP
President

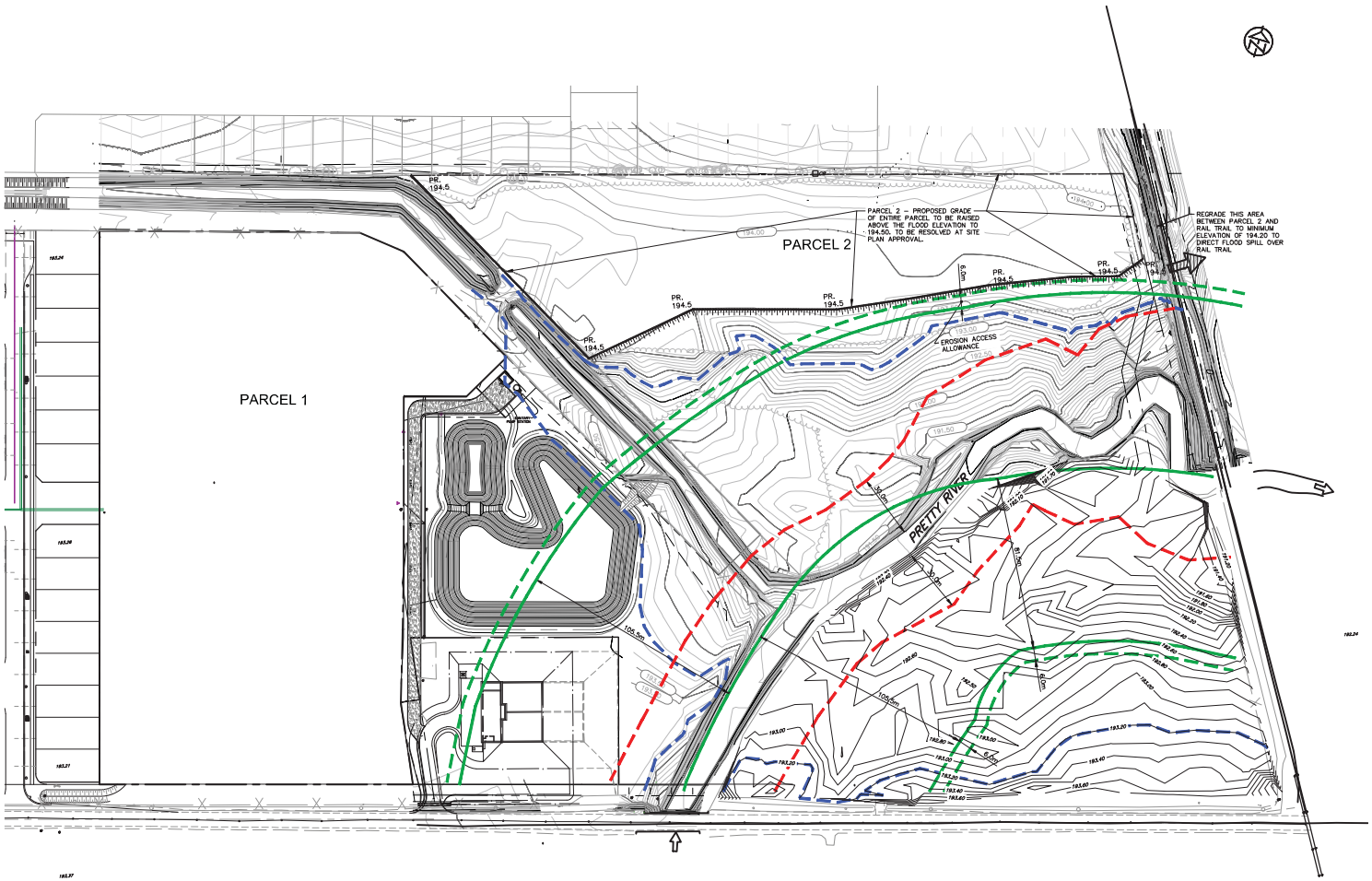
David Marshall B.A.Sc., P.Eng.
Intermediate Engineer

DJH/DAM:rlh

copy:	Peter Alm	NVCA	email (palm@nvca.on.ca)
	Mark Bryan	Town of Collingwood	email (mbryan@collingwood.ca)
	John Velick	Town of Collingwood	email (jvelick@collingwood.ca)
	Mark Liddy	Liberty Development	email (mark@libertydevelopment.ca)

I:\2017 Projects\117003 - Pretty River Hydrology Review\Documents\L - NVCA - Response to Draft Plan of Subdivision Comments.docx

Figure 1



KEY PLAN
N.T.S.

LEGEND
- X-SECTION I.D.
- EX. 100 YR FLOOD ELEV.-104.9m³/s
- EX. REGIONAL STORM FLOOD ELEV. UPDATED REGIONAL-172.8m³/s
- SECTION LINE
- 100-YEAR FLOODLINE
- MEANDER BELT LIMITS
- 6.0m MEANDER BELT ACCESS ALLOWANCE
- 30.0m SETBACK FROM WATER COURSE

BENCHMARKS

NOTES
1. CONTOURS FROM GREENLAND CONSULTING ENGINEERS EDEN OAK HOMES – McNABB RESIDENTIAL SUBDIVISION HAZARD AREAS (APRIL 2009).

No.	REVISION DESCRIPTION	DATE
1.	1ST SUBMISSION	MAR 11/19

ENGINEER STAMP

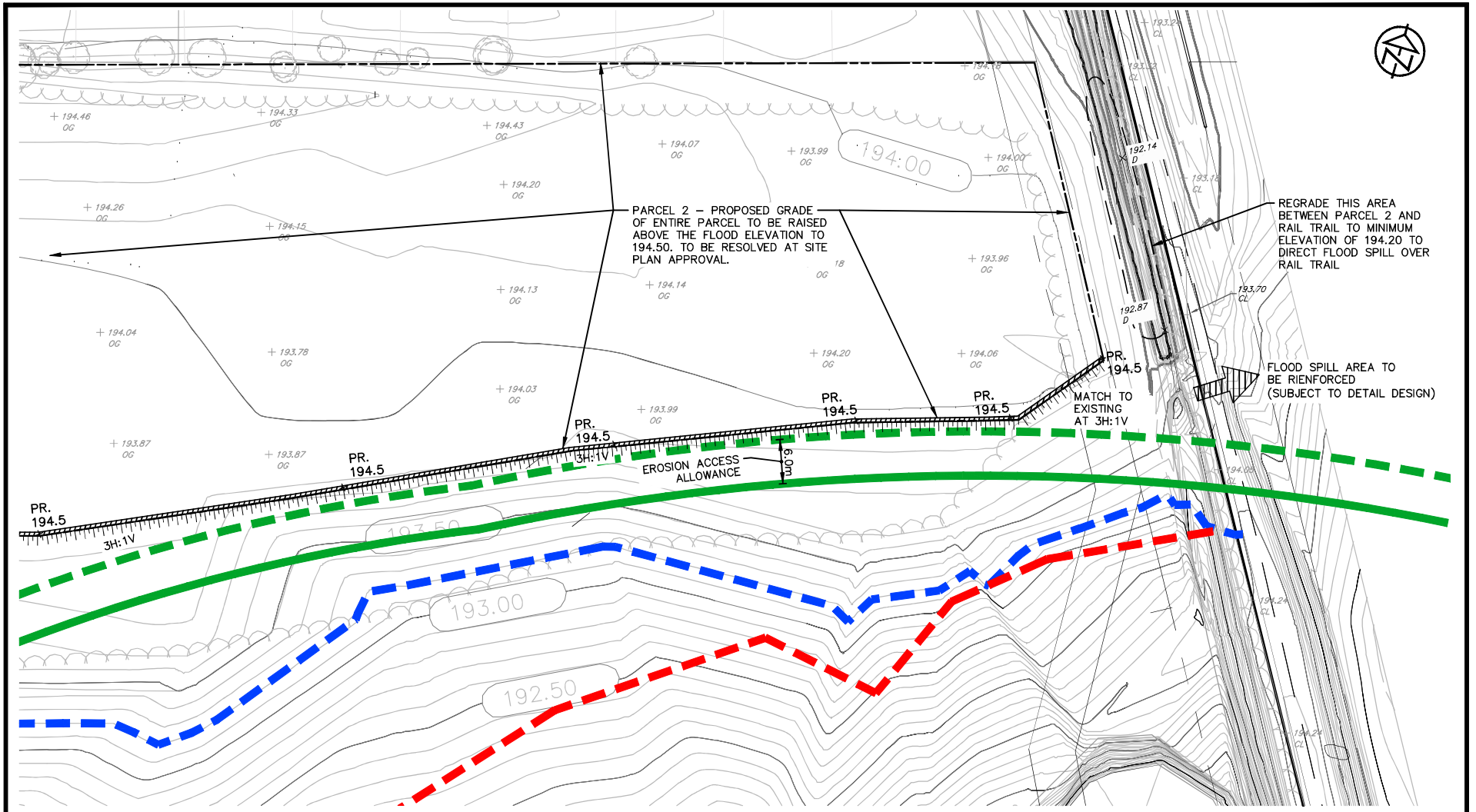
1579669 ONTARIO INC.
PRETTY RIVER ESTATES PHASE II
TOWN OF COLLINGWOOD

SETBACKS AND PROPOSED DEVELOPMENT PARCELS 1 & 2

TATHAM ENGINEERING

DESIGN: DAM	FILE: 117003	DWG:	
DRAWN: RD	DATE: NOV. 2018	**FIG-1**	
CHECK: DJH	SCALE: 1:1000		

Figure 2



TATHAM ENGINEERING

PRETTY RIVER ESTATES PHASE II
TOWN OF COLLINGWOOD
GRADING/FLOOD SPILL CONCEPT - PARCEL 2

DWG. No. **FIG. 2**

SCALE: 1:500	DRAWN: DEP	DATE: MAY/19	JOB NO. 117003

Drawing Name: 117003–FIG02.dwg, Plotted: May 15, 2019

CONDELAND ENGINEERING LIMITED
TECHNICAL DIVSION
STORM WATER MANAGEMENT ANALYSIS

PROJECT NUMBER: 15-010

PROJECT LOCATION: PROPOSED RESIDENTIAL DEVELOPMENT
EAST OF HURONTARIO STREET NORTH OF POPLAR
Town of Collingwood

CLIENT: EDEN OAK (MC NABB) INC.

East SWM Pond Characteristics
Stage-Storage-Discharge Relationship

orifice invert = 191.9
orifice dia = 0.5
orifice centroid ele.= 192.15
weir length= 3
orifice area = 0.19625
ICD invert= 190.6
weir elevation 193

	ELEVATION (m)	DEPTH (m)	AREA (sq.m.)	STORAGE (cu.m.)	STORAGE (Ha-m)	ICD Type 'C' Discharge Rate (lps)		ICD Type 'C' Discharge Rate (cum/sec)	Head on orifice (m)	Orifice Discharge (invert 190.70 in cum/sec)	Weir Discharge	Total Discharge (cum/sec)	
	189.60	0.00	1080.56	0.00	0.0000								
	189.90	0.30	1266.73	123.77	0.0124	0.00	FOREBAY	0.0000	0.00	0.00	0.00	0.0000	0.0000
	190.00	0.40	1333.95	312.66	0.0313	0.00		0.0000	0.00	0.00	0.00	0.0000	0.0000
	190.20	0.60	1471.19	370.17	0.0370	0.00		0.0000	0.00	0.00	0.00	0.0000	0.0000
0	190.30	0.70	1541.20	801.25	0.0801	0.00		0.0000	0.00	0.00	0.00	0.0000	0.0000
0.10	190.40	0.80	3240.68	966.26	0.0966	0.00	PERMANENT POOL	0.0000	0.00	0.00	0.00	0.0000	0.0000
0.20	190.50	0.90	3420.18	1459.47	0.1459	0.00		0.0000	0.00	0.00	0.00	0.0000	0.0000
0.30	190.60	1.00	3551.17	1808.04	0.1808	0.00		0.0000	0.00	0.00	0.00	0.0000	0.0000
0.10	190.70	0.80	3741.96	367.91	0.0368	11.00	ACTIVE STORAGE	0.0110	0.00	0.0000	0.0000	0.0110	0.0368
0.20	190.80	0.90	2876.50	748.83	0.0749	16.00		0.0160	0.00	0.0000	0.0000	0.0160	0.0749
0.30	190.90	1.00	4019.66	1143.64	0.1144	19.00		0.0190	0.00	0.0000	0.0000	0.0190	0.1144
0.40	191.00	1.10	4144.23	1551.83	0.1552	22.00		0.0220	0.00	0.0000	0.0000	0.0220	0.1552
0.50	191.10	1.20	4270.48	1972.57	0.1973	24.50		0.0245	0.00	0.0000	0.0000	0.0245	0.1973
0.60	191.20	1.30	4398.41	2406.01	0.2406	26.50		0.0265	0.00	0.0000	0.0000	0.0265	0.2406
0.70	191.30	1.40	4528.01	2852.33	0.2852	28.50		0.0285	0.00	0.0000	0.0000	0.0285	0.2852
0.80	191.40	1.50	4659.30	3311.7	0.3312	30.00		0.0300	0.00	0.0000	0.0000	0.0300	0.3312
0.90	191.50	1.60	4792.26	3784.28	0.3784	31.50		0.0315	0.00	0.0000	0.0000	0.0315	0.3784
1.00	191.60	1.70	4926.89	4270.24	0.4270	33.00		0.0330	0.00	0.0000	0.0000	0.0330	0.4270
1.10	191.70	1.80	5063.21	4769.74	0.4770	34.50		0.0345	0.00	0.0000	0.0000	0.0345	0.4770
1.20	191.80	1.90	5201.20	5282.96	0.5283	36.50		0.0365	0.00	0.0000	0.0000	0.0365	0.5283
1.30	191.90	2.00	5340.87	5810.06	0.5810	38.00		0.0380	0.00	0.0000	0.0000	0.0380	0.5810
1.40	192.00	2.10	5482.22	6351.22	0.6351	39.50		0.0395	0.00	0.0000	0.0000	0.0395	0.6351
1.50	192.10	2.20	5626.49	6906.65	0.6907	41.00		0.0410	0.00	0.0000	0.0000	0.0410	0.6907
1.60	192.20	2.30	5773.00	7476.64	0.7477	42.50		0.0425	0.00	0.0000	0.0000	0.0425	0.7477
1.70	192.30	2.40	5922.29	8061.42	0.8061	44.00		0.0440	0.00	0.0000	0.0000	0.0440	0.8061
1.80	192.40	2.50	6073.48	8661.21	0.8661	45.50		0.0455	0.25	0.3564	0.0000	0.4019	0.8661
1.90	192.50	2.60	6226.85	9276.23	0.9276	47.00		0.0470	0.35	0.4217	0.0000	0.4687	0.9276
2.00	192.60	2.70	6382.42	9906.69	0.9907	47.33		0.0473	0.45	0.4782	0.0000	0.5255	0.9907
2.10	192.70	2.80	6541.59	10552.89	1.0553	47.67		0.0477	0.55	0.5286	0.0000	0.5763	1.0553
2.20	192.80	2.90	6705.95	11215.27	1.1215	48.00		0.0480	0.65	0.5747	0.0000	0.6227	1.1215
2.30	192.90	3.00	6874.60	11894.3	1.1894	48.33		0.0483	0.75	0.6173	0.0000	0.6656	1.1894
2.40	193.00	3.10	7047.55	12590.4	1.2590	48.67		0.0487	0.85	0.6572	0.0000	0.7058	1.2590
2.50	193.10	3.20	7248.97	13305.23	1.3305	49.00		0.0490	0.95	0.6948	0.1613	0.9050	1.3305
2.60	193.20	3.30	7429.63	14039.16	1.4039	49.33		0.0493	1.05	0.7304	0.4562	1.2359	1.4039
2.70	193.30	3.40	7592.43	14790.26	1.4790	49.67		0.0497	1.15	0.7644	0.8380	1.6521	1.4790
2.80	193.40	3.50	7781.22	15558.95	1.5559	50.00		0.0500	1.25	0.7969	1.2902	2.1372	1.5559
2.90	193.50	3.60	7975.04	16346.76	1.6347	50.33		0.0503	1.35	0.8282	1.8031	2.6817	1.6347