WILSON DEVELOPMENTS INC.

FUNCTIONAL SERVICING REPORT

ECO PARKWAY INDUSTRIAL SITE

TOWNSHIP OF SOUTHGATE

AUGUST 2023

COBIDE Engineering Inc
517 10th Street
Hanover, ON N4N 1R1
TEL: 519-506-5959
www.cobideeng.com

COBIDE ENGINEERING INC

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1. INTRODUCTION

Cobide Engineering Inc. was retained by Wilson Developments to provide engineering services in support of a Site Plan Approval Application for Phase 1 of their proposed industrial development in the village of Dundalk.

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

1.1 LOCATION

The proposed development is located Part of Lots 235 and 236, Former Township of Proton, Township of Southgate, County of Grey (described herein as the “site”). A Site Location Map is included as Figure 1. The subject property is approximately 4.85 hectares in area.

1.2 DEVELOPMENT PROPOSAL

The proposed development be completed in phases with Phase 1 consisting two (2) 1,113.6 m^2 rental unit buildings, adjacent parking areas and an interior roadway. Phase 2 will consist of constructing a 9,300 m^2 industrial building. The total area to be developed is approximately 4.85 hectares.

There will be a private road throughout the site providing access around the buildings. One entrance will be provided in the southwest corner of the property off Eco Parkway.

The Site Plan showing the overall configuration of the development has been included in Appendix A and noted as SP1.

The subject property is currently designated Industrial in the Township of Southgate’s Official Plan and is zoned “M1 – General Industrial Zone” in the Township of Southgate’s Zoning By-law. The subject property is within the Dundalk Settlement Boundary of the current Official Plan of the Township of Southgate and thus is intended for servicing from municipal water and municipal sewage.

The servicing of Phase 2 will be dealt with under a separate apparoval.

MAP SOURCE - MTO ROAD MAP

COBIDE ENGINEERING INC
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Client/Project

ECO PARKWAY INDUSTRIAL DEVELOPMENT
WILSON DEVELOPMENTS
Township of Southgate, Ontario
FUNCTIONAL SERVICING REPORT

Figure No.

1

Title

REGIONAL LOCATION MAP

ORIGINAL SHEET – 8 x 11

H:\Wilson\03710 – Eco Park Drive Industrial Site\Drawings\Working Drawings\03710 Regional Location – FSR.dwg Jun 07, 2022 – 9:53am

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 proposed development's estimated demands which are determined by the Ministry of the Environment, Conservation and Parks (MECP) 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 MECP.

Based on MECP 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 the average recommended commercial water demand of 5 L/m^2 of floor area/day per the MECP's Design Guidelines for Drinking-Water Systems (2008).

Table 1 below summarizes the projected water demands for the proposed development.

Table 1 - Proposed Water Demands

Demand	Area	Consumption	Peaking Factor	Peak Rate (L/day)	Peak Rate (L/s)
Rental	2,227 m^2	5 L/m^2/day	2.5	27,838	0.32

The system should be capable of supplying a minimum of 0.32 L/s of water to meet the peak hour demand of the proposed development.

2.3 WATERMAIN CONFIGURATION

A 150mm diameter watermain will be connected to the municipal system at the proposed entrance into the development. There is currently a 150mm diameter watermain on the east side of Eco Parkway.

A single 50mm diameter connection will be provided to each storage building.

A drawing showing the proposed watermain distribution network has been included in Appendix A.

3. SANITARY SEWER SYSTEM

The sanitary servicing of the proposed development will be sized based on the existing conditions at the connection to the municipal sanitary sewer and the proposed development's estimated site demands which are determined by the MECP *Design Guidelines for Sewage Works (2008).*

3.1 DESIGN CRITERIA

The sanitary sewer system will be designed in accordance MECP guidelines.

The sanitary sewer will be designed to convey the projected peak flow based on the site's occupancy load as well as extraneous flows.

3.2 DESIGN FLOW RATES

The sanitary sewer will be design flows are expected to be similar to the water usage. Therefore the peak flows are expected to be approximately 0.32 l/s.

3.3 SANITARY SEWER CONFIGURATION

There will be a sanitary sewer through the middle of the site with a single connection to the existing sanitary sewer. Based on the as built drawings received for the area, there are sanitary sewers north of the site which connect to the sanitary sewer system on Eco Parkway that will provide the outlet for the development.

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.

A drawing showing the proposed sanitary collection network has been included in Appendix A as Drawing 03710-SS1.

4. STORM SEWER SYSTEM

The subject property is currently vacant. The site is generally sloping from south to north, and west to east. There are no existing storm sewers on the property. The site mainly discharges into an existing ditch on the west side of Eco Parkway. Eco Parkway will be considered Discharge Point #1 for the purposes of this report.

The proposed development will be graded such that runoff is conveyed via storm sewer system and sheet flow to a new wet stormwater management pond in the northeast corner of the property. The outlet for the stormwater management pond will consist of a headwall, and a 300mm dia. storm sewer c/w an orifice, that will then discharge into the existing ditch on the west side of Eco Parkway.

The storm sewer system will be designed in accordance with the municipal and conservation authority guidelines including the Ministry of the Environment, Conservation and Parks (MECP) Design Guidelines. The storm sewer system will use the rationale method to size the storm sewer to accommodate the 5 year peak flow from the development. The majority of the site will discharge to the proposed storm sewers.

The hydrologic modelling software PCSWMM Version 7.4.3240 Professional 2D was used to determine the pre and post-development peak flows of the 5 yr., 25 yr., and 100 yr. storm events (3 hour Chicago Storm Event, Dundalk IDF Parameters using MTO Curve Look-Up Tool).

The pre-development and post-development parameters and model outputs are contained in Appendix B.

For the purposes of this report, Discharge Point #1 will be the Eco-Park Way Ditch and Discharge Point #2 will be the lands to the north of the property.

4.1 DESIGN REQUIREMENTS

The intent of stormwater quantity control is to limit the flows under proposed conditions to existing levels or less to protect the downstream watercourses, infrastructure and properties.

Minor and Major flows from the majority of the development will be conveyed to the proposed stormwater management facility via a new storm sewer system throughout the site and overland flow routes.

Due to the increase in impervious area, stormwater quantity control will be required for the site. The design of the stormwater management facility has assumed a free outlet from the pond.

4.2 SWM FACILITY CHARACTERISTICS

The stormwater management facility and outlet structure have been designed to control peak runoff rates as well as conform to MECP best practices.

In order to provide the above required volumes and discharges, the following SWM Facility geometry is being proposed:

Table 4.1 – SWM Facility Geometry

SWM FACILITY	DETAILED DESIGN
Side Slope	3:1 - 5:1
SWM Facility Bottom	508.00 m
Permanent Pool Elevation	509.00 m
Top Elevation	510.25 m
High Water Elevation	509.57 m

The outlet configuration for the SWM Facility will be as follows:

- A 300mm diameter storm sewer with a 175mm orifice and an outlet elevation of 509.00 m;
- The outlet pipe will discharge into the roadside ditch on the west side of Eco Parkway

As seen by the proposed inverts, the proposed stormwater management facility will be constructed as a wet pond.

4.2.1 SWM FACILITY PERFORMANCE

Below is a summary of the hydraulic performance of the stormwater SWM Facility during the various storm events.

Table 4.2 – SWM Facility Performance

RETURN PERIOD	ELEVATION (m)	STORAGE (m^3)	DISCHARGE (l/s)
5 Year	509.35	1,448	35.3
25 Year	509.47	2,049	43.1
100 Year	509.57	2,542	48.3

4.3 MODELLING RESULTS

Based upon the above outlet structure, the following summarizes the pre-development and post development peak flows to the discharge point.

Table 4.3 - Peak Flow Summary

RETURN PERIOD	DISCHARGE POINT #1 (L/S)		DISCHARGE POINT #2 (L/S)	
	PRE	POST	PRE	POST
5 Year	43.3	35.3	15.3	0
25 Year	92.9	43.1	32.4	0
100 Year	147.8	48.3	51.2	0

As seen in the above table, the post development peak flows will be less than the pre development peak flows for all design storm events at Discharge Point #1. The peak flow is being conservatively controlled by the proposed stormwater management pond.

4.4 WATER QUAILITY

The MOE guidelines require that extended detention SWM facility's provide quality treatment of 40m^3/ha and discharge it over a minimum of 24 hours. Having an extended detention component in the quality ponds provides settlement of suspended solids.

The following table summarizes the volume requirements based the MOE Guidelines.

Table 4.4 - Water Quality Requirements

POST DEV DRAINAGE AREA (ha)	MOE VOLUME REQUIREMENT FOR NORMAL PROTECTION BASED ON 81.5% IMPERVIOUS (245 m^3/ha)	MOE EXTENDED DETENTION (40 m^3/ha)	PERMANENT POOL REQUIRED (m^3)
4.48 ha	1,120 m^3	180 m^3	940 m^3

The wetland facility will provide 6,250 m^3 of active storage volume. The pond will provide a permanent pool volume of 2,800 m^3. The pond has sufficient volume and size to meet water quality sizing requirements.

5. GRADING & EROSION AND SEDIMENT CONTROL

Erosion and sediment controls shall meet the requirements of the most recent version of the MECP *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 to be installed around the property boundary within the drainage corridor on the north and east side of the site to intercept sediment that could potentially be transported by sheet flow across the site. Light duty siltation fence will also be installed at any development grading limits where runoff may discharge from the site.
- It is proposed that the stormwater management pond be constructed first to act as a sedimentation basin.
- Placement of temporary straw check dams within the Eco Parkway drainage ditch downstream of the site;
- Installation of filter cloth under all new catchbasin grates until paving of the roadway is completed;
- Mud mats will be placed at construction access 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.

Sincerely,

Cobide Engineering Inc.

Travis Burnside, P. Eng.

LICENSED PROFESSIONAL ENGINEER
8/14/2023
T. L. BURNSIDE
100199868
PROVINCE OF ONTARIO

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Appendix A

DRAWINGS

FUNCTIONAL SERVICING REPORT

ECO PARKWAY INDUSTRIAL SITE

TOWNSHIP OF SOUTHGATE

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Notes

1. PROPERTY BOUNDARY DERIVED FROM INFORMATION SHOWN ON PLAN 16R-11609 BY VAN HARTEN SURVEYING INC.
2. TOPOGRAPHICAL INFORMATION DERIVED FROM FIELD SURVEY BY WILSON-FORD AS SUPPLIED BY THE TOWNSHIP OF SOUTHGATE.
3. SEE SHEET 03710-DET1 FOR TYPICAL CROSS-SECTION AND PAVEMENT DESIGN.
4. ALL ORGANIC MATERIAL WITHIN 1.2m OF FINISHED PROFILE GRADE TO BE REMOVED FROM ALL AREAS UNDER THE TRAVELLED PORTION OF THE ROAD.
5. COVER OVER WATERMAIN TO BE MINIMUM 2.0m AT ALL POINTS.
6. ALL WATERMAINS SHALL BE CONSTRUCTED OF PVC DR18.
7. SANITARY SEWER SHALL BE CONSTRUCTED OF PVC SDR35.
8. ALL JOINTS OF SANITARY MAINTENANCE HOLES 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.
9. MAINTAIN 2.50m HORIZONTAL AND 0.50m VERTICAL SEPERATION BETWEEN STORM/SANITARY SEWERS AND WATERMAIN.
10. ALL STORM CATCHBASINS TO HAVE A MINIMUM SUMP OF 600mm AND ALL STORM MAINTENANCE HOLES TO HAVE A MINIMUM SUMP OF 300mm.
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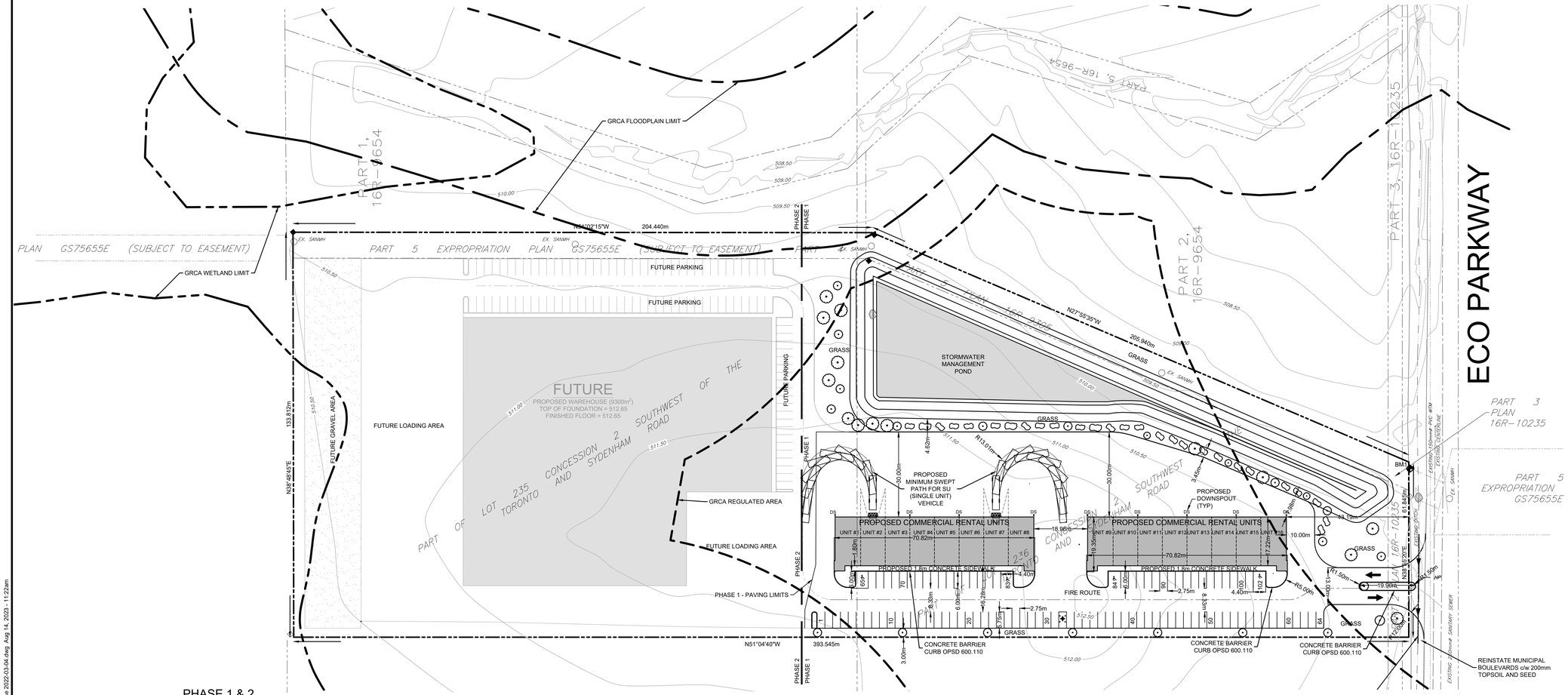

Benchmark Information

BM1
TOP OF STANDARD IRON BAR LOCATED AT NORTHEAST CORNER OF SUBJECT PROPERTY.

ELEVATION 509.20m

PHASE 1 & 2

PROPOSED INDUSTRIAL DEVELOPMENT STATISTICS

PROPOSED USE: GENERAL INDUSTRIAL (ZONE: M1)

REGULATION	REQUIRED	PROVIDED	RELIEF REQUIRED
MIN. LOT AREA	0.186ha	4.85ha	NO
MIN. LOT FRONTAGE	30.0m	61.85m	NO
MIN. FRONT YARD	15.0m	43.19m	NO
MIN. INTERIOR SIDE YARD	7.5m	18.17m	NO
MIN. REAR YARD	7.5m	60.03m	NO
MAX. LOT COVERAGE	50%	23.8%	NO
PARKING SPACES REQUIRED	83 SPACES	202 SPACES	NO

LEGEND

- SUBDIVISION BOUNDARY
- PROPOSED RIGHT OF WAY
- PROPOSED PROPERTY LINES
- EDGE OF EXISTING PAVEMENT
- PROPOSED SANITARY SEWER
- EXISTING SANITARY SEWER
- PROPOSED STORM SEWER
- EXISTING STORM SEWER
- PROPOSED SUBDRAIN
- PROPOSED WATERMAIN
- EXISTING WATERMAIN
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- CB PROPOSED CATCH BASIN
- CB EXISTING CATCH BASIN
- DICB PROPOSED DITCH INLET CATCHBASIN
- CO PROPOSED SANITARY SERVICE CLEANOUT
- CO EXISTING SANITARY SERVICE CLEANOUT
- CSV PROPOSED CURB STOP VALVE
- CSV EXISTING CURB STOP VALVE
- PROPOSED HYDRANT SET
- HYD EXISTING FIRE HYDRANT
- PROPOSED GATE VALVE
- WV EXISTING GATE VALVE
- PROPOSED CAP C/W THRUST BLOCK
- PROPOSED BLOWOFF
- EXISTING HYDRO GUY WIRE
- HP EXISTING HYDRO POLE
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- BPED EXISTING TELEPHONE PEDESTAL
- SIB STANDARD IRON BAR
- IB IRON BAR
- BM BENCHMARK
- DROP CURB

No.	DATE	DESCRIPTION	BY	APPD
2	AUG 14/23	SECOND SUBMISSION	JHL	TLB
1	JUNE 24/22	FIRST SUBMISSION	EV	TLB

REVISION / ISSUE

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LICENSED PROFESSIONAL ENGINEER
8/14/2023
T. L. BURNSIDE
100199868
PROVINCE OF ONTARIO

COBIDE ENGINEERING INC
517 - 10th STREET, Hanover, Ontario N4N 1R4
Telephone: (519) 506-5959
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Title:
PROPOSED INDUSTRIAL SITE
PART OF LOT 235 AND 236
FORMER TOWNSHIP OF PROTON
TOWNSHIP OF SOUTHGATE
DEVELOPMENT SITE PLAN

Client: WILSON DEVELOPMENTS

Design:	TLB	Scale:	1:750
Drawn:	JHL	Approved:	
Checked:	TLB		
Date:	JAN 2022		Design Engineer

DRAWING No. 03710-SP1

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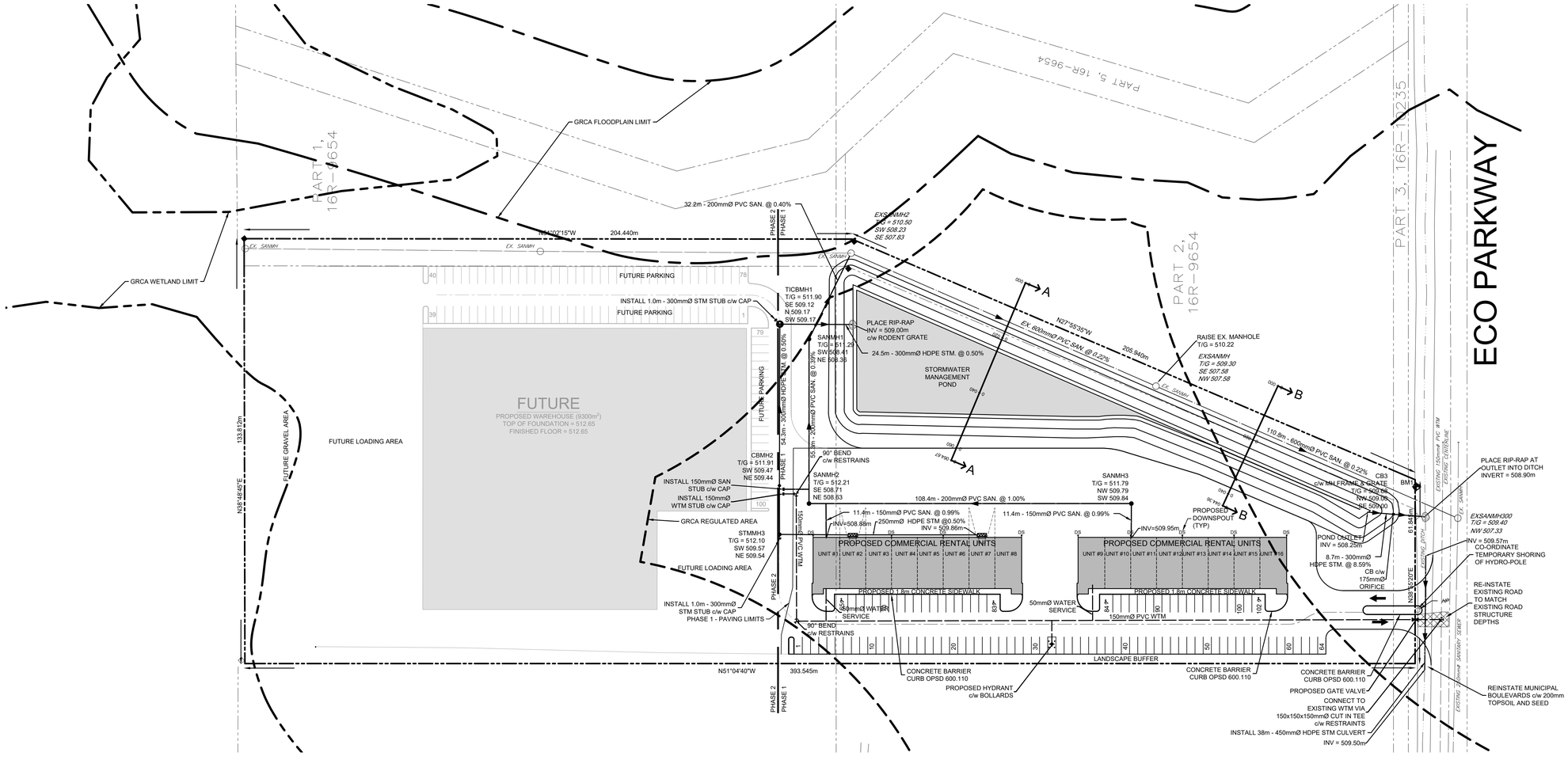

SCALE 1:750

10 0 10 20 50 METRES
50 0 25 50 100 FEET

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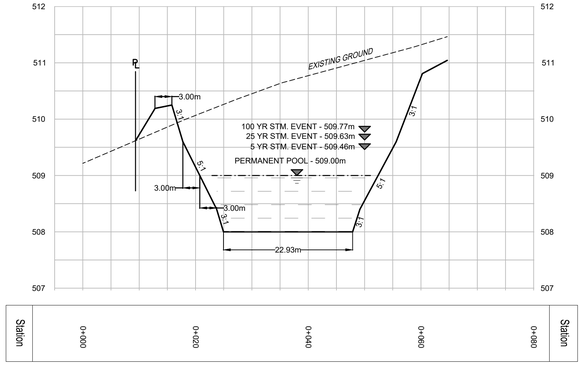
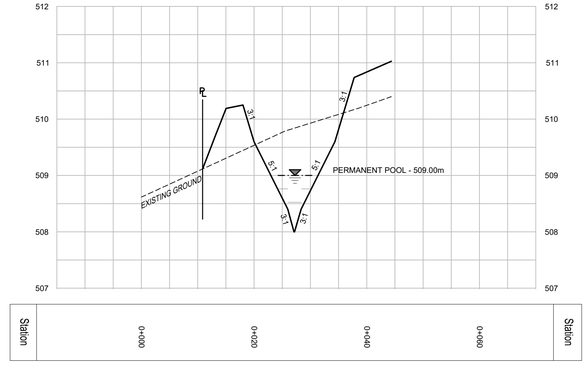
ELEVATION 509.20m

SWMP - SECTION A-A



SWMP - SECTION B-B



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PROPOSED INDUSTRIAL SITE PART OF LOT 235 AND 236 FORMER TOWNSHIP OF PROTON TOWNSHIP OF SOUTHGATE SITE SERVICING PLAN

Client:	WILSON DEVELOPMENTS
Design: TLB	Scale: 1:750
Drawn: JHL	Approved:
Checked: TLB	
Date: JAN 2022	Design Engineer
DRAWING No.	03710-SS1

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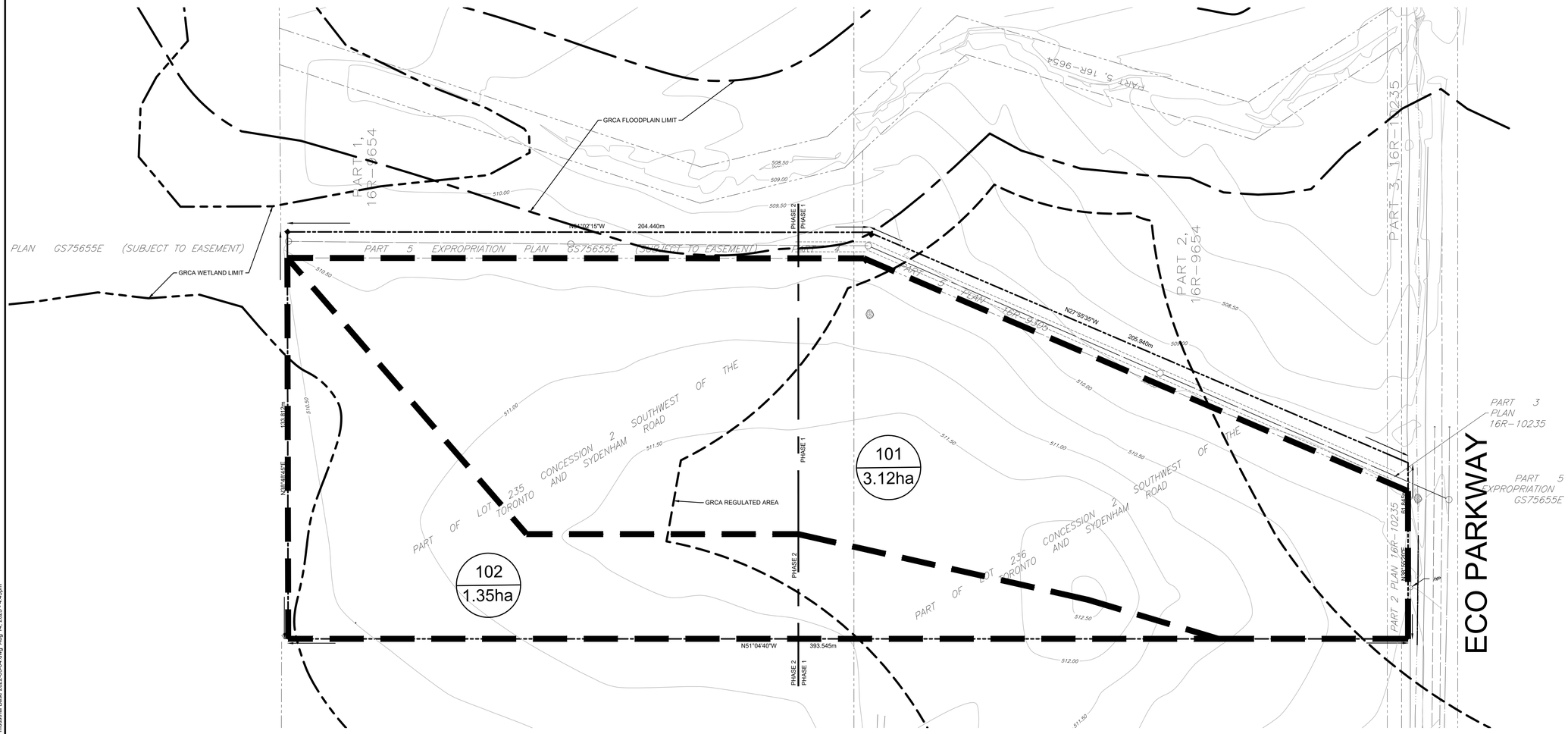


LEGEND

SUBDIVISION BOUNDARY	SANMH STMMH	EXISTING SANITARY MANHOLE	WV	EXISTING GATE VALVE
PROPOSED RIGHT OF WAY	STMMH	PROPOSED STORM MANHOLE		PROPOSED CAP C/W THRUST BLOCK
PROPOSED PROPERTY LINES	CBMH	EXISTING STORM MANHOLE		PROPOSED BLOWOFF
EDGE OF EXISTING PAVEMENT	TICBMH	PROPOSED CATCHBASIN MANHOLE	HP	EXISTING HYDRO GUY WIRE
PROPOSED SANITARY SEWER	TICB	PROPOSED TWIN INLET CATCHBASIN MANHOLE	CATV	EXISTING HYDRO POLE
EXISTING SANITARY SEWER	CB	PROPOSED TWIN INLET CATCHBASIN	BRFD	EXISTING CABLE TV PEDESTAL
PROPOSED STORM SEWER	CB	PROPOSED CATCH BASIN	SIB	EXISTING TELEPHONE PEDESTAL
EXISTING STORM SEWER	DICB	EXISTING CATCH BASIN	IB	STANDARD IRON BAR
PROPOSED SUBDRAIN	CO	PROPOSED DITCH INLET CATCHBASIN	BM	IRON BAR
PROPOSED WATERMAIN	CO	PROPOSED SANITARY SERVICE CLEANOUT		BENCHMARK
EXISTING WATERMAIN	CSV	EXISTING SANITARY SERVICE CLEANOUT		DROP CURB
PROPOSED SANITARY SERVICE	CSV	PROPOSED CURB STOP VALVE		
EXISTING SANITARY SERVICE	HYD	EXISTING CURB STOP VALVE		
PROPOSED WATER SERVICE		PROPOSED HYDRANT SET		
PROPOSED STORM SERVICE		EXISTING FIRE HYDRANT		
SANMH PROPOSED SANITARY MANHOLE		PROPOSED GATE VALVE		

Benchmark Information

BM1
TOP OF STANDARD IRON BAR LOCATED AT NORTHEAST CORNER OF SUBJECT PROPERTY.

ELEVATION 509.20m

No.	DATE	DESCRIPTION	BY	APPD
2	AUG 14/23	SECOND SUBMISSION	JHL	TLB
1	JUNE 24/22	FIRST SUBMISSION	EV	TLB

REVISION / ISSUE

Seal not valid unless signed and dated

COBIDE ENGINEERING INC
517 - 10th STREET, Hanover, Ontario N4N 1R4
Telephone: (519) 506-5959
www.cobideeng.com

Title:
PROPOSED INDUSTRIAL SITE
PART OF LOT 235 AND 236
FORMER TOWNSHIP OF PROTON
TOWNSHIP OF SOUTHGATE
PRE-DEVELOPMENT CATCHMENT AREAS

Client: WILSON DEVELOPMENTS

Design:	TLB	Scale:	1:750
Drawn:	KW	Approved:	
Checked:	TLB		
Date:	JAN 2022		Design Engineer

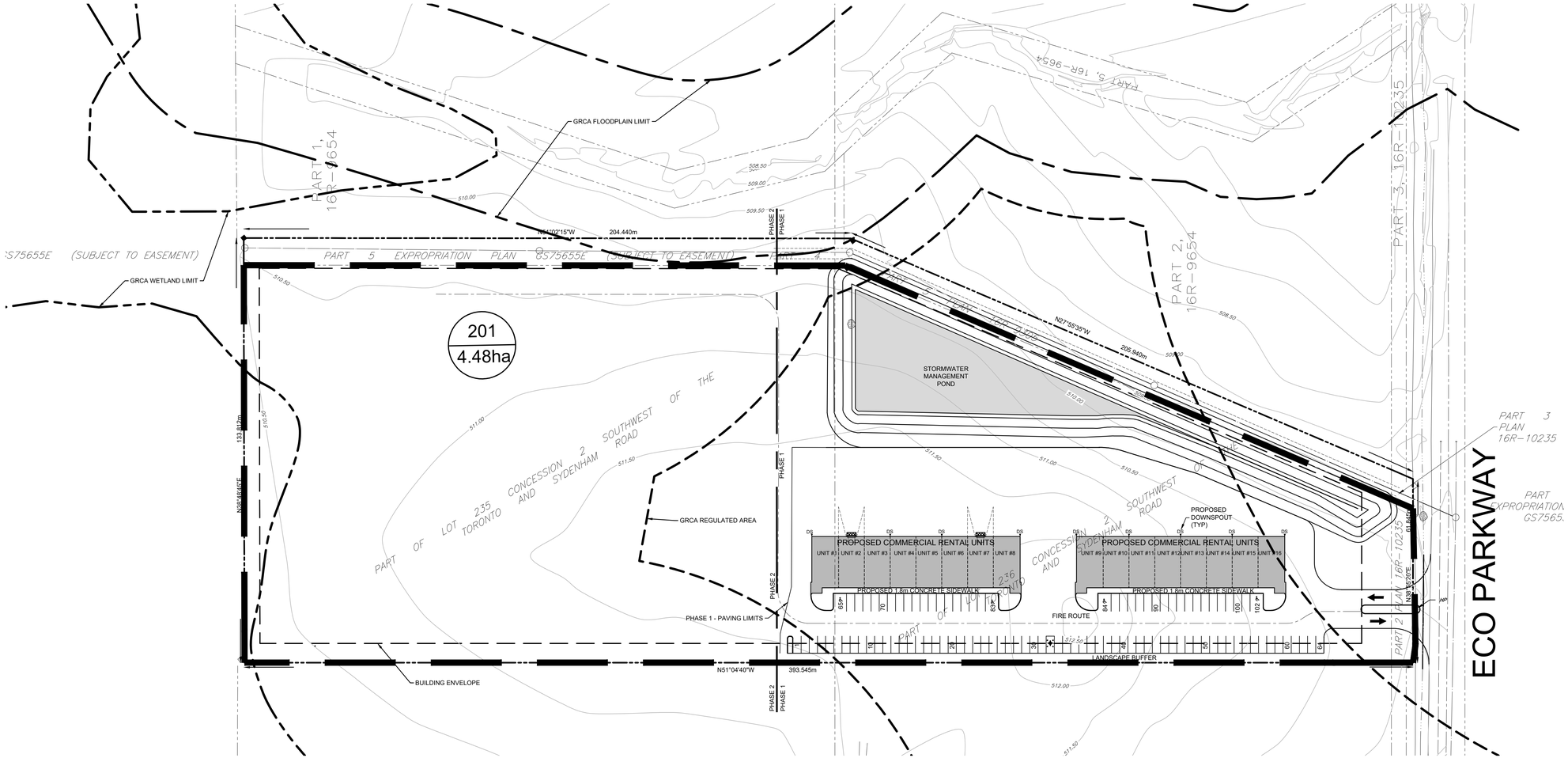
DRAWING No. 03710-SWM1

H:\Wilson\03710 - Eco Park Drive Industrial Site\Drawings\Submissions\2023-06-23 Second Submission\03710 Eco Park Drive Industrial Base 2022-03-04.dwg Aug 14, 2023 - 4:45pm

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 INFORMATION SHOWN ON PLAN 16R-11609 BY VAN HARTEN SURVEYING INC.
2. TOPOGRAPHICAL INFORMATION DERIVED FROM FIELD SURVEY BY WILSON-FORD AS SUPPLIED BY THE TOWNSHIP OF SOUTHGATE.
3. SEE SHEET 03710-DET1 FOR TYPICAL CROSS-SECTION AND PAVEMENT DESIGN.
4. ALL ORGANIC MATERIAL WITHIN 1.2m OF FINISHED PROFILE GRADE TO BE REMOVED FROM ALL AREAS UNDER THE TRAVELLED PORTION OF THE ROAD.
5. COVER OVER WATERMAIN TO BE MINIMUM 2.0m AT ALL POINTS.
6. ALL WATERMAINS SHALL BE CONSTRUCTED OF PVC DR18.
7. SANITARY SEWER SHALL BE CONSTRUCTED OF PVC SDR35.
8. ALL JOINTS OF SANITARY MAINTENANCE HOLES 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.
9. MAINTAIN 2.50m HORIZONTAL AND 0.50m VERTICAL SEPERATION BETWEEN STORM/SANITARY SEWERS AND WATERMAIN.
10. ALL STORM CATCHBASINS TO HAVE A MINIMUM SUMP OF 600mm AND ALL STORM MAINTENANCE HOLES TO HAVE A MINIMUM SUMP OF 300mm.
11. FIELD LOCATES OF ALL UNDERGROUND UTILITIES INCLUDING BUT NOT LIMITED TO; UNDERGROUND GAS, HYDRO, TELEPHONE, AND CABLE TELEVISION SHALL BE ARRANGED PRIOR TO CONSTRUCTION AND IS THEREFORE RESPONSIBILITY OF THE CONTRACTOR.
12. THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION PURPOSES UNTIL STAMPED 'ISSUED FOR CONSTRUCTION'.
13. ALL CONSTRUCTION SHALL BE COMPLETED IN ACCORDANCE WITH THE TOWNSHIP OF SOUTHGATE'S MUNICIPAL SERVICING STANDARDS.



Benchmark Information

BM1
TOP OF STANDARD IRON BAR LOCATED AT NORTHEAST CORNER OF SUBJECT PROPERTY.

ELEVATION 509.20m

No.	DATE	DESCRIPTION	BY	APPD
2	AUG 14/23	SECOND SUBMISSION	JHL	TLB
1	JUNE 24/22	FIRST SUBMISSION	EV	TLB

REVISION / ISSUE

Seal not valid unless signed and dated

COBIDE ENGINEERING INC
517 - 10th STREET, Hanover, Ontario N4N 1R4
Telephone: (519) 506-5959
www.cobideeng.com

Title:
PROPOSED INDUSTRIAL SITE PART OF LOT 235 AND 236 FORMER TOWNSHIP OF PROTON TOWNSHIP OF SOUTHGATE POST-DEVELOPMENT CATCHMENT AREAS

Client: WILSON DEVELOPMENTS

Design:	TLB	Scale:	1:750
Drawn:	KW	Approved:	
Checked:	TLB		
Date:	JAN 2022		Design Engineer

DRAWING No. 03710-SWM2

LEGEND

- SUBDIVISION BOUNDARY
- PROPOSED RIGHT OF WAY
- PROPOSED PROPERTY LINES
- EDGE OF EXISTING PAVEMENT
- PROPOSED SANITARY SEWER
- EXISTING SANITARY SEWER
- PROPOSED STORM SEWER
- EXISTING STORM SEWER
- PROPOSED SUBDRAIN
- PROPOSED WATERMAIN
- EXISTING WATERMAIN
- PROPOSED SANITARY SERVICE
- EXISTING SANITARY SERVICE
- PROPOSED WATER SERVICE
- PROPOSED STORM SERVICE
- SANMH PROPOSED SANITARY MANHOLE
- SANMH EXISTING SANITARY MANHOLE
- STMMH PROPOSED STORM MANHOLE
- STMMH EXISTING STORM MANHOLE
- CBMH PROPOSED CATCHBASIN MANHOLE
- TICBMH PROPOSED TWIN INLET CATCHBASIN MANHOLE
- TICB PROPOSED TWIN INLET CATCHBASIN
- CB PROPOSED CATCH BASIN
- CB EXISTING CATCH BASIN
- DICB PROPOSED DITCH INLET CATCHBASIN
- CO PROPOSED SANITARY SERVICE CLEANOUT
- CO EXISTING SANITARY SERVICE CLEANOUT
- CSV PROPOSED CURB STOP VALVE
- CSV EXISTING CURB STOP VALVE
- PROPOSED HYDRANT SET
- HYD EXISTING FIRE HYDRANT
- PROPOSED GATE VALVE
- WV EXISTING GATE VALVE
- PROPOSED CAP C/W THRUST BLOCK
- PROPOSED BLOWOFF
- EXISTING HYDRO GUY WIRE
- HP EXISTING HYDRO POLE
- CATV EXISTING CABLE TV PEDESTAL
- BPED EXISTING TELEPHONE PEDESTAL
- SIB STANDARD IRON BAR
- IB IRON BAR
- BM BENCHMARK
- DROP CURB

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Appendix B

MODEL PARAMETERS AND OUTPUT

STORMWATER MANAGEMENT REPORT

ECO PARKWAY INDUSTRIAL SITE

TOWNSHIP OF SOUTHGATE

Table A.1 Parameter Summary Table

Existing Conditions									
Outlet Location	**Model Catchment ID**	**Description**	**Area (ha)**	**Drainage Channel (m)**	**Flow Length (m)**	**Gradient (%)**	**Total Imperv. Connected (%)**	**Manning's 'n' (Perv.)**	**CN (Perv.)**
	101	Pre Development Site - Front Portion	3.12	120	260	2.0	0.0	0.30	72.0
	102	Pre Development Site - Back Portion	1.35	390	35	2.0	0.0	0.30	72.0
	201	Post Development Site	4.48	600	75	5.0	81.5	0.25	77.0

Table A.2 Site Soils: (as per Ontario Soil Survey Report for Grey County)

Soil Type
Listowel Silt Loam

Hydologic Soil Group
BC

TABLE OF CURVE NUMBERS (CN's)									
Land Use	Hydrologic Soil Type								
	A	AB	B	BC	C	CD	D	Manning's 'n'	
Meadow	50	54	58	64.5	71	74.5	78	0.4	continuous grass
Woodlot	50	55.3	60.5	67	73.5	76.8	80	0.4	forests
Long Grass	55	60	65	72	79	81.5	84	0.3	natural, not maintained
Lawns	60	65.5	71	77	83	86	89	0.25	maintained
Pasture/Range	58	61.5	65	70.5	76	78.5	81	0.17	farm pasture
Crop	66	70	74	78	82	84	86	0.13	farm land
Fallow (bare)	77	82	86	89	91	93	94	0.05	idle farm land (bare)
Built-up	60	65.5	71	77	83	89	89	0.25	Lawns Existing
Streets, paved	98	98	98	98	98	98	98	0.01	

HYDROLOGIC SOIL TYPE (%) - Existing Conditions								
Catchment	Hydrologic Soil Type							
	A	AB	B	BC	C	CD	D	TOTAL
101	0	0	0	100	0	0	0	100
102	0	0	0	100	0	0	0	100
201	0	0	0	100	0	0	0	100

LAND USE (%) - Existing Conditions										
Catchment	Meadow	Woodlot	Long Grass	Lawns	Pasture Range	Crop	Fallow (Bare)	Imperv. Not Connected (Rooftops)	Imperv. Connected	Total
101	0	0.0	100.0	0	0	0.0	0	0.0	0.0	100
102	0	0	100	0.0	0	0	0	0.0	0.0	100
201	0	0	0	19	0	0	0	25.8	55.7	100

CURVE NUMBER (CN) - Existing Conditions											
Catchment	Meadow	Woodlot	Long Grass	Lawns	Pasture Range	Crop	Fallow (Bare)	Built-up	Imperv. Not Connected (Rooftops)	Weighted CN - Pervious	Manning's 'n'
101	65	67	72	77	70.5	78	89	77	90	72.0	0.30
102	65	67	72	77	70.5	78	89	77	90	72.0	0.30
201	65	67	72	77	70.5	78	89	77	90	77.0	0.25

Table A.3: Impervious Area Determination for Subcatchment 101

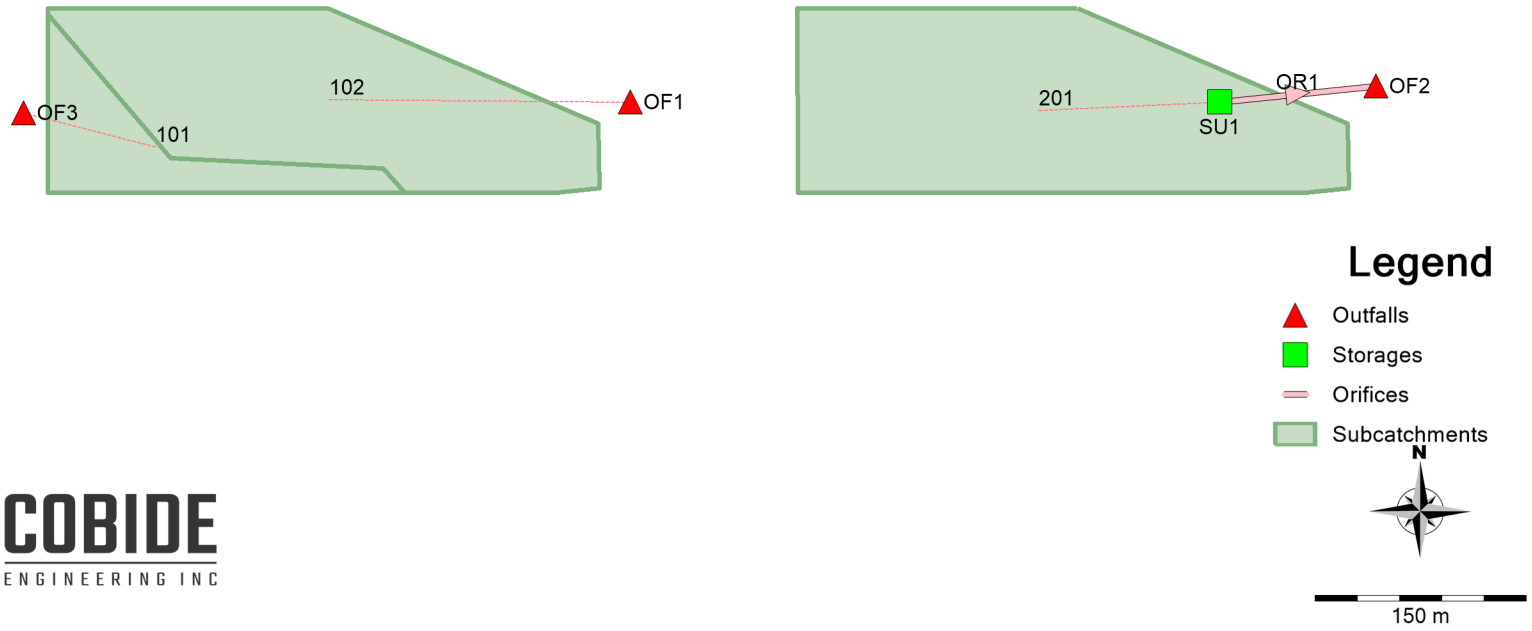
Existing Conditions

Area of Concern	Total Area (ha)	Impervious Area Connected		Impervious Area Not Connected (Rooftops)		Total (%)
		(ha)	(%)	(ha)	(%)	
101	3.12	0.00	0.0	0.00	0.0	0.0
102	1.35	0.00	0.0	0.00	0.0	0.0
201	4.48	2.50	55.7	1.15	25.8	81.5

Table A.3 - Impervious Area Determination for Existing Catchments 101

Catchment					Imperv. Area	Imperv %
101	0	m of	20	m wide ROW @ 45% imperv.	0.00 ha	0.0 %
	0	Impervious Area	720	m^2 @ 100% imperv.	0.00 ha	0.0 %
	0	Roof Area	100	m^2 @ 100% imperv.	0.00 ha	0.0 %
					0.00 ha	
102	0	m of	20	m wide ROW @ 45% imperv.	0.00 ha	0.0 %
	0	Impervious Area	24927	m^2 @ 100% imperv.	0.00 ha	0.0 %
	0	Permanent Pool	3060	m^2 @ 100% imperv.	0.00 ha	0.0 %
	0	Roof Area	11540	m^2 @ 100% imperv.	0.00 ha	0.0 %
					0.00 ha	
201	0	m of	20	m wide ROW @ 45% imperv.	0.00 ha	0.0 %
	1	Impervious Area	24950	m^2 @ 100% imperv.	2.50 ha	55.7 %
	1	Permanent Pool	3060	m^2 @ 100% imperv.	0.31 ha	6.8 %
	1	Roof Area	11540	m^2 @ 100% imperv.	1.15 ha	25.8 %
					3.96 ha	

ECO PARKWAY SWM MODEL SCHEMATIC



COBIDE
ENGINEERING INC

ECOPARK WAY SITE PLAN – MODEL DETAILS

```
[TITLE]
;;Project Title/Notes

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

START_DATE           5/25/2022
START_TIME           00:00:00
REPORT_START_DATE    5/25/2022
REPORT_START_TIME    00:00:00
END_DATE             5/26/2022
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              8

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

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- -------- -------- ----------
Chicago_3h       INTENSITY 0:05     1.0      TIMESERIES Chicago_3h
Chicago_3h_100yr INTENSITY 0:05     1.0      TIMESERIES Chicago_3h_100yr
Chicago_3h_25yr  INTENSITY 0:05     1.0      TIMESERIES Chicago_3h_25yr

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------
-
101              Chicago_3h       OF3              1.35     0        120      2        0
102              Chicago_3h       OF1              3.12     0        390      2        0
201              Chicago_3h       SU1              4.48     81.5     600      2        0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
101              0.01       0.3        0.05       0.05       25         OUTLET
102              0.01       0.3        0.05       0.05       25         OUTLET
201              0.01       0.25       0.05       0.05       25         OUTLET

[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4     Param5
;;-------------- ---------- ---------- ---------- ---------- ----------
101              72         0.5        7          0          0          CURVE_NUMBER
102              72         0.5        7          0          0          CURVE_NUMBER
```

ECOPARK WAY SITE PLAN – MODEL DETAILS

```
201              77         0.5        7          0          0          CURVE_NUMBER

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
OF1              509.1      FREE                        NO
OF2              509        FREE                        NO
OF3              0          FREE                        NO

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params            N/A      Fevap    Psi
Ksat     IMD
;;-------------- -------- ---------- ---------- ---------- ---------------------------- -------- --------
-------- --------
SU1              508      2.25       1          TABULAR    Pond                         0        0

[ORIFICES]
;;Name           From Node        To Node          Type         Offset     Qcoeff     Gated    CloseTime
;;-------------- ---------------- ---------------- ------------ ---------- ---------- -------- ----------
OR1              SU1              OF2              SIDE         509        0.65       NO       0

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4      Barrels    Culvert
;;-------------- ------------ ---------------- ---------- ---------- ---------- ---------- ----------
OR1              CIRCULAR     0.175            0          0          0

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
Pond             Storage    0          2020
Pond                        0.4        2515
Pond                        1          3790
Pond                        1.6        5130
Pond                        2          5675
Pond                        2.25       6024

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
;Chicago design storm, a = 541.32, b = 0.093, c = 0.701, Duration = 180 minutes, r = 0.4, rain units = mm/hr.
Chicago_3h


;Chicago design storm, a = 895.37, b = 0.029, c = 0.7, Duration = 180 minutes, r = 0.4, rain units = mm/hr.
Chicago_3h_100yr


;Chicago design storm, a = 737.24, b = 0.067, c = 0.7, Duration = 180 minutes, r = 0.4, rain units = mm/hr.
Chicago_3h_25yr


[REPORT]
;;Reporting Options
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS       548709.3262      4889582.2144     549762.9458      4889725.9536
UNITS            Meters
```

ECOPARK WAY SITE PLAN – 5 YEAR DESIGN STORM EVENT

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

****
Element Count
****
Number of rain gages 3
Number of subcatchments ... 3
Number of nodes 4
Number of links 1
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Chicago_3h	Chicago_3h	INTENSITY	5 min.
Chicago_3h_100yr	Chicago_3h_100yr	INTENSITY	5 min.
Chicago_3h_25yr	Chicago_3h_25yr	INTENSITY	5 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
101	1.35	120.00	0.00	2.0000	Chicago_3h	OF3
102	3.12	390.00	0.00	2.0000	Chicago_3h	OF1
201	4.48	600.00	81.50	2.0000	Chicago_3h	SU1

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
OF1	OUTFALL	509.10	0.00	0.0	
OF2	OUTFALL	509.00	0.00	0.0	
OF3	OUTFALL	0.00	0.00	0.0	
SU1	STORAGE	508.00	2.25	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
OR1	SU1	OF2	ORIFICE			

****
Cross Section Summary
****

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

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options

ECOPARK WAY SITE PLAN – 5 YEAR DESIGN STORM EVENT

```
***************
Flow Units ..... LPS
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 ........... 05/25/2022 00:00:00
Ending Date ............. 05/26/2022 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 ......         0.381        42.606
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.168        18.746
Surface Runoff ...........         0.215        23.978
Final Storage ............         0.001         0.126
Continuity Error (%) .....        -0.572


*************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
*************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.215         2.146
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.191         1.911
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.280         2.798
Final Stored Volume ......         0.303         3.033
Continuity Error (%) .....         0.000


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


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


************************
Routing Time Step Summary
************************
Minimum Time Step           :     4.50 sec
Average Time Step           :     5.00 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
```

ECOPARK WAY SITE PLAN – 5 YEAR DESIGN STORM EVENT

```
  Percent 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
  ***************************

  ----------------------------------------------------------------------------------------------------------------
                            Total      Total      Total      Total     Imperv       Perv      Total       Total
Peak  Runoff
                           Precip      Runon       Evap      Infil     Runoff     Runoff     Runoff      Runoff
Runoff   Coeff
  Subcatchment                mm         mm         mm         mm         mm         mm         mm    10^6 ltr
LPS
  ----------------------------------------------------------------------------------------------------------------
  101                       42.61       0.00       0.00      32.94       0.00       9.43       9.43        0.13
15.27   0.221
  102                       42.61       0.00       0.00      32.23       0.00      10.21      10.21        0.32
43.35   0.240
  201                       42.61       0.00       0.00       5.07      35.13       2.82      37.96        1.70
1758.46   0.891


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

  ---------------------------------------------------------------------------
                                Average  Maximum  Maximum  Time of Max    Reported
                                  Depth    Depth      HGL   Occurrence   Max Depth
  Node                 Type      Meters   Meters   Meters  days hr:min      Meters
  ---------------------------------------------------------------------------
  OF1                  OUTFALL     0.00     0.00   509.10     0  00:00        0.00
  OF2                  OUTFALL     0.00     0.00   509.00     0  00:00        0.00
  OF3                  OUTFALL     0.00     0.00     0.00     0  00:00        0.00
  SU1                  STORAGE     1.16     1.35   509.35     0  03:03        1.35


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

  ---------------------------------------------------------------------------------------------------
                                Maximum  Maximum                  Lateral       Total        Flow
                                Lateral    Total  Time of Max      Inflow      Inflow     Balance
                                 Inflow   Inflow   Occurrence      Volume      Volume       Error
  Node                 Type        LPS      LPS  days hr:min    10^6 ltr    10^6 ltr     Percent
  ---------------------------------------------------------------------------------------------------
  OF1                  OUTFALL   43.35    43.35     0  01:40       0.318       0.318       0.000
  OF2                  OUTFALL    0.00    35.28     0  03:03           0        1.47       0.000
  OF3                  OUTFALL   15.27    15.27     0  01:50       0.127       0.127       0.000
  SU1                  STORAGE 1758.46  1758.46     0  01:15         1.7         4.5       0.001


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

  No nodes were surcharged.


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

  No nodes were flooded.
```

ECOPARK WAY SITE PLAN – 5 YEAR DESIGN 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 LPS
SU1	3.464	38	0	0	4.248	47	0 03:03	35.28

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
OF1	97.22	3.79	43.35	0.318
OF2	99.27	17.08	35.28	1.465
OF3	96.71	1.52	15.27	0.127
System	97.73	22.40	90.53	1.911

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
OR1	ORIFICE	35.28	0 03:03			1.00

****
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: Mon Aug 14 16:28:54 2023
Analysis ended on: Mon Aug 14 16:28:54 2023
Total elapsed time: < 1 sec

ECOPARK WAY SITE PLAN – 25 YEAR DESIGN STORM EVENT

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
--------------------------------------------------------------


*************
Element Count
*************
Number of rain gages ...... 3
Number of subcatchments ... 3
Number of nodes ........... 4
Number of links ........... 1
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                  Data       Recording
Name                 Data Source                  Type       Interval
----------------------------------------------------------------------
Chicago_3h           Chicago_3h                   INTENSITY    5 min.
Chicago_3h_100yr     Chicago_3h_100yr             INTENSITY    5 min.
Chicago_3h_25yr      Chicago_3h_25yr              INTENSITY    5 min.


*******************
Subcatchment Summary
*******************
Name                        Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------
101                         1.35    120.00      0.00    2.0000 Chicago_3h_25yr      OF3
102                         3.12    390.00      0.00    2.0000 Chicago_3h_25yr      OF1
201                         4.48    600.00     81.50    2.0000 Chicago_3h_25yr      SU1


************
Node Summary
************
                                      Invert      Max.    Ponded    External
Name                 Type              Elev.     Depth      Area    Inflow
-----------------------------------------------------------------------------
OF1                  OUTFALL           509.10      0.00       0.0
OF2                  OUTFALL           509.00      0.00       0.0
OF3                  OUTFALL             0.00      0.00       0.0
SU1                  STORAGE           508.00      2.25       0.0


************
Link Summary
************
Name             From Node        To Node          Type            Length    %Slope Roughness
---------------------------------------------------------------------------------------------
OR1              SU1              OF2              ORIFICE


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


*****************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*****************************************************

***************
Analysis Options
```

ECOPARK WAY SITE PLAN – 25 YEAR DESIGN STORM EVENT

```
***************
Flow Units ..... LPS
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 ........... 05/25/2022 00:00:00
Ending Date ............. 05/26/2022 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 ......         0.522        58.334
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.207        23.116
Surface Runoff ...........         0.317        35.400
Final Storage ............         0.001         0.127
Continuity Error (%) .....        -0.529


*************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
*************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.317         3.168
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.285         2.853
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.280         2.798
Final Stored Volume ......         0.311         3.113
Continuity Error (%) .....         0.001


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


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


************************
Routing Time Step Summary
************************
Minimum Time Step           :     4.50 sec
Average Time Step           :     5.00 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
```

ECOPARK WAY SITE PLAN – 25 YEAR DESIGN STORM EVENT

```
  Percent 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
  ***************************

  ---------------------------------------------------------------------------------------------------------------
                            Total      Total      Total      Total     Imperv       Perv      Total      Total
Peak  Runoff
                           Precip      Runon       Evap      Infil     Runoff     Runoff     Runoff     Runoff
Runoff   Coeff
  Subcatchment                mm         mm         mm         mm         mm         mm         mm    10^6 ltr
LPS
  ---------------------------------------------------------------------------------------------------------------
  101                       58.33       0.00       0.00      40.79       0.00      17.32      17.32       0.23
32.36   0.297
  102                       58.33       0.00       0.00      39.81       0.00      18.38      18.38       0.57
92.87   0.315
  201                       58.33       0.00       0.00       6.16      48.02       4.68      52.70       2.36
2476.89   0.903


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

  ---------------------------------------------------------------------------
                                Average  Maximum  Maximum  Time of Max    Reported
                                  Depth    Depth      HGL   Occurrence   Max Depth
  Node                 Type      Meters   Meters   Meters  days hr:min      Meters
  ---------------------------------------------------------------------------
  OF1                  OUTFALL     0.00     0.00   509.10     0  00:00        0.00
  OF2                  OUTFALL     0.00     0.00   509.00     0  00:00        0.00
  OF3                  OUTFALL     0.00     0.00     0.00     0  00:00        0.00
  SU1                  STORAGE     1.24     1.47   509.47     0  03:03        1.47


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

  ---------------------------------------------------------------------------------------------------
                                Maximum  Maximum                  Lateral       Total        Flow
                                Lateral    Total  Time of Max      Inflow      Inflow     Balance
                                 Inflow   Inflow   Occurrence      Volume      Volume       Error
  Node                 Type        LPS      LPS  days hr:min    10^6 ltr    10^6 ltr     Percent
  ---------------------------------------------------------------------------------------------------
  OF1                  OUTFALL   92.87    92.87     0  01:30       0.573       0.573       0.000
  OF2                  OUTFALL    0.00    43.10     0  03:03           0        2.05       0.000
  OF3                  OUTFALL   32.36    32.36     0  01:35       0.234       0.234       0.000
  SU1                  STORAGE 2476.89  2476.89     0  01:15        2.36        5.16       0.001


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

  No nodes were surcharged.


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

  No nodes were flooded.
```

ECOPARK WAY SITE PLAN – 25 YEAR DESIGN 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 LPS
SU1	3.771	41	0	0	4.849	53	0 03:03	43.10

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
OF1	97.84	6.78	92.87	0.573
OF2	99.41	23.82	43.10	2.046
OF3	97.37	2.78	32.36	0.234
System	98.21	33.38	162.48	2.853

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
OR1	ORIFICE	43.10	0 03:03			1.00

****
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: Mon Aug 14 16:27:56 2023
Analysis ended on: Mon Aug 14 16:27:56 2023
Total elapsed time: < 1 sec

ECOPARK WAY SITE PLAN – 100 YEAR DESIGN STORM EVENT

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

****
Element Count
****
Number of rain gages 3
Number of subcatchments ... 3
Number of nodes 4
Number of links 1
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Chicago_3h	Chicago_3h	INTENSITY	5 min.
Chicago_3h_100yr	Chicago_3h_100yr	INTENSITY	5 min.
Chicago_3h_25yr	Chicago_3h_25yr	INTENSITY	5 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
101	1.35	120.00	0.00	2.0000	Chicago_3h_100yr	OF3
102	3.12	390.00	0.00	2.0000	Chicago_3h_100yr	OF1
201	4.48	600.00	81.50	2.0000	Chicago_3h_100yr	SU1

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
OF1	OUTFALL	509.10	0.00	0.0	
OF2	OUTFALL	509.00	0.00	0.0	
OF3	OUTFALL	0.00	0.00	0.0	
SU1	STORAGE	508.00	2.25	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
OR1	SU1	OF2	ORIFICE			

****
Cross Section Summary
****

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

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options

ECOPARK WAY SITE PLAN – 100 YEAR DESIGN STORM EVENT

```
***************
Flow Units ..... LPS
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 ........... 05/25/2022 00:00:00
Ending Date ............. 05/26/2022 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 ......         0.634        70.857
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.233        26.036
Surface Runoff ...........         0.403        45.058
Final Storage ............         0.001         0.126
Continuity Error (%) .....        -0.511


*************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
*************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.403         4.033
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.363         3.635
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.280         2.798
Final Stored Volume ......         0.320         3.196
Continuity Error (%) .....         0.001


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


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


************************
Routing Time Step Summary
************************
Minimum Time Step           :     4.50 sec
Average Time Step           :     5.00 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
```

ECOPARK WAY SITE PLAN – 100 YEAR DESIGN STORM EVENT

```
  Percent 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
  ***************************

  ---------------------------------------------------------------------------------------------------------------
                            Total      Total      Total      Total     Imperv       Perv      Total       Total
Peak  Runoff
                           Precip      Runon       Evap      Infil     Runoff     Runoff     Runoff      Runoff
Runoff   Coeff
  Subcatchment                mm         mm         mm         mm         mm         mm         mm    10^6 ltr
LPS
  ---------------------------------------------------------------------------------------------------------------
  101                       70.86       0.00       0.00      45.96       0.00      24.70      24.70        0.33
51.23   0.349
  102                       70.86       0.00       0.00      44.94       0.00      25.82      25.82        0.81
147.78   0.364
  201                       70.86       0.00       0.00       6.87      58.27       6.32      64.59        2.89
3078.31   0.912


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

  ---------------------------------------------------------------------------
                                Average  Maximum  Maximum  Time of Max    Reported
                                  Depth    Depth      HGL   Occurrence   Max Depth
  Node                 Type      Meters   Meters   Meters  days hr:min      Meters
  ---------------------------------------------------------------------------
  OF1                  OUTFALL     0.00     0.00   509.10     0  00:00        0.00
  OF2                  OUTFALL     0.00     0.00   509.00     0  00:00        0.00
  OF3                  OUTFALL     0.00     0.00     0.00     0  00:00        0.00
  SU1                  STORAGE     1.30     1.57   509.57     0  03:04        1.57


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

  ---------------------------------------------------------------------------------------------------
                                Maximum  Maximum                  Lateral       Total        Flow
                                Lateral    Total  Time of Max      Inflow      Inflow     Balance
                                 Inflow   Inflow   Occurrence      Volume      Volume       Error
  Node                 Type        LPS      LPS  days hr:min    10^6 ltr    10^6 ltr     Percent
  ---------------------------------------------------------------------------------------------------
  OF1                  OUTFALL  147.78   147.78     0  01:25       0.805       0.805       0.000
  OF2                  OUTFALL    0.00    48.31     0  03:04           0         2.5       0.000
  OF3                  OUTFALL   51.23    51.23     0  01:30       0.333       0.333       0.000
  SU1                  STORAGE 3078.31  3078.31     0  01:15        2.89        5.69       0.001


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

  No nodes were surcharged.


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

  No nodes were flooded.
```

ECOPARK WAY SITE PLAN – 100 YEAR DESIGN 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 LPS
SU1	4.051	45	0	0	5.342	59	0 03:04	48.31

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
OF1	98.17	9.50	147.78	0.805
OF2	99.48	29.04	48.31	2.496
OF3	97.74	3.95	51.23	0.333
System	98.46	42.48	239.39	3.635

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
OR1	ORIFICE	48.31	0 03:04			1.00

****
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: Wed Jul 19 10:15:00 2023
Analysis ended on: Wed Jul 19 10:15:00 2023
Total elapsed time: < 1 sec