



1027458 Ontario Inc.

Official Plan and Zoning By-law Amendment

Stormwater Management Brief

Phase 6 - South of Wyandotte Street East at Clover Avenue

Windsor, ON

Final Report

Table of Contents

1.0	Introduction	1
1.1	Background Information	1
1.2	SWM Design Criteria	1
2.0	Existing Conditions	3
3.0	Proposed Conditions	4
3.1	Hydrologic Analysis Methodology	4
3.2	Regional SWM Facility.....	4
3.2.1	Quantity Control	5
3.2.2	Quality Control.....	5
3.3	Minor System	6
3.4	Major System	6
3.5	Floodproofing.....	6
4.0	Future Conditions	8
5.0	Conclusions	9
	Figures	
	Figure 1 – Pre Development Drainage Areas	
	Figure 2 – Post Development Drainage Areas	
	Figure 3 – Future Development Drainage Areas	
	Tables	
	Table 3-1: North Neighbourhood Pond WSEL Summary.....	5
	Table 3-2: Water Quality for North Neighbourhood Pond.....	5
	Table 4-1: Future Phase Descriptions.....	8
	Appendices	
A	Conceptual Development Plan – Master Phasing Plan	
B	Model Extents and Input Parameters	

1.0

Introduction

Dillon Consulting Limited (Dillon) was retained by 1027458 Ontario Inc. to assist in obtaining the necessary planning approvals associated with the proposed residential development located at the southeast corner of Wyandotte Street East and Clover Avenue, herein referred to as the “subject site”, in the City of Windsor. The subject site is Phase 6 of the North Neighbourhood Development, as shown on the Conceptual Development Plan presented in **Appendix A**. This area is within the Little River Subwatershed.

To support the Official Plan and Zoning By-law Amendments, Dillon has prepared this Stormwater Management (SWM) Brief to document the SWM strategy for the subject site. This report outlines the proposed SWM strategy, supporting analysis and documentation.

1.1

Background Information

The following background information was reviewed to assist with the development of the proposed SWM strategy.

North Neighbourhood Pond Final Design Report, prepared by Dillon Consulting Limited, 2001.

Design report of the North Neighbourhood Pond.

Stormwater Management Analysis, North Neighbourhood Development, prepared by Dillon Consulting Limited, 2018.

This report presents the stormwater assessment of the North Neighbourhood Development under both existing and future built out conditions.

City of Windsor: East Riverside Flood Risk Assessment, prepared by RWDI, 2019.

This report presents the East Riverside Engineered 1:100 flood elevation.

North Neighbourhood Phase 1 and 2 Detailed Design North of Beverly Glen Street, Stormwater Management Brief, prepared by Dillon Consulting Limited, 2022.

This report presents the stormwater assessment of the proposed Jerome Trunk Sewer, as well as the streets identified on the East Riverside Development Concept Plan dated July 7, 2022, within the Phases 1 and 2 of the North Neighbourhood Subdivision under future built out conditions.

1.2

SWM Design Criteria

The North Neighbourhood Subdivision Phase 6 SWM strategy is based on criteria established in the Windsor/Essex Region Stormwater Management Standards Manual (WESMSM) (December 2018) and previous reports.

The corresponding criteria are described below.

Stormwater Quality Control

The North Neighbourhood SWM facility (North Neighbourhood Pond) is designed to provide for a “Normal” Protection Level of water quality treatment to remove 70% of total suspended solids (TSS) from the proposed site runoff.

Water Quantity Control

The proposed SWM plan is designed at a minimum to provide active storage volume for the *1:100 year 24 hour storm* (with a 2 hour time interval and using the SCS Type-II distribution) and the *1:100 year 4 hour storm* (with 15 minute time intervals and using the Chicago distribution).

Minor System Conveyance

The minor system will be designed to have a level of service to accommodate the 1:5 year 4 hour storm (with 15 minute time intervals and using the Chicago distribution) with the Hydraulic Grade Lines (HGLs) no closer than 0.30 m from the proposed roadway surface.

Major System Conveyance

The major system will be designed to have a level of service to accommodate the 1:100 year design storm, with the peak water surface elevation (WSEL) along the roadway/ parking area to not exceed 0.30 m above the minimum road grades during the governing 1:100 year event.

Climate Change Resiliency Assessment

The North Neighbourhood Pond performance has been examined under conditions more intense than the 1:100 year design storm event to assess potential impacts of climate change and the facility’s resiliency using the *Urban Stress Test design storm event*. The SWM facility is designed to contain the runoff generated from this design storm event without overtopping its banks.

2.0

Existing Conditions

The 3.48 ha subject site is currently undeveloped vacant land. Based on the available topographic information, runoff from the existing site generally travels northwest towards Wyandotte Street East as shallow surface flow, where it is collected by the existing storm sewer.

Ontario Ministry of Agriculture, Food and Rural Affairs' (OMAFRA) soil survey mapping data shows the soils within the subject site land are composed of Clyde Clay (Cc) which is classified as Hydrologic Soil Groups (HSG) D.

There are currently two trunk storm sewers that convey flow to the North Neighbourhood SWM Pond, the Beverly Glen Trunk Sewer (south of the subject site) and the Wyandotte Street East Trunk Sewer (north of the subject site). The existing drainage of the North Neighbourhood (north of Beverly Glen) is shown on **Figure 1**. For all catchment areas, flows from the undeveloped areas are conveyed as shallow overland flow through the neighbouring lands, towards Wyandotte Street East to the south where flow is collected in the existing trunk storm sewer and conveyed to the North Neighbourhood SWM Pond.

3.0 Proposed Conditions

The proposed North Neighbourhood Subdivision Phase 6 development includes five (5) apartment building complexes with 447 units total. The proposed Phase 6 drainage plan is shown on **Figure 2**. The stormwater design for the other North Neighborhood phases has been or will be completed as separate assignments. A preliminary SWM strategy was developed to manage the runoff from the subject site:

- Local storm sewers convey the minor flows from all storms up to and including 1:5 year design storm event to the existing North Neighbourhood SWM Pond;
- Major flows from all storms up to and including 1:100 year design storm event may be stored in the parking lot area until they are conveyed by the proposed right-of-way's (ROWS) to the existing North Neighbourhood SWM Pond; and
- The existing North Neighbourhood SWM Pond provides all necessary stormwater treatment.

3.1 Hydrologic Analysis Methodology

Evaluation of the North Neighbourhood storm drainage system performance was completed with PCSWMM 2017 Professional. The hydrologic and hydraulic calculations completed using PCSWMM include the existing development, development Phases 1 through 5, which are anticipated to be constructed prior to Phase 6, the proposed Phase 6 development and the future North Neighbourhood Phase 7. Model extents and subcatchment parameters are presented in **Appendix B**.

All external flows conveyed to the North Neighbourhood Pond are shown in **Figure B-1**. Minor flows are collected by the proposed local storm sewers and conveyed to the existing SWM pond, which provides both quality and quantity control. Major flows are conveyed via the proposed ROWs to the existing SWM facility.

The proposed Phase 6 development area, as shown in **Figure B-2**, has been simulated with an imperviousness of 90%. Subcatchment parameters used in the simulation model can be found in **Table B-1**.

3.2 Regional SWM Facility

Based on the information presented in the North Neighbourhood Pond report completed by Dillon Consulting (December 2001), the following water quality design was incorporated within the pond:

- NWL elevation of 172.50;
- Permanent pool comprised of two forebays, three intermediary basins and three shallow transition areas; and
- Design permanent pool volume of 69,000 m³.

The stage-storage curve, developed based on the existing North Neighbourhood Pond, used in the PCSWMM model is tabulated in **Appendix B**.

3.2.1 Quantity Control

Hydrologic and hydraulic calculations were completed using PCSWMM to estimate the peak WSEL in the North Neighbourhood Pond. Simulations were completed for the 1:5 year, 1:100 year and the UST as defined in the WERSMSM. It is important to note that in addition to the proposed Phase 6 development the hydrologic/hydraulic calculations also include all development phases of the North Neighbourhood Subdivision. The analysis results are presented in **Table 3-1**. The calculated design water levels presented in the North Neighbourhood Pond Final Design Report are also documented for comparison purposes.

Table 3-1: North Neighbourhood Pond WSEL Summary

Storm Type	Original SWM Pond Design (WSEL) (m)	Proposed SWM Pond Design (WSEL) (m)
Normal Water Level (NWL)	172.50	172.20 ²
Chicago 1:5 year 4 hour ¹	-	173.28
Chicago 1:100 year 4 hour ¹	-	173.89
SCS Type II 1:100 year 24 hour	174.50	174.05
Urban Stress Test ¹	-	174.51
Top of Bank (m)	175.50	175.50

¹ Design storm not used at time of design.

² Note the NWL was updated in a previous study.

The data shown in **Table 3-1** suggest that the minimum calculated freeboard during the SCS Type II 1:100 year 24 hour event is approximately 1.45 m. The WSEL during the UST event is also shown to be held within the banks. Thus, the pond has sufficient capacity to accommodate the runoff from the proposed Phase 6 development.

3.2.2 Quality Control

The water quality requirements were analyzed to verify that the pond provides sufficient water quality control based on current provincial standards. Shown in **Table 3-2** are the details of the water quality calculations in comparison to what is currently provided as per the original design.

Table 3-2: Water Quality for North Neighbourhood Pond

Description	Value
Total North Neighbourhood Development Area	141 ha
Overall Weighed Percent Impervious	65%
Total Required Water Quality Unit Volume	123 m ³ /ha
Required Permanent Pool Unit Volume	83 m ³ /ha
Required Permanent Pool Volume	11,750 m ³
Provided Permanent Pool Volume	112,800 m ³

The existing North Neighbourhood SWM Pond permanent pool volume is sufficient to provide quality control to the runoff from the entire North Neighbourhood Subdivision under ultimate buildout conditions, including the proposed Phase 6 development.

Settling and dispersion calculations previously completed to verify that the pond provides sufficient forebay length were completed as part of the 'North Neighbourhood Phase 1 and 2 Detailed Design North of Beverly Glen Street Stormwater Management Brief (Dillon, November 2022)' report. The calculations include the flow contributions from the full buildout of the subdivision, including the Phase 6 development. Based on these calculations, the required settling length is 34 m, while the required dispersion length is 36 m. The actual distance from the proposed inlet to the pond forebay berm is approximately 50 m. Therefore, the pond forebay meets the provincial design guidance for water quality treatment.

3.3 Minor System

As documented in 'North Neighbourhood Phase 1 and 2 Detailed Design North of Beverly Glen Street Stormwater Management Brief (Dillon, November 2022)' runoff from Phase 6 is collected by the proposed 1650 mm Jerome Street trunk storm sewer and conveyed to the existing North Neighbourhood SWM pond.

The proposed site storm sewers will be designed to convey the site runoff to the North Neighbourhood Pond by gravity. The storm sewers will be designed to accommodate the peak discharges from the 1:5 year storm event. The preliminary proposed storm sewer layout is presented in **Figure 2**. Confirmation of the sewer sizes will be completed during detailed design.

3.4 Major System

Major flow routes will be designed to convey runoff as shallow overland flow in the proposed ROWs/ parking lot. **Figure 2** shows the proposed major flow routes. The performance of the major system will be evaluated for the 1:100 year design storm event to verify ponding depths are less than 0.3 m. Parking lot elevations will be confirmed during detailed design.

3.5 Floodproofing

As per the WESMSM, the minimum lowest opening into all buildings shall be at least 0.3 m above the Regulatory Flood Level or on-site calculated 1:100 year water storage elevation, whichever is greater. The East Riverside Engineered 1:100 year flood elevation is 176 m (RWDI, 2019). Therefore, the lowest opening elevation (LOE) for all buildings in the proposed development must be greater than or equal to the higher of the following two criteria:

- East Riverside Engineered 1:100 year flood elevation (176 m) plus 0.3 m freeboard; or
- Calculated on-site 1:100 year High Water Level (HWL) plus 0.3 m freeboard.

The on-site 1:100 year High Water Level will be calculated during detailed design to confirm the required minimum floodproofing elevation.

4.0

Future Conditions

Ultimate build out conditions of the North Neighbourhood is proposed to include one additional phase of development that is anticipated to be constructed after Phase 6. The proposed future phase is shown on **Figure 3**.

The future phase is described in **Table 4-1**.

Table 4-1: Future Phase Descriptions

Phase	Description
7	This phase of development is 1.65 ha is proposed to consist of 2 multi-unit buildings with a total of 308 units.

Previously completed analyses of the North Neighbourhood Pond show that the SWM Pond has sufficient capacity to accommodate runoff from this future development phases under developed conditions.

5.0

Conclusions

Dillon has prepared a preliminary stormwater strategy to support the proposed North Neighbourhood Subdivision Phase 6 development. The preliminary stormwater strategy is designed to meet the corresponding local and provincial SWM policies such that the development of this site will not result in adverse effects on the downstream receiving water systems. The proposed SWM strategy includes:

- A local storm sewer to convey the 1:5 year design storm event without surcharging closer than 0.30m from the proposed roadway surface.
- The proposed parking lot will be designed to convey the 1:100 year design storm event with levels below 0.3 m.
- The North Neighbourhood Pond to provide the required quality and quantity storage.

The existing North Neighbourhood Pond has sufficient capacity to accommodate the runoff from the proposed Phase 6 development while meeting the WERSMSM guidelines for freeboard during the governing 1:100 year event, and without overtopping the pond during the UST event.

This report is respectfully submitted for review and approval. Please contact the undersigned should you have any questions or require any additional information.

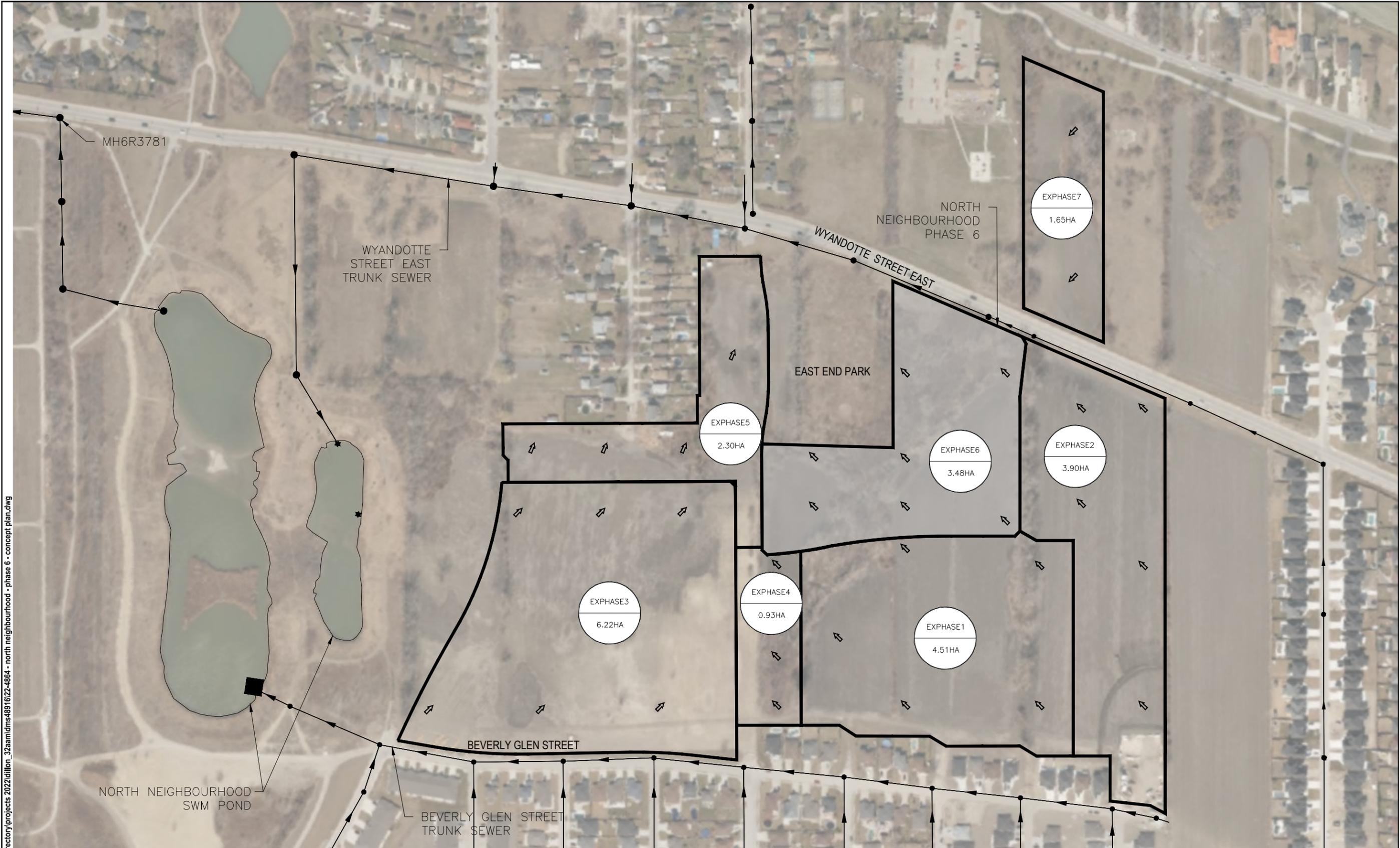
Sincerely,

DILLON CONSULTING LIMITED



Nick Emery, P.Eng.
Water Resources Engineer

Figures



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LEGEND

-  EXISTING STORM SEWER AND MAINTENANCE HOLE
-  SUBJECT SITE LIMITS

 OVERLAND FLOW ROUTE DIRECTION


 NAME CATCHMENT ID
 AREA CATCHMENT AREA (Ha)



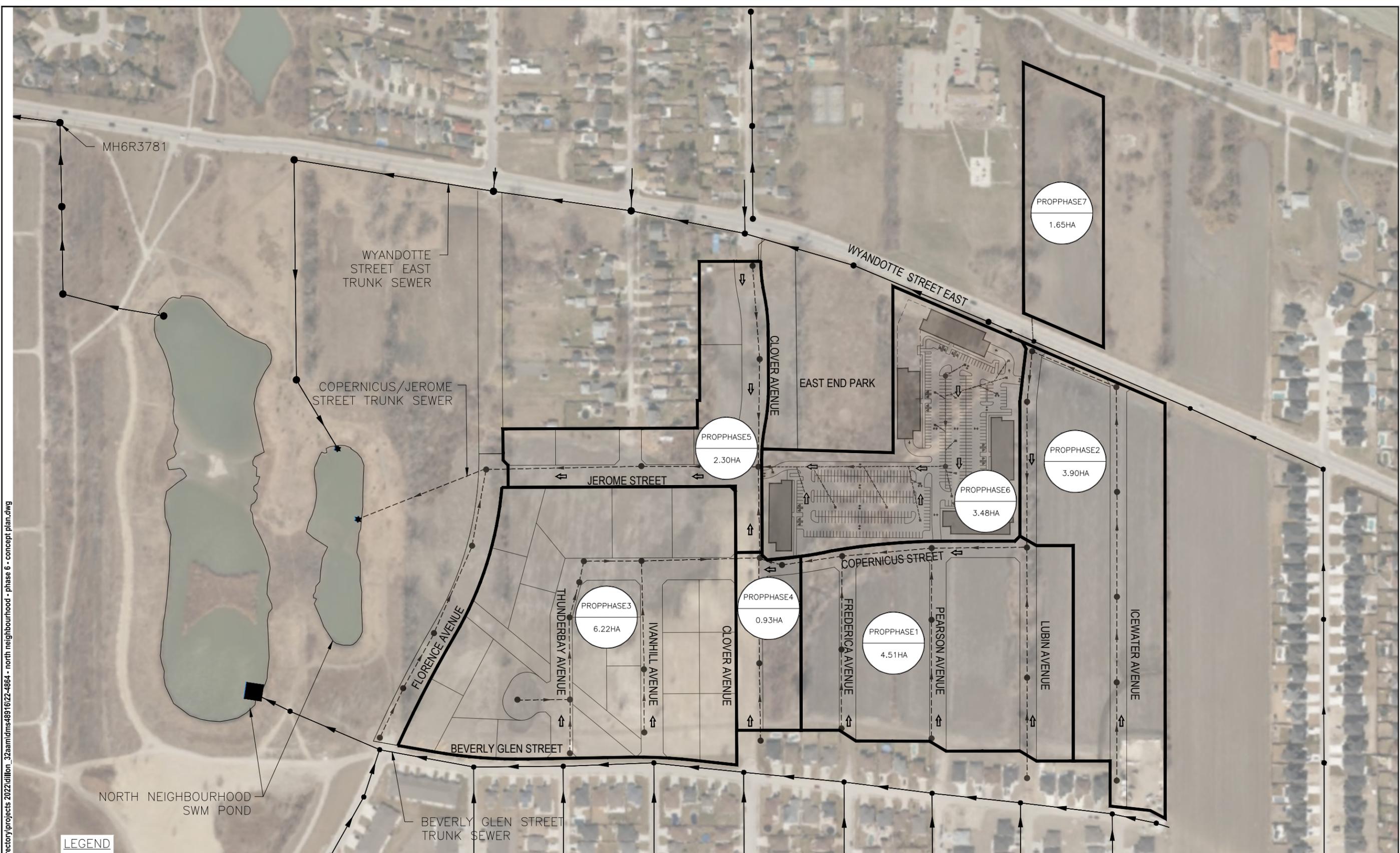
DILLON CONSULTING

DATE	FEBRUARY 2023
SCALE	1:1500

PROJECT	NORTH NEIGHBOURHOOD PHASE 6
TITLE	PRE DEVELOPMENT DRAINAGE AREAS

PROJECT NO.	22-4864
FIGURE NO.	1

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LEGEND

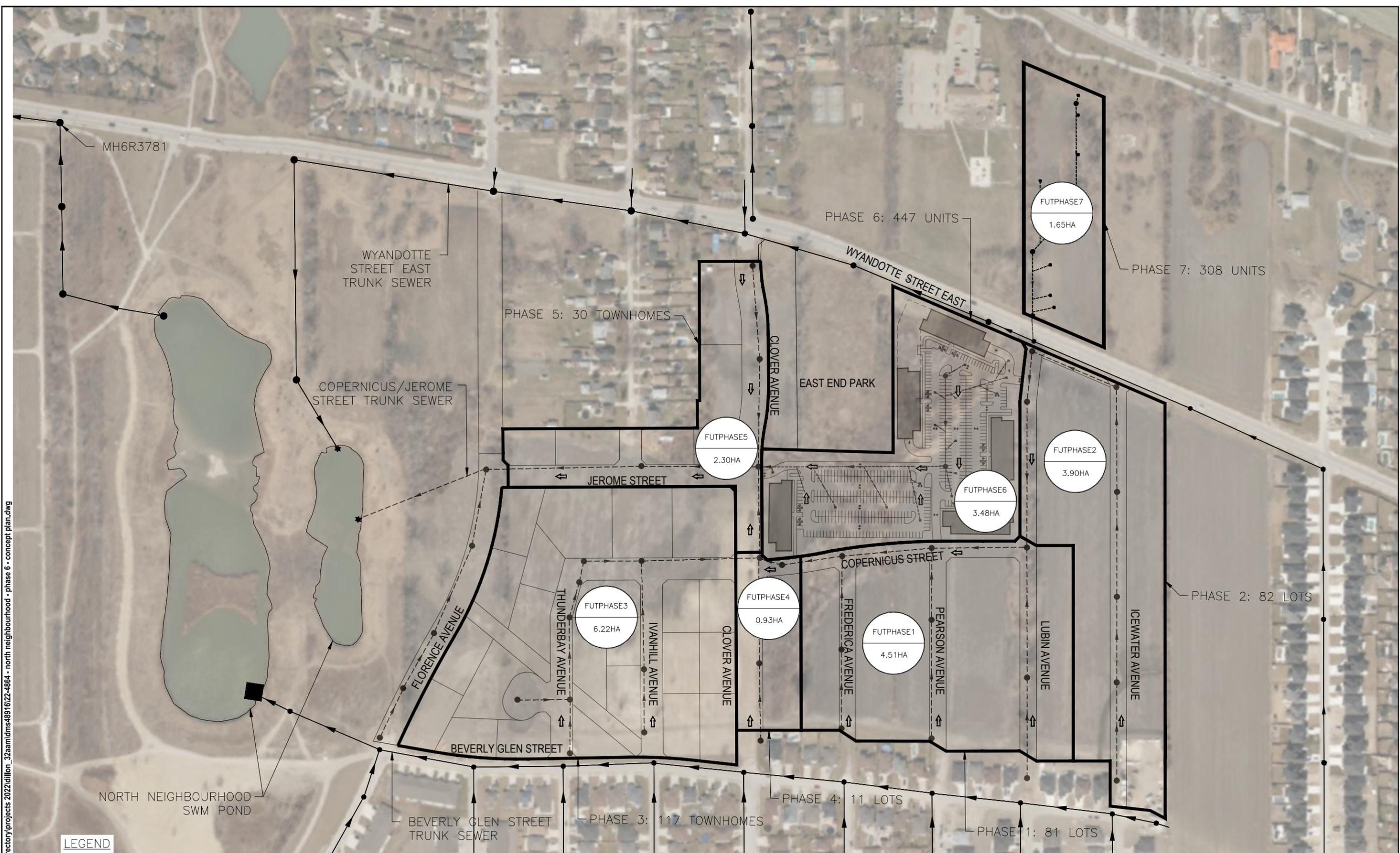
- PROPOSED STORM SEWER AND MAINTENANCE HOLE
- EXISTING STORM SEWER AND MAINTENANCE HOLE
- SUBJECT SITE LIMITS
- OVERLAND FLOW ROUTE DIRECTION
- | | |
|------|---------------------|
| NAME | CATCHMENT ID |
| AREA | CATCHMENT AREA (Ha) |

DATE **FEBRUARY 2023** SCALE **1:1500**

PROJECT	NORTH NEIGHBOURHOOD PHASE 6
TITLE	POST DEVELOPMENT DRAINAGE AREAS

PROJECT NO.	22-4864
FIGURE NO.	2

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 DILLON CONSULTING	PROJECT NORTH NEIGHBOURHOOD PHASE 6	PROJECT NO. 22-4864
	TITLE PROPOSED FUTURE PHASES	FIGURE NO. 3
DATE FEBRUARY 2023	SCALE 1:1500	

Appendix A

Conceptual Development Plan – Master Phasing Plan

PHASE 6: FIVE (5) MULTIPLE DWELLING BUILDINGS WITH 447 UNITS TOTAL

- BUILDING "A": 6-STOREYS, 63 UNITS
- BUILDING "B": 6-STOREYS, 63 UNITS
- BUILDING "C": 6-STOREYS, 63 UNITS
- BUILDING "D": 12-STOREYS, 129 UNITS
- BUILDING "E": 12-STOREYS, 129 UNITS

PHASE 7: TWO (2) MULTIPLE DWELLING BUILDINGS WITH 308 UNITS TOTAL

- BUILDING "A": 11-STOREYS, 154 UNITS
- BUILDING "B": 11-STOREYS, 154 UNITS

**PHASE 5:
30 TOWNHOME DWELLINGS**

**PHASE 3:
122 TOWNHOME DWELLINGS**

PHASE 2: 71 LOTS

PHASE 4: 11 LOTS

PHASE 1: 81 LOTS

1027458 ONTARIO INC.
EAST RIVERSIDE DEVELOPMENT
NORTH NEIGHBOURHOOD

CONCEPTUAL DEVELOPMENT PLAN
MASTER PHASING PLAN
JUNE 5, 2023

	SUBJECT AREA PHASE 1 (± 4.51ha)		SUBJECT AREA PHASE 2 (± 3.90ha)		SUBJECT AREA PHASE 3 (± 6.22ha)		SUBJECT AREA PHASE 4 (± 0.93ha)		SUBJECT AREA PHASE 5 (± 2.30ha)		SUBJECT AREA PHASE 6 (± 3.48ha)		SUBJECT AREA PHASE 7 (± 1.65ha)
	PROPOSED TOWNHOMES		PROPOSED SINGLE DETACHED DWELLINGS		MULTI-UNIT RESIDENTIAL BUILDINGS		PROPOSED ROW		PROPOSED PARK LANDS				

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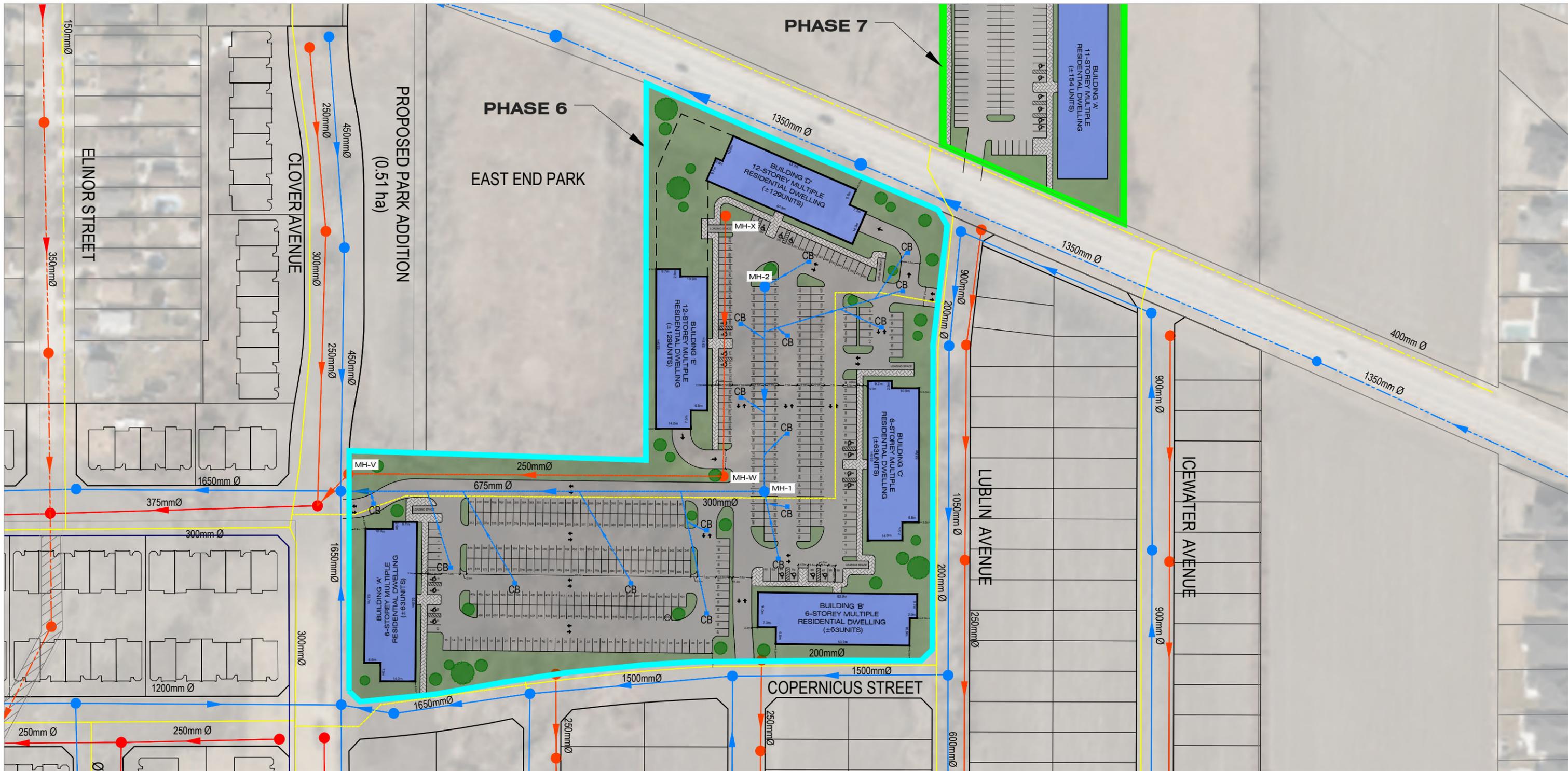
SOURCE: MAPPMY CITY WINDSOR AERIAL (2021)

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CHECKED BY: KDT
DESIGNED BY: MRU

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PROJECT: 21-1185
STATUS: DRAFT
DATE: 06/05/2023



1027458 ONTARIO INC.
 EAST RIVERSIDE DEVELOPMENT NORTH
 NEIGHBOURHOOD - SOUTH OF WYANDOTTE
 CITY OF WINDSOR

CONCEPTUAL SERVICING PLAN
 FIGURE A-2

- | | | | | | |
|--|-----------------------------|----------------------|--|---------------------------------|-------------------------|
| SUBJECT AREA
PHASE 6 (± 3.48ha) | PROPOSED
LANDSCAPED AREA | PROPOSED
PAVEMENT | PLANNED TO BE CONSTRUCTED
PHASES 1-5 SANITARY SEWER | PROPOSED PHASE 6 SANITARY SEWER | EXISTING SANITARY SEWER |
| MULTIPLE DWELLING
RESIDENTIAL BUILDING
(447 UNITS) | PROPOSED
SIDEWALK | | PLANNED TO BE CONSTRUCTED
PHASES 1-5 STORM SEWER | PROPOSED PHASE 6 STORM SEWER | EXISTING STORM SEWER |
| | | | PLANNED TO BE CONSTRUCTED
PHASES 1-5 WATER LINE | PROPOSED PHASE 6 WATER LINE | EXISTING WATER LINE |

PHASE 6 - MULTI-UNIT RESIDENTIAL
 UNITS COUNT - 447 UNITS
 HEIGHT - 6 & 12 STOREYS
 PARKING SIZE - 3.0 m X 5.5m

PROPOSED MINIMUM SETBACKS
 FRONT YARD DEPTH - 5.5m
 BACK YARD DEPTH - 7.5m
 SIDE YARD DEPTH - 1.5m

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SOURCE: CITY OF WINDSOR AERIAL (2021)

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 CHECKED BY: ZCS
 DESIGNED BY: ESB/MRU

SCALE: 1:1500



PROJECT: 22-4864
 STATUS: DRAFT
 DATE: 12/12/2022

Appendix B

Model Extents and Input Parameters

Figure B-1: Full Model Extents to North Neighbourhood Pond

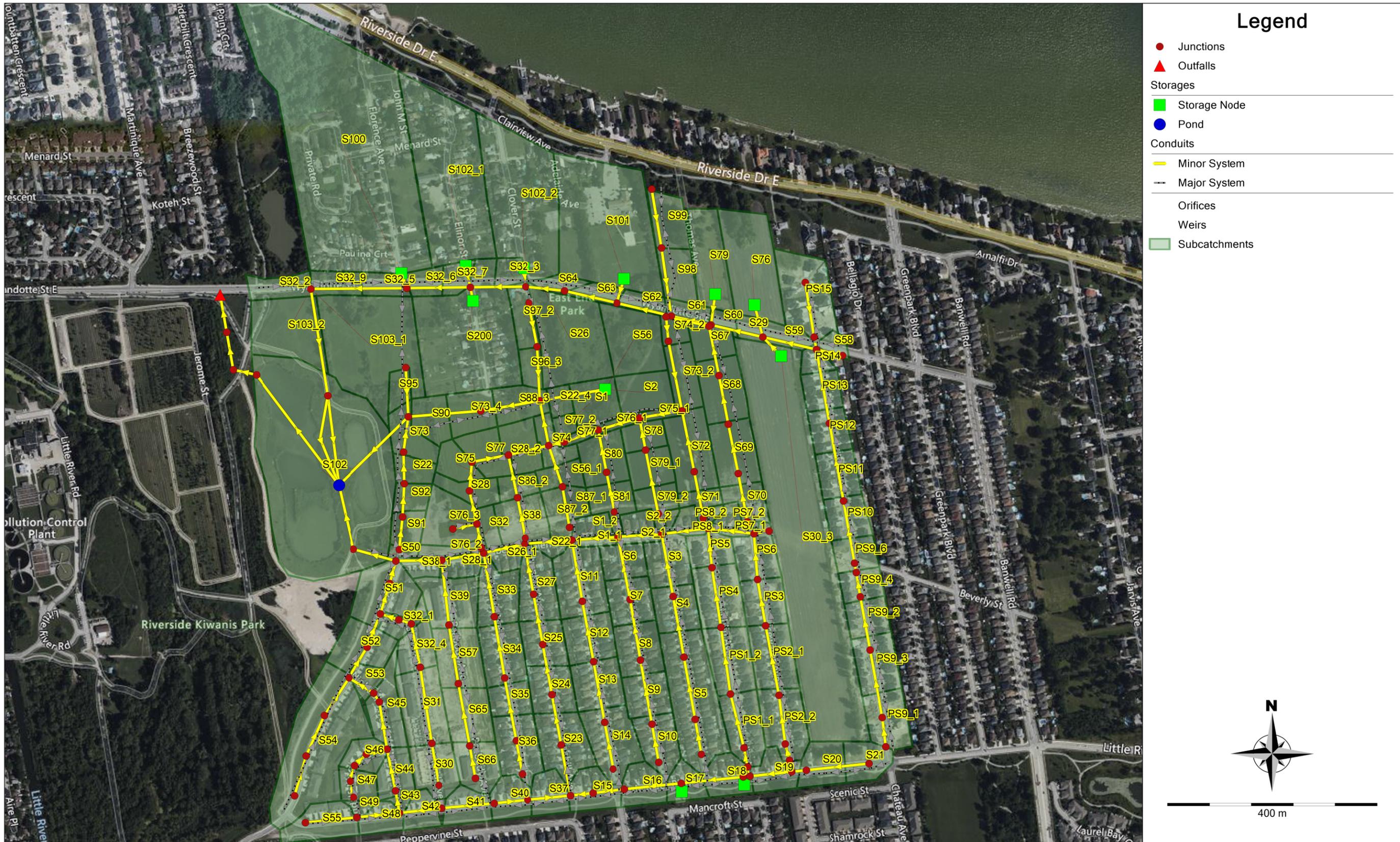


Figure B-2: Phase 6 Development Model Extents



Table B-1: Proposed Phase 6 Development Area Subcatchment Parameters

Name	Area (ha)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Green-Ampt		
							Suction Head (mm)	Conductivity (mm/hr)	Initial Deficit (frac.)
S1	0.7385	90	0.013	0.15	2.5	7.5	180	0.5	0.1
S2	0.7499	90	0.013	0.15	2.5	7.5	180	0.5	0.1
S22_4	0.2502	90	0.013	0.15	2.5	7.5	180	0.5	0.1
S56	1.3208	90	0.013	0.15	2.5	7.5	180	0.5	0.1
S77_2	0.1621	90	0.013	0.15	2.5	7.5	180	0.5	0.1

Table B-2: North Neighbourhood Stage Storage Curve

Depth (m)	Elevation (m)	Area (m ²)	Incremental Volume (m ³)	Cumulative Volume (m ³)
0	168.5	16,304	0	0
4	172.5	42,114	112,829	112,829
4.25	172.75	43,861	10,746	123,575
4.5	173	45,621	11,185	134,759
4.75	173.25	47,393	11,626	146,385
5	173.5	49,178	12,071	158,456
5.25	173.75	50,975	12,518	170,975
5.5	174	52,785	12,969	183,944
5.75	174.25	54,607	13,423	197,367
6	174.5	56,442	13,880	211,248
6.25	174.75	58,289	14,341	225,589
6.5	175	60,149	14,804	240,393
6.75	175.25	62,022	15,271	255,663
7	175.5	63,908	15,741	271,404