FUNCTIONAL SERVICING & STORMWATER MANAGEMENT REPORT

Dixie Mall Redevelopment

In Support of an Official Plan and Zoning By-Law Amendment

Report Prepared For:

Slate Asset Management

Report Prepared By:

KWA Project No. 19410

December 6th, 2022

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1.0 INTRODUCTION

KWA Site Development Consulting Inc. ("KWA") has been retained by Slate Asset Management ("Slate") to prepare this Functional Servicing & Stormwater Management Report in support of an Official Plan Amendment and Zoning By-Law Amendment application for the redevelopment of north-west section of the existing Dixie Outlet Mall located in the City of Mississauga, herein referred to as the "Site". The municipal address is 1250 South Service Road.

The Site is 2.87 ha and is bound by South Service Road and QEW to the north, Haig Boulevard and residential lots to the west, residential lots to the south, and the existing Dixie Outlet Mall to the east. Refer to **Figure 1 – Site Location Plan.** The proposed development will require property ownership limits to be revised as a portion of the existing mall will be demolished to allow for future development blocks and private roads. A recent 1.0 ha (2.5 acres) expropriation by the MTO along the South Service Road frontage has reduced the overall property area of Dixie Outlet Mall.

1.1 PROPOSED ARCHITECTURAL SITE PLAN AND POPULATION DENSITY

Based on the proposed Site Plan from Giannone Petricone Architects dated December 7, 2022, the 2.87 ha redevelopment proposal contemplates a total of five (5) blocks that can be described as follows:

- Development Blocks: There are 3 residential blocks.
- Park Block: There is 1 public park block along the west and south perimeter.
- Easement Block: There is an easement block representing the 100-year flood limit for the Applewood Creek.

Table 1: Land Use Summary

Block	Land Use	Total Area (ha)	Total Apartment Units
1	Park	0.72	-
2	Residential	0.64	911
3	Residential	0.71	220
4	Residential	0.66	132
5	Easement	0.14	-
TOTAL		**2.87**	**1263**

As per Region of Peel's criteria of 2.7 persons/ unit, the expected total population for the redevelopment is **3410 people.**

Refer to **Figure 2 – Site Layout** and **Figure 3 – Site Plan**.

KWA SITE DEVELOPMENT CONSULTING INC.
2453 Auckland Drive
Burlington, ON L7L 7A9

REVISION BLOCK

#	DATE	DESCRIPTION
1.	12/06/22	ISSUED FOR ZBA

SITE LOCATION PLAN

SLATE ASSET MANAGEMENT

DIXIE MALL REDEVELOPMENT

MISSISSAUGA, ONTARIO

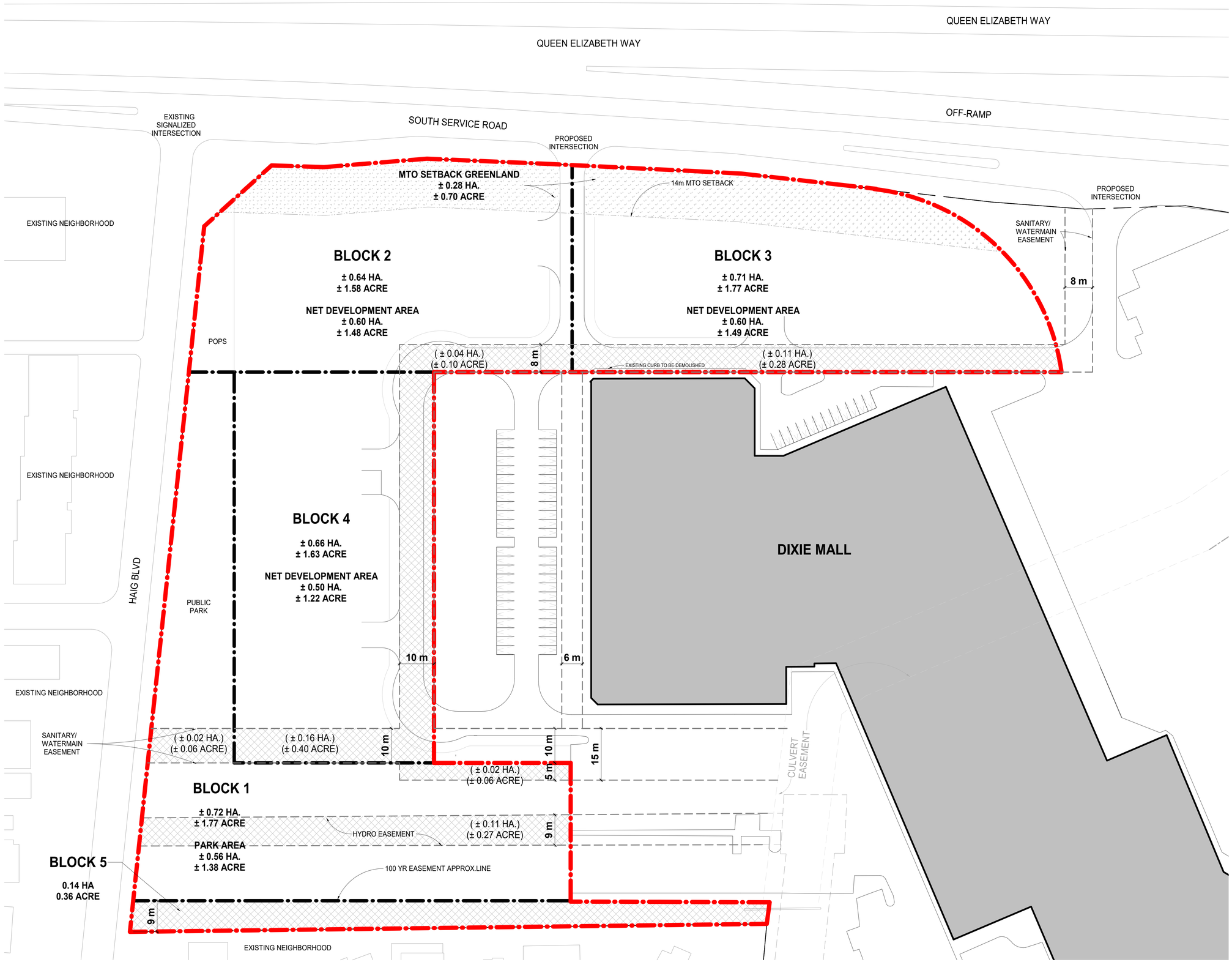
PROJECT No: 19410 | DRAWN BY:BC2 | CHECKED BY:CDB

NORTH ARROW

METRIC SCALE

N.T.S.

FIG 1



1 A050 BLOCK PLAN
1 : 500

Revision	Date
3 ISSUED FOR ZBA/OPA	2022.12. XX

giannone petricone associates
Giannone Petricone Associates Inc. Architects
96 Spadina Avenue, Toronto, Canada M5V 2J6
T 416.591.7788 F 416.591.1293 E mail@gpaia.com

DIXIE MALL DEVELOPMENT

1250 South Service Road
Mississauga, ON L5E 3E5

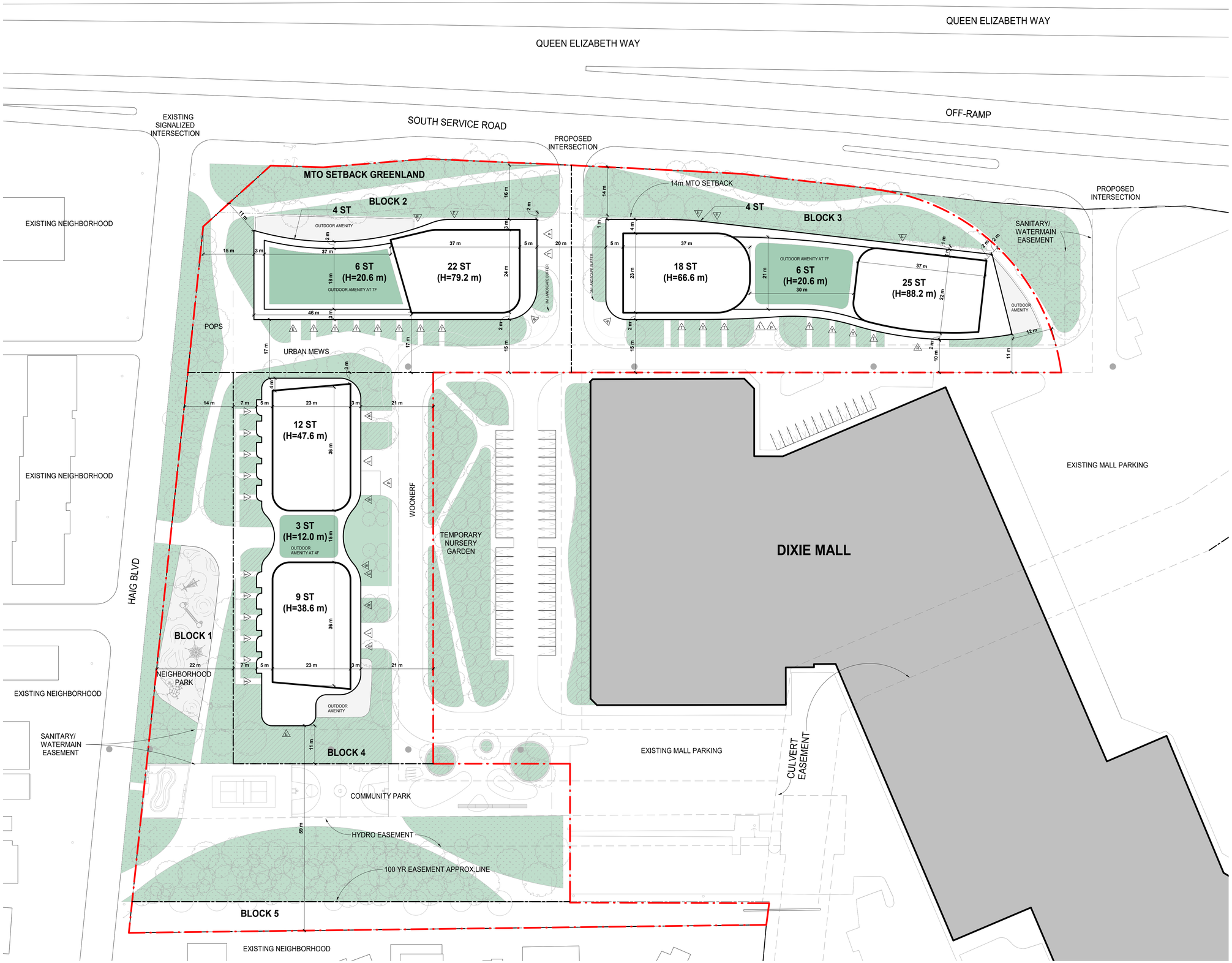
BLOCK PLAN

FIG 2 - SITE LAYOUT

DRAWN BY:	GPA
CHECKED BY:	GPA
PROJECT START DATE:	06/28/22
PROJECT NO.:	22138
SHEET NUMBER	

A050

PLOT DATE: 2022-12-07 12:42:53 PM



1 / A100 SITE PLAN
1 : 500

Revision	Date
3 ISSUED FOR ZBA/OPA	2022.12. XX

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DIXIE MALL DEVELOPMENT

1250 South Service Road
Mississauga, ON L5E 3E5

SITE PLAN

FIG 3 - SITE PLAN

DRAWN BY:	GPA
CHECKED BY:	GPA
PROJECT START DATE:	06/28/22
PROJECT NO.:	22138
SHEET NUMBER	

A100

PLOT DATE: 2022-12-07 12:43:15 PM

2.0 STUDY PARAMETERS

This Functional Servicing and Stormwater Management Report has been prepared in coordination and with regard to the following documents and drawings:

- Architectural Plans prepared by Giannone Petricone Associates
- Planning Reports prepared by Glen Schnarr & Associates
- Landscape Design by Janet Rosenberg & Studio
- Transportation Report by LEA Associates
- Topographic Survey by R. Avis Surveying Inc.
- Geotechnical Report by Grounded Engineering
- Region of Peel Public Works Design, Specifications and Procedures Manual Linear Infrastructure - Sanitary Sewer Design criteria March 2017
- Region of Peel Public Works Design, Specifications and Procedures Manual Linear Infrastructure – Watermain Design Criteria June 2010
- Region of Peel Public Works Design, Specifications and Procedures Manual Linear Infrastructure – Functional Servicing and Storm Water Management Report Nov. 2009
- Region of Peel 2020 Water & Wastewater Master Plan for the Lake-Based System Volume 3
- City of Mississauga Transportation & Works Department Section 8 – Storm Drainage Design Requirements January 2020
- City of Mississauga Transportation & Works Department Section 2 – Design Requirements Manual September 2016.
- Credit Valley Conservation Stormwater Management Criteria, August 2012
- Credit Valley Conservation and Toronto and Region Conservation Authority Low Impact Development Stormwater Management Planning and Design Guide – Version 1.0 2011
- Ministry of Environment Stormwater Management Planning and Design Manual March 2003
- Ministry of Environment's Design Guidelines for Drinking-Water Systems 2008

3.0 SITE GRADING

3.1 EXISTING SITE GRADING

A topographical survey was completed by R. Avis Surveying Inc. in May 2019 which indicated that the Site generally slopes to the south. This can be attributed to the Applewood Creek on the east side of the Site that drains in a southerly direction toward Lakeview Golf Course. There are catch basins within the parking lot which connect to the existing 2.1 x 2.85 m box culvert at multiple locations. The box culvert conveys flows from the east tributary of the Applewood Creek from the north side of the QEW at Harvest Drive, across the highway, and southwesterly through the Mall property under the existing mall structure and eventually discharging into the open creek system. The north parking lot flows connect into the box culvert underneath the existing Mall. The west and south parking lot flows outlet directly into the Applewood Creek.

3.2 PROPOSED SITE GRADING

The proposed grading plan consists of grades along the Site perimeter area and within the development blocks. Grading is generally governed by the existing boundary conditions. The grades along the existing east and south driveways fronting the existing mall were matched. The MTO setback areas within Blocks 2 and 3 will drain north towards South Service Road. The proposed grading plan considers the storm outlet elevations, finished floor elevations, parking lot slopes, major overland flow paths, adequate cover over proposed services, and private street alignment. Generally, the development slopes to the south-east towards a connection into the box culvert. There is a high point in the middle of the private street fronting Block 4. There are curb cuts into the temporary nursey garden so the flows going north, east, and south within the private streets are directed to the garden. Detailed grading design for the development blocks and park blocks will be completed during the Site Plan Approval process.

Refer to **Figure 4 – Proposed Grading Plan** for the proposed conceptual grading to support the ZBA application.

4.0 SANITARY FLOW

4.1 EXISTING SANITARY SERVICING

An existing 900mm/1050mm reinforced concrete trunk sanitary sewer draining south is located on Haig Boulevard. An existing 1200mm reinforced concrete trunk sanitary sewer draining south is located on Dixie Road. The sanitary flows from the existing Mall (including on-site No Frills) are currently pumped to the Haig Boulevard sanitary sewer. As the Mall was developed before the existence of the Dixie Road sanitary sewer, sanitary flows ultimately drain to the Region of Peel's G.E. Booth Lakeview Wastewater Treatment Plant located south of Lakeshore Road East, approximately 2.2 km south of the Site. No sanitary sewer improvements are identified in the 2022 Capital Budget for areas adjacent to the Site. Ongoing expansion and retrofit work at the G.E. Booth Wastewater Treatment Plant is shown in the Region's Capital Budget for the next 10+ years.

4.2 EXISTING SANITARY FLOW

The Site is currently zoned commercial. Sanitary flows for the entire Mall outlet to the 900mm Haig Boulevard trunk sewer. Using the following Region of Peel's Public Works Sanitary Sewer Design Criteria (2009), the theoretical existing commercial sanitary flow draining to the Haig Boulevard sewer is determined to be **18.6 L/s**.

- Population Density: Commercial = 50 persons/ha
- Peaking Factor = Calculated using the Harmon Formula
- Design Flow = 302.8 Litres / capita / day (for domestic sewer flow)
- Infiltration Flow + Foundation Drains= 0.00028 $m^3/s/ha$ (0.28 L/s/ha)

Refer to *City of Mississauga drawing # 86042-1* dated June 1986 in **Appendix A**, that shows the sanitary sewer connection into the Haig Boulevard trunk sewer. Also, refer to **Appendix A** for Existing Commercial Sanitary Calculations.

4.3 SANITARY DESIGN FLOW

The sanitary design flows and population density for the Site have been calculated based on the Region of Peel's Public Works Sanitary Sewer Design Criteria 2009. The relevant design criteria are summarized below:

SOUTH SERVICE ROAD

14m MTO SETBACK

14m MTO SETBACK

PRIVATE STREET

PRIVATE STREET

EXISTING PARKING TO REMAIN

CULVERT EASEMENT

EXISTING MALL TO REMAIN

SERVICING EASEMENT

HYDRO EASEMENT

EX. WALL

CULVERT EASEMENT EXISTING PARKING TO REMAIN

EX. WALL

HYDRO EASEMENT

EXISTING MALL TO REMAIN

100 YR EASEMENT APPROXIMATE LINE

EXISTING PARKING TO REMAIN

HAIG BOULEVARD

MYRON DRIVE

LP

HP

LP

LEGEND

+ 104.50	PROPOSED ELEVATION
+ 107.00 (EX)	EXISTING ELEVATION
+ 104.50(FCL)	FUTURE CENTERLINE ELEVATION FROM MTO PLANS
	PROPOSED MAJOR FLOW PATH
0.6%	PROPOSED CL PROFILE SLOPE
102.00	EXISTING CONTOUR
	PROPOSED PROPERTY BOUNDARY
HP	EXISTING HYDRO POLE

NOTES:
- ALL DIMENSIONS AND ELEVATIONS IN METERS

REVISION BLOCK

#	DATE	DESCRIPTION
1	12/06/22	ISSUED FOR ZBA

LICENSED PROFESSIONAL ENGINEER
C. DEL BUONO
100137127
DEC. 6, 2022
PROVINCE OF ONTARIO

KWA SITE DEVELOPMENT CONSULTING INC.
2055 Appleby Line
Burlington, ON L7L 7A9

NORTH ARROW

METRIC SCALE
0 15 Metres
1:500

GENERAL GRADING PLAN

SLATE ASSET MANAGEMENT

DIXIE MALL
MISSISSAUGA, ONTARIO

PROJECT No: 19410 | DRAWN BY:BC2 | CHECKED BY:CDB

FIG 4 - SGP

- Population Density: Apartments = 2.7 persons/unit
- Peaking Factor = Calculated using the Harmon Formula
- Design Flow = 302.8 Litres / capita / day (for domestic sewer flow)
- Infiltration Flow + Foundation Drains= 0.00028 $m^3/s/ha$ (0.28 L/s/ha)

4.4 Post-Development Sanitary Flow

The proposed development will outlet to the 900mm sanitary sewer on Haig Boulevard as it does today. The connection to the Haig Boulevard sewer is preferred as connecting into the Dixie Road sewer would require crossing the MTO box culvert that bisects the site.

Refer to Table 2 for sanitary flows summary.

Table 2: Proposed Sanitary Flows Summary

Draft Plan Blocks	Total Area (ha)	Total Population	Average Flow (L/s)	Peaking Factor	Peak Flow	Infiltration (L/s)	Total Sanitary Flow (L/s)
1 & 5 (Park & Easement)	0.86	0	0	0	0	0	0
2, 3 & 4 (Development)	2.01	3410	11.95	3.39	40.6	0.8	41.4
TOTAL	**2.87**	**3410**	**11.95**		**40.6**		**41.4**

The existing 19.6 ha Dixie Outlet Mall development has sanitary flows of 18.6 L/s draining to the Haig Boulevard sewer. The 2.87 ha of the redevelopment will have sanitary flows of **41.37 L/s**, whereas the remaining 16.73 ha of the Dixie Outlet Mall development will have sanitary flows of 15.97 L/s.

The sanitary sewer flows outletting to Haig Boulevard will increase by **38.8 L/s** (57.3 – 18.6) over pre-development conditions. This attributes to approximately 4% of the sanitary sewer capacity on Haig Boulevard.

It is important to note that the calculated population density based on a 2.7 persons/unit is conservative, resulting in conservative estimates of sanitary flow. For the entire Site, there are approximately 72% 1-bedroom units, 17% 2-bedroom units, and 11% 3-bedroom units proposed. A large proportion of the suite type contemplated at this stage is 1-bedroom units.

4.5 Proposed Connection and Layout

Blocks 2, 3, and 4 will be serviced by 250 mm or 300mm sanitary sewers along private streets. Additional 250mm sanitary sewers are proposed for potential future developments. All site flows will outlet to the 375mm sanitary sewer, which will be placed within a servicing easement and connect to the 900 mm municipal sewer on Haig Boulevard.

The proposed sanitary sewer will cross the culvert easement and connect to the existing sanitary forcemain, which will convey 15.97 L/s of flow from the remaining Dixie Outlet Mall site.

Refer to **Figure 5 – Sanitary Servicing Plan.** Refer to **Appendix A** for detailed sanitary calculations.

SOUTH SERVICE ROAD

14m MTO SETBACK

14m MTO SETBACK

PRIVATE STREET

65.6m - 300mm DIA
SAN @ 0.50%

OBV:100.12

MH8A

OBV:100.03

OBV:100.43

MH9A

OBV:100.45

69.4m - 250mm DIA
SAN @ 0.50%

OBV:100.81

MH10A

OBV:100.78

69.4m - 250mm DIA
SAN @ 0.50%

OBV:101.22

5.0m - 250mm DIA
SAN @ 0.50%

OBV:101.19

MH11A

OBV:101.16

EXISTING
PARKING
TO REMAIN

CULVERT
EASEMENT

EX. 110.22m 900mm DIA
C76-57T-III @ 0.54%

EX. SAN MH18
TOP:104.60
NW INV:98.65
SE INV:98.60

111.0m - 300mm DIA
SAN @ 0.50%

PRIVATE STREET

EXISTING MALL
TO REMAIN

SA

EX. 104.30m
900mm DIA
C76-57T-III @
0.67%

22.5m - 375mm DIA
SAN @ 0.50%

OBV:98.92

11.8m - 375mm DIA
SAN @ 0.85%

MH3A

OBV:99.46

OBV:99.47

SAN INV:101.65
EX. STM CULVERT
OBV: +/- 99.50

55.9m - 250mm DIA
SAN @ 3.59%

EX. SAN CONNECTION
EX. SAN +/- INV 98.03m

MH1A

52.5m - 375mm DIA
SAN @ 0.49%

MH6A

OBV:100.41

MH7A

OBV:102.45

HAIG BOULEVARD

SERVICING
EASEMENT

OBV:99.31

OBV:99.34

MH4A

OBV:99.68

74.4m - 250mm DIA
SAN @ 0.98%

OBV:100.44

CULVERT
EASEMENT
EXISTING
PARKING
TO REMAIN

OBV:99.06

MH2A

OBV:99.03

HYDRO EASEMENT

EX. 150mm DIA
SAN FORCEMAIN

NEW SANITARY SERVICE
FOR THE EXISTING MALL
AND THE PROPOSED
REDEVELOPMENT

EX. WALL

EX. WALL

HYDRO EASEMENT

EXISTING MALL
TO REMAIN

100 YR EASEMENT
APPROXIMATE LINE

EXISTING
PARKING
TO REMAIN

MYRON DRIVE

LEGEND

- PROPOSED SANITARY SEWER
- PROPOSED SANITARY MANHOLE
- EXISTING SANITARY SEWER
- EXISTING SANITARY MANHOLE
- PROPOSED PROPERTY BOUNDARY
- EASEMENT LIMIT

NOTES:
- ALL DIMENSIONS AND ELEVATIONS IN METERS

REVISION BLOCK

#	DATE	DESCRIPTION
1	12/06/22	ISSUED FOR ZBA

KWA SITE DEVELOPMENT CONSULTING INC.
2055 Appleby Line
Burlington, ON L7L 7A9

NORTH ARROW

METRIC SCALE
0 15 Metres
1:500

SANITARY SERVICING PLAN

SLATE ASSET MANAGEMENT

DIXIE MALL
MISSISSAUGA, ONTARIO

PROJECT No: 19410 | DRAWN BY: RC2 | CHECKED BY: CDB

FIG 5

5.0 WATER SUPPLY

5.1 EXISTING WATER SERVICING

The existing water infrastructure adjacent to the Site consists of a 400mm watermain on Dixie Road connecting to the 300mm watermain on South Service Road, which then connects to the 200mm watermain on Haig Boulevard. The Site obtains treated water from Arthur P. Kennedy Water Treatment Plant located south of Lakeshore Boulevard East, approximately 3.5 km south of the Site. This plant is operated by the Ontario Clean Water Agency (OCWA) on behalf of the Region of Peel. The Region owns and operates the water distribution system. The Site is within the Region's central trunk system and Pressure Zone 1 (also denoted as CT1). Elevations in this pressure zone range from the Lake Ontario at 75.0m to 106.7m. The proposed Site elevation is approximately 103.0m to 105.5m.

As per the Region of Peel Water and Wastewater Master Plan, there are two transmission mains within the CT1 starting from the A.P. Kennedy WTP and delivering water to the Silverthorn Reservoir: a 900-mm diameter transmission main and a 1500-mm diameter transmission main. The total theoretical Pressure Zone 1 central transmission capacity is approximately 342 ML/d. However, the actual capacity is estimated at approximately 279 ML/d. The total reservoir capacity at the A.P. Kennedy WTP is 25 ML.

Existing hydrants surrounding the Dixie Outlet Mall are located on the east and west sides of Dixie Road, south side of South Service Road and west side of Haig Boulevard. Existing hydrants are located within the Mall along the fire access route.

There are no watermain improvements identified in the 2022 Capital Budget for areas adjacent to the Site.

5.2 POST-DEVELOPMENT WATER DEMAND

The domestic and fire water demand for the Site was calculated based on the Region of Peel's Public Works Watermain Design Criteria. The relevant design criteria are summarized below:

- Average Daily Demand: Residential = 280 Litres / capita / day
- Max Day Factor: Residential = 2.0
- Peak Hour Factor: Residential = 3.0

- Average Daily Demand: Commercial = 300 Litres / employee / day
- Max Day Factor: Commercial = 1.4
- Peak Hour Factor: Commercial = 3.0

Fire Demand is based on MOE Design Guidelines for Drinking-Water Systems. The suggested fire flow for an equivalent population of 3410 would be **116 L/s** (interpolated using Table 8-1: Fire Flow Requirements).

The Region of Peel strives to maintain a minimum operation pressure of 275 kPa (40 psi) and maximum operating pressure of 690 kPa (100 psi).

The detailed water demand calculations can be found in **Appendix B** and are summarized in the Table below.

Table 3: Water Demand

Draft Plan Blocks	Population	Average Daily Demand (L/s)	Max Daily Demand (L/s)	Peak Hour Demand (L/s)
1	0	0.00	0.00	0.00
2	2460	7.97	15.94	23.91
3	594	1.93	3.85	5.78
4	356	1.16	2.31	3.47
5	0	0.00	0.00	0.00
TOTAL	**3410**	**11.05**	**22.10**	**33.15**

The post-development water demands are as follows:

- Domestic Supply Line – Peak Hour Demand = **33.15 L/s**
- Maximum Fire Flow Demand + Peak Daily Demand = **138.25 L/s**

A fire hydrant test was completed in November 2022 by Troy Life & Fire Safety Ltd. The static hydrant is located at the corner of South Service Road and the north Mall entrance, and the flow hydrant is located at the corner of South Service Road and Haig Boulevard. This testing indicated a static water pressure of 64 psi and theoretical fire flow of 6746 USGPM (426 L/s) at a residual pressure of 20 psi. There is sufficient pressure and flow in the municipal system to provide the required demands of the proposed development.

5.3 Proposed Connection and Layout

Blocks 2, 3 and 4 will be serviced by 300mm watermains that will connect to the 300mm watermain on South Service Road and the 200mm watermain on Haig Boulevard through a servicing easement. Refer to **Figure 6 – Water Distribution Plan.**

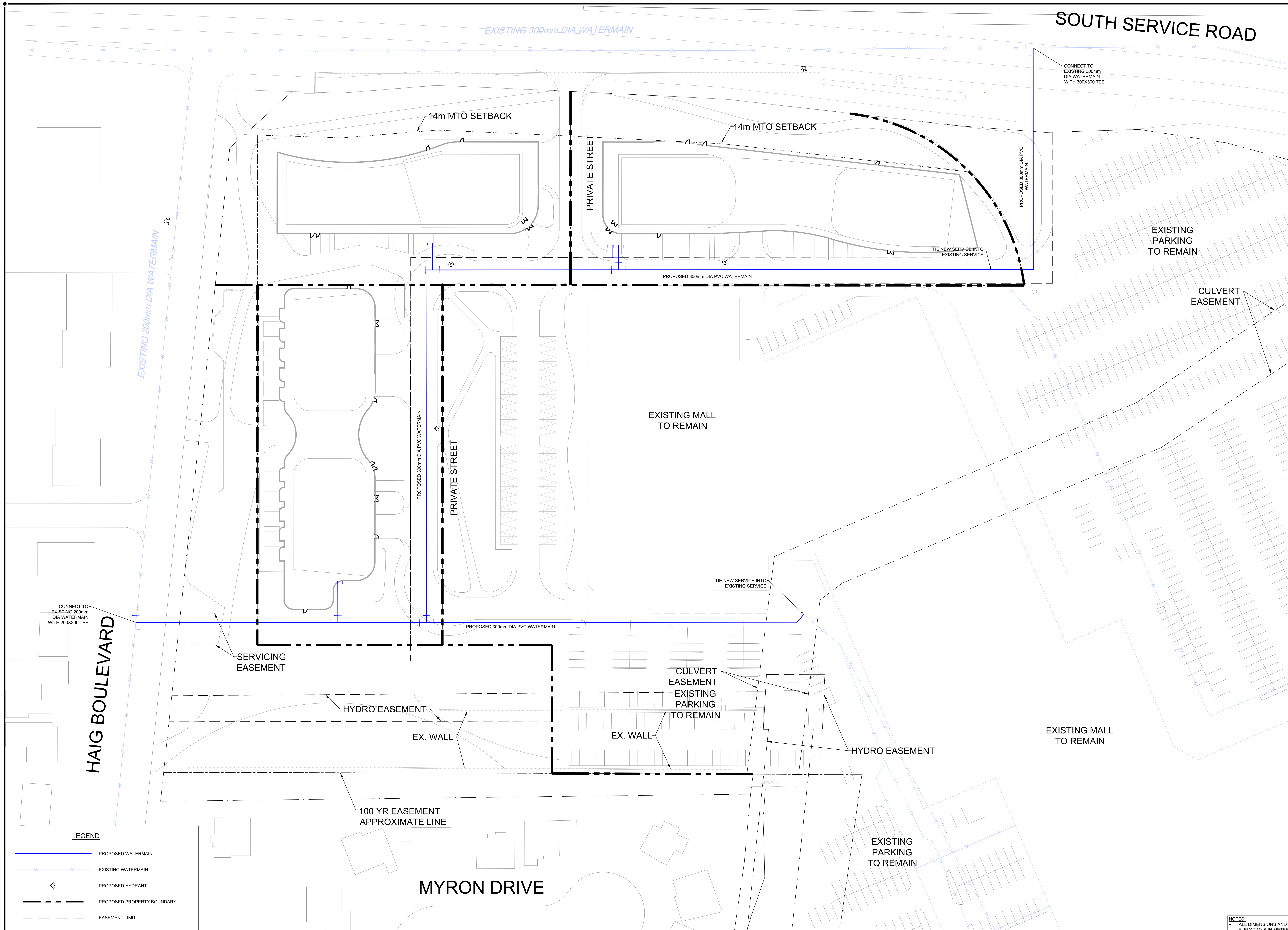
Backflow prevention valves and chambers will be required at each municipal connection and confirmed during detailed design in the Site Plan Applications. For building heights that exceed 84m, the Ontario Building Code will require 2 municipal connections per building for fire security.

Hydrants are proposed within 45m of the buildings' Siamese fire department connection and the distance will be confirmed during the individual site plan applications.

6.0 Stormwater Management

6.1 Pre-Development Drainage Conditions

The Site generally slopes in the south direction. There is an existing 2.1m x 2.85m box culvert that bisects the Dixie Outlet Mall property to convey drainage from north of the QEW to Applewood Creek. This culvert also collects runoff from the on-site private storm sewer system. It currently runs through the parking lot and beneath the existing mall. The Site is primarily impervious consisting of mall rooftop areas and associated asphalt parking lot areas.



REVISION BLOCK

#	DATE	DESCRIPTION
1	12/06/22	ISSUED FOR ZBA

KWA SITE DEVELOPMENT CONSULTING INC.
2453 Auckland Drive
Burlington, ON L7L 7A9

NORTH ARROW

METRIC SCALE
0 15 Metres
1:500

WATER DISTRIBUTION PLAN

SLATE ASSET MANAGEMENT

DIXIE MALL

MISSISSAUGA, ONTARIO

PROJECT No:19410
DRAWN BY:BC2
CHECKED BY:CDB

FIG 6

6.2 FUTURE MTO IMPROVEMENTS

MTO is constructing a new interchange layout at Dixie Road. The South Service Road will be realigned to accommodate the new interchange and to allow for directional access at Dixie Road and the QEW. As part of this work, MTO is proposing the existing box culvert be converted to a twinned box culvert outletting to the Applewood Creek. The twinned box culvert will be on east side of existing box culvert and will not form part of or encroach the proposed development.

6.3 DESIGN CRITERIA

The following guidelines have been specified in the City of Mississauga's Development Requirements Manual:

Water Quantity Control: For the Applewood Creek Subwatershed, 100-yr post-development flows must be controlled to the 2-yr pre-development flows. For pre-development lands, it is implied as raw land for which the runoff coefficient is equal to 0.25 but will not exceed 0.50 for a site that is already developed.

Water Quality Control: Enhanced (Level 1) protection through the removal of 80% of total suspended solids (TSS) is required.

Water Balance: The first 5mm of runoff shall be retained on-site and managed by way of infiltration, evapotranspiration, re-use or filtration.

6.4 ALLOWABLE RELEASE RATE

Drainage from the park block and the three development blocks will be conveyed through storm sewers to MH1, which outlets to the Applewood Creek. The MTO setback areas will drain towards South Service Road and will not be captured by the proposed storm sewer network. A small portion of the Block 3 area will be collected by existing catch basins to the south. Additionally, flows from the temporary nursery garden will be collected by the proposed storm sewer network and conveyed to MH1. Drainage within the 100-yr creek easement corridor will be maintained as the pre-development condition. Refer to **Figure 7 – Storm Servicing Plan** and **Figure 8 – Proposed Storm Servicing Drainage Plan** for the drainage areas to the creek.

The pre-development flow rates for the proposed site were determined using the Rational Method. The inputs were:

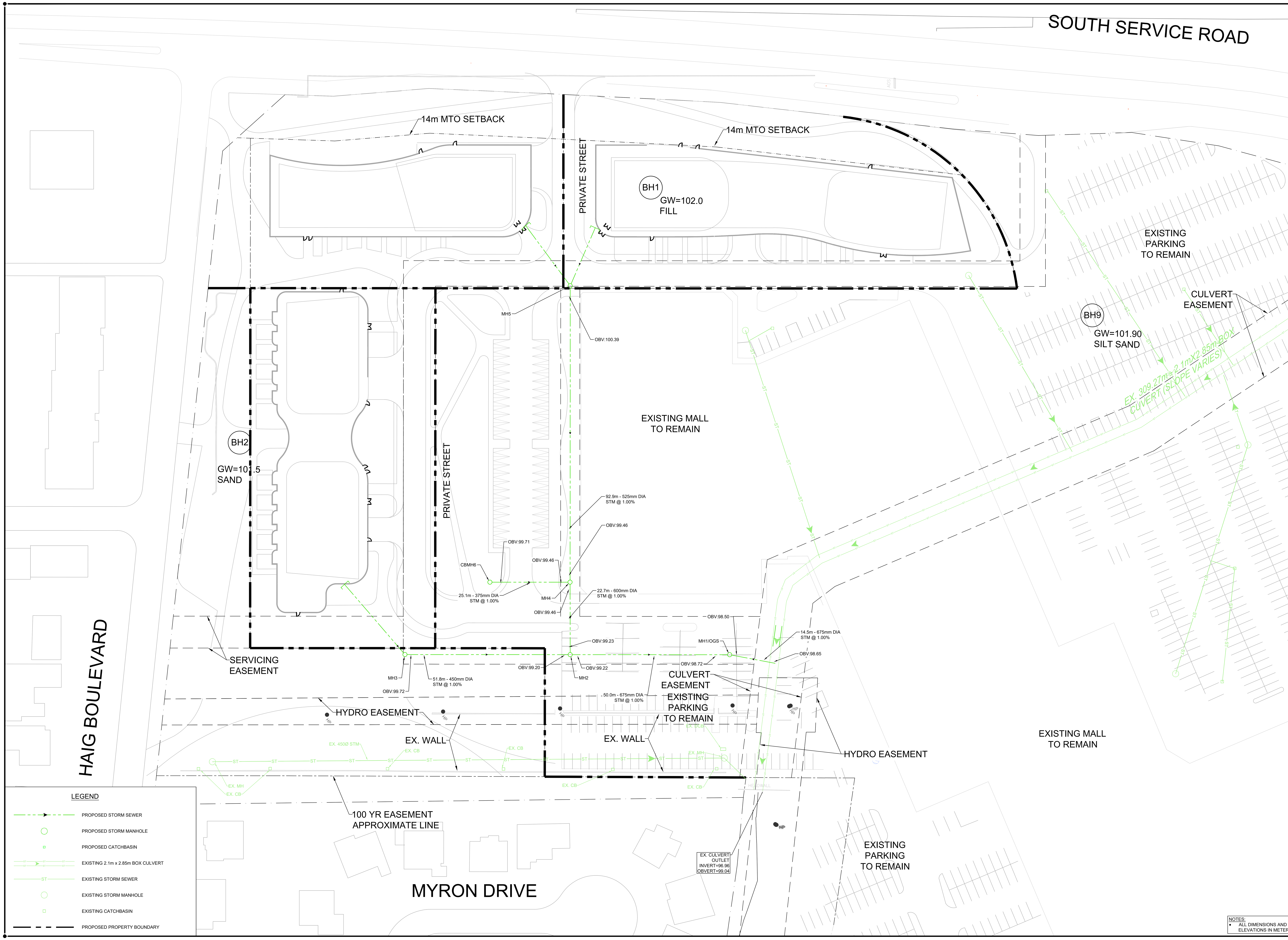
- Site Area (A) = 2.87 ha
- Time of Concentration: 15 minutes
- Pre-development Runoff Coefficient (C): 0.5 as per City of Mississauga's Development Requirements Manual
- Intensity (i): 60 mm/hr for a 2-yr storm event based on a = 610, b = 4.6, c = 0.78 as per City of Mississauga's Development Requirements Manual

$$Q = CiA = 0.5 * 60\ mm/hr\ * 2.87\ ha$$

$$Q = 0.239\ m^3/s$$

The 2-year pre-development flow for the site is **0.239 m^3/s.**

Quantity control is to be provided individually for each development block. The release rates are proportionally assigned for the blocks according to their areas. Given total flow of 0.239 m^3/s and site area of 2.87 ha, the resulting unit rate is **83.2 L/s/ha.**



REVISION BLOCK

#	DATE	DESCRIPTION
1	12/06/22	ISSUED FOR ZBA

KWA SITE DEVELOPMENT CONSULTING INC.
2453 Auckland Drive
Burlington, ON L7L 7A9

NORTH ARROW

METRIC SCALE
0 15 Metres
1:500

STORM SERVICING PLAN

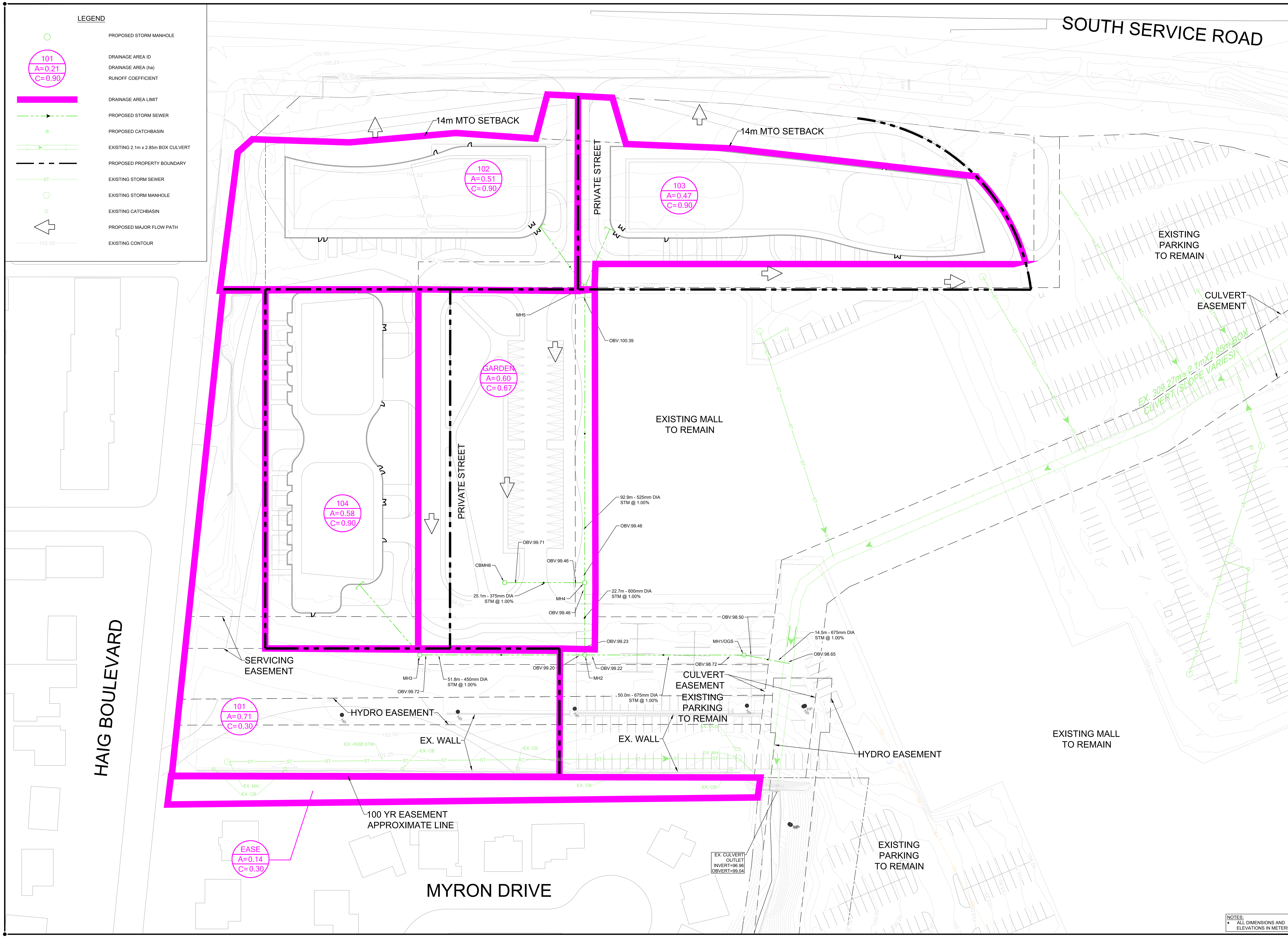
SLATE ASSET MANAGEMENT

DIXIE MALL

MISSISSAUGA, ONTARIO

PROJECT No:19410 DRAWN BY:BC2 CHECKED BY:CDB

FIG 7



LEGEND
PROPOSED STORM MANHOLE
DRAINAGE AREA ID
DRAINAGE AREA (ha)
RUNOFF COEFFICIENT
101
A=0.21
C=0.90
DRAINAGE AREA LIMIT
PROPOSED STORM SEWER
PROPOSED CATCHBASIN
EXISTING 2.1m x 2.85m BOX CULVERT
PROPOSED PROPERTY BOUNDARY
EXISTING STORM SEWER
EXISTING STORM MANHOLE
EXISTING CATCHBASIN
PROPOSED MAJOR FLOW PATH
EXISTING CONTOUR
SOUTH SERVICE ROAD
14m MTO SETBACK
14m MTO SETBACK
PRIVATE STREET
102
A=0.51
C=0.90
103
A=0.47
C=0.90
EXISTING PARKING TO REMAIN
CULVERT EASEMENT
EX. 309.27m - 2.1mX2.85m BOX CULVERT (SLOPE VARIES)
MH5
OBV:100.39
GARDEN
A=0.60
C=0.67
EXISTING MALL TO REMAIN
PRIVATE STREET
104
A=0.58
C=0.90
92.9m - 525mm DIA STM @ 1.00%
OBV:99.46
OBV:99.71
CBMH6
OBV:99.46
25.1m - 375mm DIA STM @ 1.00%
MH4
22.7m - 600mm DIA STM @ 1.00%
OBV:99.46
OBV:98.50
14.5m - 675mm DIA STM @ 1.00%
MH1/OGS
OBV:98.65
OBV:99.23
HAIG BOULEVARD
SERVICING EASEMENT
OBV:99.20
OBV:99.22
OBV:98.72
MH3
51.8m - 450mm DIA STM @ 1.00%
MH2
OBV:99.72
CULVERT EASEMENT
50.0m - 675mm DIA STM @ 1.00%
EXISTING PARKING TO REMAIN
101
A=0.71
C=0.30
HYDRO EASEMENT
EX. WALL
EX. WALL
HYDRO EASEMENT
EXISTING MALL TO REMAIN
100 YR EASEMENT APPROXIMATE LINE
EASE
A=0.14
C=0.30
EX. CULVERT OUTLET INVERT=96.96 OBVERT=99.04
EXISTING PARKING TO REMAIN
MYRON DRIVE
NOTES:
• ALL DIMENSIONS AND ELEVATIONS IN METERS

REVISION BLOCK

#	DATE	DESCRIPTION
1	12/06/22	ISSUED FOR ZBA

KWA SITE DEVELOPMENT CONSULTING INC.
2453 Auckland Drive
Burlington, ON L7L 7A9

NORTH ARROW

METRIC SCALE
0 15 Metres
1:500

PROPOSED STORM SERVICING DRAINAGE PLAN

SLATE ASSET MANAGEMENT

DIXIE MALL
MISSISSAUGA, ONTARIO

PROJECT No:19410
DRAWN BY:BC2
CHECKED BY:CDB

FIG 8

6.5 POST-DEVELOPMENT CONDITIONS

6.5.1 DRAINAGE DIRECTIONS

The proposed development contains on-site stormwater sewers, with one new connection to the existing box culvert, which eventually discharge to Applewood Creek. The layout of the storm sewers is depicted in **Figure 7 – Storm Servicing Plan.** Refer to **Figure 8 – Proposed Storm Servicing Drainage Plan** for the post-development drainage conditions**.**

6.5.2 RUNOFF QUANTITY CONTROL

The 100-year post-development peak flows will be reduced to the 2-year pre-development peak flows. Using the allowable release rate of **83.2 L/s/ha**, the release rate for each block can be determined. Since 100-year flows are being considered, the runoff coefficient is multiplied by the MTO factor of 1.25, to a maximum value of 1. Applying the Modified Rational method, the storage required to maintain the prescribed release rate is found. The storage rate per area required for parks (C=0.30) is 44 m^3/ha, for the temporary nursery garden block (C=0.67) is 233 m^3/ha and for impervious surfaces (C=0.90) is 303 m^3/ha.

Table 4: Summary of Modified Rational Method Calculations

Block ID	Area (ha)	Runoff Coefficient	tc (min)	Release Rate[1] (m^3/s)	Storage Required (m^3)	Storage/ Area[2] (m^3/ha)
101	0.71	0.34	15	31	0.059	44
102	0.51	1.00	15	154	0.042	303
103	0.47	1.00	15	142	0.039	303
104	0.58	1.00	15	176	0.048	303
Temp Garden	0.60	0.84	15	140	0.050	233
TOTAL	**2.87**			**643**	**0.239**	

[1] Release Rate is based on 83.2 L/s/ha (allowable release rate based on pre-development conditions)

[2] Storage/ Area is calculated by taking the Storage Required and dividing by block area

The Modified Rational Method calculations can be found in **Appendix C**.

For the proposed development, stormwater management strategies will be individually chosen and designed for each of the blocks during detailed design. Subsequent Site Plan Applications will be submitted once the process is further advanced. Some feasible options for quantity control are to direct runoff into underground storage tanks and/ or LID practices through internal conveyance systems.

Park and temporary garden blocks will predominately be pervious surfaces, for which little runoff is expected for small storm events so runoff is more of a concern during less-frequent, more-intense storm events. Some recommendations for achieving quantity control is through the means of underground storage tanks, above ground surface depressions and/ or through LID practices. The blocks will be designed in detail at a later stage, at which time, the individual quantity control measures can be determined.

Flows from each block will be controlled by an orifice. Further, an orifice control downstream of MH1 may be required to control runoff from the private streets. The total allowable release rate for redevelopment drainage area to the creek should be equal to or less than 239 L/s.

6.5.3 STORM SEWER DESIGN

The minor storm sewer system is designed to convey the 10-yr storm flows. The storm sewer layout includes servicing stubs for the expected development blocks. The Storm Design Sheet can be found in **Appendix C**.

6.5.4 QUALITY CONTROL

Quality control would be required for development, park, and the temporary nursery garden blocks. In accordance with the Ministry of the Environment stormwater management criteria for enhanced protection, a minimum water quality target of 80% TSS removal is required.

Development Blocks

Drainage from the development blocks will receive 80% TSS removal through a combination of LIDs and/ or OGS units prior to discharging to the private streets. The location and composition of the LIDs within the development blocks will be finalized during the Site Plan approval stage. The following are some feasible LID strategies:

- **Bioretention:** Bioretention is a stormwater infiltration practice that treats runoff from paved areas by using the natural properties of soil and vegetation to remove contaminants. Most are designed as swales or islands and are constructed adjacent to roads, parking lots or other paved areas. Runoff from these impervious surfaces are directed into the bioretention area, where it ponds and slowly infiltrates. According to LID Treatment Train Tool by created by STEP, bioretention may provide 75% TSS removal.
- **Grassed swales:** Grass swales are shallow sloped, densely vegetated channels designed to treat stormwater runoff. As water flows through the channel, vegetation slows the water and allows for sedimentation and filtering of pollutants through the subsoil. According to LID Treatment Train Tool created by STEP, enhanced swales may provide 40% TSS removal.
- **Permeable pavement:** Permeable pavement help to restore natural infiltration functions to the landscape and reduce impacts to watercourses by allowing rainwater to slowly infiltrate into the ground. Contaminants are removed from the stormwater as it infiltrates slowly through the gravel sub-base and into the native soil. According to LID Treatment Train Tool created by STEP, permeable pavements may provide 75% TSS removal.
- **Green roofs:** Green roofs are contained areas of vegetation, such as grasses or shrubs, that can be planted on top of buildings. Although green roofs are not credited any TSS removal as of now, they provide many benefits beyond stormwater quality control.

A Geotechnical Engineering Report was prepared by Grounded Engineering Inc. in January 2021. The hydraulic conductivity across the Site ranges from approximately 10×10^{-8} (for clayey silt) up to 10×10^{-3} (for silt and sand fill). As per Appendix C - Site Evaluation and Soil Testing Protocol for Stormwater Infiltration provided by the Toronto and Region Conservation Authority Stormwater Management Criteria Guidelines (August 2012), hydraulic conductivity can be converted to infiltration rates, resulting in rates between 7 mm/hr to 158 mm/hr. The groundwater depth was observed in December 2020 and January 2021, and ranged from 1.3 m to 3.3 m. Infiltration-based techniques can be considered within the blocks, given there is available space.

Park and temporary nursery garden Blocks

Runoff in landscaped areas will essentially be clean as it will only travel over pervious surfaces; therefore, no water quality controls are required for the park block. The redevelopment will also include a temporary nursery garden, which can be utilized for LIDs such as swales and infiltration trenches.

The treatment train approach for the site will consist of individual LIDs within the blocks and a downstream OGS for the entire redevelopment. In general, OGS units are credited a %TSS removal of 50%. The OGS will be specified in the detailed design stage accordingly.

6.5.5 WATER BALANCE

Each block will retain 5mm of rainfall for the purpose of water balance. This can be achieved through a combination of LID strategies, such as bioretention, grassed swales, and permeable pavements. While this will be discussed in detail at a later stage, it is important to note that high imperviousness, underground parking requirements, and low hydraulic conductivity of the underlying soil might make it difficult for all blocks to achieve this target.

7.0 CONCLUSION

We trust that this report sufficiently addresses the site servicing requirements and that the proposed development is feasible from municipal servicing and stormwater management perspectives. In summary:

Sanitary Servicing:

- The proposed development will outlet to the 900mm sanitary sewer on Haig Boulevard.
- The sanitary sewer flows outletting to Haig Boulevard will increase by **38.8 L/s** (57.3 – 18.6) over the pre-development conditions.

Water Servicing:

- The proposed development will connect to the 300mm watermain on South Service Road and the 200mm watermain on Haig Boulevard.
- Peak hour demand = **33.15 L/s**
- Fire flow is calculated based on MOE Design Guidelines for Drinking-Water Systems. Maximum Fire Flow Demand + Peak Daily Demand = **138.25 L/s**

Stormwater Servicing:

- The proposed development contains on-site storm sewers, with one new connection to the existing box culvert, which discharges to Applewood Creek

Runoff Quantity Control:

- The 100-year post-development peak flows are reduced to the 2-year pre-development flows of 0.239 m^3/s for the drainage area of 2.87 ha.
- Development blocks: Quantity control for the development blocks will be individually chosen and designed at the SPA stage. Some options include underground storage tanks and LID practices.
- Parks/ temporary garden: For large storm events, quantity control may be provided in underground storage tanks, above ground surface depressions and/ or through LID practices.

Post Development Quality Control:

- Quality control for the blocks can be provided through a variety of LID measures, where the combination equates 80% TSS removal.

- A combination of LIDs, which will be finalized for each site plan block during the Site Plan approval stage, can be used. Some feasible options include bioretention, grassed swales, permeable pavements, and green roofs.
- Quality control might not be required for the park block as the runoff can be considered clean. The temporary nursery garden can include LIDs such as swales and infiltration trenches.
- An OGS unit is recommended downstream for the overall redevelopment.

Water Balance:

- Depending on the block's soil infiltration rates and groundwater levels, water balance for the blocks can be provided through a variety of infiltration-based LID measures to retain 5 mm of rainfall.

Please do not hesitate to contact the undersigned if you have any questions or concerns.

Yours very truly,

KWA Site Development Consulting Inc.

Per:

Pavneet Brar, MASc, EIT
pavneet.brar@kwasitedev.com

Carlo Del Buono, P. Eng., LEED AP
carlo.delbuono@kwasitedev.com

APPENDIX A

SANITARY DEMAND CALCULATIONS

Sanitary Demands - Existing

Project Name: Dixie Outlet Mall
Project Number: 19410
Location: Mississauga, Ontario
Date: 5-Dec-22
Prepared by: PB

Infiltration Allowance + Foundation Drain Allowance 0.000280 m3/sec/ha

Flow Data		
Type of Development	Equivalent Population (ppl / ha)	Rate (Litres / cap / day)
Single family (greater than 10m frontage)	50	302.8
Single family (less than 10m frontage)	70	302.8
Semi-detached	70	302.8
Row dwellings	175	302.8
Apartments	475	302.8
Commercial	50	302.8
Light Industrial	70	302.8

Description	Outlet	Commercial Land Area for Equiv Pop (ha)	Townhouse Land Area for Equiv Pop (ha)	Apartment Land Area for Equiv Pop (ha)	Other Land Area (ha)	Total Land Area (ha)	# Townhouses	# Apartment (1 Bedroom)	# Apartment (2 Bedroom)	# Apartment (3 Bedroom)	Total Apartment Units	Total Units (Apartment + Townhouses)	Commercial Population	Townhouse Population *	Apartment Population *	Total Population *	Average Flow (L/s)
Commercial	Haig	19.60				19.60					0	0	980	0	0	980	3.43
Total		**19.60**	**0.00**	**0.00**	**0.00**	**19.60**	**0**	**0**	**0**	**0**	**0**	**0**	**980**	**0**	**0**	**980**	**3.43**

* Townhouse and Apartment populations calculated based on 2.7 people / unit

Flows to Haig Blvd

Total Average Flow =	**3.43**	**L/s**
Peaking Factor =	**3.81**	
Peak Flow =	**13.07**	**L/s**
Infiltration =	**5.49**	**L/s**
Total Sanitary Flow =	**18.56**	**L/s**

Capacity Check: Sewer on Haig Blvd

900 Pipe Capacity @ 0.6% =	**1463.00**	**L/s**
Required/ Available =	**1%**	

Sanitary Demands - Remaining Dixie Outlet Mall Flows

Project Name: Dixie Outlet Mall
Project Number: 19410
Location: Mississauga, Ontario
Date: 5-Dec-22
Prepared by: PB

Infiltration Allowance + Foundation Drain Allowance 0.000280 m3/sec/ha

Flow Data		
Type of Development	Equivalent Population (ppl / ha)	Rate (Litres / cap / day)
Single family (greater than 10m frontage)	50	302.8
Single family (less than 10m frontage)	70	302.8
Semi-detached	70	302.8
Row dwellings	175	302.8
Apartments	475	302.8
Commercial	50	302.8
Light Industrial	70	302.8

Description	Outlet	Commercial Land Area for Equiv Pop (ha)	Townhouse Land Area for Equiv Pop (ha)	Apartment Land Area for Equiv Pop (ha)	Other Land Area (ha)	Total Land Area (ha)	# Townhouses	# Apartment (1 Bedroom)	# Apartment (2 Bedroom)	# Apartment (3 Bedroom)	Total Apartment Units	Total Units (Apartment + Townhouses)	Commercial Population	Townhouse Population *	Apartment Population *	Total Population *	Average Flow (L/s)
Commercial	Haig	16.73				16.73					0	0	837	0	0	837	2.93
Total		**16.73**	**0.00**	**0.00**	**0.00**	**16.73**	**0**	**0**	**0**	**0**	**0**	**0**	**837**	**0**	**0**	**837**	**2.93**

* Townhouse and Apartment populations calculated based on 2.7 people / unit

Flows to Haig Blvd

Total Average Flow =	**2.93**	**L/s**
Peaking Factor =	**3.85**	
Peak Flow =	**11.28**	**L/s**
Infiltration =	**4.68**	**L/s**
Total Sanitary Flow =	**15.97**	**L/s**

Capacity Check: Sewer on Haig Blvd

900 Pipe Capacity @ 0.6% =	**1463.00**	**L/s**
Required/ Available =	**1%**	

Sanitary Demands - Phase 1

Project Name: Dixie Outlet Mall
Project Number: 19410
Location: Mississauga, Ontario
Date: 5-Dec-22
Prepared by: CDB/ PB

Infiltration Allowance + Foundation Drain Allowance 0.000280 m3/sec/ha

Flow Data		
Type of Development	Equivalent Population (ppl / ha)	Rate (Litres / cap / day)
Single family (greater than 10m frontage)	50	302.8
Single family (less than 10m frontage)	70	302.8
Semi-detached	70	302.8
Row dwellings	175	302.8
Apartments	475	302.8
Commercial	50	302.8
Light Industrial	70	302.8

Description	Outlet	Commercial GFA for Equiv Pop (ha)	Townhouse GFA for Equiv Pop (ha)	Apartment GFA for Equiv Pop (ha)	Other Land Area (ha)	Total Land Area (ha)	# Townhouses	# Apartment (1 Bedroom)	# Apartment (2 Bedroom)	# Apartment (3 Bedroom)	Total Apartment Units	Total Units (Apartment + Townhouses)	Commercial Population	Townhouse Population *	Apartment Population *	Total Population *	Average Flow (L/s)
Slate #1	park					0.72					0	0	0	0	0	0	0.00
Slate #2	Haig					0.64		257	440	214	911	911	0	0	2460	2460	8.62
Slate #3	Haig					0.72		62	106	52	220	220	0	0	594	594	2.08
Slate #4	Haig					0.66		37	64	31	132	132	0	0	356	356	1.25
Slate #10	Haig					0.14						0		0	0	0	0.00
Total		**0.00**				**2.87**	**0**	**356**	**610**	**297**	**1263**	**1263**	**0**	**0**	**3410**	**3410**	**11.95**

* Townhouse and Apartment populations calculated based on 2.7 people / unit

Flows to Haig

Total Average Flow =	**11.95**	**L/s**
Peaking Factor =	**3.39**	
Peak Flow =	**40.6**	**L/s**
Infiltration =	**0.8**	**L/s**
Total Sanitary Flow =	**41.37**	**L/s**

Capacity Check: Sewer on Haig Blvd

Flow required =	**57.3**	**L/s**
900 Pipe Capacity @ 0.6%	**1463**	**L/s**
Required/ Available =	**4%**	

GENERAL NOTES

1. ALL MATERIAL AND WORKMANSHIP SHALL CONFORM TO CITY OF MISSISSAUGA AND REGION OF PEEL STANDARDS.
2. WATERMAINS AND/OR WATER SERVICE MATERIAL 100mm AND LARGER MUST BE P.V.C. CLASS 150 MANUFACTURED TO AWWA SPEC. C-900-75 COMPLETE WITH TRACER WIRE. SIZES 50mm AND SMALLER ARE TO BE POLYETHYLENE AWWA C901-78 IN SIZES 25 TO 50mm.
3. WATERMAINS AND/OR WATER SERVICES ARE TO HAVE A MINIMUM COVER OF 1.7m WITH A MINIMUM HORIZONTAL SPACING OF 1.2m FROM THEMSELVES AND ALL OTHER UTILITIES.
4. WATERMAINS MUST HAVE A MINIMUM VERTICAL CLEARANCE OF 0.15m OVER/0.30m UNDER SEWERS AND ALL OTHER UTILITIES WHEN CROSSING.
5. PROVISIONS FOR FLUSHING WATER LINE PRIOR TO TESTING, ETC, MUST BE PROVIDED WITH AT LEAST A 50mm OUTLET ON 100mm AND LARGER LINES. COPPER LINES ARE TO HAVE FLUSHING POINTS AT THE ENDS THE SAME SIZE AS THE LINE. THEY MUST BE HOSED OR PIPED TO ALLOW WATER TO DRAIN ONTO A PARKING LOT OR DOWN A DRAIN. ON FIRE LINES FLUSHING OUTLET TO BE 100mm DIAMETER MIN. OR A FIRE HYDRANT.
6. ALL CURB STOPS TO BE 1.5m OFF THE FACE OF THE BUILDING UNLESS OTHERWISE NOTED.
7. HYDRANT & VALUE SET TO REGION STANDARD 2057A (S-E). DIMENSIONS A & B, 0.7 & 0.3m
8. ALL HYDRANTS TO HAVE PUMPER NOZZLE OUTLET.
9. WATERMAINS TO BE INSTALLED TO GRADES AS SHOWN ON APPROVED SITE PLAN. COPY OF GRADE SHEET MUST BE SUPPLIED TO INSPECTOR PRIOR TO COMMENCEMENT OF WORK, WHEN REQUESTED BY INSPECTOR.
10. CONC. STORM SEWER UP TO AND INCLUDING 375mm SHALL MEET CSA SPEC. A257.1 E.S.
11. 450mm TO 600mm CONCRETE SEWER PIPE SHALL MEET CSA SPEC. A257.2 CLASS III
12. ALL STORM AND SANITARY SEWER MAINS, MANHOLES, AND CATCHBASINS, SHALL BE FITTED WITH APPROVED RUBBER GASKET JOINTS.
13. STORM MANHOLES TO BE BENCHED TO THE CROWN OF ALL PIPES ON A VERTICAL PROJECTION FROM THE SPRING LINE.
14. THRUST BLOCKS CONFORMING TO REGION OF PEEL SPECIFICATIONS SHALL BE INSTALLED ON THE WATERMAIN AT ALL BENDS, TEES, REDUCERS, AND ENDS.
15. P.V.C. SANITARY SEWER TO CONFORM TO CSA STANDARD B137.3, ASTM D2729, ASTM 3034.
16. SINGLE CB LEADS - 250mm, DOUBLE CB LEADS - 300mm, MINIMUM SLOPE 1.00% UNLESS OTHERWISE NOTED
17. WATERMETER TO BE SET TO REGION STANDARD 1-4-7

STORMWATER MANAGEMENT

LOT AREA = 4.28 HA. (SENTRY REALTY)

PROPOSED ROOF AREA = 1.25 HA

A RUNOFF PRIOR TO DEVELOPMENT - 5 YEAR STORM

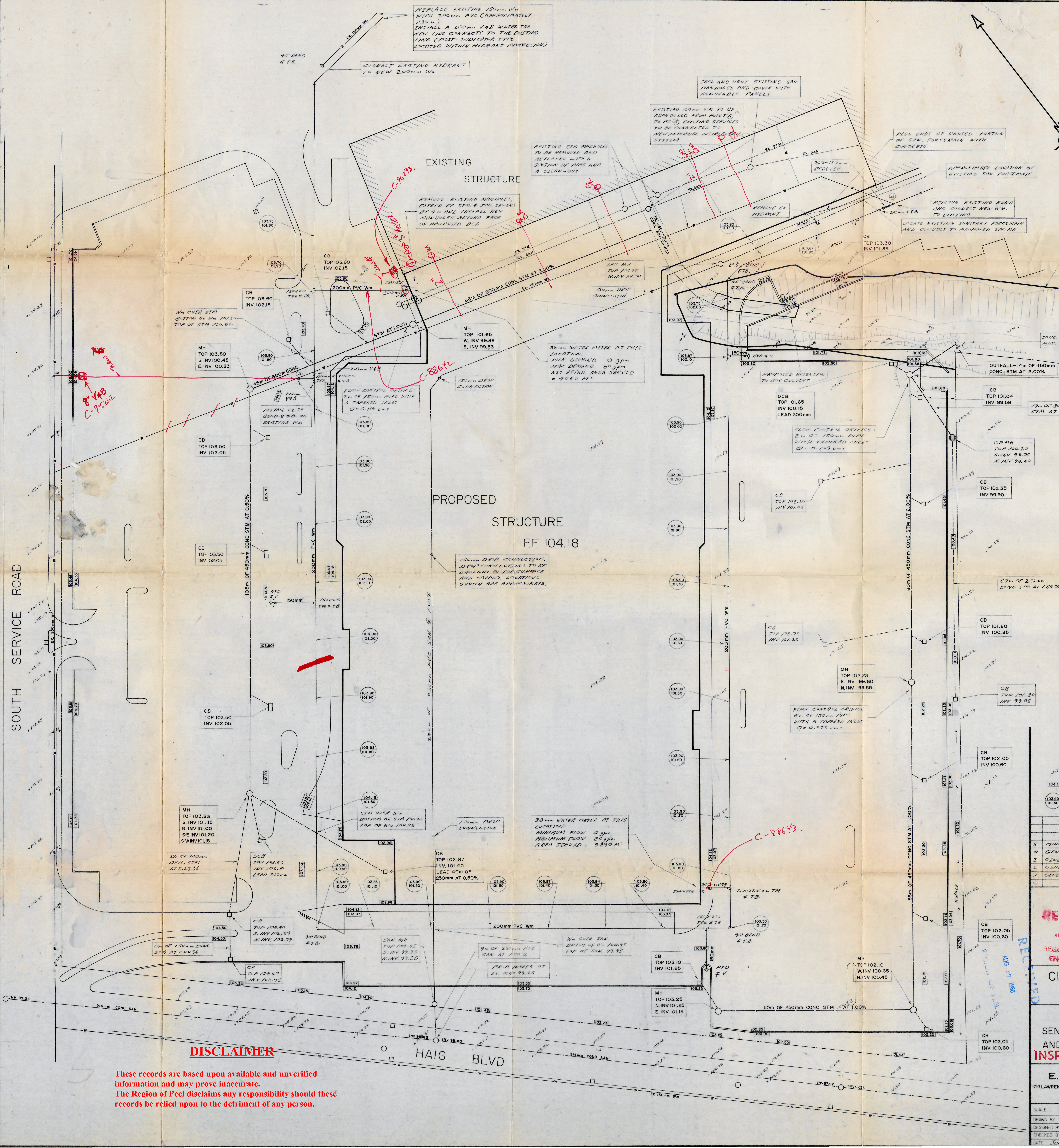
$Q = \frac{CIA}{360} = 0.24$ cms $T_c = 20$ min., $I = 67$ mm/hr., $A = 4.28$, $C = 0.30$

B DISCHARGE FROM 20 CONTROLLED FLOW ROOF DRAINS AT 0.00095 cms EACH = 0.019 cms

C DISCHARGE FROM FLOW CONTROL ORIFICE - EAST PARKING LOT:
LENGTH = 2m
DIAMETER = 150mm
HEAD = 3.3m
INLET - TAPERED
Q = 0.109 cms

D DISCHARGE FROM FLOW CONTROL ORIFICE - WEST PARKING LOT:
LENGTH = 2m
DIAMETER = 150mm
HEAD = 3.6m
INLET - TAPERED
Q = 0.114 cms

E FLOW FROM SITE AFTER DEVELOPMENT
Q = 0.019 + 0.109 + 0.114
Q = 0.242 cms



LEGEND

Symbol	Meaning
102.38	EXISTING ELEVATION
104.12	PROPOSED ELEVATION
103.90	PROPOSED SURFACE ELEVATION
101.50	PROPOSED TOP OF WATERMAIN

NO	REVISIONS	DATE	BY	APP'D
5	MINOR REVISIONS	Aug 27/86	EDR	
4	GENERAL REVISIONS	Aug 13/86	EDR	
3	GENERAL REVISIONS	July 25/86	EDR	
2	GENERAL REVISIONS	July 16/86	EDR	
1	GENERAL REVISIONS	JN 24/86	EDR	

RECEIVED AUG 27 1986 REGION OF PEEL ENGINEERING

REGISTERED PROFESSIONAL ENGINEER E. D. ROBERTS PROVINCE OF ONTARIO

RECEIVED AUG 27 1986

CITY OF MISSISSAUGA

THE REGIONAL MUNICIPALITY OF PEEL WATER DIVISION APPROVED

DIXIE MALL
SENTRY REALTY HOLDINGS AND FIRST PLAZAS INC.

INSPECTORS COPY

E. D. ROBERTS, P.Eng.
1719 LAWRENCE AVE E, STE 205, SCARBOROUGH ONT, MIR 2X7
755-3861 445-0170

SCALE	1:400	PROJECT NO	
DRAWN BY			
DESIGNED BY	EDR	DRAWING NO	86042-1
CHECKED BY			
DATE	JUNE 12/86		

APPENDIX B

WATER DEMAND CALCULATIONS

Water Demands - Phase 1

Project Name: Dixie Outlet Mall
Project Number: 19410
Location: Mississauga, Ontario
Date: 5-Dec-22
Prepared by: PB

Flow Data					
Type of Development	Equivalent Population (ppl / ha)	Units	Average Consumption Rate (L / cap / day)	Max Day Factor	Peak Hour Factor
Single family (greater than 10m frontage)	50	L / cap / day	280	2	3
Single family (less than 10m frontage)	70	L / cap / day	280	2	3
Semi-detached	70	L / cap / day	280	2	3
Row dwellings	175	L / cap / day	280	2	3
Apartments	475	L / cap / day	280	2	3
Commercial	50	L / employee / day	300	1.4	3
Light Industrial	70	L / employee / day	300	1.4	3

											Commercial Flows				Townhouse Flows				Apartment Flows			
Description	Commercial GFA for Equiv Pop (ha)	Townhouse GFA for Equiv Pop (ha)	Apartment GFA for Equiv Pop (ha)	Other Land Area (ha)	Total Land Area (ha)	# Apartment (1 Bedroom)	# Apartment (2 Bedroom)	# Apartment (3 Bedroom)	Total Apartment Units	Total Units (Apartment + Townhouses)	Commercial Population	Commercial Average Flow (L/s)	Commercial Max Day (L/s)	Commercial Peak Hour (L/s)	Townhouse Population *	Townhouse Average Flow (L/s)	Townhouse Max Day (L/s)	Townhouse Peak Hour (L/s)	Apartment Population *	Apartment Average Flow (L/s)	Apartment Max Day (L/s)	Apartment Peak Hour (L/s)
Slate #1					0.72				0	0	0	0.00	0.00	0.00	0	0.00	0.00	0.00	0	0.00	0.00	0.00
Slate #2	2.53				0.64	257	440	214	911	911	0	0.00	0.00	0.00	0	0.00	0.00	0.00	2460	7.97	15.94	23.91
Slate #3	3.95				0.72	62	106	52	220	220	0	0.00	0.00	0.00	0	0.00	0.00	0.00	594	1.93	3.85	5.78
Slate #4	1.90				0.66	37	64	31	132	132	0	0.00	0.00	0.00	0	0.00	0.00	0.00	356	1.16	2.31	3.47
Slate #10					0.14				0	0	0	0.00	0.00	0.00	0	0.00	0.00	0.00	0	0.00	0.00	0.00
Total	**8.38**				**2.87**	**356**	**610**	**297**	**1263**	**1263**	**0**				**0**				**3410**	**11.05**	**22.10**	**33.15**

* Townhouse and Apartment populations calculated based on 2.7 people / unit

Fire Flow Demand

Project Name: Dixie Outlet Mall
Project Numbe 19410
Location: Mississauga, Ontario
Date: 5-Dec-22
Prepared by: PB

From MOE's Design Guidelines for Drinking-Water Systems

Table 8-1: Fire Flow Requirements

EQUIVALENT POPULATION[1]	SUGGESTED FIRE FLOW (L/s)	DURATION (HOURS)
500 – 1 000	38 (10 ft/s)	2
1 000	64 (17 ft/s)	2
1 500	79 (21 ft/s)	2
2 000	95 (25 ft/s)	2
3 000	110 (29 ft/s)	2
4 000	125 (33 ft/s)	2
5 000	144 (38 ft/s)	2
6 000	159 (42 ft/s)	3
10 000	189 (50 ft/s)	3
13 000	220 (58 ft/s)	3
17 000	250 (66 ft/s)	4
27 000	318 (84 ft/s)	5
33 000	348 (92 ft/s)	5
40 000	378 (100 ft/s)	6

Note [1]: When determining the fire flow allowance for commercial or industrial areas, it is recommended that the area occupied by the commercial/industrial complex be considered at an equivalent population density to the surrounding residential lands.

Excerpt from Table 8-1

Pop	Fire Flow (L/s)	Duration (hrs)
3000	110	2
4000	125	2

Interpolation for equivalent population

3410	116	2.00

APPENDIX C

STORMWATER MANAGEMENT CALCULATIONS

Rational Method

Project No:		19410	
Project Name:		Dixie Mall	
Storm Event:		2	years
ABC's:	a	610	
	b	4.6	
	c	0.78	
Time of Concentration:	t	15	min
Runoff Coefficient:	C	0.5	
Site Area	A	2.87	ha
Intensity [i=a/(t+b)c] or [i=a*tb] if B=0	i	59.89	mm/hr
Flow [Q=CiA/360]	Q	0.24	m^3/s
		239	l/s

Modified Rational Calculation

Project Name: Dixie Mall
Project Number: 19410

Rainfall Data			
Location:	Mississauga	a	1450.00
Event	100	b	4.90
		c	0.78

Block ID	Area (ha)	Runoff Coefficient	t_c (min)	Storage Required (m^3)	Release Rate (m^3/s)	Storage/ Area (m^3/ha)
101	0.71	0.34	15	31	0.059	44
102	0.51	1.00	15	154	0.042	303
103	0.47	1.00	15	142	0.039	303
104	0.58	1.00	15	176	0.048	303
Temp Garden	0.60	0.84	15	140	0.050	233
TOTAL	2.87			643	0.239	

Modified Rational **Area:** **101**

Project Name: Dixie Mall
Project Number: 19410

Rainfall Data			
Location:	Mississauga	a	1450.000
Event	100	b	4.900
		c	0.780

Site Data		
Area	0.71	ha
Runoff Coefficient	0.34	
AC	0.24	
Tc	15	
Time Increment	10	
Release Rate	59	l/s
Storage Required	31	m^3

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (m3/s)	Runoff Volume (m3)	Released Volume (m3)	Storage Volume (m3)	
15	141	0.09	84	53	31	********
25	102	0.07	102	89	14	
35	82	0.05	114	124	-10	
45	69	0.05	124	159	-36	
55	60	0.04	131	195	-64	
65	53	0.04	137	230	-93	
75	48	0.03	143	266	-123	
85	43	0.03	147	301	-154	
95	40	0.03	152	337	-185	
105	37	0.02	156	372	-216	
115	35	0.02	159	408	-248	
125	33	0.02	163	443	-280	
135	31	0.02	166	478	-313	
145	29	0.02	169	514	-345	
155	28	0.02	172	549	-378	
165	26	0.02	174	585	-411	
175	25	0.02	177	620	-443	
185	24	0.02	179	656	-477	
195	23	0.02	181	691	-510	
205	22	0.01	184	726	-543	
215	22	0.01	186	762	-576	

Modified Rational **Area:** **102**

Project Name: Dixie Mall
Project Number: 19410

Rainfall Data			
Location:	Mississauga	a	1450.000
Event	100	b	4.900
		c	0.780

Site Data		
Area	0.51	ha
Runoff Coefficient	1.00	
AC	0.51	
Tc	15	
Time Increment	10	
Release Rate	42	l/s
Storage Required	154	m^3

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (m3/s)	Runoff Volume (m3)	Released Volume (m3)	Storage Volume (m3)	
15	141	0.20	180	38	141	
25	102	0.15	218	64	154	
35	82	0.12	243	89	154	********
45	69	0.10	263	115	148	
55	60	0.08	279	140	139	
65	53	0.07	292	165	127	
75	48	0.07	304	191	113	
85	43	0.06	314	216	97	
95	40	0.06	323	242	81	
105	37	0.05	331	267	64	
115	35	0.05	339	293	46	
125	33	0.05	346	318	28	
135	31	0.04	353	344	9	
145	29	0.04	359	369	-10	
155	28	0.04	365	395	-29	
165	26	0.04	371	420	-49	
175	25	0.04	376	445	-69	
185	24	0.03	381	471	-90	
195	23	0.03	386	496	-110	
205	22	0.03	391	522	-131	
215	22	0.03	395	547	-152	

Modified Rational **Area:** **103**

Project Name: Dixie Mall
Project Number: 19410

Rainfall Data			
Location:	Mississauga	a	1450.000
Event	100	b	4.900
		c	0.780

Site Data		
Area	0.47	ha
Runoff Coefficient	1.00	
AC	0.47	
Tc	15	
Time Increment	10	
Release Rate	39	l/s
Storage Required	142	m^3

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (m3/s)	Runoff Volume (m3)	Released Volume (m3)	Storage Volume (m3)	
15	141	0.18	165	35	130	
25	102	0.13	201	59	142	
35	82	0.11	224	82	142	********
45	69	0.09	242	106	137	
55	60	0.08	257	129	128	
65	53	0.07	269	152	117	
75	48	0.06	280	176	104	
85	43	0.06	289	199	90	
95	40	0.05	298	223	75	
105	37	0.05	305	246	59	
115	35	0.05	313	270	43	
125	33	0.04	319	293	26	
135	31	0.04	325	317	9	
145	29	0.04	331	340	-9	
155	28	0.04	337	364	-27	
165	26	0.03	342	387	-45	
175	25	0.03	347	411	-64	
185	24	0.03	351	434	-83	
195	23	0.03	356	457	-102	
205	22	0.03	360	481	-121	
215	22	0.03	364	504	-140	

Modified Rational **Area:** **104**

Project Name: Dixie Mall
Project Number: 19410

Rainfall Data			
Location:	Mississauga	a	1450.000
Event	100	b	4.900
		c	0.780

Site Data		
Area	0.58	ha
Runoff Coefficient	1.00	
AC	0.58	
Tc	15	
Time Increment	10	
Release Rate	48	l/s
Storage Required	176	m^3

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (m3/s)	Runoff Volume (m3)	Released Volume (m3)	Storage Volume (m3)	
15	141	0.23	204	43	161	
25	102	0.17	248	72	175	
35	82	0.13	277	101	176	********
45	69	0.11	299	130	169	
55	60	0.10	317	159	158	
65	53	0.09	332	188	144	
75	48	0.08	345	217	128	
85	43	0.07	357	246	111	
95	40	0.06	367	275	92	
105	37	0.06	377	304	73	
115	35	0.06	386	333	53	
125	33	0.05	394	362	32	
135	31	0.05	401	391	11	
145	29	0.05	409	420	-11	
155	28	0.04	415	449	-33	
165	26	0.04	422	478	-56	
175	25	0.04	428	507	-79	
185	24	0.04	433	536	-102	
195	23	0.04	439	564	-126	
205	22	0.04	444	593	-149	
215	22	0.03	449	622	-173	

Modified Rational **Area:** **Temp Garden**

Project Name: Dixie Mall
Project Number: 19410

Rainfall Data			
Location:	Mississauga	a	1450.000
Event	100	b	4.900
		c	0.780

Site Data		
Area	0.60	ha
Runoff Coefficient	0.84	
AC	0.50	
Tc	15	
Time Increment	10	
Release Rate	50	l/s
Storage Required	140	m^3

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (m3/s)	Runoff Volume (m3)	Released Volume (m3)	Storage Volume (m3)	
15	141	0.20	177	45	132	
25	102	0.14	215	75	140	********
35	82	0.11	240	105	135	
45	69	0.10	259	135	124	
55	60	0.08	275	165	110	
65	53	0.07	288	195	93	
75	48	0.07	299	225	74	
85	43	0.06	309	255	55	
95	40	0.06	318	284	34	
105	37	0.05	327	314	12	
115	35	0.05	334	344	-10	
125	33	0.05	341	374	-33	
135	31	0.04	348	404	-56	
145	29	0.04	354	434	-80	
155	28	0.04	360	464	-104	
165	26	0.04	365	494	-129	
175	25	0.04	371	524	-154	
185	24	0.03	376	554	-178	
195	23	0.03	380	584	-204	
205	22	0.03	385	614	-229	
215	22	0.03	389	644	-255	

Storm Sewer Design Sheet (Rational Method)

Project Name: Dixie Outlet Mall
Project Number: 19410
Location: Mississauga, ON
Date: 10/31/2022
Prepared by: ARV

Rainfall Data	(Main Storm Event)	(Additional design storm events, if needed)				
	10yr					
a	1010.00					
b	4.60					
c	0.78					

Manning's Roughness Coefficient 0.013

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Description	Upstream Node	Downstream Node	Pipe Shape	Pipe Diameter OR Span/Rise (mm)	Length (m)	Slope (%)	Area (ha)	C	A x C (ha)	Accumulative A x C (ha)	Design Event	Intensity (mm/hr)	Time of Concentration (min)	Area Flow (l/s)	Other Flows	Total Flow (l/s)	Actual Diamete (m)	Pipe Area (m2)	Hydraulic Radius (m)	Material	Pipe Capacity (l/s)	Velocity (m/s)	Time of Flow (min)	Ratio (Flow to Capacity)	OK?
Block 4	STUB	MH3	Circular	375	29	1.00%	0.58	0.9	0.522	0.522	10yr	99.17	15	143.79	0	143.79	0.3810	0.1140	0.0953	PVC	182.91	1.60	0.30	0.79	YES
	MH3	MH2	Circular	450	51.8	1.00%	0	0.9	0	0.522	10yr	97.99	15.30	142.09	0	142.09	0.4480	0.1576	0.1120	PVC	281.74	1.79	0.48	0.50	YES
BLOCK 2 & BLOCK 3	MH5	MH4	Circular	525	92.9	1.00%	0.98	0.9	0.882	0.882	10yr	99.17	15	242.96	0	242.96	0.5334	0.2235	0.1334	CONC	448.66	2.01	0.77	0.54	YES
GARDEN	CBMH6	MH4	Circular	375	25.1	1.00%	0.6	0.67	0.402	0.402	10yr	99.17	15	110.74	0	110.74	0.3810	0.1140	0.0953	PVC	182.91	1.60	0.26	0.61	YES
107 (Fut. Condo)	PLUG	MH4	Circular	375	10.3	1.00%	0.59	0.9	0.531	0.531	10yr	99.17	15	146.27	0	146.27	0.3810	0.1140	0.0953	PVC	182.91	1.60	0.11	0.80	YES
	MH4	MH2	Circular	600	22.7	1.00%	0	0.9	0	1.815	10yr	96.23	15.77	485.14	0	485.14	0.6096	0.2919	0.1524	CONC	640.56	2.19	0.17	0.76	YES
	MH2	MH1	Circular	675	50	1.00%	0	0.9	0	2.337	10yr	95.59	15.94	620.57	0	620.57	0.6858	0.3694	0.1715	CONC	876.93	2.37	0.35	0.71	YES
	MH1	CULVERT	Circular	675	15	1.00%	0	0.9	0	2.337	10yr	94.34	16.29	612.42	0	612.42	0.6858	0.3694	0.1715	CONC	876.93	2.37	0.11	0.70	YES
BLOCK 1	EX. STM CB59	EX STM MH58	Circular	250	47.7	2.52%	0.71	0.3	0.213	0.213	10yr	99.17	15	58.67	0	58.67	0.2510	0.0495	0.0628	PVC	95.41	1.93	0.41	0.61	YES
EXISTING DRAINAGE	EX STM MH58	EX. STM CB45	Circular	450	94.4	1.81%	0	0.9	0	0.213	10yr	97.57	15.41	57.73	0	57.73	0.4480	0.1576	0.1120	PVC	379.04	2.40	0.65	0.15	YES
EXISTING DRAINAGE	EX. STM CB45	EX. STM MH61	Circular	450	78.7	1.30%	0.28	0.9	0.252	0.465	10yr	95.15	16.07	122.90	0	122.90	0.4480	0.1576	0.1120	PVC	321.23	2.04	0.64	0.38	YES
EXISTING DRAINAGE	EX. STM MH61	CULVERT	Circular	450	14.5	1.30%	0.16	0.9	0.144	0.609	10yr	92.90	16.71	157.16	0	157.16	0.4480	0.1576	0.1120	PVC	321.23	2.04	0.12	0.49	YES