FUNCTIONAL SERVICING &
STORMWATER MANAGEMENT REPORT
6728 Sixth Line, Town of Milton ON L9T 2Y3

December 22, 2023

Prepared for:
Anatolia Capital Corporation

Prepared by:
Stantec Consulting Ltd.
300-675 Cochrane Drive
Markham ON L3R 0B8

Project Number:
160623071

Revision	Description	Author	Date	Quality Check	Date	Independent Review	Date
0	1st Submission	SV	05-2023	AP	05-2023	LZ	05-2023
1	2nd Submission	SV	12-2023	AP	12-2023		

The conclusions in the Report titled Functional Servicing & Stormwater Management Report are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

Stantec has assumed all information received from Anatolia Capital Corporation (the "Client") and third parties in the preparation of the Report to be correct. While Stantec has exercised a customary level of judgment or due diligence in the use of such information, Stantec assumes no responsibility for the consequences of any error or omission contained therein.

This Report is intended solely for use by the Client in accordance with Stantec's contract with the Client. While the Report may be provided to applicable authorities having jurisdiction and others for whom the Client is responsible, Stantec does not warrant the services to any third party. The report may not be relied upon by any other party without the express written consent of Stantec, which may be withheld at Stantec's discretion.

Prepared by: _____
Signature

_____
Sandra Vrban, M.A.Sc. P.Eng

Reviewed by: _____
Signature

_____
Amber Palmer, P.Eng

Approved by: _____
Signature

_____
Leila Zavareh, M.Eng., P.Eng

Table of Contents

1 INTRODUCTION & SITE DESCRIPTION 1
1.1 Site Description 2
1.1.1 Existing Conditions 2
1.1.2 Proposed Conditions 3
1.2 Concurrent and Previous Studies 3

2 ENVIRONMENTAL OPPORTUNITIES 4
2.1 Watercourses 4
2.2 Wetland Compensation 4
2.3 Invasive and Non-Native Plant Species Control 5

3 CONCEPTUAL GRADING AND ROAD ACCESS 6
3.1 Existing Soil Conditions – Geotechnical Information 6
3.2 Grading Design 7
3.2.1 Design Constraints and Procedures 7
3.2.2 Grading Design Criteria 8
3.2.3 Earthworks 8
3.3 Roadworks 9
3.3.1 Fifth Line 9
3.3.2 Sixth Line 9
3.3.3 Derry Road 9
3.3.4 Clark Boulevard 9

4 STORMWATER MANAGEMENT 11
4.1 Background and Objectives 11
4.1.1 Quality Treatment 11
4.1.2 Thermal Mitigation 12
4.1.3 Quantity Storage Unitary Rates 13
4.1.4 Allowable Discharge Unitary Release Rates 14
4.1.5 Hydrologic Verification 14
4.2 Drainage Conditions 16
4.2.1 Existing Drainage 16
4.2.2 Proposed Drainage 17
4.3 Stormwater Management Approach 19
4.3.1 Lot Level and Conveyance 19
4.3.2 End of Pipe 23
4.3.3 Summary 24
4.4 Proposed Stormwater Management Plan 24
4.5 End-Of-Pipe Facility Design 25
4.5.1 SWM Facility S4-1B-1 25
4.5.2 SWM Facility S4-1B-2 26
4.5.3 SWM Facility S4-1B-3 27
4.5.4 SWM Facility S4-1B-4 28
4.5.5 General Design Criteria 28
4.5.6 SWM Pond S5-1 29
4.5.7 SWM Pond S5-2 Quantity Control 30
4.5.8 Quality Treatment 31
4.5.9 Water Balance 31

5 WATERCOURSES 32
5.1 Introduction and Background 32

5.1.1 Reach BP-1-A ... 32
5.1.2 Reach BP-1-B ... 32
5.2 Existing Meander Belt Analysis ... 32
5.3 Conceptual Natural Corridor Design ... 32
5.3.1 Design Objectives ... 32
5.3.2 Channel Planform ... 33
5.3.3 Bankfull Channel ... 33
5.3.4 Corridor Requirements ... 33
5.3.5 Hydraulic Substrate Sizing ... 34
5.3.6 Design Elements ... 34
5.3.7 Crossing Span Recommendations for Reach BP-1-B ... 35
5.3.8 Interim and Long-Term Channel Conditions ... 36
5.3.9 Site Restoration Recommendations ... 37
5.4 Hydraulic Analyses ... 37
5.4.1 Proposed Crossings ... 37

6 WATER SUPPLY AND DISTRIBUTION ... 39
6.1 Water System Assessment ... 39
6.1.1 Existing and Proposed Conditions ... 39
6.1.2 Existing Water Supply ... 39
6.1.3 Proposed Water Distribution System ... 39
6.1.4 Overview ... 40
6.1.5 Methodology ... 40
6.1.6 Fire Demands ... 41
6.1.7 System Pressure Requirements ... 42
6.1.8 Analysis ... 42

7 SANITARY SEWER DESIGN ... 44
7.1 Background ... 44
7.2 Proposed Sanitary Sewer System ... 44

8 STORM SEWER DESIGN ... 46
8.1 Background ... 46
8.2 Proposed Storm Drainage System ... 46

9 SITE EROSION AND SEDIMENT CONTROL ... 47

10 UTILITIES ... 48

11 PHASING AND CONSTRUCTION STAGING ... 49

12 POST CONSTRUCTION SITE MONITORING ... 51

13 CONCLUSIONS AND RECOMMENDATIONS ... 52

LIST OF TABLES

Table 4.1 – 2003 MOE Water Quality Storage Requirements based on Receiving Waters 12
Table 4.2 – FSEMS Quantity Storage Unitary Rates for the Derry Green Business Park 13
Table 4.3 – FSEMS Peak Discharge for SWM Facilities in the Derry Green Business Park 14
Table 4.4 – Revised Storage Discharge Relationship for SWM Facilities S5-1 and S5-2 within SIS 4 and SIS 5A 15
Table 4.5 – Summary of Required Storage and Allowable Release Rates 16
Table 4.6 – LID Evaluation Matrix 20
Table 4.7 – Recommended SWM Practices 24
Table 4.8 – Preferred SWM Practices 25
Table 4.9 – Summary of Allowable and Proposed Quantity Control for SWM Facility S4-1B-1 25
Table 4.10 – Summary of Allowable and Proposed Quantity Control for SWM Facility S4-1B-2 26
Table 4.11 – Summary of Allowable and Proposed Quantity Control for SWM Facility S4-1B-3 27
Table 4.12 – Summary of Allowable and Proposed Quantity Control for SWM Facility S4-1B-4 28
Table 4.13 – Summary of Allowable and Proposed Quantity Control for SWM Facility S4-1B-4 30
Table 4.14 – Summary of Quality Treatment Provided by SWM Pond S5-1 30
Table 4.15 – Summary of Allowable and Proposed Quantity Control for SWM Facility S5-2 31
Table 4.16 – Summary of Quality Treatment Provided by SWM Pond S5-2 31
Table 5.1 – Summary of Bankfull Discharges for Realigned Reaches BP-1-A and BP-1-B 33
Table 5.2 – Summary of Proposed Corridor Dimensions 34
Table 5.3 – Proposed Condition Realigned Reach BP-1-A Crossing 38
Table 5.4 – Proposed Condition Realigned Reach BP-1-B Crossing 38
Table 6.1 – Water Distribution Design Criteria 41
Table 6.2 – Water Demand 41
Table 6.3 – Fire Flow Requirements 42
Table 6.4 – Hazen-Williams Roughness Factors 42
Table 6.5 – Modeled Service Pressures 43
Table 7.1 – Sanitary Sewer Design Parameters 45
Table 8.1 – Storm Sewer System Design Parameters 46

LIST OF APPENDICES

APPENDIX A DRAWINGS

A.1 Site Plan
A.2 As-Builts
DWG G042 – ZONE 4 FEEDERMAINS P&P (STA 0+000 TO 0+280)
DWG G043 – ZONE 4 FEEDERMAINS P&P (STA 0+280 TO 0+560)
DWG G044 – ZONE 4 FEEDERMAINS P&P (STA 0+560 TO 0+840)
DWG G045 – ZONE 4 FEEDERMAINS P&P (STA 0+840 TO 1+120)
DWG G046 – ZONE 4 FEEDERMAINS P&P (STA 1+120 TO 1+400)
DWG G047 – ZONE 4 FEEDERMAINS P&P (STA 1+400 TO 1+680)
DWG PP7 – FIFTH LINE WTM & SAN SEWER (STA 11+710 TO 12+000)
DWG PP8 – FIFTH LINE WTM & SAN SEWER (STA 12+00 TO 12+290)
DWG PP9 – FIFTH LINE WTM & SAN SEWER (STA 12+290 TO 12+570)
DWG PP10 – FIFTH LINE WTM (STA 12+570 TO 12+860)
DWG PP11 – FIFTH LINE WTM (STA 12+860 TO 13+150)
DWG PP1 – DERRY ROAD WTM & SAN SEWER (0+000 TO 0+280)
DWG PP2 – DERRY ROAD WTM & SAN SEWER (0+280 TO 0+560)
DWG PP3 – DERRY ROAD WTM & SAN SEWER (0+280 TO 0+560)
A.3 Engineering Drawings and Figures
Figure 1.1 – Site Location Plan
Drawing 3.1 – Grading PLan

Drawing 3.2 – Grading PLan
Drawing 3.3 – Cut-Fill Analysis
Drawing 3.4 – Derry Road P&P
Drawing 3.5 – Clark Boulevard P&P
Figure 3.1 – 26.0 ROW Cross-Section Clark Boulevard
Figure 4.1 – Pre-Development Drainage Plan
Figure 4.2 – Post-Development Drainage Plan
Figure 4.3 – Pond S5-1 Plan View
Figure 4.4 – Pond S5-1 Cross-Section
Figure 4.5 – Pond S5-2 Plan View
Figure 4.6 – Pond S5-2 Cross-Section
Figure 5.1 – Channel Plan View
Figure 5.2 – Clark Boulevard Culvert Detail
Figure 6.1 – Water Servicing Plan
Figure 7.1 – Sanitary Servicing Plan

APPENDIX B WATER DISTRIBUTION ANALYSIS

APPENDIX C STORM SEWER & SANITARY SEWER DESIGN SHEETS

APPENDIX D STORMWATER MANAGEMENT CALCULATIONS

APPENDIX E BACKGROUND INFORMATION

E.1 Town of Milton Schedule C-9-C
E.2 SIS 3A Addendum, SIS 3B, SIS 4A, and SIS 5A Addendum Excerpts
E.3 GEO Morphix Fluvial Geomorphology Reports

1 Introduction & Site Description

Stantec Consulting Ltd. (Stantec) has been retained by Anatolia Capital Corporation (Anatolia) to prepare a Functional Servicing and Stormwater Management Report (FSSWMR) in support of the proposed Official Plan Amendment, Zoning By-Law Amendment, and Site Plan Approval Applications for the proposed industrial buildings within the Anatolia Lands (referred to as the Subject Lands).

The Anatolia Lands are approximately 62.49 ha in size, with a total developable area of 45.90 ha, located within Subwatershed Impact Study (SIS) Areas 4 and 5A, and are bound by Derry Road to the north, Sixth Line to the east, Trans Canada Pipe Line (TCPL) easement to the South, and Greenland/woodlot to the west. The development is proposed to consist of the following, as shown on the Draft Plan prepared by GSAI, dated November 28, 2023 and Site Plan prepared by Ware Malcomb, dated November 28, 2023 provided in **Appendix A.1**:

- Three (3) industrial building blocks including parking and landscaped areas and one (1) private stormwater pond within industrial block 3;
- One (1) commercial block;
- One (1) stormwater management block and buffer block;
- Future channel BP-1-A and BP-1-B re-alignments (natural heritage system blocks and buffer blocks);
- Road widenings for Derry Road and Sixth Line; and,
- Clark Boulevard extension.

The Subject Lands are located within the Derry Green Corporate Business Park Secondary Plan Area (OPA 29), in the Town of Milton, Regional Municipality of Halton, Ontario. **Figure 1.1** illustrates the location of the Subject Lands, and surrounding lands.

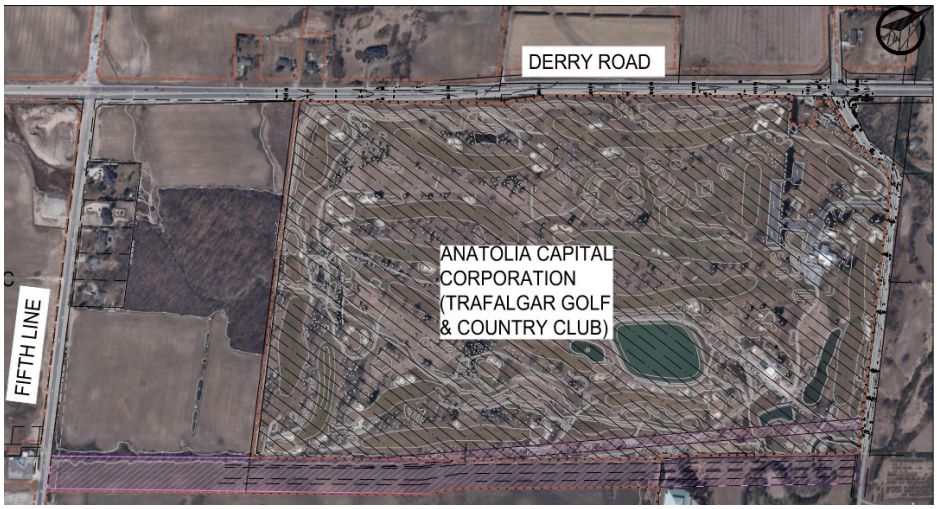


Figure 1.1 Site Location

This FSSWMR has been prepared to address the municipal servicing strategies for the Site including grading and road works, sanitary wastewater collection, water supply and distribution, stormwater servicing and the provision of utilities (electricity, telecommunications, and natural gas). This report is to be read in conjunction with the other technical documents submitted with the planning application, as outlined further in **Section 1.2**.

The servicing strategies presented in this report are conceptual. Detailed engineering drawings for the design of municipal infrastructure (storm drainage, sanitary drainage, water supply and distribution and road works), utilities, and site grading will be submitted to Town of Milton (Town) and Agency review following Draft Plan Approval. All infrastructure works will be designed and constructed to Town of Milton and Halton Region standards and specifications as required.

For the purposes of this report, directional references contained herein assume Fifth Line and Sixth Line run north and south adjacent to the Site. As such Sixth Line is referred to as east of the Site and Fifth Line, west of the Site. All other directional references follow the same assumption.

1.1 Site Description

1.1.1 Existing Conditions

The Site is comprised of the decommissioned Trafalgar Golf & Country Club lands. Surrounding existing land uses primarily consist of agricultural to the north, east, and west, and Natural Heritage System (NHS) to the south.

Site topography generally slopes southeast towards the confluence of reach BP-1-A and BP-1-B located at the southeast corner of the site, which ultimately discharges to Sixteen Mile Creek. Reach BP-1-A conveys flow from external lands to the north and flows from north to south across the site within a pipe. Existing watercourse BP-1-B conveys flow from external lands to the northwest and flows from west to east across the site.

1.1.2 Proposed Conditions

The Subject Lands will be designated as Prestige Business Park and will consist of light industrial and warehouse employment uses spanning three development blocks as well as a commercial block. Additional land use designations within the site include the future natural heritage system blocks and buffers for the realignment of watercourses BP-1-A and BP-1-B, one (1) public stormwater management pond block and buffer block, and the extension of a municipal road identified as Clark Boulevard from the southern property line north to Derry Road. The three development blocks are proposed to consist of three industrial buildings as shown on the enclosed Site Plan prepared by Ware Malcomb (**Appendix A.1**), including parking areas, drive aisles, landscaped areas, and one private pond. Development of the lands will proceed through the Draft Plan of Subdivision process. The lands will be on full municipal services including water, sanitary sewers, storm sewers, and utilities (electricity, telecommunications, and natural gas).

1.2 Concurrent and Previous Studies

Previous studies have been completed in support of the Derry Green Business Park Secondary Plan and development of the Subject Lands. These studies are relied upon to provide the appropriate criteria that apply to this design. The studies are listed below:

- "*Subwatershed Impact Study – SIS Area 3A Addendum, 3B and 4"*, prepared by Stantec Consulting Ltd. et al., dated April 2023;
- "*Subwatershed Impact Study – SIS Area 5 Addendum"*, prepared by Stantec Consulting Ltd. et al., dated April 2023;
- *"Erosion and Sediment Control Report – Anatolia Investments Corporation"*, prepared by Stantec Consulting Ltd., dated February 2023;
- *"Functional Stormwater and Environmental Management Strategy (FSEMS) – Derry Green Corporate Business Park Secondary Plan Area",* prepared by AMEC Environment and Infrastructure dated 2015;
- *"Preliminary Geotechnical Investigation – Derry Green SIS Area"*, prepared by AME Materials Engineering, dated August 2019;
- *"Hydrogeological Investigation – Derry Green Corporate Business Park SIS 3A, 3B, and 4"* prepared by Stantec Consulting Ltd., dated March 2022.
- *"Derry Green Business Park, Water and Wastewater Servicing Area Servicing Plan"*, prepared by AMEC Environmental & Infrastructure dated September 2012

2 Environmental Opportunities

2.1 Watercourses

As noted in **Section 1.1**, two tributaries of the Sixteen Mile Creek, reach BP-1-A and reach BP-1-B, traverse the Site. The tributaries are classified as Natural Heritage Systems (NHS) due to their potential function as natural corridors for wildlife movement. As described in the SIS 3A Addendum, SIS 3B/4, and SIS 5A Addendum, the proposed realignment of these watercourses will include increased corridor widths with riparian wetlands as well as online, offline, and side channel features. The primary objective with the tributary realignments is enhancement of the natural corridor and wildlife habitat. In addition, there will be an improvement to the aquatic habitation function, including mitigation to replace and improve the limited habitats provided on site in the existing condition. Further details on the design of the watercourse realignments are provided in **Section 5** of this report.

2.2 Wetland Compensation

The SIS 3A Addendum and SIS 3B/4 identified three wetlands within existing reach BP-1-B, identified as Wetland G (Mixed Graminoid Mineral Meadow Marsh), Wetland H (Mixed Mineral Meadow Marsh), and Wetland I (Mixed Graminoid Mineral Meadow Marsh), as presented on **Figure 2.5** (**Appendix E.2**).

The proposed condition will provide opportunities for wetland compensation as described in the SIS 3A Addendum and SIS 3B/4:

"…approximately 2.487 ha of wetlands will be created through the daylighting of Reach BP-1-A and creation of its associated corridor. The proposed BP-1-A corridor will include offline and online wetland features that will increase habitat diversity and provide a more natural floodplain form. The offline features will be designed to capture flow from the tributary when water levels are above base flow and some features will also be fed by swales within the corridor. In addition, Pond 2 will be retained within the proposed corridor. It is proposed that the newly created wetlands be constructed using habitat restoration design to maximize the potential for wildlife use per direction in the FSEMS and Town of Milton Restoration Framework.

These features have also been incorporated into the natural channel design for the proposed enhancement and realignment of BP-1-B-1 and BP-1-B as well. Further, along Derry Road, enhanced swales with salt tolerant plants are proposed to mitigate water quality impacts from Derry Road."

In addition to the input from the channels, the future wetland compensation features will also be fed with clean water from rooftops within the proposed development upstream of the Site.

2.3 Invasive and Non-Native Plant Species Control

As noted in the SIS 3A Addendum and SIS 3B/4:

"Physical site disturbance may increase the likelihood that non-native and/or invasive flora species will be introduced to the surrounding vegetation communities. Invasive flora can establish in disturbed sites more efficiently than native flora and can then encroach into adjacent undisturbed areas. Landscaping and Planting Plans should be developed as part of the detailed design stage. Proposed plantings should consist of natural native plant species listed in the 2018 Conservation Halton Native Plant Species List and follow established guidelines such as CH's Guidelines for Landscaping and Rehabilitation Plans (June 2021)."

The requirements and implementation of invasive and on-native plant species control activities will be determined by the post-construction ecological monitoring results and recommendations. For details, refer to **Section 9.0** of the SIS 3A Addendum and SIS 3B/4 for detailed information.

3 Conceptual Grading and Road Access

3.1 Existing Soil Conditions – Geotechnical Information

Three geotechnical investigations have been carried out for the site:

- Preliminary Geotechnical Investigation, by Forward Engineering, September 2018; and
- Preliminary Geotechnical Investigation, by AME Materials Engineering (AME), August 2019.

Forward Engineering's investigation consisted of twenty-four (24) boreholes, with depths ranging from 1.5 to 6.5 m below existing ground surface level (EGSL), located within the existing golf course. The investigation concentrated in the areas within the existing golf course. The summarized conclusions have been highlighted below:

- A layer of topsoil/organic soil was encountered at the surface of all the boreholes with a thickness ranging from about 150 to 380 mm;
- A layer of fill/disturbed soil was found below the topsoil/organic soil layer in 17 out of the 24 boreholes with thickness ranging from 0.25 to 3.35 m below EGSL; and
- Based on the encountered subsoil conditions, the proposed industrial/commercial building structures can be supported on conventional footings established on the undisturbed, native stiff to very stiff clayey silt till, at or below depths ranging between 1.0 and 3.5 m below EGSL.

For more detailed geotechnical information, refer to the Preliminary Geotechnical Investigations noted above.

AME's preliminary investigation consisted of twenty (20) boreholes including eighteen (18) monitoring wells. The boreholes are spread out within a larger area that includes adjacent lands, with depths ranging from 5 m to 8 m below existing ground surface level (EGSL). The summarized conclusions have been highlighted below:

- Topsoil was encountered in almost all boreholes. The thickness of the topsoil varied between approximately 100 mm and 400 mm with an average thickness of 250 mm;
- Fine grained fill material or disturbed soil were found underlying the topsoil at ground surface to depth's ranging from 0.25 m to 0.61 m below grade with a thickness between 300 mm to 500 mm approximately. The fill material is composed of sandy silt to silt, silty sand and clayey silt texture with trace to some gravel and organic material;
- Underlaying relatively thin layer of fill/disturbed soil, majority of the boreholes encountered undisturbed/native cohesive soil layer of clayey silt deposits or fine to coarse grained non-cohesive matrix of silt, sandy silt to sandy gravelly silt deposit;

- The existing topsoil, earth fill is considered to be unsuitable for the support of building foundations. The underlying undisturbed, native sandy silt to clayey silt/sandy silt till throughout the site are considered suitable for the support of house foundation on conventional spread or strip footings;
- Minimum pavement design recommendations:
    - Internal Driveway Aisles and Loading Zone
        - 40 mm HL3 - Surface Asphalt
        - 40 mm HL8 – Light Duty Base Asphalt
        - 60 mm HL8 – Heavy Duty Base Asphalt
        - 150 mm Crushed Limestone - Granular Base
        - 200 mm Granular B – Light Duty Granular Sub-Base
        - 300 mm Granular B – Heavy Duty Granular Sub-Base
    - Clark Boulevard (Town Standard for Collector Road)
        - 40 mm HL3 HS – Surface Asphalt
        - 100 mm HL8 HS – Base Asphalt
        - 150 mm Granular A – Granular Base
        - 375 mm Granular B Type II – Granular Sub-Base

For more detailed geotechnical information, refer to the previously noted geotechnical reports.

3.2 Grading Design

3.2.1 Design Constraints and Procedures

Constraints in designing the road profile and site grading are as follows:

- Raise the Site to accommodate channel block and SWM Pond S5-1, SWM Pond S-2 and private SWM facility S4-1B, as outlined in the SIS, while trying to match existing grades along the development limits of the Site.
- Match existing and future road profile grading of Derry Road.
- Match existing (interim) and future road profile grading of Fifth Line at intersection with future Clark Boulevard on neighbouring lands to the south.
- Match existing grading of Union Gas easement and environmental linkage.

- Match existing grading of Natural Heritage System.
- Satisfy the Town's requirements for minimum and maximum road grades.
- Provide major overland flow routes for flows in excess of the storm sewer capacity.
- Maintain adequate cover over storm, sanitary sewers, and watermains.

3.2.2 Grading Design Criteria

The pavement grades for the development will range between a minimum of 0.5% and a maximum of 5%. Within landscaped areas, slopes are proposed to be from 0.5% to 5% or 3:1 slope to accommodate various grade changes within the site, particularly adjacent to the proposed SWM facilities, proposed drainage channels and along various perimeter locations surrounding the site. Retaining walls are shown various locations throughout the site where 3:1 sloping cannot be accommodated. Refer to **Drawing 3.1** for the proposed grading plan.

3.2.3 Earthworks

Cut and fill operations are required to provide positive drainage for local services, address topographic/environmental constraints, and accommodate the required channel realignment and proposed SWM Facilities. As a result, it is anticipated that a significant earthwork operations will be required. Preliminary earthworks calculations have been performed to estimate the cut and fill quantities. Based on the preliminary road profiles and site grading; the conceptual design indicates an export volume in the range of approximately 211,000 m^3 for the Subject Lands. It is anticipated that the existing ponds within the golf course consist of unsuitable material that needs to be sub-excavated, the quantity should be verified by further geotechnical investigation. Furthermore, there are five underground tanks and two surface LID measures proposed for the Site, which will further increase the amount of cut. Note that the estimated cut/fill volumes are preliminary in nature can vary significantly in detail design.

Excess topsoil material is to be minimized by designating a portion of it to be used as fill material within specific areas of the site (i.e., proposed channels, SWM Facilities, and landscaped areas). Additionally, surplus topsoil material is to be disposed of off-site.

Importing and exporting of fill and topsoil should be managed in accordance with O.Reg. 406/19 'On-site and Excess soil Management', and 'Management of Excess Soil – A guideline for Best Management Practices' (Government of Ontario, 2019). In addition, comprehensive Sediment and Erosion Control plans will be prepared as part of any future Site Alteration Permit applications, based on current guidelines in place.

During detailed design, adjustments to the road profile and site grading are anticipated to further refine the earthworks and on-site soil management.

Refer to **Drawing 3.2** for the areas, depths, and quantity summery of the anticipated cut and fill required based on the proposed preliminary grading design.

3.3 Roadworks

3.3.1 Fifth Line

Fifth Line is currently a Town of Milton Major Arterial right-of-way (ROW). An Environmental Assessment (EA) study was undertaken by the Town for Fifth Line from Derry Road to Britannia Road and filed on October 2016. The EA concluded that the current 2-lane rural cross section ROW is to be widened to an urban 4-lane section within a 37.5 m ROW. This included a proposed realignment of the roadway and centerline. For the section of Fifth Line that fronts SIS Area 3A (approximately Station 9+200 to 10+000), the alignment is to be shifted slightly to the east and then to the west prior to connecting Derry Road. In terms of profile, the existing road is proposed to be raised between 0.5 m to 1.5 m.

It should be noted that Halton Region has indicated that consideration of a future 6 lane configuration of Fifth Line within a future 47.0 m road right-of-way, which is to be considered during the design and development of the Site. Through discussions with the Town, detail design of Fifth Line is anticipated to commence in 2022, with construction anticipated to start by 2024/2025.

3.3.2 Sixth Line

Sixth Line is currently a Town of Milton two-lane rural roadway. The Town of Milton is proposing to widen Sixth Line to an urbanized four-lane road. An EA for the proposed widening is anticipated to occur in 2024 with construction to follow possibly between 2027 and 2029. A portion of Sixth Line is within the Regional floodline as illustrated on **Drawing 3.1**. The proposed driveway access to Building 3 is outside of the Regional floodline.

3.3.3 Derry Road

Derry Road is a Regional ROW constructed to a 4-lane urban cross section. Derry Road will be upgraded in the future to allow for on road bike lane and Multi-Use Trail within the boulevard on both sides by approximately 2031. It is understood that the existing road profile will be maintained through the urbanization. Please refer to **Drawings 3.3** and **3.4** for Derry Road existing plan and profile information.

3.3.4 Clark Boulevard

Clark Boulevard is a Town of Milton major collector road with a ROW width of 26 m constructed to an urban cross section. Clark Boulevard is proposed to be extended through the Site from the existing Union Gas easement to Derry Road, as per the Towns Transportation Master Plan (TMP). The preliminary alignment illustrated on the plan herein is based on the following:

- Located opposite the proposed west approach to Fifth line being designed as part of the Oxford Business Park. Intersection geometry mirrors that of the west side;
- Design radius of 200m per TAC manual;
- Super-elevation at curve crossing Union Gas easement; and

- Interface at Derry Road to match location illustrated within SIS 5A.

A preliminary road plan and profile concept for Clark Boulevard is illustrated on **Drawings 3.5**, which incorporates longitudinal slopes between 0.5% and 3.0% and will connect to the future grade of Fifth Line at its west limit and the existing elevation of Derry Road at its north limit. Refer to **Figure 3.6** for the Clark Boulevard right-of-way cross section. It is anticipated that Fifth Line reconstruction will be completed prior to the construction of Clark Boulevard, therefore no interim grade transition has been accounted for. This will be re-evaluated at the time of detailed design.

4 Stormwater Management

4.1 Background and Objectives

The FSEMS provides the guidelines for stormwater management for all properties and watercourses within the Derry Green Business Park Secondary Plan Area. These guidelines were developed though an integrated stormwater plan and refined through companion studies including the SIS 3A/3B/4 and SIS 5A Addenda completed in support of the proposed development of the Site and neighbouring properties within the Derry Green Business Park Secondary Plan Area.

Within the Site, an underground SWM Facility, identified as underground SWM Facility S4-1B, is proposed to service Industrial Building 1 block. To fit within the block configuration, underground SWM Facility S4-1B has been discretized into four smaller underground SWM Facilities identified as underground SWM Facility S4-1B-1, S4-1B-2, S4-1B-3, and S4-1B-4.

A public (municipal owned) SWM Pond, identified as SWM Pond S5-1, is proposed to service the Industrial Building 2 block and a portion of the proposed Clark Boulevard right-of-way.

A private SWM Pond, identified as SWM Pond S5-2, is proposed to service the Industrial Building 3 block.

Refer to **Figure 4.2** for the proposed drainage areas and locations of the SWM Facilities.

The stormwater management criteria applied to the design of the stormwater facilities described above have been further refined through companion studies such as the SIS 3A/3B/4 and SIS 5A Addenda prepared by Stantec et al., (April 2023). The criteria, approach, and design of the proposed stormwater management facilities are summarized in the subsequent sections below.

For detailed information, please refer to the SIS 3A/3B/4 and SIS 5A Addenda.

4.1.1 Quality Treatment

Quality control for discharge from the proposed underground SWM Facility and SWM Ponds shall satisfy the Enhanced Level (formerly Level 1) protection level of long-term Total Suspended Solids (TSS) removal, equivalent to an 80% TSS removal rate, per the MECP (formerly MOE) SWM Planning and Design Manual (SWMPDM).

Water quality requirements for traditional SWM Ponds as described in the MECP SWMPDM are summarized in **Table 4.1**. The volumes noted include permanent pool requirements, of which 40m^3/ha is allotted for the extended detention/erosion section of the SWM Pond.

Table 4.1 – 2003 MOE Water Quality Storage Requirements based on Receiving Waters

Protection Level	SWM Type	Storage Volume (m^3/s) [1]			
		35%	55%	70%	85%
Enhanced 80% long-term S.S removal	Infiltration	25	30	35	40
	Wetlands	80	105	120	140
	Hybrid	110	150	175	195
	Wet Pond	140	190	225	250

[1]Of the specified storage volume for wet facilities, 40 m^3/ha is extended detention.

For underground SWM Facilities, the overall stormwater management system must demonstrate an equivalent Enhanced Level 80% TSS removal rate. This is typically achieved via a treatment train of several stormwater quality treatment technologies such as chamber system isolator rows, Low Impact Developments (LIDs), and Manufactured Treatment Devices (MTDs).

4.1.2 Thermal Mitigation

During summer months, outflows from SWM ponds can have higher temperatures than the receiving watercourses, which can lead to adverse impacts on surrounding aquatic habits. Therefore, thermal mitigation of stormwater discharge is an important consideration.

As described above, Industrial Building blocks 2 and 3 will be serviced by SWM Pond S5-1 and S5-2, respectively, which are proposed to be wet pond facilities with deeper permanent pools and bottom draw outlets. The deeper permanent pool allows cooler water to settle near the bottom where is it collected and convey through the bottom draw outlet where temperatures are lower.

Industrial Building block 1 will be serviced by SWM Facility S4-1B (comprised of SWM Facilities S4-1B-1, S4-1B-2, S4-1B-3, and S4-1B-4), which is proposed to be an underground stormwater chamber system and will therefore be significantly insulated from solar radiative heating and will therefore provide thermal mitigation for inflowing stormwater runoff.

Other mitigation measures that can be considered during detailed design stage for suitability and implementation of the SWM Facilities include:

- A bottom-draw pipe situated within the deepest portion of the permanent pool;
- Incorporating berms into the pond to increase the length-to-width ratio of the pond; and resident time within the pond to encourage cooling;
- Incorporate cooling trenches between the SWM pond and ultimate outlet if a deeper permanent pool is not feasible;
- Landscaping of the entire facility and outlet as detailed in the FSEMS and CH's Landscaping Guidelines;

- Incorporate infiltration and evapotranspiration using infiltration galleries and bioswales within the development envelope (where appropriate); and,
- Incorporate a bioswale treatment at the outfall or an outfall pocket wetland with native plantings and additional benefits such as polishing, energy dissipation, and flow dispersion.

4.1.3 Quantity Storage Unitary Rates

The FSEMS prepared by Wood (November 2015) provided quantity storage unitary rates for developments within the Derry Green Business Park Secondary Plan Area, and are therefore applicable in the design of the SWM Facilities proposed to service the Site.

Quantity storage unitary rates per the FSEMS are provided in **Table 4.2** below. Unitary rates corresponding to the Regional storm event were not provided in the FSEMS, and the report indicated that Regional controls would need to be considered at the SIS stage. Analyses completed by Wood as part of the SIS Area 5A established that the Regional storm event quantity storage and allowable discharge unitary rates are approximately double the 100 Year storm event unitary rates. Therefore, this derivation of Regional storm event unitary rates has been applied to the preliminary design of the SWM Facilities servicing the Site.

Limitations in on-site storage options (e.g., parking lot ponding, roof storage through roof controls), may not provide a storage volume capable of attenuating the Regional storm event. Therefore, in areas where SWM ponds are proposed, the SWM Pond blocks are required be sized to provide quantity control storage up to and including the 100 Year storm event based on FSEMS guideline and storage capacity for the Regional storm event per the volume requirements from the applicable SIS study areas (SIS Areas 3A Addendum, SIS Area 3B/4, and SIS Area 5A Addendums).

Storage requirements are summarized in **Table 4.2** below and were confirmed by WSP (formerly Wood) through hydrologic verification as presented in the SIS Areas 3A Addendum, SIS Area 3B/4, and SIS Area 5A Addendums prepared by Stantec (April 2023).

Table 4.2 – FSEMS Quantity Storage Unitary Rates for the Derry Green Business Park

Return Period	Cumulative Storage Required (m^3/impervious ha)
Erosion Storm Event [1]	300
25 Year Storm [1]	550
100 Year Storm [1]	685
Regional Storm [2]	1467

[1]2015 FSEMS Table 5.1.2.

[2]Wood Hydrologic Verification of Proposed Stormwater Management Facility in the Menkes, Derry Green Corporate Park Area, Town of Milton –

4.1.4 Allowable Discharge Unitary Release Rates

The SIS Areas 3A Addendum, SIS Area 3B/4, and SIS Area 5A Addendum prepared by Stantec (April 2023) provided allowable discharge unitary release rates previously established in the FSEMS (Wood, 2015) for developments within the Derry Green Business Park.

Allowable discharge unitary release rates are provided in **Table 4.3**. The FSEMS did not provide unitary release rates for the Regional Storm, and the report indicated that Regional controls would need to be considered at the SIS stage. As part of the 2021 SIS Area 5A Addendum prepared by Jennifer Lawrence et al a Hydrologic Verification was conducted by Wood to determine the allowable discharge peak flow rates for the Regional storm event. Therefore, peak flows for storms up to and including the 100 Year storm event are determined using the FSEMS guidelines, and the Regional event is controlled to the recommendations provided directly by Wood. The peak discharge release rates are summarized **Table 4.3** and were confirmed by WSP (formerly Wood) through an additional Hydrologic Verification conducted in support of the SIS Areas 3A Addendum, SIS Area 3B/4, and SIS Area 5A Addendum prepared by Stantec (April 2023).

Table 4.3 – FSEMS Peak Discharge for SWM Facilities in the Derry Green Business Park

Storage Quantity Component	Cumulative Storage Required ($m^3/s/impervious\ ha$)
Erosion Storm Event[1]	0.0011
25 Year Storm[1]	0.0130
100 Year Storm[1]	0.0211
Regional Storm[2]	0.0535

[1]2015 FSEMS Table 5.1.2.

2 Obtained from Wood Hydrologic Verification of Proposed Stormwater Management Facility in the Menkes Land, Derry Green Corporate Park Area, Town of Milton, 2017.

4.1.5 Hydrologic Verification

The HSP-F hydrologic verification analysis was completed by WSP (formerly Wood) utilizing the proposed drainage plans and controls proposed within the SIS Areas 3A Addendum, SIS Area 3B/4, and SIS Area 5A Addendum prepared by Stantec (April 2023). The modeling evaluated the proposed underground SWM Facility and SWM Ponds to determine if the erosion control and flood control criteria from the FSEMS had been satisfied or if alternate controls were needed. Refer to the 2023 SIS 3A Addendum, SIS 3B/4, and 2023 SIS 5A Addendum for full analysis and results.

As confirmed in the March 2023 Hydrologic Verification, the recommended stormwater controls presented in the 2023 SIS 3A Addendum, 3B, and 4 and the 2023 SIS 5A Addendum consist of the following:

- 100 year control for SWM Facility S4-1B
- Regional control for SWM Facility S5-1
- 100 year control for SWM Facility S5-2

The March 2023 Hydrologic Verification by WSP (formerly Wood) included in **Appendix E.2** also provided recommended modifications to the storage discharge relationship for SWM Pond S5-1 and SWM Pond S5-2 which are presented in **Table 4.4**.

Table 4.4 – Revised Storage Discharge Relationship for SWM Facilities S5-1 and S5-2 within SIS 4 and SIS 5A

Facility ID	Criteria	Required Cumulative Active Storage Volume (m^3)	Allowable Discharge (m^3/s)
S5-1	Erosion Control	5,321	0.020
	25-year	12,723	0.270
	100-year	14,278	0.367
	Regional Storm	30,983	0.510
S5-2	Erosion Control	1,896	0.007
	25-year	3,339	0.084
	100-year	4,113	0.136

It should be noted, however, that the March 2023 Hydrologic Verification did not recommend any modifications to the quantity unitary storage rates or allowable discharge unitary release rates applied to the design of underground SWM Facilities S4-1B-1, S4-1B-2, S4-1B-3, or S4-1B-4. Therefore, the quantity unitary storage rates and allowable discharge unitary release rates presented in **Table 4.2** and **Table 4.3** have been used in the design of the above listed underground SWM Facilities. A summary of required storage and allowable release rates is presented in **Table 4.5** below.

Table 4.5 – Summary of Required Storage and Allowable Release Rates

Facility ID	Return Period	Required Cumulative Active Storage Volume (m^3)	Allowable Discharge (m^3/s)
S4-1B-1[1]	Erosion Control	1,122	0.004
	25-year	2,058	0.052
	100-year	2,563	0.084
S4-1B-2[1]	Erosion Control	1,151	0.004
	25-year	2,109	0.053
	100-year	2,627	0.086
S4-1B-3[1]	Erosion Control	759	0.003
	25-year	1,391	0.035
	100-year	1,732	0.057
S4-1B-4[1]	Erosion Control	2,936	0.011
	25-year	5,382	0.135
	100-year	6,703	0.220
S5-1[2]	Erosion Control	5,321	0.020
	25-year	12,723	0.270
	100-year	14,278	0.367
	Regional Storm	30,983	0.510
S5-2[2]	Erosion Control	1,896	0.007
	25-year	3,339	0.084
	100-year	4,113	0.136

1. Required active storage volumes and discharge rates per FSEMS quantity unitary storage rates and allowable discharge unitary release rates as described in **Table 4.2** and **Table 4.3**.
2. Required active storage volumes and discharge rates per recommendation in Hydrologic Verification prepared by Wood (March 2023).

4.2 Drainage Conditions

4.2.1 Existing Drainage

The Site generally slopes in a southeasterly direction through the existing Trafalgar Golf and Country Club. Runoff is conveyed via a combination of uncontrolled overland flow and conveyance via existing watercourses BP-1-A and BP-1-B, ultimately discharging to existing watercourse 7-III.

As indicated on **Figure 4.1** (**Appendix A**), runoff drains southeast via overland flow and is intercepted by existing Reach BP-1-B, flowing east. Runoff generated by external lands located northwest of the Site are also conveyed by existing Reach BP-1-B.

Runoff also drains east via overland flow to the south and is intercepted by existing Reach BP-1-A. Reach BP-1-A conveys flow from external lands to the north and flows from north to south across the Site within an existing pipe.

1. DERRY ROAD

A portion of the existing drainage from Derry Road approximately 260m east of Fifth Line to 560m east of Fifth Line is captured and piped to a headwall located in the north boulevard which then is conveyed in an existing swale in the north boulevard discharging to BP-1-A at the upstream face of the existing culvert. Drainage from 560m east of Fifth Line to 250m west of Sixth Line sheet flows from the road centerline to existing swales in the north and south boulevards, with these swales discharging to BP-1-A at the existing culvert. Drainage from 250m west of Sixth Line to Sixth line will sheet flow from road centerline north to an existing swale in the north boulevard and from road centerline south to an curb and pipe system, both of which discharge to the Middle Tributary of Sixteen Mile Creek east of Sixth Line.

4.2.2 Proposed Drainage

In the proposed condition, runoff generated by the Site will be captured and conveyed via storm sewer systems, discharging to various SWM Facilities as described below. The proposed drainage strategy is consistent with the SIS 3A Addendum, SIS 3B/4 and SIS 5A Addendum prepared by Stantec (April 2023).

1. DEVELOPMENT BLOCK 1

As indicated on **Drawing 8.1**, the Development Block 1 will be serviced by underground SWM Facility S4-1B, which has been further discretized into four individual underground SWM Facilities in order to best accommodate the site configuration and proposed drainage patterns.

Minor system (up to and including the 5 year storm event) runoff and major system (greater than the 5 year storm event up to and including the 100 year storm event) generated by a 3.98 ha catchment is captured and conveyed by the proposed storm sewer system to underground SWM Facility S4-1B-1 located in the drive aisle immediately west of Industrial Building 1. Runoff discharging from underground SWM Facility S4-1B-1 is attenuated by orifice controls in structure STM MH CONTROL6 and is conveyed through underground SWM Facility S4-1B-4. Runoff is further attenuated by orifice controls in structure STM MH CONTROL 2 and ultimately discharges to re-aligned Reach BP-1-B via a 750 mm dia. concrete storm headwall (HW 20).

Minor and major system runoff generated by a 4.08 ha catchment is captured and conveyed by the proposed storm sewer system to underground SWM Facility S4-1B-2 located in the drive aisle immediately east of Industrial Building 1. Runoff is attenuated by orifice controls within structure STM MH CONTROL3 and ultimately discharges to realigned Reach BP-1-B via a 750 mm dia. concrete storm headwall (HW 20).

Minor and major system runoff generated by a 2.69 ha catchment is captured and conveyed by the proposed storm sewer system to underground SWM Facility S4-1B-3 located within the landscaped area south of Industrial Building 1. Runoff is attenuated by orifice controls within structure STM MH

CONTROL1 and ultimately discharges to realigned watercourse BP-1-B via a 750 mm dia. concrete storm headwall (HW 20).

Minor and major system runoff generated by the block roof area (10.41 ha) is captured by Building 1 roof drains and conveyed to underground SWM Facility S4-1B-4. Runoff is attenuated by orifice controls within structure STM MH CONTROL2 and ultimately discharges to realigned watercourse BP-1-B via a 750 mm dia. concrete storm headwall (HW 20).

In order to provide flow attenuation for the various storms and ensure adherence to the FSEMS and hydrologic verification flow targets (for erosion control, 25 yr and 100 yr storm events) multiple orifice controls are needed and proposed to be installed into weir wall within the control MHs. To ensure the 100 year peak flow from each tank and from the Site does not exceed the allowable release rate, a backup orifice tube is proposed downstream of the control MH which will govern the release rates for the 100 yr storm.

Refer to **Figure 4.2** for the proposed drainage plan and catchment areas and **Drawing 8.1** for the servicing layout.

2. DEVELOPMENT BLOCK 2 AND 4 AND CLARK BLVD

Consistent with the SIS 5A Addendum prepared by Stantec (April 2023), major and minor system runoff generated by a 16.97 ha area including drainage from Development Block 2, Development Block 4 and Clark Blvd will be serviced by SWM Pond S5-1.

Drainage from Development Block 2 and 4 will be captured by catchbasins and conveyed south via storm sewers, ultimately discharging into the forebay of SWM Pond S5-1 via a 1200 mm diameter concrete storm headwall.

Minor system runoff from Clark Blvd will be captured by catchbasins and conveyed south via storm sewers, ultimately discharging into the forebay of SWM Pond S5-1 via a 675 mm diameter concrete storm headwall. Major system runoff from Clark Blvd will drain south via overland flow within the right-of-way and will spill into SWM Pond S5-1 via a defined overland flow route as presented on **Figure 4.2**. Ultimately, runoff attenuated by SWM Pond S5-1 will discharge to realigned watercourse BP-1-A via a 675 mm dia. concrete headwall.

The pond will be oversized to provide quality and quantity control for a portion of Derry Road that is unable to be captured and conveyed to the pond and will instead be directed to realigned watercourse BP-1-A as shown on **Drawing 8.1.**

3. DEVELOPMENT BLOCK 3

Consistent with the SIS 5A Addendum prepared by Stantec (April 2023), minor system runoff generated by a 6.10 ha area within Development Block 3 will be captured by catchbasins and conveyed south via storm sewers, ultimately discharging into the forebay of SWM Pond S5-2 via a 975 mm dia. concrete storm headwall.

Major system generated by the 6.10 ha area will drain south via overland flow and will spill into SWM Pond S5-2 via a defined overland flow route as presented on **Figure 4.2**. A portion of the major system runoff will be captured and conveyed by storm sewers to the pond. Ultimately, runoff attenuated by SWM Pond S5-2 will discharge to realigned watercourse BP-1-A via a 675 mm dia. Concrete headwall.

4. DERRY ROAD

The 0.91 ha section of Derry Road just west of Future Clark Boulevard Extension to 140 m east of BP-1-A cannot be captured and piped to the SWM ponds S5-1 due to grading constraints. Therefore, a treatment train is proposed for this section of road to include quality treatment provided by converting existing roadside swales to enhanced bioswales with salt tolerant plants and incorporating an OGS unit prior to discharge into the realigned BP-1-A. The sizing and specifications for the treatment train will be provided at the detailed design stage. Since the flows directed through the treatment train will remain uncontrolled, SWM Pond S5-1 has been designed to provide quantity control for the 0.91 ha area (i.e., thereby providing overcontrol) and ensuring discharge rates remain within the allowable rates for the Site and Derry Road drainage as per the FSEMS requirements.

5. CLARK BOULEVARD

Drainage from the Clark Boulevard extension north of the TCPL to Derry Road will be directed to the SWM Pond S5-1 as shown on **Figure 4.2**.

4.3 Stormwater Management Approach

4.3.1 Lot Level and Conveyance

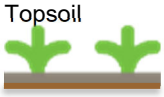
A review of the various lot level and conveyance controls has been undertaken to assess and investigate the feasibility of implementing these strategies within the Subject Lands. These methods are commonly referred to as Low Impact Development (LID) measures or Green Infrastructure (GI) which are described in detail within the *CVC/TRCA Low Impact Development Stormwater Management Planning and Design Guide (LID Guide).* LID is a more integrated approach to stormwater management than traditional end-of pipe measures. LID promotes infiltration and seeks to maintain the existing hydrology of the site after development. The following LID review and feasibility assessment will assist the preparation of the post development stormwater management strategy including mitigation plan and water balance assessment.

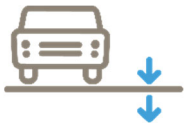
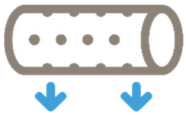
The suitability of LID measures is dependent on site-specific geophysical constraints, which may limit the applicability or effectiveness of certain LID measures.

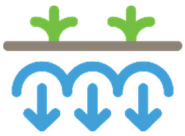
Table 4.6 describes the various LID measures, site considerations and conceptual feasibility of implementing these strategies within the Site based on the current development plan.

Table 4.6 – LID Evaluation Matrix

LID Measure	Description	Site Consideration	Feasible Y/N
Green Roofs 	A roof that is partially or fully covered with a layer of vegetation and growing medium overtop of a waterproof roof membrane. Typically implemented on conventional flat roofs for midrise or high rise buildings, and ICI buildings. *Benefits* include retention storage/reduced runoff, increased evapotranspiration, improved energy efficiency, and reduced heat-island effect in urban areas.	The Site consists of industrial buildings with flat roofs providing opportunities to incorporate green roofs. Green roofs should be reviewed as part of the site plan stage.	Y
Blue Roofs 	A non-vegetated system of rooftop storage installed over a waterproof roof membrane. Typically implemented on conventional flat roofs for midrise or high rise buildings, and ICI buildings. *Benefits* include detention storage and controlled release to building downspouts.	The Site consists of industrial buildings with flat roofs providing opportunities to incorporate blue roofs. Blue roof storage is possible and can be combined with other LID measures such as downspout disconnection and enhanced swales or bioretention facilities.	Y
Rainwater Harvesting – Retention Cisterns 	Rainwater harvesting is the process of intercepting, conveying and storing rainfall for future use for irrigation or non-potable water uses (car/bike wash, janitorial needs, toilet flushing). Cisterns are typically used on private lands within the building envelope on midrise or high rise buildings. *Benefits* include reduced runoff, increased evapotranspiration, and reduced irrigation demand.	Rainwater harvesting using cisterns for re-use is possible. Applicable types of re-use should be compared to the proposed uses at the site plan stage and best fit solutions investigated.	Y
Roof Downspout Disconnection 	Simple downspout disconnection involves directing flow from roof downspouts to a pervious area at grade that drains away from the building. *Benefits* include reduced runoff, increased evapotranspiration and infiltration, and reduced irrigation demand.	Downspout connections at grade are typically used in residential sites with surrounding vegetated areas. Implementation for larger scale buildings with adjacent vegetation or other LID features such as enhanced swales or bioretention facilities is possible and should be appropriately designed.	Y

LID Measure	Description	Site Consideration	Feasible Y/N
Extra Depth Topsoil and/or Amended Topsoil 	Amended topsoil is a mixture of higher permeability materials like sand and gravel, with lower percentage of clays and a suitable amount of compost to support plant health. Extra depth topsoil (300 mm or more) of native or amended topsoil. *Benefits* include increased retention storage, increased infiltration and evapotranspiration, and stabilization against erosion.	Appropriate soil mixtures can be incorporated into landscaped areas and other LID measures as applicable. Extra depth topsoil (300 mm or more) of native topsoil is recommended.	Y
Bioretention 	Bioretention facilities are shallow depressions that capture runoff, provide treatment (filtration), retention storage (infiltration) and detention storage. These facilities consist of vegetation with layers of soil and aggregates and optional perforated pipe/over drain. Types of bioretention include bump-outs, tree planters/cells, bioretention cells, or dry swales/bioswales *Benefits* include filtration, reduced runoff, increased evapotranspiration and infiltration.	Tree planters/cells are possible within the Clark Boulevard right-of-way. Bioretention cells or dry swales are possible within the public open spaces such as Clark Boulevard and/or private open space or buffers. Land use and spill potential are important considerations when siting these measures as well as in-situ infiltration testing. Groundwater table through much of the Site is close to surface. Appropriate separation from bottom of facilities is required to facilitate infiltration. Liners and underdrains could be incorporated into the bioretention designs if implemented in areas with high groundwater table to provide filtration, evapotranspiration and detention.	Y
Enhanced Grass Swales 	Enhanced grass swales (enhanced vegetated swales) are vegetated open channels designed to convey stormwater runoff and provide some treatment and retention (infiltration). *Benefits* include conveyance, increased filtration and infiltration	Enhanced grass swales are possible within public open space and/or private open space or buffers. Land use and spill potential are important considerations when siting these measures. Enhanced swales can be implemented within the development blocks.	Y

LID Measure	Description	Site Consideration	Feasible Y/N
Permeable Pavement 	Permeable pavement captures runoff, provides retention storage (infiltration) and detention storage. Permeable pavements consist of a porous load bearing surface overtop of a clean aggregate base and optional perforated pipe/over drain. Types of permeable pavements include porous asphalt, pervious concrete, permeable interlocking pavers, ore reinforced turf/gravel. *Benefits* include reduced runoff, increased infiltration, detention storage and controlled release to storm sewers.	Permeable pavements are possible for low traffic private roads, parking lots, driveways, pedestrian plazas and walkways. Land use and spill potential are important considerations when siting these measures as well as in-situ infiltration testing. Groundwater table through much of the Site is close to surface. Shallow permeable pavers may be considered if the proposed locations have appropriate separation from bottom of facilities to water table. However, the Site will primarily be travelled by large trucks and machinery, installation of permeable pavement is not recommended. This is because the weight of the vehicular movement will likely compress any installed pervious material, limiting the ability to infiltrate.	Y
Perforated Pipe Systems 	Perforated pipe systems are linear infiltration trenches or linear soakaways that convey stormwater runoff and provide retention storage (infiltration) and some detention storage. These systems consist of clean aggregate surrounding a perforated pipe. *Benefits* include reduced runoff, increased infiltration, detention storage.	Perforated pipes are possible within public open space block and roads and/or private sites and in areas that are 4 m or more away from basements. Land use, runoff source (roof or paved surfaces), and spill potential are important considerations when siting these measures as well as in-situ infiltration testing. Groundwater table through much of the Site is close to surface and linear infiltration trenches or soakaways are not feasible in some areas as appropriate separation from bottom of facilities to water table is not available to facilitate infiltration.	N

LID Measure	Description	Site Consideration	Feasible Y/N
Underground Infiltration Trenches and Chambers 	Underground Infiltration Trenches and Chambers are open bottom storage units that convey stormwater runoff and provide retention storage (infiltration) and detention storage. These systems consist of open bottom chambers surrounded by clean aggregate and wrapped with geotextile fabric. *Benefits* include reduced runoff, increased infiltration, and/or detention storage.	Underground infiltration chambers are possible with sufficient clearance to groundwater and if located 4 m or more away from basements. Land use, runoff source (roof or paved surfaces), and spill potential are important considerations when siting these measures as well as in-situ infiltration testing. Groundwater table through much of the Site is close to surface and underground infiltration trenches and chambers are not feasible in some areas as appropriate separation from bottom of facilities to groundwater table is not available to facilitate infiltration. Liners could be incorporated into the underground chamber design to provide detention storage.	Y

To confirm the feasibility of implementing infiltration-based LIDs within the Site, Stantec conducted a feasibility evaluation which considered key site characteristics such as offset from building foundations (5 m minimum), separation from seasonally high groundwater elevation, and the infiltration rate of native soils and identified areas where infiltration based LIDs could be implemented and areas where they could not. The evaluation was detailed in the Hydrologic Verification LID Feasibility Assessment memo dated March 2023. This evaluation confirmed that infiltration based LIDs are feasible within select areas in SIS 5A, including Industrial Building 3 block. This assessment was included in the 2023 3A Addendum, 3B, 4 SIS and 2023 5A SIS Addendum.

4.3.2 End of Pipe

End-of-Pipe controls are implemented at the end of the storm sewer pipe system after lot level and conveyance controls and include:

- Wet ponds – designed to provide quality treatment through settling of suspended solids into the permanent pool (average depth of 1.5 m and maximum depth of 3.0 m within the plunge pool at the outlet), and extended detention and quantity control within the active storage component.
- Wetlands – designed to provide quality treatment through settling of suspended solids into the forebay (typically 1 m deep) and shallow permanent pool (typically 0.15 m to 0.3 m deep), and extended detention and quantity control within the active storage component.
- Dry ponds – provide some quality treatment through retention time, and primarily provide extended detention and quantity control within the active storage component.
- Underground Chambers – provide quality treatment through infiltration (where feasible), and also provide erosion control storage and quantity control storage (as required).

- Manufactured Treatment Devices (MTD) – can provide separation-based quality treatment (commonly known as oil-grit-separators or OGS units) or filtration-based quality treatment. MTDs are generally used in combination with underground storage systems.

In order to satisfy the water quality requirements from the MECP, and thermal mitigation requirements related to Silver Shiner, wet ponds and underground chambers are recommended for the Site.

4.3.3 Summary

Based on the criteria outlined in **Section 4.1**, the local soil and groundwater conditions on the Subject Lands, and the proposed land use, the SWM practices noted in **Table 4.7** could be implemented on the site:

Table 4.7 – Recommended SWM Practices

SWM Practice	Lot Level	Conveyance	End-Of-Pipe
Cisterns / Rain Barrels	X		
Green Roofs	X		
Blue Roofs	X		
Rainwater Harvesting/Retention Cisterns	X		
Downspout Disconnection	X		
Extra Depth Topsoil/Amended Topsoil	X		
Bioretention / Bioswales	X		
Enhanced Swales		X	
Permeable Pavers	X		
Wet ponds			X
Underground Chambers			X

4.4 Proposed Stormwater Management Plan

From the list of SWM practices identified in **Table 4.7**, several SWM practices were selected that are suitable for use within the Subject Lands (refer to **Table 4.8**). A preliminary design strategy was created to satisfy the SWM criteria identified in **Section 4.1** using these practices. The following sections provide details on how each of the proposed SWM practices will be implemented at a conceptual level. Additional SWM practices may be incorporated at detailed design stage depending on the proposed Site Plan.

Table 4.8 – Preferred SWM Practices

SWM Practice	Type of Practice	Target Criteria
Extra Depth Topsoil/ Amended Topsoil	Lot Level	Water Balance
Enhanced Grass Swale/Bioswale	Lot Level and Conveyance	Water Quality, Water Balance
Blue Roof/Downspout Disconnection	Lot Level	Water Balance
Wet Pond	End of Pipe	Water Quantity, Water Quality, Erosion Control
Underground Chambers	End of Pipe	Water Balance (infiltration facilities), Water Quantity, Water Quality, Erosion Control

4.5 End-Of-Pipe Facility Design

4.5.1 SWM Facility S4-1B-1

1. QUANTITY CONTROL

As described in **Section 4.2.2** and presented on **Figure 4.2**, proposed underground SWM Facility S4-1B-1 will provide stormwater quantity control for a 3.98 ha drainage catchment. An iterative process was used to determine a suitable control structure configuration that is capable of attenuating runoff stored by underground SWM Facility S4-1B-1 such that the allowable release rate and storage requirements identified in **Table 4.5** can be achieved.

The release rates will be controlled via an IPEX LMF 80 Inlet Control Device (ICD) and a 224 mm diameter orifice plate will be installed into a weir wall located within control structure STM MH CONTROL6. A 150 mm backup orifice tube is proposed downstream of STM MH CONTROL6

A summary of the release rates and storage is provided in **Table 4.9** below. Refer to **Appendix D** for detailed calculations.

Table 4.9 – Summary of Allowable and Proposed Quantity Control for SWM Facility S4-1B-1

Facility ID	Return Period	Required Cumulative Active Storage Volume (m^3)	Allowable Discharge (m^3/s)	Provided Storage Volume (m^3)	Proposed Discharge (m^3/s)
S4-1B-1[1]	Erosion Control	1,122	0.004	1,205	0.004
	25-year	2,058	0.052	2,058	0.029
	100-year	2,563	0.084	2,680	0.079

2. QUALITY TREATMENT

A treatment train approach is proposed to provide quality treatment for runoff discharging from SWM Facility BP-1B-1. SWM Facility BP-1B-1 will be equipped with a Separator Row that is capable of providing 80% TSS removal and is third-party certified for Environmental Technology Verification (ETV).

Runoff discharging from SWM Facility BP-1B-1 will receive additional treatment by a HydroDome HD 8 MTD which is also capable of providing 80% TSS removal and is third-party certified for Environmental Technology Verification (ETV).

The proposed treatment train will provide 96% TSS removal for runoff attenuated by SWM Facility BP-1B-1.

Quality treatment sizing calculations and ETV certification is provided in **Appendix D**.

4.5.2 SWM Facility S4-1B-2

As described in **Section 4.2.2** and presented on **Figure 4.2,** proposed underground SWM Facility S4-1B-2 will provide stormwater quantity control for a 4.08 ha drainage catchment. An iterative process was used to determine a suitable control structure configuration that is capable of attenuating runoff stored by underground SWM Facility S4-1B-2 such that the allowable release rate and storage requirements identified in **Table 4.5** can be achieved.

The release rates will be controlled via an IPEX LMF 80 Inlet Control Device (ICD), a 215 mm diameter orifice plate, and an 80 mm diameter orifice plate will be installed into a weir wall located within control structure STM MH CONTROL3. A 150 mm backup orifice tube is proposed downstream of STM MH CONTROL3.

A summary of the release rates and storage is provided in **Table 4.10**. Calculations are in **Appendix D**.

Table 4.10 – Summary of Allowable and Proposed Quantity Control for SWM Facility S4-1B-2

Facility ID	Return Period	Required Cumulative Active Storage Volume (m^3)	Allowable Discharge (m^3/s)	Provided Storage Volume (m^3)	Proposed Discharge (m^3/s)
S4-1B-2	Erosion Control	1,151	0.004	1,154	0.004
	25-year	2,109	0.053	2,117	0.052
	100-year	2,627	0.086	2,872	0.078

1. QUALITY TREATMENT

A treatment train approach is proposed to provide quality treatment for runoff discharging from SWM Facility BP-1B-2. SWM Facility BP-1B-2 will be equipped with a Separator Row that is capable of providing 80% TSS removal and is third-party certified for Environmental Technology Verification (ETV).

Runoff discharging from SWM Facility BP-1B-2 will receive additional treatment by a HydroDome HD 8 MTD which is also capable of providing 80% TSS removal and is third-party certified for Environmental Technology Verification (ETV).

The proposed treatment train will provide 96% TSS removal for runoff attenuated by SWM Facility BP-1B-2.

Quality treatment sizing calculations and ETV certification is provided in **Appendix D**.

4.5.3 SWM Facility S4-1B-3

As described in **Section 4.2.2** and presented on **Figure 4.2**, proposed underground SWM Facility S4-1B-3 will provide stormwater quantity control for a 2.69 ha catchment area. An iterative process was used to determine a suitable control structure configuration that is capable of attenuating runoff stored by underground SWM Facility S4-1B-3 such that the allowable release rate and storage requirements identified in **Table 4.5** can be achieved.

The release rates will be controlled via an IPEX LMF 70 Inlet Control Device (ICD) and a 185 mm diameter orifice plate will be installed into a weir wall located within control structure STM MH CONTROL1. A 150 mm backup orifice tube is proposed downstream of STM MH CONTROL1.

A summary of the release rates and storage is provided in **Table 4.10**. Calculations are in **Appendix D**.

Table 4.11 – Summary of Allowable and Proposed Quantity Control for SWM Facility S4-1B-3

Facility ID	Return Period	Required Cumulative Active Storage Volume (m^3)	Allowable Discharge (m^3/s)	Provided Storage Volume (m^3)	Proposed Discharge (m^3/s)
S4-1B-3	Erosion Control	759	0.003	768	0.003
	25-year	1,391	0.035	1,397	0.029
	100-year	1,732	0.057	1,831	0.056

1. QUALITY TREATMENT

A treatment train approach is proposed to provide quality treatment for runoff discharging from SWM Facility BP-1B-3. SWM Facility BP-1B-3 will be equipped with a Separator Row that is capable of providing 80% TSS removal and is third-party certified for Environmental Technology Verification (ETV).

Runoff discharging from SWM Facility BP-1B-3 will receive additional treatment by a HydroDome HD 6 MTD which is also capable of providing 80% TSS removal and is third-party certified for Environmental Technology Verification (ETV).

The proposed treatment train will provide 96% TSS removal for runoff attenuated by SWM Facility BP-1B-3.

Quality treatment sizing calculations and ETV certification is provided in **Appendix D**.

4.5.4 SWM Facility S4-1B-4

As described in **Section 4.2.2** and presented on **Figure 4.2**, proposed underground SWM Facility S4-1B-4 will provide stormwater quantity control for the 10.41 ha roof area. In addition, SWM Facility S4-1B-4 will provide conveyance of runoff from upstream system SWM Facility S4-1B-1. Therefore, the control structure downstream of SWM Facility S4-1B-4 has been sized such that proposed discharge will not exceed the sum of allowable discharge rates from SWM Facility S4-1B-1 and SWM Facility S4-1B-4.

An iterative process was used to determine a suitable control structure configuration that is capable of attenuating the proposed peak flows from SWM Facility S4-1B-1 and SWM Facility S4-1B-4 such that the allowable release rate and storage requirements identified in **Table 4.5** can be achieved.

Stormwater runoff will be controlled via 102 mm diameter orifice plate and a 398 mm diameter orifice plate and will be installed into a weir wall located within control structure STM MH CONTROL2. A 300 mm backup orifice tube is proposed downstream of STM MH CONTROL2.I

A summary of the release rates and storage is provided in **Table 4.12**. Calculations are in **Appendix D**.

Table 4.12 – Summary of Allowable and Proposed Quantity Control for SWM Facility S4-1B-4

Facility ID	Return Period	Required Cumulative Active Storage Volume (m^3)	Allowable Discharge (S4-1B-4 (m^3/s)	Allowable Discharge (S4-1B-1 & S4-1B-4) (m^3/s)	Provided Storage Volume (m^3)	Proposed Discharge (m^3/s)
S4-1B-4	Erosion Control	2,936	0.011	0.016	2,948	0.016
	25-year	5,382	0.135	0.187	5,391	0.175
	100-year	6,703	0.220	0.304	6,822	0.297

1. QUALITY TREATMENT

As runoff attenuated by SWM Facility S4-1B-4 is roof runoff, the runoff can be considered clean and therefore does not require quality treatment.

4.5.5 General Design Criteria

The grading designs applied to SWM Pond S5-1 and SWM Pond S5-2 has been completed to meet the requirements of the MOE SWMPDM (2003) and Town of Milton Standards and are shown on **Figure 4.3** through **Figure 4.6**. Typical criteria for the design of SWM ponds include:

- The pond will be graded with side slopes of 5:1 from the pond bottom to the extended detention elevation or 3 m (horizontally) outside of the permanent pool elevation, whichever is greater, above which the slopes of a maximum of 3:1;

- Permanent pool volume will be sized to provide MOECC Enhanced Level Protection with a mean depth of 1.5 m and at least 3m deep pool at the pond outlet;
- The Permanent pool elevation is set above the 5 year level of receiving watercourse;
- Extended detention storage as per the requirements in the Subwatershed Management Study to a maximum depth of 1.0 m as per the MOE guidelines;
- Extended detention storage and flood control storage up to and including the 100 year or Regional storm event will be provided within SWM pond S5-1 and S5-2 as per the requirements in the FSEMS to a maximum depth of 1.9 m;
- Emergency spillway will be sized to convey the Regional Flow; and
- A 4 m wide maintenance access road with a maximum slope of 10:1 and a maximum cross-fall of 2% to be provided in the SWM Pond. It will be used to facilitate the access to the forebay and outlet structure for maintenance.

The SWM pond block sizes have been verified through the grading design utilizing the Town standards ensuring the block provides the required volumes in **Table 4.5**. The location and configuration of the SWM ponds are subject to change through subsequent design phases.

4.5.6 SWM Pond S5-1

1. QUANTITY CONTROL

SWM Pond S5-1 has been designed based on a total contributing drainage area of 17.88 ha per **Figure 4.2**, which consists of the Industrial Building 2 block, a 1.78 ha portion of Clark Boulevard, and a 0.91 ha portion of the ultimate Derry Road right-of-way. As described in **Section 4.2**, portions of Derry Road cannot be directed to SWM Pond S5-1 due to servicing and grading constraints. Runoff from Derry will directed to watercourse BP-1-A. To compensate for the uncontrolled discharge generated by these areas, SWM Pond S5-1 has been oversized.

An iterative process was used to determine a suitable control structure configuration that is capable of attenuating runoff stored by SWM Pond S5-1 such that the allowable release rates and storage requirements listed in **Table 4.5** can be achieved.

The release rates discharging from SWM Pond S5-1 will be controlled by a dual orifice control comprised of a 125 mm diameter orifice plate and a 440 mm diameter orifice plate located within control structure in the pond block.

A summary of the proposed release rates and storage provided by SWM Pond S5-1 is presented in **Table 4.13.** Calculations are in **Appendix D**.

Table 4.13 – Summary of Allowable and Proposed Quantity Control for SWM Facility S4-1B-4

Facility ID	Return Period	Required Cumulative Active Storage Volume (m^3)	Allowable Discharge (m^3/s)	Provided Storage Volume (m^3)	Proposed Discharge (m^3/s)
S5-1	Erosion Control	5,321	0.020	5,321	0.020
	25-year	12,723	0.270	12,723	0.199
	100-year	14,278	0.367	14,278	0.250
	Regional	30,983	0.510	30,983	0.510

In the event that the proposed outlet becomes blocked, an emergency spillway has been sized to convey the Regional storm event flow rate of 0.510 m^3/s.

2. QUALITY TREATMENT

Stormwater quality treatment will be provided by SWM Pond S5-1. The pond will provide MECP (Formerly MOE) Enhanced Level (80% TSS removal) water quality treatment in accordance with the MOE Stormwater Planning and Design Manual (SWMPDM). The required and provided water treatment storage volumes to achieve Enhanced Level treatment are presented in **Table 4.14** below. Detailed calculations are provided in **Appendix D**.

Table 4.14 – Summary of Quality Treatment Provided by SWM Pond S5-1

Facility ID	Treated Drainage Area (ha)	Treated Drainage Area Imperviousness (%)	MOE Enhanced Level Storage Rate (m^3/ha)	Permanent Pool Storage Required (m^3)	Storage Provided (m^3)
S5-1	17.88	91	227	4,057	17,401

Therefore, Enhanced Level stormwater quality treatment can be achieved by SWM Pond S5-1.

4.5.7 SWM Pond S5-2 Quantity Control

SWM Pond S5-2 has been designed based on a total contributing drainage area 6.10 ha per **Figure 4.2**, consisting of the Industrial Building 3 block. An iterative process was used to determine a suitable control structure configuration that is capable of attenuating runoff stored by SWM Pond S5-2 such that the allowable release rates and storage requirements listed in **Table 4.5** can be achieved.

The release rates from the Industrial Building 3 block will be controlled by a dual orifice control comprised of an IPEX LMF Inlet Control Device (ICD) and a 330 mm dia. orifice plate located within control structure within the pond.

A summary of the proposed release rates and storage provided by SWM Pond S5-2 is presented in **Table** 4.15. Calculations are in **Appendix D**.

Table 4.15 – Summary of Allowable and Proposed Quantity Control for SWM Facility S5-2

Facility ID	Return Period	Required Cumulative Active Storage Volume (m^3)	Allowable Discharge (m^3/s)	Provided Storage Volume (m^3)	Proposed Discharge (m^3/s)
S5-2	Erosion Control	1,896	0.007	1,896	0.007
	25-year	3,339	0.084	3,339	0.072
	100-year	4,113	0.136	4,113	0.136

In the event that the proposed outlet becomes blocked, an emergency spillway has been sized to convey a Regional storm event flow rate of 0.510 m^3/s.

4.5.8 Quality Treatment

Stormwater quality treatment will be provided by SWM Pond S5-2. The pond will provide MECP (Formerly MOE) Enhanced Level (80% TSS removal) water quality treatment in accordance with the MOE Stormwater Planning and Design Manual (SWMPDM). The required and provided water treatment storage volumes to achieve Enhanced Level treatment are presented in **Table 4.16** below. Detailed calculations are provided in **Appendix D**.

Table 4.16 – Summary of Quality Treatment Provided by SWM Pond S5-2

Facility ID	Treated Drainage Area (ha)	Treated Drainage Area Imperviousness (%)	MOE Enhanced Level Storage Rate (m^3/ha)	Storage Required (m^3)	Storage Provided (m^3)
S5-2	6.10	92	230	1,406	1,896

Therefore, Enhanced Level stormwater quality treatment can be achieved by SWM Pond S5-2.

4.5.9 Water Balance

Refer to the Hydrogeological report prepared by Stantec (May 2023).

5 Watercourses

5.1 Introduction and Background

The existing watercourses crossing the Site were reviewed and assessed through the studies completed in support of the SUS FSEMS, SIS 3A Addendum, SIS 3B/4, SIS 5A Addendum, and the CFCP. Two existing watercourses identified as Reach BP-1-A and Reach BP-1-B (**Figure 4.1**) cross the Site.

5.1.1 Reach BP-1-A

Existing Reach BP-1-A enters the Site at the north property line through a 3000 mm x 2000 mm dia. box culvert crossing Derry Road. The watercourse is then conveyed though a pipe in a southerly direction across the Site, where it discharges upstream of the confluence with existing Reach BP-1-B at the southern property line, ultimately discharging to existing Reach 7-III. BP-1-A is a medium constraint watercourse that will be realigned as part of the Site development.

5.1.2 Reach BP-1-B

Existing Reach BP-1-B enters the property at the western property boundary. The watercourse flows in southeasterly direction across the Site, where it confluences with existing Reach BP-1-A at the southeast limit of the property, ultimately discharging to existing Reach 7-III. Existing Reach BP-1-B is a medium-high constraint watercourse that allows for realignment, subject to providing enhancements to the stream and maintaining baseflow.

5.2 Existing Meander Belt Analysis

A Fluvial Geomorphological Assessment and Conceptual Channel Design (FGACCD) was prepared by GEO Morphix (December 2023) in support of the FSR. Per the FGACCD, meander belt widths for existing Reach BP-1-A and existing Reach BP-1-B were previously delineated as part of prior studies and were not reviewed or redefined by GEO Morphix as the reaches are proposed for realignment as part of the development of the Site.

5.3 Conceptual Natural Corridor Design

5.3.1 Design Objectives

As described in the FGACCD (GEO Morphix, April 2023), Reach BP-1-A and Reach BP-1-B are proposed for realignment and will provide opportunities to replace the existing morphologically-limited features with dynamically stable channels containing naturalized riffle and pool systems, with cross sectional dimensions closer to that of a naturalized watercourse conveying similar flows. The natural corridor designs proposed by GEO Morphix will offer significant improvements to aquatic and terrestrial habitat through an open channel, wetland pockets, green swales and terrestrial habitat features. The natural

corridor designs will replace existing Reach BP-1-A and Reach BP-1-B with watercourses that will offer significant improvements to channel form and function per unit length.

5.3.2 Channel Planform

The initial realigned Reach BP-1-A and Reach BP-1-B channel planform layouts were created using modelled radii of curvature (R_c) values as a guide. The radius of curvature of meanders can be used to evaluate channel stability. The final channel planforms were established by GEO Morphix through an iterative process, which consisted of developing channel cross-sections with defined bankfull geometries to calculate parameters for each channel planform (i.e., radius of curvature), followed by further refinement and determination of riffle and pool lengths based on channel gradients.

Refer to the FGACCD document in **Appendix E.3** for details.

5.3.3 Bankfull Channel

The proposed restoration designs for realigned Reach BP-1-A and Reach BP-1-B will prioritize riffle-pool channel systems that will significantly improve the channels and aquatic habitats. Incorporated in the designs are self-maintaining low-flow channels that promote fish passage, and connections to the receiving floodplains. Both realigned Reach BP-1-A and BP-1-B have been designed to carry the bankfull discharge, equivalent to the 1.25 Year return post-development flow.

Hydraulic modelling conducted by Stantec (April 2023) in support of the SIS 3A Addendum, SIS 3B/4, and SIS 5A Addendum was used to determine the appropriate bankfull discharge for each watercourse.

Table 5.1 summarizes the bankfull discharge estimates for each reach.

Table 5.1 – Summary of Bankfull Discharges for Realigned Reaches BP-1-A and BP-1-B

Channel Parameter	BP-1-A	BP-1-B
Bankfull Discharge (m^3/s)	1.43	0.77

Refer to the FGACCD in **Appendix E.3** for details.

5.3.4 Corridor Requirements

Per the FGACCD for SIS 3A Addendum, 3B/4 and the FGACCD for SIS 5A Addendum (GEO Morphix, December 2023), meander belt widths for realigned Reaches BP-1-A and BP-1-B were calculated based on the design bankfull dimensions presented in Table 5 and Table 11, respectively, to ensure that the planforms have meander belt widths that fall within their respective corridor requirements.

The meander belt widths described in the reports listed above are summarized in **Table 5.2** below.

Table 5.2 – Summary of Proposed Corridor Dimensions

Watercourse	Total Valley Floor Width (m)	Total Bank Width (m)	Total Buffer Width (m)	Total Corridor Width (m)
BP-1-A	31	14	20	65
BP-1-B	19	15	20	54

Refer to the FGACCD in **Appendix E.3** for details.

5.3.5 Hydraulic Substrate Sizing

Per the FGACCD for SIS 3A Addendum, 3B/4 and SIS 5A Addendum (GEO Morphix, December 2023), the channel substrate sizing for realigned Reach BP-1-A and realigned Reach BP-1-B was completed through an analysis of hydraulic conditions (e.g., tractive force, flow competence) in the typical channel cross sections. The sizing of channel bed substrate is completed by comparing the average shear stress acting on the bed with the substrate critical shear stress. The selected substrate parameters are further described below.

1. BP-1-A

To provide for a stable bed and level of sorting for realigned Reach BP-1-A, 70% 50 mm – 100 mm diameter riverstone, 15% Granular ‘B’, and 15% native material is proposed for the riffles. For the pools, the substrate will be comprised of 60% native material and 40% pea gravel.

2. BP-1-B

For Reach BP-1-B, the riffles will consist of 70% 50 mm - 100 mm diameter riverstone, 15% granular ‘B’ and 15% native material. These materials will always have a core of sediment that is not entrained under bankfull conditions, while maintaining the character of the native material. The pools will consist of 70% granular ‘B’ and 30% native material.

5.3.6 Design Elements

1. GREEN SWALES

5.3.6.1.1 BP-1-A

Per the FGACCD for SIS 5A Addendum (GEO Morphix, April 2023), the proposed design for realigned Reach BP-1-A includes green swale features that will connect the channel to offline wetland features. These features are typically shallow swales that will convey water from the channel and floodplain into the offline wetlands. The total length of the proposed green swale features is 250 m. These features enhance terrestrial habitat by increasing diversity and providing a more natural floodplain form.

5.3.6.1.2 BP-1-B

Per the FGACCD for SIS 3A Addendum and SIS 3B/4 (GEO Morphix, December 2023), the proposed design for Reach BP-1-B includes green swale features that will connect the channel to offline wetland features. These features are typically shallow swales that will convey water from the channel and floodplain into the offline wetlands. The total length of the proposed green swale features within the Reach BP-1-B corridor is 210 m. These features enhance terrestrial habitat by increasing diversity and providing a more natural floodplain form.

2. CORRIDOR WETLAND FEATURES

Offline wetland features will be incorporated into realigned Reach BP-1-A and BP-1-B, which will enhance the terrestrial habitat by increasing diversity and providing a more natural floodplain form and will provide various functional benefits (e.g., short-term water retention, sediment banking, etc.). The characteristics and benefits of the proposed offline wetland features include:

- Average depth of 0.60 m with deeper areas of up to 1.00 m deep provided for overwintering habitat;
- Irregular shape to maximize the wetland perimeter to increase edge effects;
- Incorporation of submerged and dry mounds to provide a topographical complex bottom to increase habitat heterogeneity; and
- Short-term water retention that will help to polish water and moderate the discharge of water into the channel.

3. HABITAT FEATURES

The design of realigned Reach BP-1-A and BP-1-B incorporates several habitat elements within the channel corridor to improve riparian habitat and promote wildlife diversity. To maximize potential for wildlife passage, forage and residency, the habitat design incorporates varying topographies and woody debris. The habitat elements include potential overwintering pools, root wads, basking logs, brush piles, raptor poles, turtle nesting sites, snake hibernacula, rock piles and terrestrial mounds.

Refer to the detail drawings provided in Appendix G of the FGACCD in **Appendix E.3** for detailed specifications.

5.3.7 Crossing Span Recommendations for Reach BP-1-B

Clark Boulevard, a future 26 m collector road will connect the proposed development to Derry Road and ultimately to Fifth Line. Clark Boulevard also crosses the realigned BP-1-B corridor north of the Union Gas easement. A 28 m long, 12.81 m wide by 2.44 m high Conspan arch culvert is proposed for the road crossing of Reach BP-1-B.

To support an appropriate tie-in with the channel, the dimensions for riffles and pools through the crossings as described in the FGACCD in **Appendix E.3** are consistent with the channel upstream and downstream of the structure. Refer to Table 13 of the FGACCD for detailed information regarding the bankfull parameters of proposed realigned Reach BP-1-B through the proposed Clark Boulevard crossing.

While the proposed conceptual channel design includes a low flow channel through the crossing, refinements may be required at the detailed design stage. The following recommendations are provided from a fluvial geomorphological perspective for consideration at subsequent design stages:

- The crossing and low flow channel design should consider channel form and fluvial processes to allow for the continuation of natural channel processes through the crossing, including sediment transport;
- The proposed design should also limit the change in velocity gradient through the crossing during more frequent flow events;
- Aquatic and terrestrial wildlife considerations and passage should also be accommodated, as appropriate; and
- Complete hydraulic stone sizing to ensure the channel is stable during the largest anticipated velocities.

5.3.8 Interim and Long-Term Channel Conditions

After construction, it is anticipated that the realigned channels will go through a period of adjustment. This is related to the growth rate of vegetation and long-term succession. In the short-term (< 5 years) some vegetation encroachment into the channel is anticipated given the proposed planting plan. When the channel is first landscaped, the vegetation will be immature with minimal canopy cover resulting in a higher percentage of grasses establishing and encroaching into the channel. As the vegetation matures and the canopy cover increases (10 – 25 years) less grass encroachment into the channel is anticipated due to reduced light penetration. The increased canopy cover will also benefit the system by reducing light penetration and increasing shading which results in a cooler channel. During this phase there will likely be limited change in channel morphology.

In the long term (> 25 years) the canopy cover will increase, riparian vegetation is anticipated to consist of less grasses and more shrubs, herbaceous, and tree species. This will likely result in greater habitat diversity due to increased woody debris. Willow and dogwood species are proposed along the channel banks which will increase woody debris within the channel. The vegetation change over time will influence channel function. The proposed meandering channel is an appropriate planform design as the vegetation encroachment in the channel decreases. The proposed substrate will also provide stability to the channel bed once vegetation encroachment is minimized.

5.3.9 Site Restoration Recommendations

For immediate erosion protection, mechanical stabilization in the form of biodegradable erosion control blankets (i.e., coir cloth, jute mat, etc.) is recommended. As the blankets will biodegrade over time, this serves as a short-term stabilization measure.

For long-term stability, implementation of planting plans within each corridor is recommended. This includes deep rooting native grasses and other herbaceous species seeded along and within channel sections, prescription of flood tolerant native shrub and tree species, and use of seed banks within the local soil. Shrubs should be planted close to the channel margins to provided maximum benefit with respect to stabilization and channel cover.

It is noted that the natural corridor designs will be reviewed and updated as necessary during detailed design based on the final Hydrologic Verification modelling results.

5.4 Hydraulic Analyses

As described in **Section 5.3**, hydraulic analyses was conducted as part of the SIS 3A Addendum, SIS 3B/4, and SIS 5A Addendum, to determine flow velocities and depths for use in shear stress calculations and substrate sizing for realigned Reach BP-1-A and Reach BP-1-B. In addition, the hydraulic analysis verified the proposed channel designs are able to convey the storm event flows up to and including the Regional Storm event without overtopping or flooding adjacent lands. The hydraulic analysis was also used to demonstrate that the existing condition riparian storage is maintained in the proposed condition.

Section 4.4 of the SIS 3A Addendum and SIS 3B/4, and **Section 4.4** of the SIS 5A Addendum provided detailed information regarding the hydraulic analysis and riparian storage. These report sections are included in **Appendix E.2.** The proposed hydraulics for reach BP-1-A was updated as part of this report and the output is included **Appendix D.** The proposed Floodplain is illustrated in **Drawing 3.1**.

5.4.1 Proposed Crossings

1. BP-1-A

The existing 3 m span culvert at Derry Road conveying flows to existing BP-1-A was installed as part of the relatively recent reconstruction of Derry Road. However, the hydraulic modelling conducted as part of the SIS 3A Addendum and SIS 3B/4 predicts that Derry Road would continue to be overtopped by the Regional storm event with the 3 m span culvert. It is therefore expected that when Derry Road is reconstructed in the future (currently scheduled for 2031 construction in Halton Region's Roads Capital Projects Planning), the existing concrete box culvert will be replaced with a 12.81 m span culvert recommended in SIS 3A Addendum and SIS 3B/4. **Table** 5.3 summarizes the predicted performance of the culverts during a Regional storm event. It is recognized that there are additional clearance and freeboard criteria for culvert crossings, including municipal design standards and the Highway Drainage Design Standards (MTO, 2008). Additional analyses will be required to confirm conformance with all criteria during detailed design of the collector roads, when horizontal alignments and vertical road profiles are more accurately established.

Table 5.3 – Proposed Condition Realigned Reach BP-1-A Crossing

Tributary ID	Location	Culvert Span (m)	Regional Storm Peak Flow Rate (m^3/s)	Freeboard (m)
BP-1-A	Derry Road	12.81	21.2	1.2

2. BP-1-B

A 12.81m wide x 2.44m high Conspan Arch box culvert is proposed to cross under Clark Boulevard at the south limit of the Site and convey flows from realigned Reach BP-1-B. A hydraulic analysis was completed to confirm that the proposed culvert can sufficiently convey flows up to and including the Regional storm event.

Table 5.4 summarizes the predicted performance of the culverts during a Regional storm event. It is recognized that there are additional clearance and freeboard criteria for culvert crossings, including municipal design standards and the Highway Drainage Design Standards (MTO, 2008). Additional analyses will be required to confirm conformance with all criteria during detailed design of the collector roads, when horizontal alignments and vertical road profiles are more accurately established.

Table 5.4 – Proposed Condition Realigned Reach BP-1-B Crossing

Tributary ID	Location	Culvert Span (m)	Regional Storm Peak Flow Rate (m^3/s)	Freeboard (m)
BP-1-B	Future Collector Clark Blvd	12.81	187.30	1.26

6 Water Supply and Distribution

6.1 Water System Assessment

6.1.1 Existing and Proposed Conditions

An overall Area Servicing Plan (ASP) was completed by AMEC in support of the Derry Green Secondary Plan, dated 2012, which outlined a conceptual water supply and distribution system to service the area. Since 2012, the Region has completed updates to the Sustainable Halton Water and Wastewater Master Plan, and prior to initiating this FSR, Stantec contacted the Region to obtain the latest copy of their overall master water model (June 2020). Following receipt of the required information, Stantec retained Municipal Engineering Solutions (MES) to complete a Preliminary Water Analysis, which is included in Error! Reference source not found. for reference.

A summary of the details of the Preliminary Water Analysis is described below.

6.1.2 Existing Water Supply

Water supply for the Derry Green Secondary Plan Area is proposed to be sourced from the Lake Ontario based Burloak Water Treatment Plant located in the Town of Burlington, Ontario. The Secondary Plan is separated into two water pressure districts (Zone TWL 250m and Zone M5L/TWL 267m), with the Site lying in Zone TWL 250m. As per the ASP, the Site and surrounding lands were previously located in Halton Region Pressure Zone M4L (now referred to as Zone TWL 250m). Halton Region has recently adjusted the pressure districts in the Town of Milton Area. Under the adjusted pressure zone boundary, the Derry Green Corporate Business Park Secondary Plan Area, including the Site, is currently within Pressure Zone TWL 250m. Similar to the external sanitary servicing, the Region constructed the transmission watermain required to service the DGCBPSP Area, from Main Street south to Fourth Line, in 2015 under Contract No. S-2977A-15, all of which was commissioned in 2019. The Region also recently constructed an additional transmission main along Derry Road, from Fourth Line to Trafalgar Road. The following outlines the external watermains located along the SIS Area boundary to service the area.

- A 750 millimeter (mm) diameter concrete pressure pipe (Regional transmission main) watermain exists along Fifth Line adjacent to the Subject Lands; and
- A 900 mm diameter transmission watermain exists along Derry Rd (south side) adjacent to the Subject Lands.

6.1.3 Proposed Water Distribution System

There is a 400mm diameter watermain on Derry Road proposed by MGM consultant, on behalf of the developer on the north side of our development to service their property (Broccolini site). The plan is to commence the construction of this watermain in 2024. This watermain will be extended by Anatolia to the east to service this development application, with Stantec Consulting Ltd undertaking the design engineering for this extension. The intent is to commence the construction with the Broccolini works in

2024. The detailed design of the proposed 400mm diameter watermain along Derry Road will be submitted under separate cover.

Building 1 and 2 will be serviced by a 400mm diameter and the 300mm diameter watermain connecting to the proposed 400mm diameter watermain along the Clarck Blvd. This watermain will be connected to the 400mm diameter watermain on Derry Road on the north side and will be terminated at the southern property limit. Due to Anatolia's development application progressing ahead of the developer on the south side (Remington), this watermain will be extended in future along Clark Boulevard and connect to the existing main line valve Chamber #7 on Fifth line to service the Remington Land.

Building 3 will be serviced by a 300mm diameter watermain connecting the proposed 400mm diameter watermain on Derry Road.

All watermains and appurtenances will be designed and constructed to the requirements of Halton Region, the Town of Milton and Ministry of the Environment, Conservation and Parks (MECP). **Drawing 6.1** illustrates the approximate locations and size of the proposed watermains. Final sizing and location of the local watermains will be confirmed during the detailed design stage of the development.

6.1.4 Overview

Municipal Engineering Solutions (MES) was retained to complete a hydraulic analysis to determine the appropriate watermain sizes to distribute domestic and fire flow water under the demand scenarios required by Halton Region, and MECP pressure and distribution guidelines. A summary of the report and results of the analysis are noted below.

6.1.5 Methodology

A water model of the surrounding existing and proposed development water distribution systems utilizing Halton Region's *InfoWater* models (June 2020) was developed.

The development population was calculated based on 125 people per hectare for light industrial area. Under steady state conditions the model was used to determine suitable pipe sizes under Average Day, Peak Hour and Maximum Day Demand (MDD) plus Fire Flow Demand (FFD) conditions and the specified demand and pressure criteria shown in

Table 6.1.

Development Density Criteria are taken from the Region of Halton Water and Wastewater Linear Design Manual (October, 2019).

The proposed Site development consists of three (3) industrial buildings with a total development area of approximately 42.2 ha, the approximate employment population was calculated to be 5,429 persons.

Table 6.1 – Water Distribution Design Criteria

Demand Type	Criteria
Average Daily Demand (m^3/capita)	0.275
Maximum Daily Demand Peaking Factor[1]	2.25
Maximum Hourly Demand Peaking Factor[1]	2.25

1. Corresponding to Industrial/Commercial/Institutional land use.

Water Distribution Design Criteria are taken from Region of Halton Water and Wastewater Linear Design Manual (October, 2019).

After determining the equivalent population, the corresponding Average Day, Maximum Day, and Peak Hour demands were calculated based on water design factors as stated in **Table 6.2**. Average Day, Maximum Day and Peak Hour demands for the development of the Subject Lands were calculated and summarized in the table below:

Table 6.2 – Water Demand

Demand Category	Water Demand (L/s)
	Anatolia Lands
Average Daily Demand	7.31
Maximum Daily Demand	16.46
Peak Hour Demand	16.46

Demands were modeled on a single node for the development. Further details on the development demands are provided in **Appendix B**.

6.1.6 Fire Demands

Fire demands were determined using the Fire Underwriter's Survey calculation methodology. The largest calculated flow for each type of unit was utilized as appropriate based on the Site Plan. This calculation is based on the type of building, floor area, number of storeys, construction class, occupancy class, and exposure factor. Due to the preliminary nature of the analysis, assumptions were made for the building design based on similar structures. The fire flow requirements should be calculated using the Fire Underwriter's Survey or Building Code formulas by a qualified mechanical designer or architect during detailed design.

For the following analysis, the calculated fire flows for each building as shown on the Site Plan is shown in **Table** 6.3 below and assigned to the nearest node in the model for the maximum day plus fire scenario. Fire flow calculations and assumptions are provided in **Appendix B**.

Table 6.3 – Fire Flow Requirements

Anatolia Lands	Fire Flow[1] (L/s)
Building 1	733
Building 2	550
Building 3	317

1. Source: Fire Underwriters Survey.

6.1.7 System Pressure Requirements

In addition to meeting fire flows, the development must be within operating pressure requirements. The Region of Halton pressure criterion stipulates a minimum of 40 pounds per square inch (psi) (275 kilopascals (kPa)) and maximum pressure of 100 psi (690 kPa). Under fire flow conditions, pressures above 20 psi (140kPa) must be maintained.

It is important to note that the Ontario Building code requires individual pressure regulating valves within buildings if pressures are above 80 psi (550 kPa).

6.1.8 Analysis

As mentioned previously, the proposed development was added to an existing InfoWater hydraulic model of the Region of Halton's water distribution system.

The elevation range within the Site ranges from approximately 192 m to 199 m. Therefore, the development will be serviced by Pressure Zone 250.

Elevations were assigned to the development according to preliminary site grading values and demands were input into new nodes created for the development. Friction factor for the pipes were assigned according to **Table 6.4** below.

Table 6.4 – Hazen-Williams Roughness Factors

Diameter - Nominal	C-Factor[1]
50mm Copper	120
100mm to 400mm PVC / HDPE	130
> 400mm Concrete Lined	110

1. Hazen-William Roughness factors are taken from Region of Halton Water and Wastewater Linear Design Manual, April, 2019.

WATERMAIN SIZING AND SYSTEM PRESSURE

MES's analysis was conducted under interim (2021) and future servicing conditions (2031) for Average Day, Maximum Day, Maximum Hour and Maximum Day plus Fire demands to size the watermains and meet pressure requirements.

The required local watermains on Clark Boulevard to service the Site were sized to be 400mm according to the results of Average Day, Maximum Day plus Fire, and Peak Hour scenarios. Water service sizes to each development block/building are sized as 300mm or 400mm diameter. A 300mm diameter service connection is also proposed to service Building 3. The pipe sizes and layout are shown on **Drawing 6.1**.

Modeled services pressures for the Site are summarized in **Table 6.5**. The results of the analysis show that the industrial development can be adequately serviced by the proposed system and pressure zone under both the interim (2021) and ultimate (2031) conditions. Fire flow requirements should be calculated using the Fire Underwriter's Survey or Building Code formulas by a qualified mechanical designer or architect during detailed design.

Under both the interim (2021) and ultimate (2031) conditions, the pressures will be above the OBC requirement of 80 psi (550 kPa).

Detailed pipe and node tables for the various scenarios modelled are included in **Appendix C**.

Table 6.5 – Modeled Service Pressures

Scenario	Average Day	Maximum Day	Peak Hour	Max. Day and Fire
Interim(2021)	71.6 - 81.0 psi (–493 - 559 kPa)	71.5 - 80.9 psi (– 493 - 558 kPa)	70.4 – 80.0 psi (–485 - 551 kPa)	408 to 951 L/s Flow available @ 20psi (140kPa)
Ultimate(2031)	76 – 85.4 psi (–524 - 589 kPa)	74.8 – 84.3 psi (–516 - 581 kPa)	62.9 – 73.3 psi (–434 - 505 kPa)	415 to 972 L/s Flow available @ 20 psi (140 kPa)

7 Sanitary Sewer Design

7.1 Background

The Region constructed the trunk sanitary sewer required to service the DGCBPSP Area, from Main Street south to the Britannia Street Sanitary Pump Station (SPS), in 2015 under Contract No. S-2977A-15, all of which was commissioned in 2019. Sanitary flows from the SPS are pumped across 16 Mile Creek to the trunk sanitary sewer along Highway No. 25, which ultimately outlets to the Mid-Halton WWTP located on the north side of the Queen Elizabeth Way, west of Third Line in the Town of Oakville. There is an existing 900mm diameter trunk sanitary sewer on Fifth Line adjacent to the Site. The following external connection points to the trunk sanitary sewer were provided by the Region to service the Site:

- MH 18A (525mm diameter CL1400 sewer @ 0.5% grade) at the intersection of Fifth Line and Derry Rd (east side), as illustrated on Region Drawing No. PP7 attached.
- MH 9A (900mm diameter CL 1400 sewer @ 0.5% grade) at the future intersection of Fifth Line and Clark Boulevard, as illustrated on Region Drawing No. PP10 attached.

The remaining external sanitary sewer required to service the Site is the following:

- Region Project ID# 6562 which involves the construction of a new 525mm diameter sanitary sewer within Derry Road from Fifth Line (MH 18A) east to future intersection with Clark Boulevard. The 2017 DC Background Technical Report identified this work to commence in approximately 2020. Since this work has yet to commence, it is anticipated that it will be completed in the near future (to be confirmed by the Region).
- The proposed 525mm diameter sanitary sewer on Derry Road from MH6A to MH302A by Anatolia and designed by Stantec Consulting Ltd. To service this development

7.2 Proposed Sanitary Sewer System

The design of the internal sanitary sewer system for the proposed development is to conform to the current Town of Milton, Halton Region, and the MECP Design Guidelines. Design parameters are summarized in **Table 7.1** below.

Table 7.1 – Sanitary Sewer Design Parameters

Design Parameter	Value	Unit
Average Domestic Flow	275	liters/capita/day
Infiltration Rate	0.286	liters/second/hectare
Design Population Light Industrial Areas	 125	 persons/hectare
Minimum Sewer Size (Industrial)	200	millimeter diameter
Minimum Flow Velocity	0.6	meters/second
Maximum Flow Velocity	3.0	meters/second
Minimum Sewer Cover Depth	2.75 1.20	meters – municipal ROW meters – internal (private)
Maximum Manhole Spacing	150	meters

The proposed sanitary servicing concept is illustrated on **Drawings 7.1.**

There is a 525mm diameter sanitary sewer on Derry Road proposed by MGM consultant, on behalf of the developer on the north side of our development to service their property (Broccolini site). The plan is to commence the construction of this sewer in 2024. This sanitary sewer will be extended by Anatolia to the east from MH 6A to MH 302A to service this development application, with Stantec Consulting Ltd undertaking the design engineering for this extension. The intent is to commence the construction with the Broccolini works in 2024. The detailed design of the proposed 525mm diameter sanitary sewer along Derry Road will be submitted under separate cover.

Building 1 and 2 will be serviced by a 250mm diameter sanitary sewer connecting to the proposed 300mm diameter sanitary sewer along the Clarck Blvd and outlet to the proposed MH 200A which connect to the proposed 525mm diameter sanitary sewer along Derry Road.

Building 3 will be serviced by a 200mm diameter sanitary sewer connecting the proposed 525mm diameter sanitary sewer on Derry Road.

Sanitary sewer sizing calculation and system design sheets are provided in **Appendix C**.

8 Storm Sewer Design

8.1 Background

The proposed functional storm drainage design for the Subject Lands, as outlined herein, is consistent with the conceptual designs outlined in the March 2023 SIS – Area 5A Addendum by Stantec.

The storm sewer system functional design for both the municipal and the internal development block drainage have been designed to capture and convey minor storm flows (5-year design storm flows) and in some cases the major flows (100 year design storm flows) to one of proposed SWM facilities. Stormwater management ponds, underground storage units and oil grit separators will be utilized for quantity and quality control. Drainage from Fifth Line and Derry Road are self-contained and are not conveyed within the Subject Lands. The proposed grading and storm sewer design has maintained the proposed drainage areas discussed within the SIS Reports.

The design of the storm sewer system for the proposed development will conform to the current Town of Milton, Region of Halton, and the Ontario MECP Design Guidelines. Design parameters for the storm sewers are summarized in **Table 8.1** below.

Table 8.1 – Storm Sewer System Design Parameters

Design Parameter	Value	Unit
Design Storm Return Period	5	year design storm
Minimum Sewer Size	300	millimeter diameter
Minimum Flow Velocity	0.6	meters/second
Maximum Flow Velocity	3.0	meters/second
Minimum Sewer Cover Depth	1.2	meters
Maximum Manhole Spacing	150	meters

It should also be noted that where private rooftop storm water flow control devices are to be implemented, the design of the downstream municipal storm drainage system (minor and major systems) are to be designed and sized without consideration of the roof top flow control devices.

8.2 Proposed Storm Drainage System

The site will be serviced by a proposed storm sewer system designed to convey the 5-year flow (minor) to the proposed SWM facilities for quality and quantity control. Areas where the proposed storm sewer system designed to convey the 100-year flow (major) are highlighted on Drawing 8.1. Flows corresponding to higher return periods (major) designed as overland flow will be conveyed through the site as shown on the grading plan (Drawing 3.1). Layout of storm sewer and pipe sizes can be found on **Drawing 8.1**. Design sheets are included in **Appendix C**.

9 Site Erosion and Sediment Control

Prior to the initiation of any construction within the site, a comprehensive Erosion and Sediment Control (ESC) program acceptable to the Town of Milton, Region of Halton, and Conservation Halton must be implemented. Phase one erosion and sedimentation control plan drawings and reports for site alteration permit outside of the regulated areas have been submitted to Town and Region on February 15, 2023.

In general, the ESC plans should include all necessary siltation control facilities designed in accordance with current Town guidelines and the requirements of Conservation Halton. Below is a list of recommended erosion and sediment control measures that will be installed and maintained during the construction of the Subject Site.

- Temporary sediment control fences, and tree protection fences (if required) will be placed prior to grading;
- Temporary construction access from Derry Road will be required and will be constructed to the requirements of the Town of Milton and Conservation and maintained to minimize mud tracking and disruption to the public;
- Install temporary swales throughout site along with check dams;
- If required during the topsoil stripping phase prior to bulk earthworks, temporary sediment traps and/or small temporary sediment control ponds may be installed to capture and treat runoff before releasing to open space areas;
- The proposed SWM pond may be constructed early on in the earthworks phase to function as an ESC pond during the earthworks and servicing phases of construction;
- Temporary topsoil stockpiles will be seeded to prevent wind erosion and stockpiled to a maximum height of 3m; and,
- All temporary erosion and sediment control measures will be routinely inspected and repaired during construction. Temporary controls will not be removed until the areas they serve are restored and stable.

10 Utilities

The Subject Site can be serviced by the following utility providers.

- Milton Hydro – electrical power
- Enbridge (Previously Union Gas) – natural gas
- Rogers and Bell – cable television and telecommunications

Service is proposed through the connection to and extension of existing services currently in place along the surrounding existing roads. Actual utility requirements will be determined during the detailed design stage of the project.

11 Phasing and Construction Staging

Schedule C-9-C (**Appendix E.1**) of the approved Secondary Plan identified a preliminary Phasing Plan which consisted of three (3) phases. Phase 1 included the lands at the southeast corner of Derry Road and Fifth Line (north of the Union Gas Easement), Phase 2 includes Anatolia Lands (north of the Union Gas Easement) and Phase 3 being the remaining lands south of Union Gas Easement. The Secondary Plan policies, specifically Section C.9.6.1.2, outlined the following conditions:

a) Phase 2 – 60% of the developable land in Phase 1 must be in registered plans of subdivision or approved site plans prior to commencement of development in Phase 2;

b) Phase 3 – 60% of the developable land in Phase 2 must be in registered plans of subdivision or approved site plans prior to commencement of development in Phase 3; and

c) Potential Future Phase – the Town and Regional Municipality of Halton are satisfied that the lands can be appropriately provided with water and wastewater services.

Notwithstanding, phasing is subject to change based on availability of servicing and development needs. At this time, a refined phasing plan has not been prepared, but it is anticipated that development will proceed in one (1) phase considering the trunk infrastructure is in place to service the lands from a sanitary and watermain perspective.

At detailed design, a phasing plan will be prepared including the construction timing and phasing of the watercourse realignment corridors and natural heritage features within or adjacent to these corridors, removal of existing permitted features, and the creation of the development blocks. This phasing plan will demonstrate no negative impacts for significant features and functions at all times.

Development may also move forward with a phased Building Construction program, depending on economic conditions.

All services required to support the specified block developments would be constructed prior to Building Construction program, including temporary and permanent stormwater management facilities, channel works, storm sewers, sanitary sewers, watermains, internal block vehicle access and parking, road access (Clarke Avenue), street lighting and utilities.

Typically, the construction staging for the development would be as follows:

1. Initial Site Earthworks (Lands Outside Regulated Areas)

    - Prepare and submit site alteration plans to the Town and Conservation Halton (CH) for site areas outside of CH regulated areas. Includes rough site grading plans and erosion / sedimentation control (ESC) plans and reports.

    - Install ESC works as required by the approved plans.

- Clear and grub the site as required.
- Strip topsoil and stockpile on site and/or removal from the site to an approved disposal site.
- Earthworks – cut and fill operations, import and place fill, excavate, remove and dispose of unsuitable materials off site.

2. Channelization Works

    - Prepare site alteration and construction phasing plans, detailed design drawings and fill permit application and submit to the Town, Conservation Halton (CH) and Fisheries and Oceans Canada (DFO) for the proposed realignment and restoration of BP-1-A and BP-1-B.
    - Construct new channel blocks including low flow channels, wetlands, wildlife habitat features, restore and stabilize the work area, and complete wildlife rescues and relocation.
    - Divert water into new channel blocks and decommission existing watercourses.

3. Remaining Earthworks

    - Prepare and submit site alteration plans and fill permit, for the remaining Site to the Town, CH Includes rough site grading plans and ESC plans and reports.
    - Install ESC works as required by the approved plans.
    - Clear and grub the remainder of the site as required.
    - Strip topsoil and stockpile on site and/or removal from the site to an approved disposal site.
    - Earthworks – cut and fill operations, import and place fill, excavate, remove and dispose of unsuitable materials off site.

4. Municipal Servicing (storm sewers, sanitary sewers, municipal stormwater management, watermains) and Roadways.

5. Site plan grading and servicing followed by building construction.

12 Post Construction Site Monitoring

A comprehensive monitoring plan including ecology, groundwater, fluvial geomorphology, natural heritage, and stormwater management parameters has been established for similar developments in the Derry Green Business Park. A monitoring program was detailed within the SIS 3A Addendum, SIS 3B/4, and SIS 5A Addendum; this monitoring plan will be implemented for the Site. For details refer to the SIS 3A Addendum, SIS 3B/4, and SIS 5A Addendum. Relevant excerpts have been provided in **Appendix E.2**.

13 Conclusions and Recommendations

Stormwater Management and Drainage

The Site can be adequately serviced with storm drainage using conventional municipal engineering practices and compliance to Town Standards.

- Within the Anatolia Industrial Building 2 and 3 blocks, the storm sewers will be designed to convey, at a minimum, runoff from the 1 in 5-year storm event.
- Within the Anatolia Industrial Building 1 block, the storm sewers are designed to convey peak flows up to and including the 100-year storm event.
- Flows from major storm events (greater than the storm sewer design capacity noted above) will generally be conveyed overland within the road right-of-way and within designated overland flow routes, to the proposed stormwater management facilities.

Following the guidance of the SIS 3A Addendum, SIS 3B/4, and 5A SIS, stormwater quality and quantity control for the site will be provided by two SWM ponds and one underground SWM Facility. Underground SWM Facility S4-1B (comprised of units S4-1B-1, S4-1B-2, S4-1B-3, and S4-1B-4) will servicing the Anatolia Industrial Building 1 Block. SWM Pond S5-1 will service the Anatolia Industrial Building 2 Block and Clark Boulevard and provide overcontrol for a portion of Derry Road drainage. SWM Pond S5-2 will service the Anatolia Industrial Building 3 Block. All SWM Facilities have been designed in accordance with municipal and provincial guidelines.

Quality treatment for Anatolia Industrial Block 1 be provided by a treatment train consisting of Isolator Rows within SWM Facility S4-1B and Manufactured Treatment Devices (HydroDome or approved equivalent), both capable of providing Enhanced Level (80% TSS removal) protection and are third-party ETV verified. The treatment train is capable of providing 92% TSS removal.

The quality control provided by the SWM ponds will achieve Enhanced Level protection corresponding to 80% long term TSS removal. Quantity control provided will meet the unit release and storage rates noted in the SIS 3A Addendum, SIS 3B/4, and 5A SIS. The release rates and storage volumes provided for the were confirmed through H-SPF modeling completed by WSP.

Watercourses

As described in the SIS 3A Addendum, SIS 3B/4, and 5A SIS, the proposed realignment of the two watercourses on the Site will include increased corridor widths with riparian wetlands as well as on-line, off-line and side channel features. The goal is enhancement for use as corridors and habitat for wildlife, in addition to the improvement in aquatic habitat function and mitigation to replace and improve the limited habitat currently provided on site.

The proposed channel blocks will utilize natural channel design which will provide bank stabilization, enhancements to river processes and floodplain function, habitat improvements and ecosystem

restoration. The northeast created wetland will provide diverse aquatic and terrestrial habitat. This will meet the goals and objectives detailed within the SIS 3A Addendum, SIS 3B/4, and 5A SIS.

Water Supply and Distribution

The Subject Lands can be adequately serviced with domestic water supply and distribution including adequate supply and pressure for firefighting purposes from connection to Halton Region's existing distribution system on Fifth Line and Derry Road through the Subject Lands. Provision of a local 300mm diameter watermain on Clark Blvd. is recommended to provide supply security to the development distribution system by providing a looped piping system and boosting available fire flow conditions within the development.

The industrial development can be adequately serviced by the proposed system and Pressure Zone 250. The pressures will be above the OBC requirement of 80 psi (550 kPa) Pressure reduction will be necessary for buildings located on elevations below approximately 194.0 m.

It is recommended that:

- Existing system pressures be confirmed in the field at detailed design.
- The fire flow requirements for each of the development buildings be calculated using the Fire Underwriter's Survey or Building Code formulas by a qualified mechanical designer or architect during detailed design.

Sanitary Sewage

The Site can be adequately serviced for sanitary drainage using conventional municipal engineering practices and in compliance with Town of Milton and Halton Region standards. This is achieved by the following proposed works.

- To services the Subject Lands located north of the Union Gas Easement, A proposed local 300mm diameter municipal sewer on Clark Boulevard and a 200mm diameter sanitary sewer from Building 3 connecting to the future 525mm diameter trunk sanitary sewer on Derry Road will be provided.

Storm Servicing

The Site can be adequately serviced for storm drainage using conventional municipal engineering practices and in compliance with Town of Milton and Halton Region standards. This is achieved through a network of storm sewers to convey minor (and identified area major) storm system flows draining to the proposed SWM facilities on the Subject Lands. Major storm system flows are accommodated via appropriately sized storm sewers as required, drainage channels and overland flow routes designed to convey the flows to the proposed SWM facilities.

Grading and Road Access

The proposed overall grading design for the site can be achieved using the conventional site design standards and compliance to the proposed stormwater management and overland flow concept.

Utilities

The Site can be serviced through the extension of existing utilities including hydro, gas, cable TV and telephone. Applications to each service provider are required to confirm capacity of existing services.

It is recommended that:

- This report be circulated to the applicable review agencies in support of the Official Plan Amendment, Zoning By-Law Amendment and Draft Plan of Subdivision Applications submitted by the Derry Green Lands Limited Partnership for these lands.

APPENDICES

Appendix A Drawings

A.1 Site Plan

A.2 As-Builts

DWG G042 – ZONE 4 FEEDERMAINS P&P (STA 0+000 TO 0+280)

DWG G043 – ZONE 4 FEEDERMAINS P&P (STA 0+280 TO 0+560)

DWG G044 – ZONE 4 FEEDERMAINS P&P (STA 0+560 TO 0+840)

DWG G045 – ZONE 4 FEEDERMAINS P&P (STA 0+840 TO 1+120)

DWG G046 – ZONE 4 FEEDERMAINS P&P (STA 1+120 TO 1+400)

DWG G047 – ZONE 4 FEEDERMAINS P&P (STA 1+400 TO 1+680)

DWG PP7 – FIFTH LINE WTM & SAN SEWER (STA 11+710 TO 12+000)

DWG PP8 – FIFTH LINE WTM & SAN SEWER (STA 12+00 TO 12+290)

DWG PP9 – FIFTH LINE WTM & SAN SEWER (STA 12+290 TO 12+570)

DWG PP10 – FIFTH LINE WTM (STA 12+570 TO 12+860)

DWG PP11 – FIFTH LINE WTM (STA 12+860 TO 13+150)

DWG PP1 – DERRY ROAD WTM & SAN SEWER (0+000 TO 0+280)

DWG PP2 – DERRY ROAD WTM & SAN SEWER (0+280 TO 0+560)

DWG PP3 – DERRY ROAD WTM & SAN SEWER (0+280 TO 0+560)

A.3 Engineering Drawings and Figures

FIGURE 1.1 – SITE LOCATION PLAN

DRAWING 3.1 – GRADING PLAN

DRAWING 3.2 – EARTHWORK QUANTITY

DRAWING 3.3 – DERRY ROAD P&P

DRAWING 3.4 – DERRY ROAD P&P

DRAWING 3.5 – CLARK BOULEVARD P&P

FIGURE 3.6 – 26.0 ROW CROSS-SECTION CLARK BOULEVARD

FIGURE 4.1 – PRE-DEVELOPMENT DRAINAGE PLAN

FIGURE 4.2 – POST-DEVELOPMENT DRAINAGE PLAN

FIGURE 4.3 – POND S5-1 PLAN VIEW

FIGURE 4.4 – POND S5-1 CROSS-SECTION

FIGURE 4.5 – POND S5-2 PLAN VIEW

FIGURE 4.6 – POND S5-2 CROSS-SECTION

FIGURE 5.1 – CHANNEL PLAN VIEW

FIGURE 5.2 – CLARK BOULEVARD CULVERT DETAIL

FIGURE 6.1 – WATER SERVICING PLAN

FIGURE 7.1 – SANITARY SERVICING PLAN

FIGURE 8.1 – STORM SERVICING PLAN

Appendix B WATER DISTRIBUTION ANALYSIS

Appendix C STORM SEWER & SANITARY SEWER DESIGN SHEETS

Appendix D STORMWATER MANAGEMENT CALCULATIONS

Appendix E BACKGROUND INFORMATION

E.1 Town of Milton Schedule C-9-C

E.2 SIS 3A Addendum, SIS 3B, SIS 4A, and SIS 5A Addendum Excerpts

E.3 GEO Morphix Fluvial Geomorphology Reports