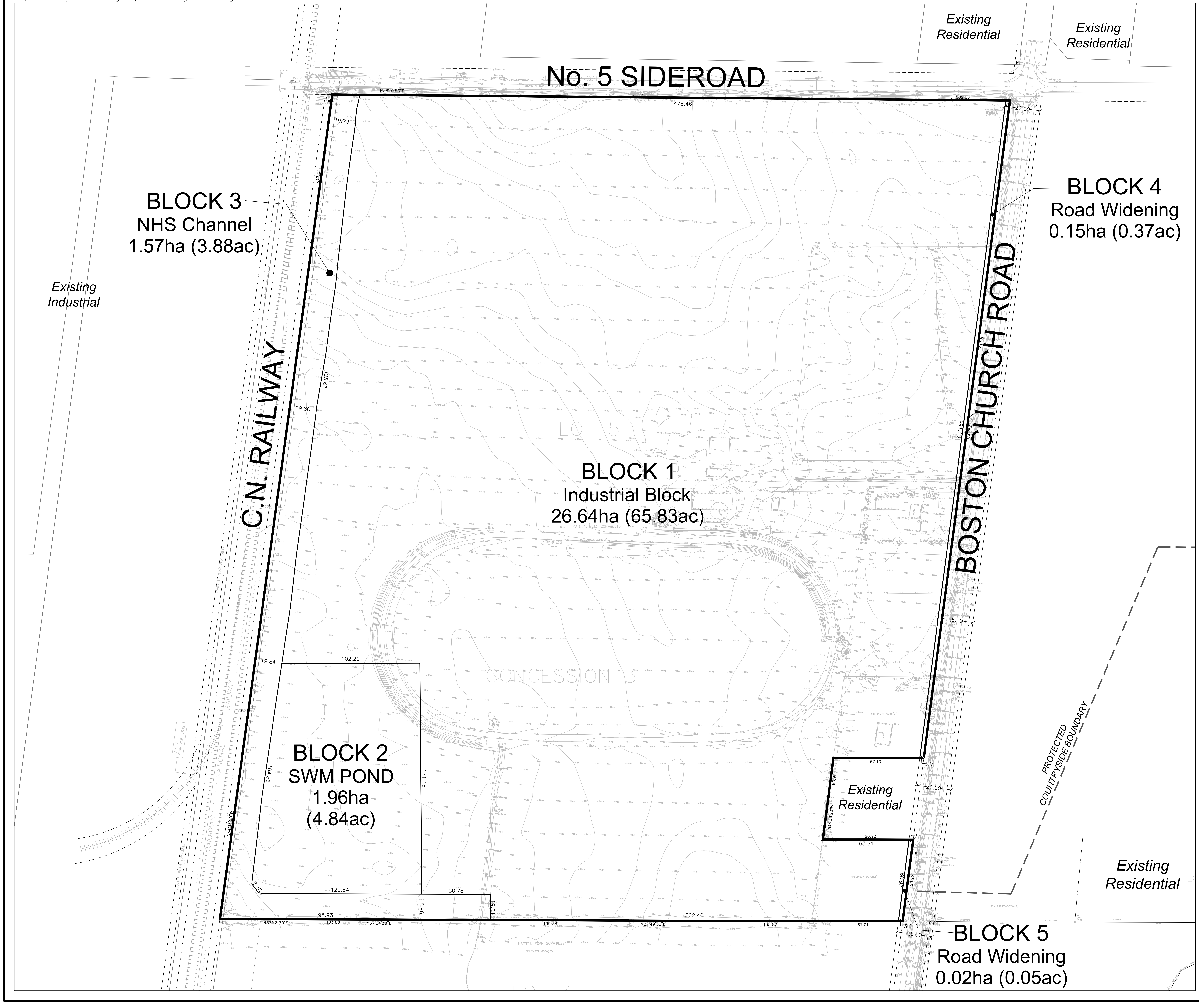
APPENDIX A

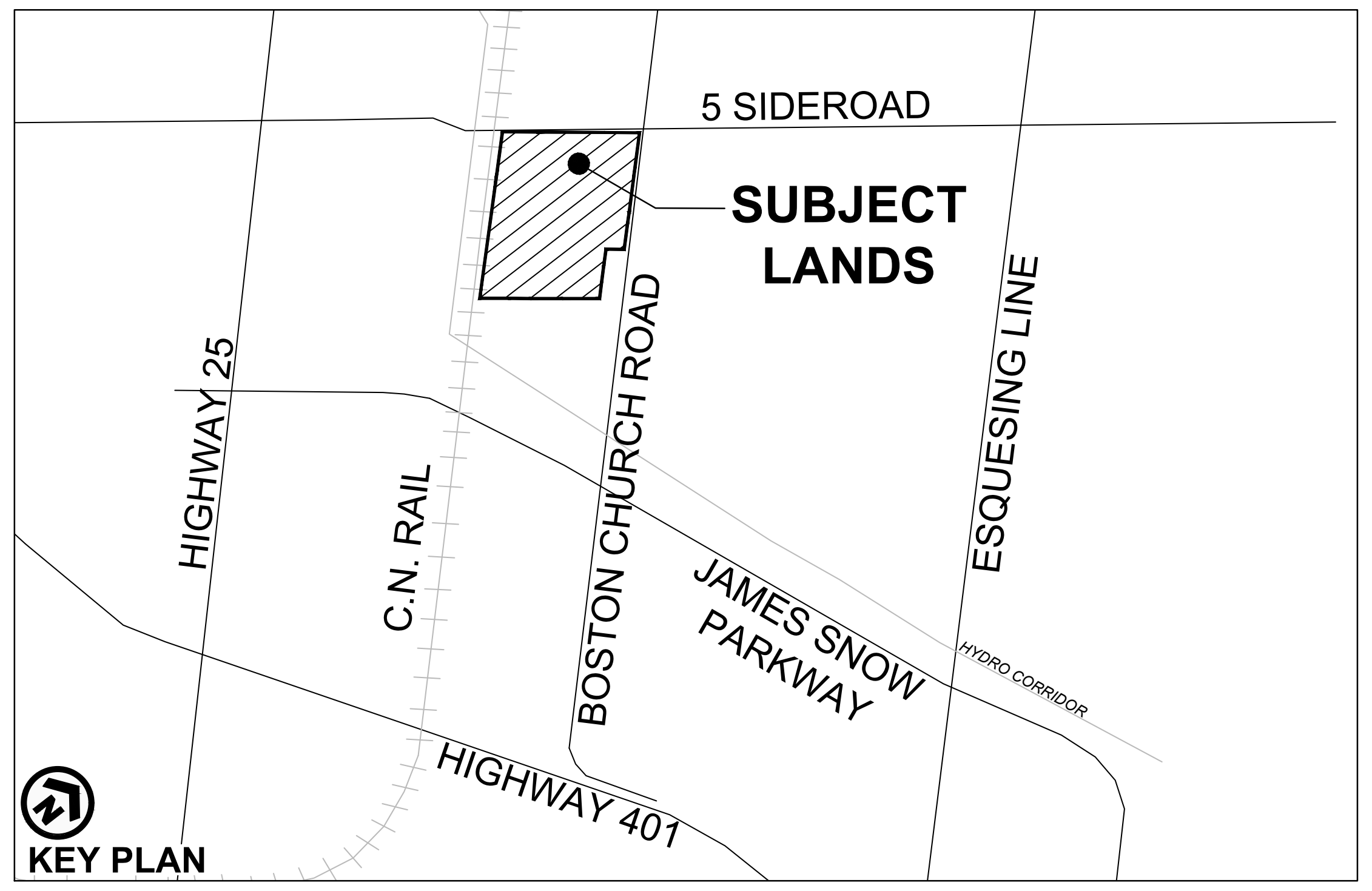
Appendix A1.i

Background

Draft Plans of Subdivision

K:\314-006\2021 08 August\DP West Aug 25 21.dwg





DRAFT PLAN OF SUBDIVISION ORLANDO CORPORATION

PART OF LOT 5, CONCESSION 3,
TOWNSHIP OF ESQUESING
REGIONAL MUNICIPALITY OF HALTON

OWNERS CERTIFICATE

I HEREBY AUTHORIZE GLEN SCHNARR & ASSOCIATES INC. TO PREPARE AND SUBMIT THIS DRAFT PLAN OF SUBDIVISION TO THE TOWN OF MILTON FOR APPROVAL.

SIGNED ____________________ DATE ____________________

PHIL KING, PRESIDENT
ORLANDO CORPORATION

SURVEYORS CERTIFICATE

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED AS SHOWN ON THIS PLAN AND THEIR RELATIONSHIP TO ADJACENT LANDS ARE CORRECTLY AND ACCURATELY SHOWN.

SIGNED ____________________ DATE ____________________

ALISTER SANKEY, O.L.S.

David B.Searles Surveying Ltd.
ONTARIO LAND SURVEYORS
4284 VILLAGE CENTRE COURT, MISSISSAUGA, ONTARIO L4Z 1S2
(905) 273–6840 FAX: (905) 896–4410
E MAIL: DBSOLS @ ON.AIBN.COM

ADDITIONAL INFORMATION

(UNDER SECTION 51(17) OF THE PLANNING ACT) INFORMATION REQUIRED BY CLAUSES A,B,C,D,E,F,G, & J ARE SHOWN ON THE DRAFT AND KEY PLANS.

H) MUNICIPAL AND PIPED WATER TO BE PROVIDED
I) SANDY LOAM AND CLAY LOAM
K) SANITARY AND STORM SEWERS TO BE PROVIDED

LAND USE SCHEDULE

LAND USE	BLOCKS	AREA (ha)	AREA (ac)
Industrial Block	1	26.64	65.83
SWM Pond	2	1.96	4.84
NHS Channel	3	1.57	3.88
Road Widening	4,5	0.17	0.42
TOTAL	**5**	**30.34**	**74.97**

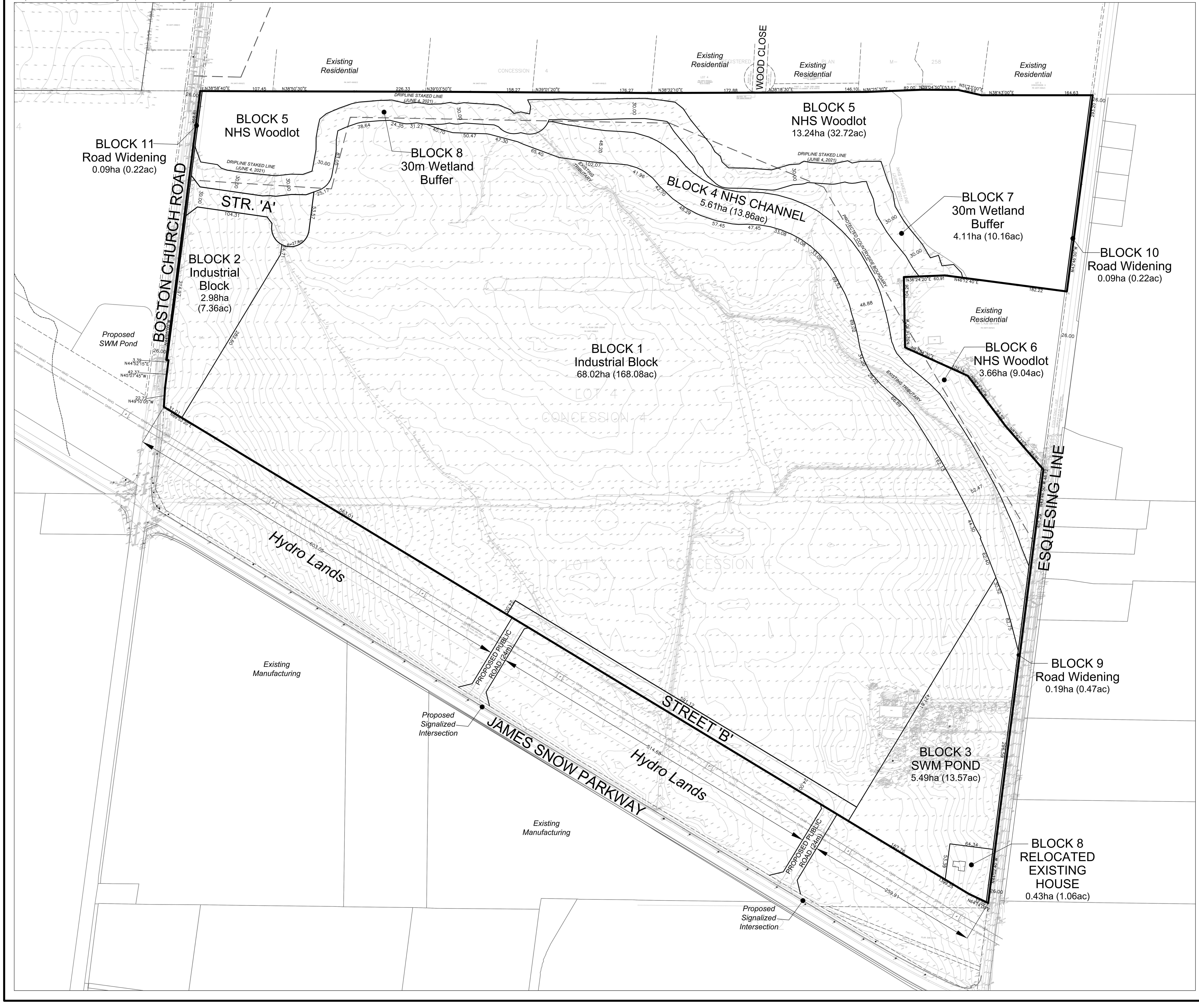
NOTES

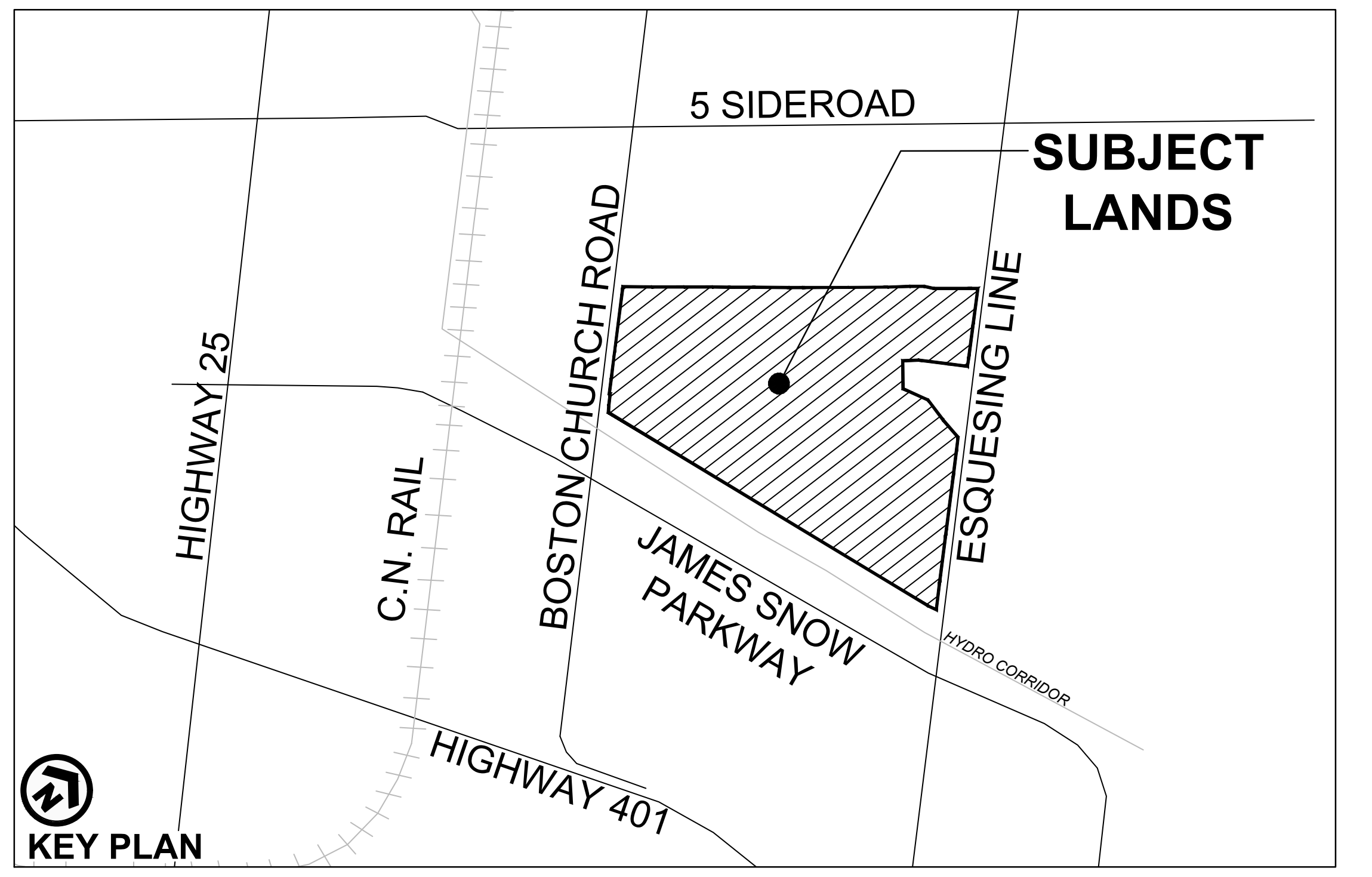
- Base mapping obtained from DB Searles

Scale 1:1250
(24 x 36)
AUGUST 25, 2021

GSAI

K:\314-006\2021 08 August\DP East Aug 26 21.dwg





DRAFT PLAN OF SUBDIVISION ORLANDO CORPORATION

PART OF LOT 3 AND 4, CONCESSION 4,
TOWNSHIP OF ESQUESING
REGIONAL MUNICIPALITY OF HALTON

OWNERS CERTIFICATE

I HEREBY AUTHORIZE GLEN SCHNARR & ASSOCIATES INC. TO PREPARE AND SUBMIT THIS DRAFT PLAN OF SUBDIVISION TO THE TOWN OF MILTON FOR APPROVAL.

SIGNED ____________________ DATE ______________

PHIL KING, PRESIDENT
ORLANDO CORPORATION

SURVEYORS CERTIFICATE

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED AS SHOWN ON THIS PLAN AND THEIR RELATIONSHIP TO ADJACENT LANDS ARE CORRECTLY AND ACCURATELY SHOWN.

SIGNED ____________________ DATE ______________

ALISTER SANKEY, O.L.S.

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H) MUNICIPAL AND PIPED WATER TO BE PROVIDED
I) SANDY LOAM AND CLAY LOAM
K) SANITARY AND STORM SEWERS TO BE PROVIDED

LAND USE SCHEDULE

LAND USE	BLOCKS	AREA (ha)	AREA (ac)
Industrial Block	1,2	71.00	175.44
SWM Pond	3	5.49	13.57
NHS Channel	4	5.61	13.86
NHS Woodlot	5,6	16.90	41.76
30m Wetland Buffer	7	4.11	10.16
Relocated Existing House	8	0.43	1.06
Road Widening	9 - 11	0.37	0.91
24.0m - 30.0m R.O.W. (790m Length)		2.22	5.49
TOTAL	**11**	**106.13**	**262.25**

NOTES

-Base mapping obtained from DB Searles
-daylight triangle at Street 'A' and Boston Church Road: 15m x 15m

Scale 1:2500
(24 x 36)
August 26, 2021

GSAI

Appendix A1.ii

Background

Highway 401 Industrial Business Park Functional Stormwater and Environmental Management Strategy (Philips, July 2000)

FUNCTIONAL STORMWATER
AND ENVIRONMENTAL MANAGEMENT STRATEGY

HIGHWAY 401 INDUSTRIAL/BUSINESS PARK
SECONDARY PLAN AREA
TOWN OF MILTON

March 2000
Revised July 2000

PHILIPS ENGINEERING LTD.
P.O. BOX 220, 3215 NORTH SERVICE ROAD
BURLINGTON, ON L7R 3Y2

TEL: 905-335-2353
FAX: 905-335-1414

E-Mail Address: admin@philipseng.com

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FUNCTIONAL STORMWATER AND ENVIRONMENTAL MANAGEMENT STRATEGY 401 INDUSTRIAL/BUSINESS PARK SECONDARY PLAN AREA TOWN OF MILTON

1. INTRODUCTION

This report provides technical support to the Secondary Land Use planning process for Milton's 401 Industrial/Business Park (ref. Figure 1). The report specifically identifies aquatic and terrestrial resources, including surface water and groundwater, and outlines where these prove to be a constraint to certain types of land use. This report also outlines the preferred stormwater and environmental management strategy for the recommended 401 Industrial/Business Park Secondary Plan. The evaluation has focussed on:

- Development of management strategies for the proposed development area in accordance with the *Sixteen Mile Creek Watershed Plan 1996 and the Sixteen Mile Creek Subwatershed Planning Study - Areas 2 and 7, January, 2000.*

- Integration of Subwatershed Plan environmental goals and objectives into the proposed land use plan.

The foregoing has inherently recognized that some development throughout the area has occurred in the past and, hence the strategies incorporate and optimize the use of infrastructure that has been previously planned and constructed.

2. BACKGROUND INFORMATION REVIEW

The 401 Industrial/Business Park Secondary Plan encompasses an area of approximately 945 ha (excluding roads and rights-of-ways) located along the Highway 401 corridor in the Town of Milton (ref. Figure 1). The area has been partially developed with a mix of industrial, commercial, institutional and residential land use (ref. Figure 2). As part of the Secondary Plan process for this area, a preferred land use concept for the study area has been prepared (ref. Figure 3).

A number previous stormwater servicing and environmental studies have been completed for various development areas within the study area including:

Highway 401 Industrial Area Implementation Policy, 1981 R.V. Anderson Associates: This study involved hydrologic analysis of the Highway 401 Industrial Park Area north of Highway 401 and, identification a preferred stormwater quantity management strategy. This study also designated general locations for stormwater quantity management facilities within the study area. These facility locations are generally consistent with facility locations S34, S36, S37, S38 and S41 (ref. Section 6). Measures to address stormwater quality management were not required at the time of the study and are not included in the report.

Stormwater Management Study – West Tributary of the 16 Mile Creek, F. J. Reinders and Associates, (undated): This study evaluated various stormwater management quantity management strategies for the West Tributary of the Sixteen Mile Creek (ref. Tributary N-2-B Figure 2). Two strategies were evaluated involving options to utilize urban or semi-urban road cross sections, on-site peak flow control measures and end-of-pipe facilities. Each of the strategies would meet a post- to pre- development control flow rate criteria for quantity control. Each strategy recommended that two stormwater management facilities be constructed, although the recommended footprint area for each varied depending on the approach. The location of the facilities as recommended generally corresponds to facilities (S34 and S36 – ref. Section 6). Measures to address stormwater quality management were not required at the time of the study and are not included in the report.

Scoped Subwatershed Plan, West Tributary of the Sixteen Mile Creek, MGM Consulting, February, 1998: This report identified environmental constraints and resources for the area west of Regional Road 25 and provides a recommended stormwater management strategy for the subject lands. The study recommended that development draining to the west tributary (ref. Watercourse N-2-B Figure 2) would provide local end-of-pipe stormwater quality facilities with stormwater quantity (i.e. flood) control at the existing stormwater quantity facility (ref. S36 at Northeast corner of Highway 401/Regional Road 25 interchange). Potential erosion impacts were proposed to be addressed through re-design of the existing watercourse (ref. Watercourse N-2-B). Stormwater quality and quantity management for lands draining to the west of tributary N-2-B would be addressed at a stormwater management facility constructed at the north-west corner of Highway 401/Regional Road 25 interchange (ref. S34).

Stormwater Management Plan (Revised) for MI Developments, Thorburn Penny, October 1998: This report was completed to support the expansion of industrial/commercial land use within the eastern area of the Highway 401 Industrial corridor, specifically the area between Boston Church Road (Third Line) and Esquesing Line (Fourth Line), north of Highway 401. The study recommends the expansion of an existing stormwater quantity facility on the site (ref. SWM facility S38 - Section 6) to provide stormwater quantity and quality control (i.e. Wet pond – Level 3 Habitat Protection). The report also recommends construction of a dry pond to reduce flow rates from the upstream area (i.e. undeveloped area) to the capacity of the downstream watercourse through the MI development site.

Milton Northwest Preliminary Master Plan -Emery Investments, The Planning Partnership, April 1999: This report provides a preliminary land use structure for the lands within the 401 Industrial/Business Park, and includes conceptual locations for stormwater management facilities.

401 Corridor Integrated Planning Project Scoped Subwatershed Study, Town of Halton Hills, Dillon Consulting Limited, 1999. This study examined the environmental impacts associated with proposed development along the proposed Highway 401 corridor within the Town of Halton Hills and a small area within the Town of Milton. The study provides recommendations for stormwater management and protection and enhancement of environmental features to be incorporated with the Highway 401 corridor.

The study also identified the existing stormwater management facilities, which have been constructed as part of the Milton Business Park Development. This development, which had been completed in the late 1980's is within the 401 Industrial/Business Park Secondary Plan area. The facility within the Business Park has been constructed to provide water quantity control only.

3. STUDY AREA INVENTORY AND CONSTRAINT IDENTIFICATION

The study area resources were examined as part of the watershed and subwatershed studies (*ref. Gore and Storrie, 1996 and Philips Planning and Engineering Limited, 2000*). As part of this functional plan, these resources have been examined in greater detail in order to facilitate the land use and infrastructure planning process. Specific discipline areas examined have included hydrogeology, hydrology, hydraulics, water quality, fisheries, streams and terrestrial systems.

3.1 Hydrogeology

Physiography and Geology

The physiography and Quaternary geology of the general area is detailed in Chapman and Putnam (1984) and Karrow (1991), respectively. Overviews are also included in both the Sixteen Mile Creek Subwatershed Plan (1996) and the Halton Aquifer Management Plan (1995) and the Sixteen Mile Creek Subwatershed Planning Study Areas 2 and 7, (2000).

The study area is composed of the general physiographic region identified as the South Slope. The shape of the bedrock surface (including the escarpment), as well as the occurrence of the overburden units which make up the above regions, is a result of the repeated glacial advances and retreats which have occurred in Southern Ontario. The most recent glacial advance and retreat formed much of the land surface and geology present in the area today. This event is referred to as the Wisconsin Glaciation, and was accompanied by various meltwater lakes and channels. The last glacial retreat ended between 10,000 and 20,000 years ago.

In the subwatershed area several glacial depositional processes resulted in various overburden deposits. As the glacier advanced the bedrock was eroded and "till" units were deposited. These consist of a mixture of materials, usually including a significant fine grained (silt and clay) component as well as sand, gravel or larger stones. As meltwater flowed away from the glacier (or temporary lakes) some stream channels were eroded and sand and gravel was left behind as "outwash" or "ice-contact" deposits. Within glacial lakes silt and clay was laid down as lakebed material, known as (glacio) lacustrine deposits.

Within the study area, the South Slope occurs from the escarpment, east-northeast to Milton and beyond towards Halton Hills. Here the South Slope is comprised of the silty to clayey Halton Till and outwash sand and gravel.

The topography within this area has a gentle, somewhat undulating form sloping southeast. Surface water drainage east of the escarpment is generally south toward Lake Ontario. The bedrock underlying the glacial deposits consists of the Queenston shale.

A recent drilling program by the Region of Halton has shown that a significant bedrock valley exists northeast of the study area. In discussions with Mr. Steve Holysh from the Region of Halton, it was indicated that a borehole was drilled along the Esquesing Line approximately 0.4 km south of No. 5 Sideroad. This borehole encountered bedrock at approximately 85 m. The cores indicate that the valley in this area is infilled, predominantly, with lower permeability silts and clays. This valley was not readily apparent from the MOE water well records, possibly due to the shallow extent of the domestic water wells.

Conceptual Groundwater Flow System

Within the study, area much of the surficial overburden consists of clay material which typically is of a low permeability, that is, it does not transmit water readily. When the clay overburden is thin and overlies a more permeable unit such as sand and gravel, underdraining of the overburden may be promoted and more extensive fracturing in the clay generally occurs. The fracturing within the clay is known to occur to depths of 8 metres (25 feet) and may allow for a more significant amount infiltration and movement of groundwater vertically. The horizontal hydraulic connection of the clay fractures is much weaker. Areas where the overburden is thinner may allow for a higher level of infiltration compared to the thicker silt/clay deposits.

The general direction of horizontal groundwater flow within the shallow overburden/shale system will be west-northwest to east-southeast, reflecting the general bedrock and overburden topography. The horizontal component of groundwater flow, particularly within the overburden, will be weak due to low permeability of the silt/clay sediments. Groundwater will likely be directed more locally where the stream reaches are in contact with the bedrock and more permeable alluvial sediments. Within the study area groundwater discharge has been observed in the wetlands and upper reach of the western tributary of the north branch and within the central portion (ref. tributary NW-2-6), south of Highway 401, of the western tributary of the north branch.

Groundwater is utilized for domestic consumption through both private and municipal wells within and to the west of the study area the study area. The Kelso wellfield to the west of the study area, provides for a majority of Milton's 13,000 m^3 per day usage. Currently, it is not shown that the Kelso wellfield is hydraulically connected to the study area but the recent indication of a buried valley may present a potential for connection if the valley extends to the west and contains a continuous sand and gravel unit.

Private domestic wells are generally drilled into the Queenston shale, localized discontinuous sand lenses within the silt clay overburden or discontinuous sand and gravel lenses at the overburden/bedrock contact. It can be generally stated, based on current information, that the aquifer potential, within the study area, is very limited in quantity. The quality of water within the Queenston shale is generally poor due to elevated levels of iron, manganese and chloride.

3.2 Hydrology

Existing Land Use Flow Rate Assessment

The hydrologic Model developed for the *Sixteen Mile Creek Subwatershed Planning Study - Areas 2 and 7, Philips Planning and Engineering Limited, January, 2000* (HSP-F) has been modified as part of this study to establish pre-development (i.e. no development north of Highway 401) flow rates at each of the primary outlet locations along the Highway 401 corridor. This has involved increasing the level of study area discretization based on hydraulic elements and points-of-interest. The flow rates have been developed using a continuous simulation technique and frequency analysis. Table 3.1 provides a summary at various locations throughout the study area (ref. Figure 5):

TABLE 3.1
PRE-DEVELOPMENT LAND USE (NO DEVELOPMENT NORTH OF HIGHWAY 401)
FREQUENCY FLOWS (m^3/s)

Location/Node	Drainage Area (ha)	Frequency (years)							
		1.25	2	5	10	20	50	100	Regional
A	61.7	0.100	0.220	0.430	0.590	0.750	0.960	1.13	5.23
B(local)	88.3	0.150	0.320	0.630	0.870	1.12	1.46	1.73	8.16
B (full)	165.0	0.280	0.600	1.18	1.62	2.07	2.68	3.16	14.91
C	62.8	0.100	0.220	0.430	0.580	0.740	0.960	1.12	5.18
D (local)	61.2	0.110	0.230	0.440	0.590	0.750	0.970	1.13	5.57
D (full)	124.0	0.210	0.440	0.860	1.18	1.50	1.93	2.26	10.46
E	29.4	0.053	0.110	0.220	0.300	0.380	0.500	0.590	2.92
F(local)	99.0	0.170	0.350	0.680	0.930	1.19	1.54	1.81	8.19
F(full)	581.3	0.810	1.87	3.69	4.98	6.21	7.75	8.84	43.70
F(full, with spill)	581.3	0.810	1.87	3.69	4.98	6.21	7.75	8.84	34.37
G (local)	85.2	0.140	0.310	0.590	0.810	1.03	1.33	1.56	7.18
G (full)[1]	482.2	0.580	1.38	2.72	3.60	4.38	5.30	5.93	35.80
G(full, with spill)[1]	482.2	0.580	1.38	2.72	3.60	4.38	5.30	5.93	26.47
H(full)	98.6	0.160	0.340	0.670	0.910	1.17	1.51	1.78	8.04
H(full, with spill)	98.6	0.160	0.340	0.670	0.910	1.17	1.51	1.78	16.42
I	397.0	0.590	1.22	2.37	3.25	4.15	5.39	6.35	28.99
J	158.2	0.250	0.530	1.02	1.39	1.78	2.30	2.71	12.35
K(full)[1]	263.0	0.550	1.10	2.11	2.81	3.47	4.29	4.86	29.50
L(local)	160.2	2.18	3.05	4.30	5.16	6.01	7.15	8.04	17.98
L(full)	621.7	2.94	4.25	5.99	7.10	8.14	9.44	10.4	53.25
L(full, with spill)	621.7	2.94	4.25	5.99	7.10	8.14	9.44	10.4	58.98
M(local)	62.5	0.110	0.240	0.470	0.650	0.820	1.06	1.23	6.31
M(full)[1]	220.7	0.310	0.650	1.27	1.71	2.11	2.62	2.98	17.40
N	76.8	0.130	0.280	0.540	0.740	0.950	1.23	1.45	6.54
O(local)	59.3	1.15	1.61	2.25	2.69	3.12	3.69	4.13	7.81
O(full)	717.4	1.86	3.11	5.02	6.35	7.64	9.35	10.6	55.06

TABLE 3.1
PRE-DEVELOPMENT LAND USE (NO DEVELOPMENT NORTH OF HIGHWAY 401)
FREQUENCY FLOWS (m^3/s)

Location/Node	Drainage Area (ha)	Frequency (years)							
		1.25	2	5	10	20	50	100	Regional
O(full with spill)	717.4	1.86	3.11	5.02	6.35	7.64	9.35	10.6	46.87
P(local)	93.9	1.01	1.40	2.02	2.47	2.94	3.62	4.17	9.05
P(full)	412.3	1.40	2.18	3.32	4.12	4.91	5.96	6.76	36.02
Q(local)	99.6	0.200	0.380	0.690	0.920	1.16	1.50	1.76	8.23

[1] - analysis results based on Wakeby Distribution
Local - flow from local catchment only (ref. Figure A-1)
Full - total flow from all upstream catchment areas (ref. Figure A-1)
With Spill - denotes flow rate calculated including potential spill from catchment 2040 to 2024 (ref. Figure A-1)

Flow Rate Assessment - Proposed Development without SWM Controls

The effects of the proposed development on peak flow rates have been undertaken through hydrologic simulation and frequency analysis. The impacts have been assessed for the proposed land use within the study area without stormwater management, as summarized in Table 3.2. The results provide a relative measure of the impact potential if stormwater quantity management controls were not implemented.

TABLE 3.2
PROPOSED LAND USE WITHOUT SWM
FREQUENCY FLOWS (m^3/s)

Location/Node	Drainage Area (ha)	Frequency (years)							
		1.25	2	5	10	20	50	100	Regional
A	52.8	0.092	0.190	0.370	0.500	0.640	0.840	1.00	4.48
B(local)	105.7	1.45	2.01	2.89	3.55	4.25	5.24	6.06	13.06
B (full)	173.6	1.76	2.44	3.50	4.27	5.07	6.19	7.10	19.30
C	71.6	0.120	0.250	0.480	0.660	0.850	1.11	1.31	5.90
D (local)	43.8	0.800	1.11	1.53	1.81	2.09	2.45	2.72	5.43
D (full)	115.4	0.900	1.24	1.70	2.01	2.30	2.67	2.95	10.73
E	29.4	0.560	0.770	1.05	1.23	1.41	1.63	1.80	3.69
F(local)	99.0	1.30	1.82	2.57	3.10	3.62	4.33	4.89	10.92
F(full)	658.0	3.72	5.22	7.31	8.73	10.1	11.9	13.3	43.11
G (local)	85.2	1.19	1.66	2.34	2.81	3.27	3.88	4.35	9.67
G(full)[1]	482.2	1.62	2.48	3.57	4.28	4.94	5.76	6.33	26.57
H(full)	98.6	1.49	2.08	2.95	3.56	4.17	5.00	5.65	17.80
I	397.0	0.590	1.22	2.37	3.25	4.15	5.39	6.35	28.99
J	158.2	0.250	0.530	1.02	1.39	1.78	2.30	2.71	12.35
K(full)[1]	362.9	1.43	1.99	2.94	3.57	4.16	4.87	5.36	30.32
L(local)	160.2	2.18	3.05	4.30	5.16	6.01	7.15	8.04	17.98
L(full)	621.7	5.34	7.44	10.4	12.4	14.3	16.8	18.8	62.34
M(local)	62.5	0.660	0.910	1.26	1.50	1.72	2.02	2.25	7.20
M(full)[1]	220.7	0.870	1.31	1.84	2.15	2.45	2.83	3.10	17.86
N[2]	76.8	0.850	1.18	1.65	1.98	2.30	2.73	3.07	8.25

TABLE 3.2
PROPOSED LAND USE WITHOUT SWM
FREQUENCY FLOWS (m^3/s)

Location/Node	Drainage Area (ha)	Frequency (years)							
		1.25	2	5	10	20	50	100	Regional
O(local)	59.3	1.15	1.61	2.25	2.69	3.12	3.69	4.13	7.81
O(full)	717.3	4.79	6.70	9.42	11.3	13.1	15.6	17.4	49.65
P(local)	93.9	1.01	1.40	2.02	2.47	2.94	3.62	4.17	9.05
P(full)	412.3	3.94	5.27	7.33	8.85	10.4	12.7	14.5	42.30
Q(local)	99.6	0.200	0.380	0.690	0.920	1.16	1.50	1.76	8.23

[1] - Analysis results based on Wakeby Distribution

[2] - Flow to node N is directed into the existing SWM facility and outflow from the facility is the total of flow from the development area (i.e. culvert 14 is not used in the Hydrologic model results)

Local - flow from local catchment only (ref. Figure A-1)

Full - total flow from all upstream catchment areas including potential spill from catchment 2040 to 2024 (ref. Figure A-1)

The results indicate that typically, without stormwater management flow rates would increase significantly for all storm events.

Subwatershed Plan Management Approach

The majority of the inventory and analysis for the study area has been completed as part of the Subwatershed Plan. The analysis completed for this area included evaluation of stormwater facility sizing required to meet subwatershed based objectives and performance targets for:

- *Stormwater quality management (habitat protection requirements)*
- *Erosion control*
- *Flood Control*

The Subwatershed Study also verified the performance of the stormwater quantity management system at:

- *Existing Stormwater Management Facility at High Point Development (ref. S34)*
- *Proposed facility (expansion) at MI developments.*

The following information summarizes the specific analysis and results for these facilities.

High Point and Magna (MI Development) Sites

The High Point and MI Developments (Magna) stormwater management facilities are existing and/or have received "planning" approval, hence in order to properly assess the performance of the proposed stormwater management system recommended by the *Subwatershed Planning Study for Areas 2 and 7,* the frequency analysis has necessarily excluded the existing development and associated stormwater management infrastructure within High Point and Magna (MI Development) Lands, in an effort to re-establish a 'true' representation of pre-development flow characteristics.

Evaluation of the effectiveness of the proposed/existing facilities (at High Point and Magna) has been based on the operating characteristics provided by the Town of Milton and Conservation Halton (ref. Tables 3.3 and 3.4).

TABLE 3.3
HIGH POINT STORMWATER MANAGEMENT FACILITY (S36)
STORAGE – DISCHARGE PROPERTIES

Storage (m^3)	Discharge (m^3/s)
0	0
10 000	2.06
47 000	5.45
71 800	8.96
87 000	11.65
97 400	15.50

Total Drainage Area directed to facility = 691 ha
Development Area = 251 ha @ 68 % impervious
External Area = 517 ha

TABLE 3.4
MI DEVELEOPMENTS (MAGNA) STORMWATER MANAGEMENT FACILITY (S38 AND S39)
STORAGE – DISCHARGE PROPERTIES

Upper Facility (S39)

Storage 1(m^3)	Discharge (m^3/s)
0	0
5 500	0.25
10 000	0.80

Total Drainage Area directed to facility = 51.3 ha
(undeveloped area)

Lower Facility (S38)

Storage (m^3)	Discharge (m^3/s)
0	0
1 070	0.747
5 430	0.970
14 230	1.20
28 670	1.32
62 250	2.44

Total Drainage Area directed to facility = 157 ha
Development Area = 105.74 ha @ 87 % impervious
External Area = 51.3 ha

Table 3.5 provides flow rates associated with; a more representative pre-development condition, (excluding Magna and High Point), Magna and High Point with their constructed approved stormwater facilities only, and a future land use with all existing and proposed stormwater facilities in place.

TABLE 3.5
COMPARISON OF MAGNA AND HIGH POINT STORMWATER MANAGEMENT FACILITY FREQUENCY FLOWS (m^3/s)
FOR EXISTING AND PROPOSED LAND USE CONDITIONS

Description	Node	Frequency (years)							
		1.05	**1.25**	**2**	**5**	**10**	**20**	**50**	**100**
Pre-development Land Use (Magna and High Point) Existing Stormwater Management Facilities Excluded	2.183 (High Point)	0.52	1.07	2.11	3.89	5.24	6.61	8.48	9.95
	2.172 (Magna)	0.13	0.29	0.59	1.12	1.53	1.95	2.53	2.98
	2.141 (Main Street)	7.47	11.0	16.2	23.7	28.9	33.9	40.5	45.6
	2.140 (Derry Road)	9.04	13.2	19.2	27.8	33.6	39.2	46.6	52.2
Pre-development Land Use (Magna and High Point) With Existing High Point Stormwater Management Facility in place only	2.183 (High Point)	0.41	0.89	1.79	3.31	4.41	5.49	6.92	7.99
	2.172 (Magna)	0.13	0.29	0.59	1.12	1.53	1.95	2.53	2.98
	2.141 (Main Street)	7.33	10.7	15.7	22.7	27.4	32.0	38.0	42.6
	2.140 (Derry Road)	8.92	12.9	18.7	26.8	32.2	37.4	44.2	49.4
Future Land Use With Stormwater Management Facilities at all proposed locations	2.183 (High Point)	2.08	2.58	3.40	4.74	5.79	6.91	8.58	10.0
	2.172 (Magna)	0.72	0.88	1.08	1.32	1.46	1.58	1.73	1.84
	2.141 (Main Street)	8.99	12.5	17.6	24.8	29.8	34.8	41.4	46.5
	2.140 (Derry Road)	10.5	14.5	20.4	29.0	35.0	40.9	48.9	55.2

The foregoing table indicates:

- Future land use flow rates at the High Point Highway 401 outlet are essentially maintained for the 50 and 100-year events. Although future land use flow rates are slightly increased for the annual to 20-year event, the existing High Point facility would effectively mitigate increases in peak flow rates for extreme storm events (i.e. 50 and 100 year).
- The existing High Point facility has not been designed to provide extended detention storage for erosion control, hence, as may be expected the peak flows for frequent events (i.e. annual return period) indicate a larger relative increase.
- The Magna Facility would provide effective stormwater quantity control and would effectively over-control 100 year event flow rates to 60 % of the pre-development flow rate. Slight increases in peak flow rates would occur for more frequent events up to the 5-year return event based on the frequency analysis results.

➢ *High Point West*

Proposed Development of the High Point West site has been the focus of a Scoped Subwatershed Study (ref. *Scoped Subwatershed Study, West Tributary Sixteen Mile Creek*, MGM Consulting, February 1998). This study outlined a number of stormwater servicing alternatives, and recommended, as a preferred alternative:

- Construction of a number of stormwater (wetlands) quality facilities throughout the development area
- Replacement of the Regional Road 25 culvert and use of the existing High Point stormwater management facility for quantity control for lands draining to the "West Tributary of the Sixteen Mile Creek"
- Construction of a stormwater quantity management facility upstream of Highway 401 to service a development area of approximately 104 ha (i.e. westerly facility) for the portion of the development draining to the south.

Through the *Sixteen Mile Creek Subwatershed Planning Study Areas 2 and 7* an assessment of the performance of the proposed stormwater management facility was undertaken based on the stormwater management facility characteristics provided in the Scoped Subwatershed Report. Discussion with the report authors (ref. pers. comm. Guther-Rice) indicated that the facility size would be revised as a result of on-going discussions with the Town of Milton, Conservation Halton and the Town of Milton's Engineering Consultant. Hence, sizing of the stormwater management facility for this development (ref. Figure 8 - SWM Facility S34) has been undertaken based on the performance criteria developed for the Milton North Area. A subsequent meeting with the engineering consultant resulted in the following general considerations for the development area:

- The flood control function provided in the Existing SWM facility, east of Regional Road 25, appears to be adequate to address impact from the High Point (West) Development Area and would indicate that flood control storage would not be required for the lands draining to tributary N-2-B,
- Water Quality management for lands draining to tributary N-2-B would be required. Sizing to meet the Level 1 habitat protection standard would be required.
- Erosion control requirements for land draining to the N-2-B tributary could potentially be addressed through retrofit of the existing facility east of Regional Road 25 (ref. Facility S36), or alternatively could be incorporated into on-site facilities
- Stormwater Management facilities for lands draining to Tributary N-2-B may be incorporated along the watercourse and may use a distributed facility approach (as proposed in the Scoped Subwatershed Study). Some consolidation of drainage area may be possible to achieve a minimum facility drainage area of 5-10 ha.
- Management of the Regulatory storm spill along the Highway 401/Regional Road 25 interchange ramps will be required to be addressed within the design of site grading for the lands draining to the South and design of the facility outlet (ref. Facility S34). An Assessment of the potential impact of spill under Regulatory storm conditions has been undertaken as outlined in the following section.

➢ *Regulatory Storm Spill Potential*

During the course of this study and consultation with proponents of *the Scoped Subwatershed Study* (MGM Consulting), Town of Milton and Conservation Halton staff, the potential for stormwater spill, from the N-2-B tributary, southward, at the west side of Regional Road 25 was identified. The location where the spill would occur is generally located along the Westbound Highway 401 ramp from Regional Road 25.

An evaluation of the mechanics of this spill and measures to deal with the spill under development conditions has been undertaken. The spill mechanics have been determined based on hydraulic analysis (HEC-2) of the N-2-B local tributary and local overbank topography of the spillway as provided by MGM Consulting.

TABLE 3.6
SPILLWAY RATING CURVE FOR PRE-DEVELOPMENT CONDITIONS

WSEL Elevation (m)		Flow to Regional Road 25 Culvert (m^3/s)	Flow Across Spillway (m^3/s)
Section 2	Section 3		
N/A	N/A	0	0
208.80	209.37	0.25	0
208.80	209.51	0.5	0
208.79	209.64	0.75	0
208.78	209.86	1	0
209.39	210.02	2.5	0
209.87	210.29	5	0
210.05	210.61	7.5	0
210.23	210.91	10	0
210.57	211.39	14.98	0.02
210.81	211.79	19.47	0.53
211.31	212.24	25.77	4.23
211.62	212.38	27.16	12.84
212.26	212.26	27.48	32.52

The foregoing information has been incorporated into the hydrologic model to account for potential inter-catchment transfer of flow due to this spillway, between subcatchments 2040 and 2024 (ref. Figure B-2 - Appendix B).

Results of the continuous hydrologic modelling indicate that, under existing and proposed land use conditions, the flow rates in Tributary N-2-B do not exceed the 14.98 m^3/s required to initiate spill. Hence, there would be no spill across the interchange ramp under both pre-development and post-development conditions (i.e. all flows are contained within the channel) up to the 100 year event levels

Spill would occur however, under the Regulatory storm event. Peak spill flow rates would be 8.73 and 9.91 m^3/s for existing and proposed land use conditions. Hence, the Regulatory flow rate at Culvert 9 (ref. Figure 5) would be 19.1 m^3/s. Based on information provided by MGM Consulting (October 8, 1999), a maximum Regulatory Flood Elevation of 209.2m (without Highway 401 Centre Barriers) and 210.2 m (with Highway 401 Centre Barriers) would occur at the existing Highway 401 culvert at the High Point West (ref. Culvert 9- Figure 5), based on a maximum Regulatory flow rate of 24.87 m^3/s.

Therefore, the existing spillway hydraulic performance may be maintained under proposed development provided that all development is maintained above these regulatory flood elevations. Proposed lot grading in the spill zone area should be established with consideration of this requirement.

3.3 Hydraulics

Culvert Crossings

As part of this study inventory, field inspections and verification of Highway 401 culvert crossings has been completed since this corridor provides the most formidable economic and functional challenge with respect to hydraulic improvements. These crossings form the primary hydraulic constraints within the Study area (ref. Figure 5). Table 3.7 provides a summary of the various culvert crossing characteristics.

TABLE 3.7
CULVERT SUMMARY
STUDY AREA HIGHWAY 401

Culvert	Tableland Elevation (m)	Upstream Invert (m)	HW[1] (m)	D (m)	HW/D	Culvert Span (m)	Unit Flow (m^3/s)	Flow Capacity[1] (m^3/s)	Downstream Invert (m)	Culvert Slope (m/m)
1	207.5	204.98	2.52	0.91	2.77	0.91	2.13	1.94	N/A	N/A
2	207.5	205.62	1.88	0.91	2.07	0.91	1.4	1.27	205.39	0.007
3	207.5	206.5	1	1.14	0.88	1.14	1.42	1.62	205.93	0.016
4	212.5	208.93	3.57	1.68	2.13	2.36	6.7	15.81	208.46	0.013
5	212.5	209.44	3.06	0.99	3.09	1.83	3.7	6.77	209.08	0.010
6	212.5	209.04	3.46	0.99	3.49	1.83	4	7.32	208.47	0.016
7	212.5	209.32	3.18	1.22	2.61	1.22	4.7	5.73	208.83	0.014
8	208.8	205.18	3.62	1.83	1.98	3.65	7.5	27.38	204.6	0.017
9	212.5	205.72	6.78	0.99	6.85	1.42	6.6	9.37	205.41	0.009
10	212.5	209.12	3.38	1.22	2.77	1.42	4.8	6.82	208.39	0.021
11	217.5	213.77	3.73	1.15	3.24	1.15	4.8	5.52	213.46	0.009
12	222.5	217.75	4.75	1.2	3.96	1.15	6.5	7.48	216.76	0.028
13	222.5	217.2	5.3	1.6	3.31	2.85	8.8	25.08	216.44	0.022
14	208.8	208.19	0.61	1.25	0.49	2.20	0.76	1.67	207.73	0.013

[1] Based on difference between inferred tableland elevation and upstream invert.

The MTO was contacted with respect to recent detailed hydraulic assessments associated with the foregoing. This information was not in a suitably accurate form for use in this study.

The assessment of culvert performance has been referenced to typical tableland elevation upstream of Highway 401. An assessment of each culvert's capacity relative to the required 1.0 m freeboard has not been completed due to the lack of detailed data available for the travelled portion of the Highway 401.

Flood Plain Mapping/Delineation

Flood plain mapping for the Sixteen Mile Creek was completed by Proctor and Redfern in 1986. A digitized version of the limits of the flood plain, as received from the Region of Halton and has been included in the constraints identified for the study area.

Based on the 130 ha drainage area limit for flood plain delineation, additional flood plain mapping will be required in a number of areas within the 401 Industrial/Business Park as part of detailed site plan applications, specifically:

- Tributary N-2-B
- Tributary NW-2-G1
- Tributary EU-3-A

Due to the scale of the mapping available for this study (i.e. 1:10 000 OBM mapping with 5.0 m contours and 2.5 m interpolations) defining the flood limits for Tributary NW-2-G and the Watercourse downstream of MI developments has not been considered appropriate. Topographic survey has been provided by MGM consulting for Tributary N-2-B, however, mapping of the flood plain through this reach has not been completed as part of this study based on past recognition by the local proponents and agencies that this reach will be relocated and enhanced as part of future development (ref. Subwatershed Planning Study Areas 2 and 7, January, 2000).

3.4 Water Quality

The impact of urban development on pollutant loading has been well documented. The increase in impervious surfaces along with vehicular traffic, and other human uses increases the loading and washoff of pollutants potentially impairing instream water quality. These potential impacts include the following:

- Increase in annual pollutant loading from developing areas resulting in degraded in stream water quality
- Increases in pollutant concentrations during storm event impacting aquatic resources
- Thermal inputs due to runoff from paved surfaces and from stormwater management facilities may increase water temperature.

Other potential impacts would include the potential for contamination of groundwater resources due to urban pollutants and spills.

These potential impacts would be addressed through the recommended stormwater management strategy. Typically, stormwater management would include provision of stormwater quality treatment facilities (wet ponds, wetlands) prior to discharge to receiving watercourses, spill containment measures, thermal mitigation and measures such as maximizing infiltration to reduce washoff and transport of pollutants (where appropriate given the groundwater resources in the area and type of urban discharge). Typically for industrial development infiltration of cleaner roof top drainage would be generally preferred to infiltration of road and parking area discharge

3.5 Fisheries

Background Review

Fisheries resources within the study area have been previously identified as part of the Sixteen Mile Creek Watershed Plan, with an emphasis on the main branches. That report summarized existing information and confirmed that the Kelso Branch is coldwater habitat, supporting rainbow trout, downstream from the Kelso Reservoir. The Watershed Plan also reported that several of the smaller tributaries within the current study area are intermittent.

The north branch of Sixteen Mile Creek was examined as part of the Scoped Subwatershed Plan, West Tributary Sixteen Mile Creek (MGM Consulting Inc., 1998). It was noted that the portion of this stream which lies north of Highway 401 has been altered in many areas, however, a well-defined channel with 'natural' features was present where recent alterations had not occurred. The culvert which conveyed this stream beneath Regional Road 25 was identified as a barrier to fish migration under low flow conditions. (That culvert has since been replaced). Four warmwater fish species were captured by electrofishing. The study stated that modification of this watercourse would be acceptable from a fisheries perspective, provided that natural channel design principles were applied and vegetated buffers provided.

Inventory

A more detailed inventory of the watercourses within the study area was undertaken as part of the Subwatershed Study for Areas 2 and 7 (ref. Philips 2000). The methods and results of this inventory related to the Secondary Plan study area are outlined as follows:

Methods

All tributaries within the Secondary Plan Study area were initially evaluated by using 1:50,000 topographic maps, Ontario Base Maps, and infrared aerial photography (dated June 1997) combined with strategic field examinations. The primary field investigation with fish collections was undertaken from July 29 to August 14, 1998, within the typical low-flow period in southern Ontario. Upon analysis of the collected data, additional detailed examination of the infrared aerial photography was undertaken, followed by field investigations on May 11 and August 6, 1999, to complete the characterization of the study area. Sampling locations are presented in Figure 2.

Results

The results of the fish sampling are summarized in Table 3.8, and the channel characterization are presented in Figure 4. Each reach is discussed below. Watercourse number references have been based on the numbering system developed for *the Sixteen Mile Creek Subwatershed Areas*

2 and 7 Planning Study for each of the development areas [i.e. North (N), Northwest (NW) and Existing Urban (EU)]

TABLE 3.8
FISH SPECIES CAPTURED WITHIN THE STUDY AREA SINCE 1993

Station	**2A7**	**2A8[1]**	**2B2**	**2B3**	**2B4**	**2B5**	**2B6**	**2H1**	**2H2**	**2H3**	**2H4**	**2H5[2]**	**2I1**
Number of Species	**9**	**12**	**6**	**9**	**5**	**7**	**4**	**3**	**5**	**5**	**0**	**4**	**0**
rainbow trout	x	x											
brown trout	x	x											
white sucker	x	x		x		x	x	x	x			a	
northern hognose sucker		a											
redside dace			x	x		x							
carp	x												
common shiner		x		x	x	x							
bluntnose minnow		x	x	x					x				
fathead minnow			x	x		x	x			x			
blacknose dace	x	x	x	x	x	x				x		a	
longnose dace	x												
creek chub		x	x	x	x	x	x	x	x	x		a	
rainbow darter	x	x											
fantail darter	x	x											
johnny darter	x	x		x	x	x							
rock bass		x											
pumpkinseed									x	x			
largemouth bass								x	x				
brook stickleback			x	x	x		x			x		a	

x = species collected by C. Portt and Associates, July 29 – August 14, 1998
a = species collected for other studies
[1] = additional data from Ecoplans, 1995 (September 14, 1993)
[2] = C. Portt and Associates (November 28, 1996)

- *NW-1-A (Kelso Branch)*

The Kelso Branch begins at the outlet of Kelso Reservoir (immediately below Kelso Dam) and flows downstream towards Milton. Consistent with earlier work, this stretch of Sixteen Mile Creek was found to be characterized by abundant groundwater inputs, riparian and overhead cover, large woody debris and open substrate, and a mostly natural stream channel, that results in significant habitat areas for cold water fish. Generally, these characteristics were observed to diminish as the gradient and land use changed towards Milton. Coldwater habitat, as indicated by the presence of rainbow trout, brown trout, and mottled sculpin (*Cottus bairdi*), extends from the Kelso Dam to the upstream end of the Milton concrete channel.

The reach of the Kelso Branch that is contained within the Secondary Plan study area, includes a wetland upstream of the CPR railway, and a short section of stream that contains the water control structure at the upstream end of the Milton Pond. The wetland has a meandering channel that provides deep water habitat with reduced current velocities. Downstream of the control structure the Kelso Branch is channelized along the edge of the Milton Pond, however, there is abundant instream cover and good riparian vegetation (trees) that shade the stream. Thirteen species of fish in total were collected at the upstream end (2A8) and the downstream end (2A7) of this reach, including rainbow trout and brown trout.

- *NW-2-B*

This is essentially a series of connected ditches through an existing industrial area. The upper half was either dry roadside ditch, or dry terrablock channel when examined. Some ponding occurs where it crosses the railway lines: upstream of the two lines, and between them. These ponds appear to be a result of poor drainage and do not appear to be part of a natural area or a stormwater retention pond. A few dead trees in these ponds suggest that this ponding is a recent phenomenon. Downstream of the railway lines the watercourse was dry until it passed a short distance underground. A few dying fathead minnows where observed in July 1998 in a small isolated pool of water in a culvert upstream from where this ditch discharges to a terrablock section downstream (NW-2-G3)

- *NW-2-C*

This watercourse is mostly buried. It only exists on the surface as a stormwater management pond at the upstream end, and as a short section of ditch at the downstream end where it connects to the ditch that follows the railway embankment.

- *NW-2-D*

This watercourse was dry when examined, and is not considered fish habitat. It drains into redside dace habitat, however.

- *NW-2-G1*

This is a permanently flowing watercourse, which received groundwater inputs. Despite the fact that this reach has been channelized and is largely devoid of any woody riparian vegetation, it supports a population of redside dace, which is considered a vulnerable fish species by the Committee on the Status of Endangered Wildlife in Canada. It has a relatively diverse fish community with 9 species captured (sites 2B3, 2B4), and has a number of aquatic plant and macroinvertebrate species (snails, clams, crayfish) that indicate good quality habitat.

- *NW-2-G2*

This reach provides the only section of natural channel with some riparian cover in this tributary, downstream of Highway 401. Considering that this tributary has the only known population of redside dace within Sixteen Mile Creek, the maintenance of this natural reach is important.

- *NW-2-G3*

This reach consists of a terrablock channel, however, there is permanent flow from upstream. Downstream of this reach, a fish collection (2B2) found 6 species, including redside dace.

- *N-1-A*

This is a grassed swale between two cultivated fields, which extends north from the Highway 401 right-of-way. There is a small pond on this swale, which appears to have been created by a combination of excavation and dam construction across the swale. There was no flow in this system in December of 1998, nor was there any evidence of a defined channel within the swale downstream from this pond, indicating that flow is ephemeral. There is no defined channel in the Highway 401 ditch which this swale leads into, although shallow water was present in that ditch for a few metres (<10) upstream from the Highway 401 culvert in December of 1998.

- *N-1-B*

This is a depression across a field, and had been cultivated in the summer of 1998. It leads to a ditch along Highway 401.

- *N-2-A*

This reach is a vegetated swale, with a short section of ditched channel at the downstream end. Flow in this reach is ephemeral.

- *N-4-A*

This reach of the West Fork of the North Branch passes through the Milton Heights Marsh. Though it was intermittent when examined in 1998 and 1999, it provides fish habitat in isolated pools, and is upstream of redside dace habitat. Four fish species were found upstream of this reach, and 7 species, including redside dace, were found at a site downstream (2B5). Permanent flow appears to begin immediately downstream of this reach.

- *N-5-A*

This stream, known as the Mansewood Tributary, is located within Subwatershed Area 3 of the Sixteen Mile Creek *(ref. Sixteen Mile Creek Watershed Plan, Gore and Storrie, 1996).*

An assessment of the downstream reaches of this tributary, including base flow and fisheries sampling, was completed as part of the 401 Corridor Integrated Planning Project, Scoped Subwatershed Plan, Dillon Consulting, April 1999. Base flow sampling results indicate little or no flow at the time of inspection *(ref. Stations F1 and F2).* However, fish sampling on this tributary has indicated the presence of 5 species including white sucker, common shiner, blacknose dace, creek chub and brook stickleback.

The 401 Corridor Study also identified an existing culvert approximately halfway between Fifth Line and the hydro corridor which may obstruct fish passage.

The reach location of the Mansewood Tributary which traverses the current study area, has been altered as part of the Milton Business Parks Development and its location varies from that shown on the current Base Plan.

- *N-2-B*

This is the main channel of the East Fork of the North Branch. Between No 5 Sideroad and Regional Road 25 this reach passes through old fields and active cropland. There is a vegetated buffer in most reaches, that generally includes shrubs and small trees. Some sections appear to have been straightened, however, most maintain, or are re-developing, some natural channel form.

This branch has recently been straightened immediately upstream and downstream of Regional Road 25. Immediately upstream from Highway 401, this branch flows through a large stormwater management pond. After passing under Highway 401 the East Fork enters a concrete channel which becomes a culvert beneath the correctional facility. The channel has been straightened from the downstream end of this culvert to the upstream end of a second concrete channel, which begins at Steeles Avenue and continues downstream to the Main Branch of Sixteen Mile Creek. This reach is likely dry to standing pools during summer in most years.

0The East Fork (based on fish sampling stations 2H1, 2H2, 2H3, 2H4 and 2H5) supports 8 species of fish, all of which are tolerant of high temperatures. The large stormwater management pond just north of Highway 401 in the East Fork (2H2) results in the occurrence of fish species that are commonly found in pond situations. Just upstream of Steeles Avenue, at the lower end of this reach (2H1), largemouth bass (*Micropterus salmoides*) were captured, which probably originated from that stormwater management pond.

- *N-2-C*

Note: Tributaries N-2-C and N-2-D located within the High Point Development Area have not been illustrated on Figure 4 (Constraint Plan), as have been altered and/or eliminated through development and no longer exist as illustrated on base mapping for this project (OBM, 1984).

- *N-2-D*

Note: Tributaries N-2-C and N-2-D located within the High Point Development Area have not been illustrated on Figure 4 (Constraint Plan), as have been altered and/or eliminated through development and no longer exist as illustrated on base mapping for this project (OBM, 1984).

- *N-2-E*

Though not examined in the field, aerial photographs indicate that this watercourse exists as a featureless swale north of Highway 401 within the study area. This is supported by the fact that further downstream (south of Highway 401), the same aerial photograph shows this swale as being cultivated through its channel just prior to it connecting with the West Fork of the North Branch of Sixteen Mile Creek.

- *N-3-A*

The upstream half of this reach was a dry swale planted through with crops when examined. The downstream half to Highway 401 is dry vegetated swale with occasional ditched sections. It apparently connects to the ditch beside Highway 401 and does not continue south.

- *N-3-B/EU-3-A*

The upstream sections of this reach have been buried under a large lot associated with some industry. The downstream sections where ditched and dry when examined. Some water was found between the North Service Road and Highway 401, however, no fish could be found in this short watered section (sampling site 2I1). Downstream of the Highway 401 is an impassable barrier at the upstream end of a long buried section, thus fish could not re-colonize this reach if extirpated. This finding is substantiated by an electrofishing examination undertaken by Golder Associates in November 1998, which also failed to collect fish.

- *EU-2-A*

This is a ditch/swale that was dry when examined.

Broad-Level Constraints

A constraint rating was applied to the watercourses within the study area during the Sub-watershed Study, based on three related characteristics, permanence of flow, channel form, and fish communities.

A **high** constraint rating was applied to permanently flowing streams. Virtually all of these have diverse fish communities and well-defined channels with a range of substrates. Some reaches have trout populations; others have populations of at-risk species. Some reaches within these streams have been altered to the point where they provide little or no fish habitat, but these are included as a high level constraint based on their potential or value as a migration route. Areas with a high constraint rating should be protected in, or restored to, a condition which is as close to their natural condition as feasible.

A **medium** constraint rating was applied to intermittent streams which, based on the presence of a defined channel with sorted substrates, were thought to flow for extended periods. It is believed that many of the larger intermittent tributaries particularly those which are proximate to and accessible from the East and Main Branches, provide spawning and nursery habitat in the spring for fish from the permanently flowing streams. Multiple fish species were found in some of these streams, despite habitat being confined to isolated pools at the time of sampling. The natural form and function should be maintained for watercourses assigned a medium constraint rating.

A **low** constraint rating was applied to watercourses which are ephemeral or intermittent, have either poorly defined channels with no clear sorting of substrate or no defined channels, and where in all cases but one, brook stickleback were the only fish species captured where isolated pools were present. These pools were almost always associated with road culverts. For these watercourses function should be maintained, but it is considered feasible to eliminate the channels themselves, if necessary.

The constraint level associated with each watercourse is shown in Figure 4.

Key Findings

(i) The Kelso branch is a good quality stream which supports a coldwater fish community, including rainbow and brown trout. This branch receives groundwater inputs which are a key factor in maintaining its cold water community.

(ii) The northwest Tributary (ref. watercourse N-4-A, NW-2-G) supports a diverse fish community including a population of redside dace, which is a vulnerable fish species in Ontario. Groundwater maintains permanent flow. Several reaches of this watercourse have been previously straightened.

(iii) The north tributary (ref. watercourse N-2-B) is well defined in its upper reaches, however, flow is intermittent. Further downstream alterations include straightening, on-line stormwater ponds, and long reaches of concrete culvert/channel. There are fish present in the 'natural reaches'. The effect of this tributary on downstream water quality and water temperature is important.

(iv) Virtually all of the watercourses, which arise east of Regional Road 25, are ephemeral, and do not contain fish habitat. Their effect on downstream impacts on water quality and water quantity are however, important, as all lead eventually to watercourses which have either important coldwater communities or warmwater fish communities which include vulnerable fish species.

3.6 Streams

Background Review

While the documentation that was prepared from the Subwatershed Study (Areas 2 and 7), represents the most thorough and important source from the background review, there are several other sources which provide some specific information pertaining to the surface channels within this planning area. The main sources of information include reports prepared for the Magna Lands towards the east end of the study area and the Scoped Subwatershed Study for the High Point West lands. These sources typically provide some descriptions of the existing state of the watercourses and (in the Scoped Subwatershed Study), classified individual reaches following the Rosgen system. Generally, the information provided in these specific reports agrees with the findings from the broader Subwatershed Study, in that the surface channels are typically small, previously altered, lacking in structural diversity, with few identified erosional sites.

Inventory

The fluvial geomorphology component built upon the information provided in the Subwatershed Study through completing field reconnaissance and using data collected as part of a channel design through the High Point West proposed development. This planning area is traversed by three significant channels in a northwest to southeast direction. All three are located within the western half of the planning area. The southern most is the main channel of Sixteen Mile Creek flowing from the Kelso reservoir. It exhibits a broad meandering form, with a well-defined bed morphology (pool-riffle sequences). Bank erosion is prevalent along the outside bends and has been stabilized to varying extents through the placement of rip rap.

The other two significant channels are much smaller in size and flows conveyed. They were categorized as Level 2 streams in the Subwatershed Study, primarily since they had been previously straighten or altered and would benefit from some rehabilitation. These channels vary in width from approximately 1.5m to over 4m. Banks are typically low, indicating little incision. Substrates are a mix of fine-grained sand to clay with some cobbles comprising poorly defined riffles. The riparian vegetation is predominantly shrubs and herbaceous species, in a thin corridor, although this vegetation does exert an influence on channel form, creating a narrower, yet deeper channel.

The remaining surface channels vary in form from surface depressions, swales and intermittent streams with defined beds and banks. Most are fairly narrow, near their headwater origin and have been altered. These channels are narrow and in-stream processes are highly governed and controlled by the underlying Halton Till. None of these channels were observed to be perennial.

TABLE 3.9
SUMMARY OF WATERCOURSE FUNCTIONAL CHARACTERISTICS

Location Reference	Status [1.] [i.e. colour]	Approximate Flood plain Top Width (m)	Belt Width (m)
Milton North-West			
NW1-A	Red	300-400	300-400
NW1-B	Green	N/A	N/A
NW1-C	Blue	6	6
NW1-D	Blue	6	6
NW1-E	Red	6	6
NW1-F	Blue	6	6
NW2-B	Green	7	7
NW2-C to NW2-D	Green	N/A	N/A
NW2-F	Green	N/A	N/A
NW2-G	Blue	25-30	25-30
Milton North			
N-1-A, N-1-B	Green	N/A	N/A
N-2-A	Green	N/A	N/A
N-2-B	Blue	30-35	30-60
N-2-E	Green	N/A	N/A
N-3-A	Green	N/A	N/A
N-4-A	Red	20-35	30-40
N-5-A	Blue	N/A – No change anticipated through Existing Milton Business Parks Subdivision Rehabilitation opportunities should be evaluated with regard for site specific constraints.	
Existing Urban			
EU-1-A EU-2-A EU-3-A	Blue	N/A- No Change is anticipated to these tributaries through the existing urban development Rehabilitation opportunities should be evaluated with regard for site specific constraints.	

Note: [1]Red: To remain open in-place; Blue: To remain open, however, realignment is possible; Green: Enclosure is possible, subject to replication of function.
[2]Tributary references NW-2-E and NW-3-C are not used in numbering of tributaries.

Constraints

- given the existing erosion occurring along the main channel of Sixteen Mile Creek (NW-1-A), peak flows should not increase after development and any increase in flow volume should be minimized
- Channel section 'N-4-A' is sensitive and experiencing some natural bank erosion, therefore, peak flows should not increase and flow volumes should not change
- based on channel form and boundary materials, instream erosion potential is minimal
- sediment transport would consist of a substantial portion of fine material conveyed in suspension, thus on-line ponds should be avoided
- There are several sites, due mainly to previous alteration, that the channel is highly sensitive to any change in flow or sediment regimes. One such example is channel section 'N-2-B', which to due a straighten form and low gradient is susceptible to aggradation and subsequent bank erosion. This section would be greatly enhanced and have increased stability through being rehabilitated through natural channel design.

- The current stormwater pond 'S36' is a large on-line facility. The channel system would greatly benefit from re-constructing the pond so that it is off-line and restoring the meandering channel form. This would re-establish sediment transport from upstream areas across Highway 401 and downstream to the main channel.
- Numerous other sections of channel, that have been previously altered (straightened) such as 'NW-2-G1' could be improved through restoration of a natural channel form.

3.7 Terrestrial Resources

Background literature and data pertaining to terrestrial resources in the Secondary planning Area was assembled as part of the Subwatershed Planning Study for Areas 2 and 7. Information was solicited from the Region of Halton, Conservation Halton, Ministry of Natural Resources, and the Natural Heritage Information Centre (Peterborough). Additional background information was assembled including published documents, consultants reports, and literature relevant to resources in the study area. Field scientists who are knowledgeable regarding particular resources were contacted to gain insight on current and historic conditions. Technical support on matters related to current provincial policy and wetland evaluation was sought from agencies including Conservation Halton, and the Ministry of Natural Resources.

Vegetation Resources

Woodlots, wetlands, hedgerows, successional areas and non-urban ornamental vegetation features were identified on a preliminary basis on 1:10,000 aerial photographic enlargements derived from the Region's 1:20,000 scale 1994 coverage (Northway Photomap). Subsequent to completion of the initial field studies in 1998, the Study Team was able to access 1997 digital infrared photography from the Ministry of Natural Resources. This resource was used to verify earlier feature mapping, and for wetland evaluation work.

Field studies of vegetative resources were conducted between early August and late September 1998, and between late May and late July 1999. Selected species of difficult taxonomic genera were collected for further laboratory examination. Species status was confirmed in accordance with available documents including Varga *et. al.* (1999), Riley (1989), Crins (1986), Geomatics (1993), and Oldham (1994).

Individual features were assessed and documented in the field according to community series defined under the ELC system (Ecological Land Classification for Southern Ontario – MNR, 1998). Individual features were field-assessed for structural diversity, canopy diameter class, canopy closure, topography, slope, drainage, and linkage. A detailed summary of this methodology is presented in the Natural Heritage System Technical Appendix of the Subwatershed Areas 2 and 7 Study, January, 2000.

Wildlife Resources

Field investigations of wildlife were carried out in three seasons (fall, spring, summer) between 1998 and 1999. Field visits by the team wildlife biologist were specifically timed to provide critical seasonal information on habitat use by migratory and breeding birds, and on the range of calling frogs and toads. Incidental wildlife sighting were also recorded by vegetation personnel in the course of their studies.

Due to the predominance of agricultural and developed lands in the study area, woodlots and wetland pockets were the primary focus of field surveys of wildlife. A majority of the large woodlots and areas undergoing succession to tree cover were surveyed. Since wetland habitats are very scarce in the study area, most accessible bodies of water, including dug ponds and creek margins, were also surveyed for wildlife. The majority of wildlife records were referenced to the closest documented vegetation feature; some were accorded individual site-specific identification numbers.

Constraints

Biological constraints have been identified on the basis of background documentation, site-specific field studies, wetland evaluations and discussions with the Technical Steering Committee. A hierarchy has been applied which rates constraints represented in each identified natural feature on the basis of scoring on key attribute measures, size and connectivity, as follows (ref. Table 3.10).

- *High Biological Constraint*

These features have been rated as high constraint on the basis of:

a) *relative canopy maturity, canopy closure, habitat structure, steep slopes, and/or poor drainage, presence of significant plant or animal species, and/or*
b) *presence of habitat to potentially support forest interior conditions (adequate in terms of size and shape); and/or*
c) *linkage to primary habitat corridors (i.e. within 50m of East/West Branches of 16 Mile creek)*

- *Moderate Biological Constraint*

These features have been rated as moderate constraint on the basis of:

a) sub-mature canopy maturity, canopy closure, habitat structure, moderate slopes, and/or imperfect drainage, and/or
b) linkage to secondary habitat corridors (i.e. within 50 m of smaller tributaries)

- *Low Biological Constraint*

These are features which are:

a) relatively small, immature, open-canopied, on flat to gently sloping terrain, and/or located in well-drained conditions;
b) not located within 50 m of a primary or secondary habitat corridor.

TABLE 3.10
TERRESTRIAL FEATURES AND CONSTRAINT SUMMARY FOR THE NORTH AND NORTH WEST DEVELOPMENT AREAS
(REF. FIGURE #4)

Natural Heritage Feature Type	Area (ha)	Component Vegetation Units	Constraint Factors							
			Age	Canopy Closure	Habitat Structure	Slope	Drainage	Potential Forest Interior	Linkage	Significant Species
Woodland/Successional	12.17	174 (TDS), 187 (W), 188 (OFS)	■	□	o	o	□	No	□	No
Woodland/Wetland	2.84	152 (W), 153 (W), 155 (TDS), 537 (M), 538 (AQ)	■	□	□	□	■	No	□	No
Woodland	0.64	156 (TDS)	□	□	o	o	■	No	■	No
Woodland/Wetland	4.80	217 (W), 221 (TDS), 223 (M)	■	□	□	o	■	No	□	No
Woodland	1.70	211 (W)	■	□	□	o	□	No	□	No
Valleyland/Successional	0.48	Portion of 197 (W), 197.1 (OFS)	■	□	o	□	■	No	□	No
Woodland	4.92	196 (W)	■	□	□	o	□	No	o	No
Woodland	4.00	287 (W)	■	□	□	o	o	No	o	No
Woodland	4.92	150 (W)	■	□	□	□	□	No	o	No
Woodland	7.48	145 (TDS), 146 (DF), 147 (W),	■	■	■	□	□	No	□	No
Woodland/Wetland	19.28	9.2 (DF), 11 (TDS), 12 (TDS), 13 (DF), 15 (SW), 16 (TDS), 49 (SW),	■	■	■	□	■	No	■	No

TOTALS

Woodland: 35.83ha

Woodland/Wetland: 26.92ha

Valley: 0.48 ha

Total Natural Coverage: 63.23ha

Percent Natural Coverage: 5.01%

Interpretation

■ = Area contains units with high constraint for factor
□ = Area contains units with moderate constraint for factor
o = Area contains units with low constraint for factor

Potential Forest Interior

"Yes" indicates that based on size and shape, portions of identified terrestrial feature could support forest interior species

DF = Deciduous Forest
W = Woodland
PL = Plantation
TDS = Tree-dominated Succession

M = Marsh
AQ = Aquatic
MF = Mixed Forest
W = Woodland
SW = Swamp

SDS = Shrub-dominated Succession
OFS = Old Field Succession

Significant Species

"Yes" indicates documented occurrence(s) of plant or animal species considered rare or uncommon on a regional, provincial or national scale

"Yes?" indicates significant plant and/or animal species occur within ESA 16 but may or may not occur in area in question

Linkage

■ = Habitat associated with primary valley corridors of East/Main Branch of Sixteen Mile Creek
□ = Habitat associated with secondary stream corridors of East/Main Branch of Sixteen Mile Creek
o = Habitat not within 50 m of primary or secondary stream corridor

Physical and Land Use Context

- The Study Area is flat to gentle in topography, containing gentle slopes except along certain reaches of the Main Branch of the Sixteen Mile Creek. Most of the study area is dominated by imperfectly drained, fine-textured soils. There are local pockets of coarse-textured materials associated with the Milton outlier of the Niagara Escarpment.

- Along the Sixteen Mile tributaries, more complex and steep topography is present, in association with groundwater discharge.

- Intensive agriculture has eliminated most natural cover within the tablelands of the Study Area. The remaining habitats are undergoing continued fragmentation for agriculture and urban development.

- Most remnant features have experienced various levels of repeated disturbance from human activities such as dumping, filling, firewood cutting and informal access.

Vegetation

- The Study Area contains 8 woodlots, 2 evaluated wetlands, and several substantive successional areas, in addition to hedgerows, dug ponds and ornamental plantings. Natural woodland and wetland comprises less than 5 % of the total landscape.

- Forest species composition consists of deciduous cover (bur oak and shagbark hickory, local pockets of silver maple; local pockets of successional species such as poplar and basswood).

- None of the woodlots present can be considered Provincially significant on the basis of size, hydrologic sensitivity, linkage, forest structure, or potential for forest interior habitat. However, given the limited natural cover present, these features represent the only opportunities for woodland habitat within the future Natural Heritage System.

- Other naturally occurring woody vegetation cover consists of tree and shrub dominated succession, open-grown trees and hedgerows, dominated by white elm, bur oak, hawthorn and grey dogwood, with infrequent white ash, red oak and shagbark hickory. Old growth specimens of oak and hickory occur in some hedgerows, or as open-grown trees. Although heavily fragmented, these represent some local opportunities to enhance east-west linkages within the Study Area, particularly north of Highway 401.

- Botanical diversity is low to moderate in the forested units, reflecting past agricultural uses such as grazing.

- Swamp and marsh cover is generally scarce within the Study Area although small wetland pockets are prevalent in the woodlots. The dominant marsh species observed was cattail, with frequent occurrence of reed canary grass, bulrushes and sedges. The dominant swamp species was silver maple, with frequent occurrence of bur oak, green ash and basswood.

- Two evaluated wetlands occur in the Study Area, comprised of swamp and/or marsh cover. These were recently re-evaluated as locally significant under the Ontario Wetland Evaluation System (OWES) (3^{rd} Ed., 1993). The identified wetlands are partially reliant on groundwater discharge. No provincially rare plant or animal species were detected in these wetlands; significant bird and fish species were detected. These features are partially reliant on groundwater discharge, and would serve as habitat nodes as part of the Natural Heritage System.

- Riparian cover associated with smaller tributaries of the Sixteen Mile Creek is very limited, or lacking due to agricultural and urban encroachment. The enhancement of riparian cover along tributaries, which will be integrated into future development, represents an opportunity to achieve a ‘net gain’ of natural cover in the Study Area.

- Small aquatic features (including excavated ponds) were identified as supporting amphibian activity. These contained fringes of typical wetland species such as cattails and bulrushes. Submerged and floating aquatic vegetation was observed in some ponds. In some cases these augment the functions of natural habitats in their vicinity, and therefore represent an opportunity.

- Under existing conditions the Natural Heritage System, as identified in the Watershed Plan, is confined to the Main Branch of Sixteen Mile Creek. Riparian habitat is limited and fragmented, and is considered inadequate to sustain important natural corridor functions.

- Pockets of remnant deciduous and mixed forest remain in residential and industrials areas of Milton. These represent opportunities to provide a more sustainable Natural heritage System through the urban area.

- Parks and streetscapes in the urbanized portion of the Study Area have been planted with primarily non-native tree species although some large remnant native trees remain in the landscape.

Wildlife

- Field surveys conducted in 1998/99 documented 47 bird species in the Milton North (401 Industrial/Business Park) lands. Twenty-five species exhibited breeding evidence of which 7 species were considered significant and recognized as conservation priorities for Halton Region (Couturier, 1999). All but one of these were seen in the vicinity of the evaluated wetland at Bronte Street and Sixteen Mile Creek. The remainder of species that did not show breeding evidence were birds seen away from suitable habitat during breeding season, regular occurring breeding species seen outside of the typical breeding season, or migrants.

- Open-country birds were generally under documented. This was probably a result of the fact that survey efforts focused primarily on wooded and semi-wooded environments. Additional surveys would likely yield additional sightings and species.

- Five reptile and amphibian species have been documented within in the Milton North (401 Industrial/Business Park) lands based on recent records and published data. None are provincially or regionally significant. Three species were observed during the 1998/99 surveys. The other two species reported were documented in the mid-1980s.

- All reptile and amphibian sightings were recorded only in four areas consisting of wetlands along Sixteen Mile Creek, or dug ponds. This highlights the relative rarity of these terrestrial features in the existing landscape, as well as the value of these features for herpetofauna. One of the four locations was the same location where most significant birds were observed.

- Ten mammal species were documented in the Milton North lands; none are considered provincially significant (OMNR, 1993). Eight species were encountered during the 1998/99 field surveys, primarily within remnant natural habitats. Two of the ten species reported were based on records from the mid 1980s.

- One common species of butterfly was noted during 1998/99 field surveys. Many more species likely utilize habitats in the Study Area, especially in successional habitats with wet meadow components.

In summary, the most significant wildlife habitat areas were the riparian corridors and scattered small woodlots. The Main Branch of Sixteen Mile Creek exhibited the greatest diversity and greatest enhancement opportunities and likely serves as a significant wildlife movement corridor between areas above and below the Escarpment. Most herpetofaunal records were from this area. Efforts to establish vegetated links along the smaller tributaries would be beneficial. Wildlife diversity could also be enhanced if the existing woodlots could be enlarged and linked to the existing riparian systems.

3.8 Summary of Constraints and Issues

Subwatershed characterization, including ranking of resources and identification of constraints has been completed as outlined in the *Sixteen Mile Creek Subwatershed Planning Study - Areas 2 and 7 - General Report, Philips Planning and Engineering Limited, January, 2000* which examined the overall subwatershed areas. In addition, a focussed characterization of the study area has also been completed as outlined in *Highway 401 Industrial/Business Park Secondary Plan Background & Options Report, Macaulay Shiomi Howson, September 1999.* These characterization activities identified the following for the 401 Industrial/Business Park lands:

Key General Constraints

Watercourses

- Size of drainage area and form/habitat requires that certain reaches remain open
- Localized erosion in Main Branch requires on-site and possibly off-site attention

Fisheries

- Redside dace; significant indicator species; high degree of stormwater management treatment
- Cool Water – Temperature issues; additional form of stormwater management treatment required

Terrestrial

- Previous loss of terrestrial resources (limited amount of remaining terrestrial)
- Main branch of Sixteen Mile/ESA corridor of significance
- Highway 401 is a barrier which impedes migration

Stormwater

- Downstream flood susceptibility/channel capacity
- Limited culvert capacity particularly at Highway 401 (and Regional Road 25 – spill potential)
- Existing SWM facilities (Highpoint S36, Magna S38, Magna South S30 plus on site south of Highway 401)
- Areas of increased infiltration potential (Area C, ref. Figure 4); potential requirement to infiltrate 'clean' runoff

Key Storm Servicing and Environmental Management Issues/Opportunities

a) Sixteen Mile Creek Main Branch is a Type 1 Habitat, hence all stormwater quality management for newly developing areas which discharge to the Main Branch of the Sixteen Mile Creek would need to be designed to achieve Level 1 Habitat Protection for pollutant removal performance.

b) The Sixteen Mile Creek Main Branch is sensitive to thermal impacts hence stormwater Management Practices must incorporate thermal mitigation measures. Self-sustaining populations of rainbow trout (*Oncorhynchus mykiss*) and/or brown trout (*Salmo trutta*) are present throughout the mainstream of the Kelso Branch, and downstream into the upper reaches of the Main Branch. Cool summer water temperatures are essential to their survival. Redside dace are found in a tributary to the North Branch. This species is usually associated with areas of groundwater discharge, and hence is believed to require cool water temperatures.

c) There are areas (ref. Figure 4 - Area C) where increased infiltration capacity to the near surface sand and gravel layer may occur. In these areas enhanced infiltration of runoff may be required. Due to concerns regarding water quality impacts, the recharging water quality must be acceptable such that local water wells are not impacted in accordance with the Ontario Drinking Water Objectives. Natural infiltration into the sand and gravel unit may be of the order of 300 mm/year. On-site infiltration is to be promoted in areas identified through site specific study as part of the next level of planning application [Infiltration storage should be subtracted from overall water quality and quantity (erosion control) requirements]. Infiltration of roof top drainage (only), through rear yard ponding or dry wells, may be implemented. Due to concerns regarding potential for contamination of groundwater resources, infiltration of runoff from roads and parking areas would not be recommended.

d) Due to current flood damage potential within the Urban Milton community, control of peak storm flow rates to pre-development rates or less is required.

e) Opportunities to lower (and flatten) existing streams to improve outlet depth for urban servicing needs to consider the impacts on sediment transport and potential for aggradation.

f) Department of Fisheries and Oceans will require a Comprehensive Fisheries Compensation Plan which would include the evaluation of stormwater and watercourse management opportunities to ensure that the basis for subsequent mitigation or compensation is incorporated in the subwatershed management strategies for the 401 Industrial/Business Park Area. The requirement for a Fisheries Compensation Plan is identified in the *Sixteen Mile Creek Subwatershed Planning Study - Areas 2 and 7 - General Report, Philips Planning and Engineering Limited, January 2000.* The mitigation/compensation may include; enhancement of on-site watercourses/habitats in accordance with the opportunities identified in the Subwatershed Plan, downstream function replication through stormwater management, off-site compensation; or other forms of management.

g) Opportunities to protect the remaining natural habitats and linking them into the development fabric should be considered as follows:

- Placing a high priority on protection or integration of features, which have been identified as medium to high constraint areas based on the terrestrial resource analysis,
- Restoring degraded natural features, under-utilized public open spaces (e.g. parks), conservation easements, and active recreational areas bordering natural habitat,
- Managing rail and utility corridors for secondary habitat linkage benefits,
- Initiating land stewardship programs,
- Providing buffers to protect woodlots, riparian areas and other natural features.

h) Enhancement of the Sixteen Mile Creek Main Branch corridor should be a priority.

i) For the surface watercourses that will remain, it is vital that a suitable corridor is provided that will permit natural channel migration, while ensuring the channel is functionally connected to its floodplain. One of the best means of accomplishing this, is providing a corridor bottom width that matches the meander belt width for the particular reach. The belt width is sensitive to peak flows and flow volumes, thus, if an existing belt width could be determined, or if one is measured from historic air photos, a conservative value should be selected, or an additional 5m buffer included to account for the probable effects from development.

j) Factors affecting linkages include extensive agricultural activities, existing urban development, the significant east-west barrier created by Highway 401, channelization of the Creek through the urban area of Milton, and more generally, roadways throughout the Study Area which fragment natural features and corridors:

- Ensure that Regional and Town Policies (Secondary Plans & Subwatershed Management Plans) reflect the Provincial Policy Statement on Natural Heritage.
- Maintain and enhance remaining linkage features (stream corridors, valleys, hedgerows, etc.)
- Replace secondary linkages removed by development with substantial new landscape linkages.
- Restore linkages by utilizing hydro, pipeline and rail corridors to establish secondary habitat linkages.
- Re-establish functional corridors and linkages, including open space and under-planted areas along the creek in the Town of Milton.
- Establish buffers and setbacks around existing natural features.
- Integrate Natural Heritage System links to features outside the Study Area.

k) Many smaller tributaries of Sixteen Mile Creek lack physical form, riparian cover, and permanent streamflow.

- Establish minimum riparian corridor width standards through future development areas
- Reinstate wetlands where possible to extend the hydro period in habitats associated with tributaries.

l) Habitat diversity has been reduced in the Study Area. Wetlands, ponds, mature woodlands and successional meadows and thickets are very limited in extent.

- Reinforce existing habitat fragments through regeneration and active restoration.
- Develop stewardship programs to promote reforestation and wetland creation.
- Protect and restore habitats associated with the Main Branch valley system as these have a high potential to sustain diverse habitats and species.

m) Existing woodlands have been regularly disturbed by grazing or logging, and are now dominated by immature growth.

- Develop stewardship programs to encourage landowners to incorporate principles of habitat management for remaining woodlands and successional habitats, and consolidate smaller fragments into larger habitat blocks.

4. POLICIES, OBJECTIVES AND TARGETS

The following outlines the policies and objectives for managing the impacts associated with the development of the Highway 401 Industrial/Business Park related to:

- flooding
- stream morphology and erosion
- hydrogeology
- water quality
- aquatic habitat
- fisheries
- vegetation and wildlife.

The Town of Milton, Regional Municipality of Halton, Conservation Halton, Ministry of Natural Resources, Ministry of Transportation Ontario, Ministry of the Environment, and Department of Fisheries and Oceans each have criteria and guidelines pertaining to drainage and natural resource areas within the study area. In addition to each agencies' specific policy, the *Sixteen Mile Creek Watershed Plan* identified specific:

- watershed goals and objectives
- watershed management strategies, and,
- subwatershed issues and objectives

Based on the unique characteristics of Subwatershed Area 2, in which most of the Secondary Plan Study area is located, the Sixteen Mile Creek Watershed Plan identified key issues, goals and management strategies. Table 4.1 outlines the subwatershed specific resources, issues, objectives and targets for Subwatershed 2 as determined through the Sixteen Mile Creek Watershed Plan.

TABLE 4.1
SUBWATERSHED 2 – WEST BRANCH
KELSO TO JUNCTION WITH EAST BRANCH

Key Resources	**Aquatic:**	Resident (brown) and migratory (rainbow) trout habitat, Kelso to built Milton 101(1); altered and degraded coldwater habitat and migration route downstream (103, 104)
	Terrestrial	Part ESA 18/ASNI/Escarpment; variable riparian habitat Kelso to built Milton, ESA 16/Sixteen Mile Creek Valley downstream
	Water Supply:	Good water quality upstream of Milton, degraded water quality downstream of Milton (high bacteria, nutrients)
	Landform/Soils	Part Niagara Escarpment upstream, Sixteen Mile Creek Valley downstream
	Recreation:	Rattlesnake Point – Crawford Lake, angling groups (coldwater fishery primarily)
Major Land Use Activities	**Town of Milton**	Concrete channel, STP (esp. historical impacts)
	Agriculture	Pasture
	Local Rural (Golf Course)	
Key Issues	• Protection of coldwater fishery currently at or near threshold conditions (temperature, structural/limitations, riparian cover removal)	
	• Town of Milton expansion – management water quality/quantity	
	• STP closure implications	
	• Protection of Valley, erosion control	
Objectives/Targets	• Maintain resident and migratory coldwater fish habitat extent and extend downstream of Milton if feasible (maintain, reduce water temperature < existing near lethal 24 – 25°C maximums, maintain baseflow, maintain/enhance water quality)	
	• Maximum infiltration/recharge and contribution to stream baseflow	
	• Maintain existing hydrologic regime/water budget to extent feasible	
	• Facilitate migratory passage of rainbow trout	
	• Protect main stream corridor and enhance if feasible	
	• Ensure no increase in flooding and erosion	
	• Specific peak flow rates and flow exceedence – duration criteria (ref. Sixteen Mile Creek Watershed Plan Appendix D – Tables D.11, D.12, and D.13)	
Key Management Strategies /Actions	• Emphasize dispersal and recharge of runoff all impervious surfaces	
	• Collect additional natural system data prior to development	
	• Enhance riparian cover in new development buffers and through Milton if feasible to ESA	
	• Provide nesting cover in concrete channel for migrating trout	
	• Reconfigure Mill Pond as bypass system with no fish access	
	• Assess STP removal implications to ensure no decrease in baseflow or increases in temperature	
	• Emphasize dispersal and recharge of runoff all impervious surfaces	
	• Prevent valley erosion (geotechnical setbacks and runoff management)	
	• Protect core habitat corridor and streams with appropriate site-specific buffers and other measures	
	• Assess minor tributaries for seasonal baitfish use and other functions which should be maintained or restored with enhancement as part of development proposals	
	• Water temperature controls	

1 Subcatchment
* Abstracted from "Sixteen Mile Creek Watershed Plan, Prepared in Support of the Halton Urban Structure Plan", February 1996 Halton Urban Structure Review Consulting Team – Table D.2, page D-3

401 Industrial/Business Park Objectives

Based on the foregoing, as well as more recent subwatershed characterization work conducted in 1998/99 as part of the Subwatershed Planning Study, the following objectives have been identified specifically for the 401 Industrial/Business Park area:

(i) Maintain/enhance baseflow to the Sixteen Mile Creek – Main Branch.

(ii) Based on existing flood damage potential downstream of this area, Post to Pre-development peak flow control as a minimum would be required to achieve flood control objectives.

(iii) Control (storage) of stormwater runoff to maintain existing flow-duration exceedance characteristics in the Main and East branches of the Sixteen Mile Creek would be required based on the presence of localized channel erosion.

(iv) Stormwater Quality treatment of runoff from developing areas is required to mitigate surface water quality impacts in accordance with Ministry of Environment guidelines, to a Level 1 standard.

Stormwater Management Facilities Criteria

Based on the analysis completed through the *Subwatershed Planning Study Sixteen Mile Creek Watershed - Areas 2 and 7,* a number of stormwater management facility sizing criteria have been identified for the 401/Industrial/Business Park area. These criteria relate primarily to mitigation of flood, erosion and quality of stormwater impacts.

Table 4.2 provides a summary of the stormwater quality storage requirements applied to this area.

TABLE 4.2
WATER QUALITY STORAGE REQUIREMENTS
(FROM MOEE 1994)

Protection Level	**SWMP Type**	**Storage Volume (m^3/ha for Impervious Levels)**			
		35%	**55%**	**70%**	**85%**
Level 1	Infiltration	25	30	35	40
	Wetlands	80	105	120	140
	Wet Pond	140	190	225	250

Table 4.3 provides the required extended detention (erosion control) volume, on an impervious hectare basis, and extended detention flow rate control for the 401 Industrial/Business Park Area.

TABLE 4.3
SUMMARY OF STORMWATER MANAGEMENT FACILITY EROSION CONTROL STORAGE CHARACTERISTICS

Planning Area	Subcatchment/ SWM Facility Number	Total Drainage Area (ha)	Erosion Control Storage (Extended Detention) [m^3/ impervious ha]	Extended Detention Flow Rate[1] [m^3/s/development ha]
North of Highway 401 (North Area)	2025 - s40 2024 - s34 2040 - s35 2030 – s37 2031 – s37	43.8 98.6 85.2 43.8 29.4 (+ 71.6 external)	229	0.0012
	2022- s36 2042-s36	99.0 76.8	N/A - Existing SWM Facility does not provide erosion Control Function - Model results for Future Land Use with SWM include erosion storage retro-fit)	
South of Highway 401 (North-West Area)	2044 – s33 2045 – No Facility Shown	27 19	315	0.0011
External to Phase 1 Area	7016- s42	19	430	0.0011

[1] Corresponds to outflow rate at full storage

Table 4.4 provides a summary of the required storage-discharge relationship for proposed facilities within the 401 Industrial/Business Park Area. [Note: The table provides storage-discharge values for the 25 year and 100 year events; these should be considered ordinates of midpoint and maximum storage discharge, as they correspond only approximately to the 25 and 100 year flow response].

TABLE 4.4
SUMMARY OF STORMWATER MANAGEMENT FACILITY FLOOD CONTROL CHARACTERISTICS[1]

Planning Area	Subcatchment Facility Number	Drainage Area (ha)	Flood Control Storage up to 25 year stage [m^3/ imp ha]	25 Year Controlled Flow Rate[2] m^3/s/development ha]	Flood Control Storage up to 100 year stage [m^3/ imp ha]	100 year Controlled Flow Rate[2] [m^3/s/development ha]	Total Flood Control Storage [m^3/ imp ha]
North of Highway 401 (North Area)	2025 - s40 2024 - s34 2030 – s37 2031 – s37	43.8 98.6 43.8 29.4 (+ 71.6 external)	277	0.0124	89	0.0177	366
	2022 - s36 2040 - s36[3] 2042 - s36	99.0 88.2 76.8	Existing Facility (ref. Table 3.3)				
South of Highway 401 (North-West Area)	2044 - s33 2045 - No Facility Shown	27 19	166	0.0094	85	0.0155	251
External to Phase 1 Area	7016- s42	19	284	0.011	81	0.034	365

[1] Excludes Extended Detention storage required for Erosion and Water Quality

[2] Corresponds to outflow rate at full storage

[3] Note: Flood control for the lands west of Regional Road 25 draining to facilities denoted as s35, is proposed to be provided in Facility s36.

The MTO requires a 14 m setback from the Highway 401 right-of-way for any stormwater management facility.

Proposed Stormwater Management Flood Impact Mitigation Performance

The performance of the proposed stormwater management facilities has been undertaken based on continuous hydrologic simulation and frequency analysis. Table 4.5 provides a summary of the peak flow rates under proposed development conditions including stormwater management.

TABLE 4.5
PROPOSED LAND USE WITH SWM (DEVELOPMENT NORTH OF HIGHWAY 401)
FREQUENCY FLOWS (m^3/s)

Location/Node	Drainage Area (ha)	Frequency (years)							
		1.25	2	5	10	20	50	100	Regional
A	52.8	0.052	0.130	0.270	0.390	0.510	0.680	0.810	4.48
B(local)	105.7	1.45	2.01	2.89	3.55	4.25	5.24	6.06	13.06
B (full)	173.6	0.900	1.12	1.41	1.59	1.75	1.96	2.12	19.30
C	71.6	0.120	0.250	0.480	0.660	0.850	1.11	1.31	5.90
D (local)	43.8	0.800	1.11	1.53	1.81	2.09	2.45	2.72	5.43
D (full)	115.4	0.280	0.510	0.890	1.15	1.40	1.73	1.97	10.73
E	29.4	0.097	0.160	0.270	0.350	0.420	0.520	0.600	3.69
F(local)	99.0	1.30	1.82	2.57	3.10	3.62	4.33	4.89	10.92
F(full)	658.0	2.12	3.02	4.31	5.20	6.09	7.27	8.19	43.11
G (local)	85.2	0.460	0.910	1.64	2.15	2.64	3.25	3.69	9.67
G(full)[1]	482.2	0.900	1.87	3.30	4.15	4.88	5.72	6.30	26.57
H(full)	98.6	0.320	0.530	0.850	1.08	1.32	1.63	1.87	17.80
I	397.0	0.590	1.22	2.37	3.25	4.15	5.39	6.35	28.99
J	158.2	0.250	0.530	1.02	1.39	1.78	2.30	2.71	12.35
K(full)[1]	362.9	0.620	1.22	2.24	2.91	3.52	4.24	4.74	30.32
L(local)	160.2	2.18	3.05	4.30	5.16	6.01	7.15	8.04	17.98
L(full)	621.7	2.99	4.28	6.06	7.23	8.36	9.81	10.9	62.34
M(local)[1]	62.5	0.170	0.310	0.520	0.660	0.800	0.970	1.10	7.20
M(full)	220.7	0.390	0.810	1.50	1.99	2.48	3.11	3.58	17.86
N	76.8	0.850	1.18	1.65	1.98	2.30	2.73	3.07	8.25
O(local)	59.3	1.15	1.61	2.25	2.69	3.12	3.69	4.13	7.81
O(full)	717.3	2.99	4.00	5.39	6.34	7.26	8.48	9.42	49.65
P(local)	93.9	1.01	1.40	2.02	2.47	2.94	3.62	4.17	9.05
P(full)	412.3	2.03	2.72	3.72	4.44	5.16	6.14	6.92	42.30
Q(local)	99.6	0.200	0.380	0.690	0.920	1.16	1.50	1.76	8.23

[1] - analysis results based on Wakeby Distribution
Local - flow from local catchment only (ref. Figure A-1)
Full - total flow from all upstream catchment areas including potential spill from catchment 2040 to 2024 (ref. Figure A-1)

Table 4.6 provides a summary of the differences in “pre” and “post” development flow rates. The hydrologic modeling for proposed development conditions .

TABLE 4.6
PERCENT DIFFERENCE IN FREQUENCY FLOWS BETWEEN FUTURE WITH SWM AND EXISTING CONDITIONS
FREQUENCY FLOWS (%)

Location/Node	Frequency (years)							
	1.25	2	5	10	20	50	100	Regional
B	221	87	19	-1.8	-15.5	-27	-33	29
D	33	16	3.5	-2.5	-6.7	-10	-13	2.6
E	83	45	23	16.7	10	4.0	1.7	26.4
F	162	61	17	4	-1.9	-6.2	-7.3	25.4
G	55	35	21	15	11.4	7.9	6.2	0.38
H	100	56	27	19	12.8	7.9	5.1	8.4
K	13	11	6	3.6	1.4	-1.2	-2.5	2.8
L	1.7	0.7	1.2	1.8	2.7	3.9	4.8	5.7
M	26	25	18	16	17	18.7	20	2.6
O	61	29	7	-0.16	-4.97	-9.3	-11	5.9
P	45	25	12	7.8	5.09	3.0	2.4	17.4

The foregoing results indicate that typically, the proposed stormwater management effectively mitigates flood impacts particularly for less frequent severe storm events. There are a number of locations where minor increases in flood impact would occur.

These differences peak flow rates arise form a number factors including:

- Consolidation of drainage area to central facilities and local diversions to single outlet points
- Shifts in timing of peak flow rates where a significant upstream drainage area is present, which may increase in-stream peak flow rates even with the recommended stormwater management

At these locations site specific modification of the storage/discharge relationship of each facility may be considered to further refine the facility performance in the context of the local constraints. This may involve the following:

- Where consolidation of flow to centralized facilities is proposed, use of remnant outlets (culverts) should be utilized for major system relief outlets to ensure that predevelopment flow rates are maintained for all outlet locations, and to prevent adverse flooding of the development area under regulatory events.
- In locations where consolidation of drainage area has been proposed the selection of the appropriate outlet location for SWM facility discharge should be based on an assessment downstream habitat and riparian user where feasible splitting SWM facility discharge to maintain flows to multiple outlets should also be considered.
- At locations where the proposed development is located downstream of a significant external drainage area, modifying the discharge characteristics of the SWM facility may be considered such that a higher proportion of the total storage may be used in extended detention and control of frequent storm events with reduced (or no control) provided for major storm events. Such proposed modification must be supported by

site specific modeling and analysis (including external areas) which verifies that in-stream peak flow rates at the downstream limits of the development are not increased over predevelopment levels.

- For Facility s36 the storage-outflow curve under erosion-control retro-fit conditions may be further optimized to provide a greater proportion of storage at a lower outflow rate, This would be undertaken at the time of the detailed design of the potential retro-fit.

Erosion Mitigation Assessment

Erosion Assessment has not been completed as part this study, however the overall effectiveness of the proposed stormwater management systems has been analyzed as part of the *Sixteen Mile Creek Subwatershed Planning Study, Areas 2 and 7, Town of Milton (PP&E, January 2000).* Sizing of stormwater management facilities has been completed in accordance with the *Sixteen Mile Creek Subwatershed Planning Study, Areas 2 and 7* hence the required erosion mitigation performance will be achieved.

Natural Heritage Strategy

The Watershed Plan recommendations included a methodology for evaluation of terrestrial resources with respect to the overall watershed resources and integrity of the natural functions and linkages within the watershed. This approach is in accordance with the Provincial Policy Statement (1996) which provides direction for the protection or integration of certain resources that have been identified as 'significant' according to provincial standards: wetlands, habitats of endangered or threatened species, fish habitat, woodlands, valleylands, wildlife habitat, and areas of natural and scientific interest. The Halton Regional Plan (1995) incorporates these features as Greenlands A and B'. The Town of Milton Official Plan (1997) reflects the Halton Region Greenlands categories, and identifies Environmental Linkage Areas which are primarily watercourse-based.

The mandate to plan for future development within a Natural Heritage framework stems partially from the Provincial Policy Statements, and from the regional and locally-based planning initiatives noted above. The opportunities identified in the preceding chapter reflect three basic levels of mandate, as follows:

1) Protection of 'significant' features as defined under the Provincial Policy Statement (1996), is largely mandatory and would be required to be implemented subject to findings of detailed environmental impact studies. This pertains primarily to the Main Branch of Sixteen Mile Creek. Despite this level of protection, some further loss is considered inevitable in order to establish efficient infrastructure to support future development.

2) Provision of more substantial and sustainable stream corridors is related to regulatory matters of floodplain management and stream stability, but also contains a discretionary aspect in terms of the degree to which terrestrial objectives are incorporated into implementation. This represents the greatest opportunity to offset past and future habitat losses.

3) Protection or enhancement of features not addressed under 1) or 2) are in theory covered under Section 2.3.3 of the Provincial Policy Statements (i.e. diversity of natural features, and natural connections between them, to be maintained and improved where possible) but are more discretionary and fully dependent on the adoption and effective implementation of local policies (region, municipality, and other approving agencies) in concert with the co-operation and flexibility of development proponents and other private stakeholders in the Subwatersheds.

Due to the existing habitat fragmentation in the Study Area, the degree to which the third level of opportunities is supported and implemented will largely determine whether a sustainable Natural Heritage System can be achieved. In the Subwatershed Areas 2 & 7 Study, a relatively aggressive program was outlined which targets an overall 'net gain' principle in terms of protection of natural cover and enhancement of functions over existing conditions. The application and refinement of this principle in the Study Area represents the only feasible means to maintain and improve Natural Heritage features and functions. Cumulative change to habitat quality and functions is considered largely inevitable as the future development areas are converted from rural to urban uses.

Due to the depleted state of natural cover in the Milton North study area, the objectives should be to protect:

a) larger terrestrial features, b) those linked to nearby features or watercourses, and c) those containing evaluated wetlands. If these features are integrated, and stream-based corridors are restored wherever feasible, a net gain of habitat and ecological function can be attained. A minimum target of 15% natural cover (including uplands, wetland, valley and riparian habitat, and created habitat in stormwater facilities) is considered desirable in Milton North.

5. EVALUATION AND ASSESSMENT OF MANAGEMENT STRATEGIES

This section details the various stormwater management techniques that may alone or in combination, reasonably be used to address watershed and subwatershed policies, objectives and criteria. Potential management solutions have been screened based on their ability to address the respective criteria. It should be recognized that the range of techniques which are applicable to the study area is affected by past on-going development of this area and recommendations of previous studies.

The nature and history of development within the 401 Industrial/Business Park Secondary Plan Area suggests the need for a comprehensive approach to stormwater management. The planning of stormwater management infrastructure for new (i.e. "Greenfield") development is relatively straightforward and well defined. Conversely, stormwater management for infill and redevelopment is typically complicated by constraints imposed through past land use and infrastructure design, as well as the various degrees of redevelopment and the associated land use planning processes involved (which define the legal avenues to require stormwater management). Similarly, infill developments (particularly for small parcels) pose a challenge with respect to the limited types of stormwater mitigation techniques that are available through which to provide effective mitigation of hydrologic and water quality impacts.

5.1 Long List Screening

5.1.1 Screening of Component Stormwater Management Techniques

Stormwater management techniques considered for this assessment can be classified according to the following general categories:

(i) "Do Nothing" - Future Uncontrolled Development
(ii) "Optimized" Diversion of minor and/or major system flow between subwatersheds and subcatchments
(iii) Source and Conveyance Controls
(iv) End-of-Pipe Facilities

1. "Do Nothing" - Future Uncontrolled Development

Build-out of the Study Area, without controls, would lead to degraded runoff water quality, and potential reduction in base flow with associated impacts on downstream habitats. Previous Studies (ref. *Milton Highway 401 Industrial Park Implementation Policy*) have confirmed the potential impacts of uncontrolled development. The erosion assessment undertaken as part of the *Sixteen Mile Creek -Watershed Plan* and *Sixteen Mile Creek Subwatershed Planning Study - Areas 2 and 7* also indicates that erosion potential would increase without controls. In addition, this alternative would not meet the objectives of Provincial and Municipal programs for environmental protection, nor the erosion and stormwater quality objectives of the Watershed and Subwatershed Plans. Therefore, this alternative is considered to be unacceptable. Notwithstanding, it has remained part of this assessment as a benchmark for assessment of the effectiveness of other proposed stormwater management strategies as required by the Municipal Engineers Association (MEA) Class Environmental Assessment Procedures.

2. *'Optimized' Major/Minor System Diversion*

The optimized diversion of flow between subcatchment areas (i.e. between each of the subsystems within the 401 Industrial/Business Park Area) must consider the following constraints:

- The capacity Highway 401 culvert crossings and downstream channels is limited and flood potential should not be increased at any crossing.
- Minor systems diversions must consider the impacts to base flow contributions to downstream habitats. As a general rule, the volume of base flow to each system must be maintained and the period of flow following storm events should be maintained and or extended.

Based on the foregoing, diversion of minor system flow between subcatchment areas has been carried forward as a feasible alternative.

3. *Source and Conveyance Controls*

The use of source and conveyance controls would rely on providing measures within the context of site development to promote infiltration and pollutant removal on a local site by site basis. These measures rely on eliminating the direct connection between impervious surfaces such as roofs, roads, parking areas, and the storm drainage system, as well as the promotion of infiltration on each development site.

A number of potential source and conveyance control techniques have been listed in Table 5.1

TABLE 5.1
SOURCE AND CONVEYANCE SYSTEM
STORMWATER MANAGEMENT TECHNIQUE SCREENING

Technique	Comment	Screening Evaluation
Reduced Lot Grading	• Requires relatively flat topography • reduction of typical lot grade slopes from 2.0% standard to 0.5 –1.0% • promotes infiltration, reduces runoff volumes, and increases runoff travel time. • reduces use of properties following rainfall events as a result of less efficient drainage.	• Generally compatible with existing topography and nature of development within the 401 Industrial/Business Park Area • **Carried Forward**
Discharge of Roof Leaders to Pervious Surface	• reduces the directly connected impervious areas, which results in lower runoff volumes, increased runoff travel time and increased infiltration. • promotes passive infiltration while allowing positive drainage of yards	• **Carried Forward**
On-site stormwater flow rate control (parking lot and roof top storage)	• These measures have been recommended through previous studies (Stormwater Management Study, West Tributary of 16 Mile Creek, F.J.Reinders, undated). • Difficult to ensure long term effectiveness and maintenance • Effectiveness for peak flow control is dependant on location within subwatershed relative to outlet	• **Not Carried Forward**

TABLE 5.1
SOURCE AND CONVEYANCE SYSTEM
STORMWATER MANAGEMENT TECHNIQUE SCREENING

Technique	Comment	Screening Evaluation
Roof Leader Discharge to Ponding Areas or Infiltration Pits	• provisions for ponding of rainfall from impervious surfaces such as roofs and parking area on the surface or subsurface of pervious land areas. • increases infiltration, and reduce total runoff volume. • reduced use and enjoyment of lands due to standing water and potential negative reaction by the Public due to perceived deficiency in the surface drainage system. • feasibility is highly dependent on local soil conditions. • potential groundwater contamination and therefore is considered for use in conjunction with roof drainage only.	• incidence of low infiltration capacity clay soils limit effectiveness and feasibility • Concerns regarding Water quality would preclude application to road and parking area drainage • Would be applicable in areas of higher capacity (ref. Area C) for roof top/landscaped area only • **Carried Forward as supplemental measure only**
Rural Road Cross-section	• rural ditch collection/conveyance system with ditch/swale drainage rather than an urban road section. • increased infiltration, increase in runoff travel time and improvements to water quality due to vegetative uptake of nutrients and settling of coarse suspended sediment in the swale system. • increased land requirement (ROW) • perception of a reduced level of service. • limited effectiveness to address erosion considerations.	• limited effectiveness with high density development areas • Concerns for water quality impact preclude use in industrial area • **Not Carried Forward**
Surface Conveyance Techniques (Swales, Watercourses) (within Development)	• natural watercourses, man-made channels and swales, maintain natural runoff-storage and hydraulic routing relationships, provide opportunities for baseflow and interflow contribution and enhanced infiltration • watercourses provide major system(flood) flow conveyance • provide for terrestrial and aquatic habitats and linkages • water quality benefits related to natural biological pollutant uptake • natural fluvial processes of sediment transport and deposition are maintained • recreation and aesthetic value.	• limited effectiveness with high density development areas • **Carried Forward**
Water Quality Inlets (Three Chamber Oil/Grit Separators Manhole Separators	• consist of chambers used to separate oil and grit from runoff from impervious surfaces • each unit services small area (i.e. 1 ha) • high aesthetic value (located underground), public acceptance, and effective protection/containment of oils and grease. • poor removal of soluble and fine-grained pollutants, and relatively high maintenance and construction costs as well as potential lack of municipal control over such facilities located on individual development sites.	• Potential utility on high density sites where spill control is a high priority • **Carried Forward as a supplemental stormwater (quality only) management for road and parking areas in areas of increased infiltration potential (ref. Area C) and where there is a risk due to potential spills.**

TABLE 5.1
SOURCE AND CONVEYANCE SYSTEM
STORMWATER MANAGEMENT TECHNIQUE SCREENING

Technique	Comment	Screening Evaluation
Pervious Pipe and Catch Basin systems	• subsurface conveyance system features include pervious pipe systems • promotes infiltration, reduces runoff volumes • increased potential for groundwater contamination, in the context of roadway runoff • potential for failure due to clogging and high maintenance cost as well as unproven performance in winter conditions • high dependency on soil infiltration capabilities • high maintenance costs • unproven winter performance • low long term reliability	• Concerns relating to water quality impacts preclude use in this setting • **Not Carried Forward**

A screening level assessment of source control effectiveness indicates that the use of Source and Conveyance controls alone, would not achieve the erosion control requirements for the proposed development, and would decrease downstream erosion impacts as compared to uncontrolled development) only marginally. Notwithstanding, each of the techniques carried forward can be utilized to mitigate local impacts on groundwater recharge and stormwater quality, by providing opportunity for settling and vegetative uptake of pollutants.

Based on the presence of local wells in the areas surrounding the Secondary Plan Area and strong potential of a regionally significant aquifer beneath the Industrial/Business Park Area. A number of land use specific measures have been recommended as standard requirements for development within the Secondary Plan Area. The particular measures that have been recommended are outlined in Appendix A (ref. Region of Halton Correspondence), and are listed as follows:

1) Liquid storage areas must have secondary containment to hold any spills or leaks at 10% of the total volume of the containers or 110% of the largest container, whichever is larger.

2) Design of inground protection channels for transfer hoses to minimize damage from vehicles and to catch leaks or spills is required.

3) Any areas used for cleaning parts, machinery, etc. must be located within a containment area with an impermeable floor. There must be no direct access to outside.

4) New and waste material storage areas must be roofed, isolated from floor drains and have sealed surfaces.

5) Underground storage tanks are discouraged, however where used, they must have secondary containment, a monitoring system incorporating high level and leak sensing audio/visual alarms, level indicators and overfill protection. A protective plate will be placed in the bottom of the tank if a dip stick is to be used.

6) Untreated rinse waters and floor drains must not discharge to a sanitary sewer, septic system, storm drain or surface water.

7) Waste collection stations, with labelled containers for each kind of waste, must be provided throughout the work area for spent chemicals, soiled rags, etc.

8) Uncovered receiving areas must be designed with a spill sump to catch and store any spilled chemicals with a manual operation for emptying.

9) Wastewater from any laboratory operation must be discharged to a lab drain system that is separate from the sanitary wastewater drains. Lab drains must lead to a neutralization system prior to discharge to the sanitary sewer.

10) Uncovered scrap metal storage areas must have a separate stormwater collection system with an oil/grit separator which discharges to a sanitary sewer or a holding tank.

11) Hazardous materials must not be put down drains, but rather must be properly disposed of by a licensed hazardous waste hauler.

4. End-of-Pipe Facilities

End-of-pipe facilities typically do not replicate natural hydrologic conditions as well as source controls or conveyance controls. However, end-of-pipe facilities offer a number of significant practical benefits in terms of providing Municipal control, ease of maintenance, and a high degree of effectiveness in runoff management, as required for mitigation of flooding, erosion and water quality impacts. Previous studies have also recommended the implementation of end-of pipe facilities (ref. R. V. Anderson Associates, 1981).

A variety of end-of-pipe facilities and techniques are considered for use within the 401 Industrial/Business Park Area and have been screened as outlined in Table 5.2

TABLE 5.2
END-OF-PIPE STORMWATER MANAGEMENT TECHNIQUE SCREENING

Technique	Comment	Screening
Extended Detention (Dry Ponds, Wet Ponds Wetlands)	• temporary detainment and slow release of storm runoff • enhances stormwater quality through the settling of sediments and adsorbed contaminants (i.e. total phosphorus, metals etc.) • generally does not reduce runoff volumes, however a release rate set less than the erosive flow threshold of the downstream channel reduces exposure to erosive flow levels. • provisions for base flow augmentation, • increases water temperature downstream due to increased solar exposure • poor removal of soluble and bacterial pollutant • provides removal of sediment through settling of stored waters. • potential for re-suspension of sediments	• provides effective erosion mitigation • **Carried Forward**

TABLE 5.2
END-OF-PIPE STORMWATER MANAGEMENT TECHNIQUE SCREENING

Technique	Comment	Screening
Infiltration (Infiltration Basins)	• typically infiltration is best implemented on relatively small local applications • larger end-of-pipe application of this technique has historically been less successful than lot level application. • reduced runoff volume provides for reduced erosion potential, attenuated peak flows, enhanced groundwater recharge, remove contaminants and moderated temperature fluctuations. Drawbacks include potential groundwater contamination, dependency on hydraulic conductivity of soil, seasonal effects, clogging, high maintenance costs and a high failure rate.	• Water Quality impacts preclude use for roads and parking area drainage • Potential application in areas of increased infiltration potential (ref. Area C) • **Carried Forward as supplemental measure**
Stormwater Retention (Wet Ponds, Wetlands)	• stormwater retention basins maintain a permanent pool of water • can be combined with extended detention to attenuate peak flows, remove sediments and enhance fish and wildlife habitats • provides aesthetic and recreational benefits • provides significant removal of pollutants through settling and biological processes. • reduces the potential for re-suspension of previously settled material • potential to increase water temperatures (minimized through use of wetland), eutrophication, potential nuisance wildlife • provides effective water quality treatment • thermal impacts can be minimized through use of wetlands rather than wet pond	• **Carried Forward**

Evaluation of Retro-fit Potential at Existing High Point Facility

The High Point Facility was assessed for additional volume required for extended detention and permanent pool to service proposed development which has not yet obtained Draft Plan Approval.

Essentially these lands comprise approximately 39.9 hectares of Industrial and Employment Lands as outlined in Table 5.3.

TABLE 5.3
SUMMARY OF DEVELOPMENT LANDS
CONTRIBUTING TO RETRO-FIT OF EXISTING HIGH POINT STORMWATER MANAGEMENT FACILITY

Development Parcel Reference	Total Area (ha)	Land use (impervious coverage-%)	Impervious Coverage (ha)
Oshawa Properties	29	Industrial (68%)	19.7
1232886 Ont.	5.1	Industrial (68%)	3.5
1232886 Ont.	5.8	Employment (60%)	3.5
Totals	**39.9**		**26.7**

The amount of permanent pool storage required for water quality, as outlined in the current Ministry of Environment Guidelines (ref. MOE, 1994) for wet ponds has been assessed to be approximately 178 m^3/ha (based on a 67% impervious coverage and Level 1 Habitat Protection).

Erosion control storage as outlined in the *Sixteen Mile Creek Subwatershed Planning Study Areas 2 and 7 (Philips Planning and Engineering Ltd., January 2000)* requires 229 m^3/imp. hectare with a peak drawdown rate of 0.00012 m^3/s/ha.

Based on the foregoing, the required volume of erosion control (extended detention) storage and water quality storage for the remaining development have been determined as outlined in Table 5.4.

TABLE 5.4
RETRO-FIT STORAGE REQUIREMENTS AND DEPTHS FOR EXTENDED DETENTION AND PERMANENT POOL AT THE HIGH POINT FACILITY

Development Area Reference	Extended Detention		Permanent Pool	
	Unitary Storage (m^3/imp ha)	Storage (m^3)	Unitary Storage (m^3/ha)	Storage (m^3)
Oshawa Properties and 1232886 Ont. Parcels	229	6114	178	7102

Survey data obtained for the High Point Facility indicates a surface area of 13,600 m^2. From this survey information, the depths associated with the required storage volume have been determined as summarized in Table 5.5.

TABLE 5.5
STORAGE REQUIREMENTS AND DEPTHS FOR EXTENDED DETENTION AND PERMANENT POOL AT THE HIGH POINT FACILITY

Development Area Reference	Extended Detention		Permanent Pool	
	Storage (m^3)	Depth (m)	Storage (m^3)	Average Depth over Existing Facility Area (m)
Oshawa Properties and 1232886 Ont. Parcels	6114	0.45	7102	0.52

The foregoing analysis indicates that providing the required erosion control storage to service the remaining development within the High Point area is feasible and may be accomplished through modifications to the existing facility outfall structure to increase water levels within the facility by approximately 0.45 metres, drawing down over the subsequent 24-48 hours following each storm event.

Stormwater quality storage may also be provided through retrofit of the existing facility, however the required increase in depth of 0.52 m may impact on the function of the facility. Hence, it is suggested that excavation of the additional volume would be preferred. Assuming a depth of 2.0 m of excavated depth, an additional 0.36 ha of facility surface area would be required.

Based on the hydrologic analysis, completed as part of the *Subwatershed Planning Study Sixteen Mile Creek Watershed - Areas 2 and 7,* end-of-pipe facilities would provide the required erosion, flood and stormwater quality mitigation required for development of the 401 Industrial/Business Park Area.

5.2 "Short-Listed" Stormwater Management Techniques

In summary, the following component stormwater management techniques have been carried forward as elements of alternative stormwater management solutions:

(i) Diversion

- 'Optimized' Diversion of minor system flow between subcatchments, subject to maintenance of baseflow volume and duration to important downstream habitats.

(ii) Source Controls

- Reduced lot grading within landscaped areas where such grading would reduce requirements for placement of engineered fill
- Roof leader discharge to pervious surfaces
- Rear yard ponding areas for roof top drainage only, where increase infiltration potential occurs
- Oil Grit separators as a supplemental water quality measure, specifically for management of spills in high risk areas

(iii) End-of-Pipe Facilities

- Infiltration Basins or other infiltration techniques for roof top drainage only , where increased infiltration potential occurs
- Wetlands and wet ponds

5.3 Stormwater and Environmental Management Concept Development

A Stormwater and Environmental Management Concept has been developed for the 401 Industrial/Business Park Area based on the Preferred land use plan for the area (ref. Figure 3) and application of the short-listed stormwater management techniques (ref. Section 5.2). The Conceptual Plan has been based on a number of key factors including:

(i) Conformance with previous studies (where possible) and optimization of built infrastructure. [Note: The partial development of the study area has included construction of a number of SWM facilities and implementation of stormwater management techniques. Previous studies have also recommended locations for centralized stormwater management facilities. The preferred plan incorporates the current knowledge/understanding and recommendations of these studies while ensuring that the subwatershed study objective are attained].

(ii) Development which uses an urban drainage system (i.e. curb and gutter, storm sewer) is preferred by the Municipality and Development Community based on maintenance, aesthetics, and marketability. [Note: This type of servicing for roads and parking areas has also been determined to be suitable in this area based on concerns for impact to water quality (in areas of increase infiltration potential) and the generally low infiltration capacity of the soils throughout the study area].

There are a number of factors which will influence specific elements of the preferred plan, within each development area as follows:

- ***External Drainage Conveyance***

Several parts of the developing study area receive runoff from upstream external areas outside of the proposed development. In many instances, the total drainage is small (typically less than 30-75 ha); in these instances, three options are possible:

(i) Divert upstream lands to a by-pass watercourse to avoid mixing of urban and rural drainage
(ii) Capture external drainage in the storm sewer system. This would require mixing of urban and rural discharge and typically would require oversizing of the SWM Facility
(iii) Create separate conveyance/channel/storm sewer system to convey discharge across development land without mixing

- ***Foundation Drainage Standard***

Depending on the available outlet depth (i.e. watercourses, culverts and storm sewers), there would be two general types of foundation drainage (ref. Figure 6)

(i) Shallow storm sewer system (i.e. typically 1.2 m or deeper) collecting road runoff with Foundation drainage via sump pumps discharging the surface.
(ii) Deeper storm sewer systems (i.e. typically 2.6 m or deeper) which accommodate gravity drainage of foundations

The key determinant related to the foregoing would be based on minimizing imported fill material. It should be noted that given the lack of high resolution topographic mapping for the 401 Industrial/Business Park area, detailed assessment of this issue is not feasible, only a "first order" assessment is possible, hence those will need to be verified through the follow-up design process.

- ***Stormwater Facility Type and Location***

The selection of a Stormwater Management facility type (i.e. wet pond vs. wetland) would be evaluated according to the following rationale:

(i) Wetlands are considered to be more productive in terms of environmental benefits, typically providing more organic matter and food material for receiving watercourse habitats. Wetlands are also considered more compatible than wet ponds where the facility is located adjacent to, or provides a linkage to, a watercourse, or terrestrial habitat (natural heritage systems) or open space system.
(ii) Wet Ponds are considered more appropriate as features in the urban landscape where they are relatively isolated from terrestrial/watercourse habitats or in tableland settings.

- ***Establishment of Drainage Boundaries between catchment areas***

Generally the location of subcatchment boundaries with the Study Area would be maintained. However there may be opportunities to allow limited diversion of the minor or major system flow, or both, to adjacent outlets. Any such a diversion would need to address the following:

(i) Diversions must not negatively effect the flood potential of downstream lands. This may lead to a requirement to provide additional storage to control flow rates to the pre-development peak flows at each location.
(ii) Diversion should consider the capacity of downstream systems (i.e. where additional capacity is available, diversion of flow may be appropriate).
(iii) Minor systems diversions require consideration of the impact of such diversion on baseflow within the receiving watercourse, as well as the length and importance of the habitats affected (positively or negatively).

Each of the foregoing factors has been considered as they relate to each subcatchment within the Secondary Plan Area. The individual development areas (or primary subcatchment areas) have been identified for the purpose of this assessment as follows (ref. Figure 7):

(a) East Area (within Highway 401 Integrated Planning Project Scoped Subwatershed Study Area)
(b) Employment lands draining to Phase 1
(c) MI developments
(d) Milton St. Clair lands
(e) Highpoint (East of Regional Road 25)
(f) Highpoint (West of Regional Road 25 – draining to tributary N-2-B)
(g) Highpoint West (draining to South)
(h) Emery Lands
(i) 857529 Ontario Lands
(j) Existing Urban Area

5.4 Specific Environmental Management Opportunities

In addition to the stormwater management techniques and strategies discussed in the foregoing, each development area has specific environmental management opportunities which, should be integrated into the land use and stormwater management plans, where possible. Generally, these opportunities include the following (ref. Figure 8):

TABLE 5.6
TERRESTRIAL RESOURCES AND LINKAGE OPPORTUNITIES (ref. Figure 8)

Reference	Considerations
SWS Development Area	
NW-1	Modifications to tributary NW-2-G1should integrate and have regard for TF Units 174 (tree dominated succession) & 188 (old field succession).
NW-2	Hedgerow # 170 provides a potentially important East/West connection the Escarpment, Kelso Branch of Sixteen Mile Creek, and tributary NW-2-G1. This latter tributary would benefit from enhancement to provide continuous riparian habitat.
NW-5	Enhancement of connectivity along the Kelso Branch is highly desirable. This should integrate TF Units 2 (tree dominated succession), 3 (plantation), 9.4 (tree dominated succession), 11 (tree dominated succession), 15 (wetland), 49 (deciduous forest), 52 (plantation), 156 (swamp), 173 (shrub dominated succession), 175 (plantation), 176 (plantation), & 504 (aquatic) which occur along the regulatory floodplain.
NW-9	There is a potential East/West linkage enhancement between TF Units 61(deciduous forest), 79(tree dominated succession), 80 (marsh), 83 (hedgerow), 85 (hedgerow), 86 (hedgerow) and the large woodlot Unit 73 (deciduous forest).
EU-10	There is linkage potential building upon TF Units 152 (woodlot), 153 (woodlot), 154 (shrub dominated succession), 155 (tree dominated succession), 155.1 (aquatic), 155.2 (tree dominated succession) & 155.3 (tree dominated succession) with enhancement potential along tributary NW-2-B, to improve the connectivity to NW-2-G3.
EU-11	A fragmented linkage along tributary N-2-B could be improved with channel plantings, enhancing the connection between TF Units 145 (tree dominated succession), 146 (deciduous forest), 147, (woodlot) and 148 (old field succession) and the downstream channel through the existing urban area.
N-2	This is a linkage opportunity which could connect TF Unit 196 (woodlot) to tributary N-2-B.
N-3	There is a potential East/West linkage north of Highway 401, between Tributary N-2-B, eastward to TF Units 150 (woodlot), 286 (hedgerow), 287 (woodlot), 288 (hedgerow), 289 (tree dominated succession), 295 (aquatic) & 500 (aquatic) with a final new link to the Ontario Hydro corridor where a major woodlot complex is located outside the Milton North limit. The link would utilize existing or new landscape linkages along the commercial/industrial boundary and could include stormwater management facilities.
N-4	There is potential to create an East/West linkage system north of Highway 401, between tributary N-4-A and associated TF Unit 223 (wetland), along Units including 193, 210, & 224 (hedgerows), to tributary N-2-B.
N6	There is a potential linkage along the Ontario Hydro corridor, linking woodland features located to the nort and east of the Milton North limit, and connecting to Linkage #N3.

TABLE 5.7
AQUATIC HABITAT CONSIDERATIONS FOR MILTON NORTH AREA

Reference	Considerations
North-West Area	
NW-2-G3	High fisheries constraint. Is permanently flowing, and provides habitat for a diverse fish community that includes redside dace, which are classed as "Vulnerable" by COSEWIC. Should be retained as an open system, but these sections have been ditched previously, and these could potentially be realigned, subject to habitat rehabilitation using natural channel design and riparian plantings. It is recommended that a fisheries management strategy be developed for this watercourse. Temperature is of concern.
NW-2-G2	High fisheries constraint. Should be retained and protected in its current form. Is permanently flowing, the existing channel morphology and riparian conditions provide good habitat for a diverse fish community, including redside dace which are classed as "Vulnerable" by COSEWIC. It is recommended that a fisheries management strategy be developed for this watercourse. Temperature is of concern.
NW-2-G1	High fisheries constraint. Should be retained as an open system, but could be realigned subject to habitat rehabilitation using natural channel design and riparian plantings. Is permanently flowing, and provides habitat for a diverse fish community that includes redside dace, which are classed as "Vulnerable" by COSEWIC. It is recommended that a fisheries management strategy be developed for this watercourse. Temperature is of concern.
NW-2-B (lower reaches)	Medium fisheries constraint. Should be retained as an open system, but could be realigned subject to its fish habitat function being retained. Has been altered but provides limited fish habitat. Temperature of water contributed to downstream system is of concern.
EU-1-A	Medium fisheries constraint. Should be retained as an open system, but could be realigned subject to its fish habitat function being retained. Though not permanently flowing, the existing channel provides habitat for a few fish species. Temperature effect on downstream habitat is of concern.
NW-1-A	High fisheries constraint. Should be retained and protected in its current natural form over most of its length. Could be restored to a natural form in altered lower reaches. Is a permanently flowing stream with abundant groundwater inputs and well-developed instream and riparian conditions that provide good habitat for a diverse coldwater fish community, including a significant salmonid sport fishery. Provides habitat for all salmonid life stages, including spawning. Temperature is of concern.
North Area	
N-4-A	High fisheries constraint. Should be retained and protected in its current form. Though not permanently flowing, the existing channel morphology and riparian conditions provide good habitat for a variety of fish species. It is situated upstream of a population of redside dace, which are classed as "Vulnerable" by COSEWIC. It is recommended that a fisheries management strategy be developed for this watercourse. Temperature is of concern.
N-5-A	Medium fisheries constraint. Channel has been altered in the past but supports several fish species. Should be retained as an open system but could be re-aligned subject to fish habitat function being retained.
N-2-B	Medium fisheries constraint. Should be retained as an open system, but could be realigned subject to their fish habitat function being retained. Though not permanently flowing, the existing channel provides habitat for a few fish species.

5.5 Retrofit/Cash-in-Lieu Decision Process

Stormwater Management, specifically for partially developed areas, infill development and redevelopment, should recognize that:

(i) Existing development has been constructed to different historical standards,
(ii) There will be re-development of some existing land uses which provides an opportunity to implement stormwater management to meet current standards,
(iii) The form of past development and other factors such as the size and location development, as well as downstream conditions (capacity and habitat), pose constraints to the feasibility of some forms of stormwater management,
(iv) Application of SWM on a site-by-site basis for infill and redevelopment may not (and likely would not) result in optimal mitigation of hydrologic and environmental impacts(flooding, erosion, water quality and habitat degradation), and may also result in increased capital and maintenance costs to the municipality and private landowners,

Hence, a comprehensive strategy should consider these issues in order to maximize overall benefits.

Based on the foregoing, the Decision Making Process Chart (ref. Figure 10) has been prepared to guide applicants and approval agencies. This type of approach is recognized and endorsed by the Ministry of Environment (ref. *Draft – Update to the Stormwater Management Practices Planning and Design Manual, 1998).* Typically, the process to embody these principles would involve the Subwatershed Impact Study process.

Clearly, there are a number of key elements which need to be defined in more detail, in order to ensure an effective plan, these include:

(a) Definition of "points" within the land use process where various standards may legally be applied (i.e. recognizing the range of options available at "Registration", "Draft Plan" and "Site Plan" stages)
(b) Definition of downstream constraints in relation to the Riparian obligations and Federal Fisheries Policies, and Municipal and Conservation Authority Policies. (i.e. in the case of re-development are historic uncontrolled discharge rates acceptable if contributions to off-site facilities/projects are provided?)
(c) Identification of retro-fit opportunities and other related improvement projects
(d) Definition of how broadly the application of off-site contributions may be applied (i.e. tributary based, subwatershed based)
(e) Defining mechanism for implementation, funding, proponency and timing for such projects

The essence of the foregoing approach has been incorporated into Tables 6.1 and 6.10. Clearly, there are numerous optional methods of addressing off-site impacts which only become resolvable at the next level of land use planning.

A preliminary list of potential retrofit opportunities that may be considered under a "cash in lieu" approach where site specific constraints warrant (ref. Figure 10) has been compiled as follows:

- Retrofit of existing SWM facility within Milton Business Parks (ref. facility s41 Figure 9) for water quality and/or erosion control.
- Retrofit of degraded channels with the existing built urban areas to provide natural functions. These retrofits could be carried forward at the time of site re-development

There may also be other areas outside of the Secondary Plan Area, within the Town of Milton, where similar retrofit opportunities exist.

6. PREFERRED SOLUTION

6.1 Stormwater Management

Site specific management strategies for each discrete Development Area within the Secondary Planning Study Area have been prepared detailing drainage, land use, stream and aquatic habitat considerations and stormwater management (ref. Tables 6.1 to 6.9). New development within the existing urban area would require stormwater management in accordance with the requirements of the January 2000 Subwatershed Planning Study, and consideration of the potential application of the Retrofit/Cash in lieu opportunities, as described in this report. Stormwater management facility storage volumes outlined in the following tables should be optimized through site specific modelling at the next stage of planning and design.

A graphical compilation of the foregoing, including preliminary grading is depicted on Figure 9. Sewer networks and stormwater management facilities are conceptual only for the purpose of depicting relative sizing.

Estimated capital costs for primary stormwater management works have been included in Appendix B [Note: There is a Business Park Area denoted west of Peru Road south of Highway 401, north of No. 3 Sideroad and east of the creek (NW-2-G1). This area is technically outside of the study area, hence no specific stormwater or environmental management plan has been prepared for this area. Notwithstanding, it is expected that the area would be serviced by a standalone stormwater management facility since the area is generally separate and discrete relative to upstream and downstream drainage areas. The adjacent watercourse is a candidate site for rehabilitation; the watercourse must remain open, however, realignment is possible subject to following natural channel design principles].

TABLE 6.1
DEVELOPMENT AREA STORMWATER MANAGEMENT ASSESSMENT SUMMARY
EMPLOYMENT LANDS DRAINING TO PHASE 1 AREA

Total Drainage Area (ha)	External Area (ha)	Development Area (ha)
19	N/A	19 (maximum)

Future Conditions
Primary Proposed Land Uses (ha)

Institutional	Industrial	Employment	Business Park
0	0	19	0

Comment:

Aquatic Habitat and Stream Management

On-site Watercourses to remain	Habitat Ranking	Beltwidth (m)	Description of Enhancement Objectives
N/A	N/A	N/A	No watercourses within this area have been recommended to remain as open systems however the function of the existing watercourses would need to be replicated through the design of site drainage systems

Stormwater Management

Watercourse Specific Issues/ Objectives	Option Description	Assessment
SWM Facility Location	On-site facility u/s of 401	The Ministry of Transportation Ontario requires that full post-to-pre control be provided at the Highway 401 culvert. Therefore, an on-site facility is to be provided for quantity control.
SWM Facility Sizing		Facility sizing to follow Phase 1 Area (Centre Tributary) requirements.
SWM Facility Type	1. Wetland 2. Wet pond	Wetland systems integrated adjacent the watercourse system would be preferred, however both wetlands or wet ponds are considered acceptable
Storm servicing	Deep Sewer System vs. Shallow	Based on the OBM 1:10 000 scale mapping it would appear that there would be limited opportunity to provide a deep sewer system, hence a shallow storm sewer with sump pump foundation drainage should be considered
Outlet Culvert Capacity	Highway 401	Assessment of limiting culvert capacity (i.e. H/D = 0.9) as follows: Q(culvert capacity) = 1.62 m^3/s (culvert 3) Q(100 controlled) = 0.38 m^3/s Q(100 uncontrolled) = 1.01 m^3/s The foregoing suggests that a reduced level of quantity control may be provided for these lands, subject to final design and MTO approval.

TABLE 6.2
DEVELOPMENT AREA STORMWATER MANAGEMENT ASSESSMENT SUMMARY
MI Developments

Total Drainage Area (ha)	External Area (ha)	Development Area (ha)
158.5	52.8	105.74

Future Conditions
Primary Proposed Land Uses (ha)

Institutional	Industrial	Employment	Business Park	Roads
0	66.4	0	18	17.1

Comment: This area has been partially developed with a "dry" SWM facility. Recent proposals for expanded industrial usage include proposal to expand the existing facility and convert to a wet pond facility.

A second "dry' quantity control facility has been recommended as part of the most recent proposal to limit peak flow rates to the capacity of the open channel system which traverses the site.

Aquatic Habitat and Stream Management

On-site Watercourses to remain	Habitat Ranking	Beltwidth (m)	Description of Enhancement Objectives
N/A	N/A	N/A	No watercourses within this area have been recommended to remain as open systems however the function of the existing watercourses would need to be replicated through the design of site drainage systems

Stormwater Management

Watercourse Specific Issues/ Objectives	Option Description	Assessment
SWM Facility Location	Facility location has been set (Existing - ref. S38)	The existing facility location is in general accordance with the location recommended in previous studies (ref. Milton Industrial Area – Implementation Policy , R.V. Anderson, 1981)
SWM Facility Sizing		This approved development would provide water quality treatment to Level 2 as well as flood control storage to meet "post" to "pre-development" control.
SWM Facility Type	1. Wetland 2. wet pond	The facility location is isolated from proposed Landscape Corridor, hence a wet pond would be acceptable, however a wetland or wet pond are considered acceptable
External Drainage	1. Combine with on-site drainage 2. Separate conveyance to the system outlet	Currently, external drainage is proposed to be conveyed via an existing watercourse across the site but would by conveyed into the proposed expanded pond system. Since the conveyance system bisects the central portion of the site and collects runoff from the development lands as it traverses the site, it is considered infeasible to separate external runoff for the upstream lands. A previous study had recommended an optional diversion of external drainage to subwatershed 3.
Storm servicing	Deep Sewer System vs. Shallow system	Based on the OBM 1:10 000 scale mapping, there would be limited opportunity to provide a deep sewer system with fill requirements ranging from (0.3- 3m). Hence a shallow storm sewer with sump pump foundation drainage should be considered.
Outlet Culvert Capacity	Highway 401	Based on the analysis completed previously (ref. Thorburn Penny 1998) the proposed SWM reduces the peak flow rates at the system outlet to below the downstream channel capacity. This has been confirmed through hydrologic modeling/analysis completed through the Subwatershed Plan. Consideration should be given to utilizing Culvert #5 (ref. Figure 5) for major system flow relief.

TABLE 6.3
DEVELOPMENT AREA STORMWATER MANAGEMENT ASSESSMENT SUMMARY
MILTON ST. CLAIR LANDS (BALES)

Total Drainage Area (ha)	External Area (ha)	Development Area (ha)
144.73	71.57	73.16

Future Conditions
Primary Proposed Land Uses (ha)

Institutional	Industrial	Employment	Business Park	Roads
0	36.5	0	28.7	2.5

Comment:	

Aquatic Habitat and Stream Management

On-site Watercourses to remain	Habitat Ranking	Beltwidth (m)	Description of Enhancement Objectives
N/A	N/A	N/A	No watercourses within this area have been recommended to remain as open systems however the function of the existing watercourses would need to be replicated through the design of site drainage systems

Stormwater Management

Watercourse Specific Issues/ Objectives	Option Description	Assessment
SWM Facility Location	Facility location options are limited by the presence of the CNR railway and Boston Church Rd. Hence the proposed facility would be in the general location of the existing farm pond	The recommended facility location is in general accordance with the location recommended in previous studies (ref. Milton Industrial Area – Implementation Policy, R.V. Anderson, 1981). It is also recommended that an alignment following the 401 alignment would maximize the function of the facility as linkage along the Proposed Landscape Corridor
SWM Facility Sizing		Facility sizing to follow requirements: Water Quality - Level 1 habitat Erosion – Apply Requirements (from Subwatershed Plan) Flood Control – Apply Requirements (from Subwatershed Plan)
External Drainage	1. Combine with on-site drainage 2. Separate conveyance to the system outlet	Facility sizing should incorporate external drainage if it is to be captured within the proposed SWM facility. Alternatively, external flow may be conveyed around the facility. Based on the size of the external drainage area, and benefit to water quality treatment effectiveness through avoiding dilution of urban discharge, separate conveyance of stormwater from external lands would be recommended Note: Approximately 15.9 ha of external drainage from lands east of Boston Church Road is proposed to discharge to the proposed stormwater management facility.
SWM Facility Type	1. Wetland 2. Wet pond	Based on the proximity of the facility to the 401 landscape corridor a wetland system would be preferred , however a wet pond would also be acceptable
Storm servicing	Deep Sewer System vs. Shallow	Based on the OBM 1:10 000 scale mapping, it would appear that there would be would be areas within this development which would require fill material in order allow a deep sewer system (fill requirements ranging from (3.3- 4.3m). The north sector of the site may be serviced with gravity foundation. Hence a hybrid shallow/deep storm sewer should be considered.

TABLE 6.3
DEVELOPMENT AREA STORMWATER MANAGEMENT ASSESSMENT SUMMARY
MILTON ST. CLAIR LANDS (BALES)

Watercourse Specific Issues/ Objectives	Option Description	Assessment
Outlet Culvert Capacity	Highway 401	Assessment of limiting culvert capacity as follows: Q(culvert capacity) = 7.3 + 5.8 m^3/s (culvert 6 & 7) Q(100 predevelopment target) = 0.6 (Node E) + 1.97 (Node D) Based on the foregoing the culvert available capacity would not pose an additional constraint on required SWM flow rate control. Consideration should be given to splitting both low flow and storm flow between the two culvert outlets from the site (Culverts 6 and 7 – Figure 5).

TABLE 6.4
DEVELOPMENT AREA STORMWATER MANAGEMENT ASSESSMENT SUMMARY
HIGHPOINT (EAST OF REGIONAL ROAD 25)

Total Drainage Area (ha)	External Area (ha)	Development Area (ha)
175.8 (east side of Regional Road 25 only) + 482 west of Regional Rd. 25	11 (east of Regional Road 25)	164.8

Future Conditions
Primary Proposed Land Uses (ha)

Other	Industrial	Employment	Business Park	Roads
35	83.4	18	15.8	12.72

Comment:	This area has partially developed ***(ref. HighPoint Development, Registered subdivsion and CO Recycling site)***, stormwater servicing has largely been constructed and is in place for future development.

Aquatic Habitat and Stream Management

On-site Watercourses to remain	Habitat Ranking	Beltwidth (m)	Description of Enhancement Objectives
N-2-B Length = 450m	Medium	50-60	Reinstate natural meander pattern and channel form potential to retrofit facility to allow low flow to by-pass facility

Stormwater Management

Watercourse Specific Issues/ Objectives	Option Description	Assessment
SWM Facility Location	Facility location has been set (Existing - Constructed)	The facility location is in accordance with the location recommended in previous studies (ref. Milton Industrial Area – Implementation Policy , R.V. Anderson, 1981, and F. J. Reinders)
SWM Facility Sizing		Facility currently provides stormwater quantity (flood control) function only. Some water quality treatment is likely provided due to the permanent pool component of the existing facility. There are opportunities to retrofit this facility to provide water quality and erosion control function. Assessment of retrofit opportunities has examined the potential to incorporate erosion control storage for, as a minimum, the undeveloped lands to the north of the existing "approved" development. This assessment of retrofit potential indicates that retrofit of the existing facility to accommodate the remaining development with this development area (i.e. east of Regional Road 25) indicates retrofit is feasible. A preliminary estimate of the cost of retrofit for water quality and erosion indicates a total cost of approximately $352,000. At this time, determination of whether there is sufficient conveyance capacity to convey uncontrolled flow from the proposed development (north of the existing "approved development) to the existing SWM facility (i.e. along Regional Road 25 and along the railway corridor) has not been confirmed and would be required prior to proceeding with plans to retrofit the existing SWM facility. If it is determined that there is insufficient conveyance capacity to convey flow to the existing SWM facility then an on-site SWM facility may be required within the development area north of the existing approved development. In this case a single facility to address all new development would be preferred.
SWM Facility Type	Wet Pond	The existing facility has been constructed as a wet pond, however it has not been design formally to provide water quality treatment.
Storm servicing	N/A	Area east of Regional Road 25 is fully serviced. At this time, the provisions to convey uncontrolled flows from proposed development north of the approved development area through the existing development to the existing stormwater management facility has not been confirmed.

TABLE 6.4
DEVELOPMENT AREA STORMWATER MANAGEMENT ASSESSMENT SUMMARY
HIGHPOINT (EAST OF REGIONAL ROAD 25)

Watercourse Specific Issues/ Objectives	Option Description	Assessment
Outlet Culvert Capacity	Highway 401	Assessment of limiting culvert capacity as follows: Q(culvert capacity)= 27.4 – culvert 8 + 1.67 culvert 14 Q(100 controlled) = 8.19 m^3/s Q(Regional) = 43.11 m^3/s Hence the culvert capacity is considered adequate for the design flow rate. Hydrologic modelling indicates that conveyance of flow from the eastern portion (undeveloped) of this development area to the existing facility is feasible and provides adequate control of peak flow rates. Consideration should be given to splitting major flows from the development area to the two culvert outlets (Culverts 8 and 14) to ensure that peak flow rates are maintained at each location.

TABLE 6.5
DEVELOPMENT AREA STORMWATER MANAGEMENT ASSESSMENT SUMMARY
HIGH POINT (WEST OF REGIONAL ROAD 25)

Total Drainage Area (ha)	External Area (ha)	Development Area (ha)
482.7 (west of Regional Rd. 25)	397	85.2

Future Conditions
Primary Proposed Land Uses (ha)

Other	Industrial	Employment	Business Park	Roads
14	32.7	5.6	26.4	6.47

Comment:	

Aquatic Habitat and Stream Management

On-site Watercourses to remain	Habitat Ranking	Beltwidth (m)	Description of Enhancement Objectives
N-2-B Length =1700m	Medium	50-60 m - from SWM facility S36 to Regional Road 25 35-50 m - from Regional Road 25 to Proposed James Snow Parkway 30-40 m- from James Snow Parkway to No.5 Sideroad	Reinstate natural meander pattern and channel form

Stormwater Management

Watercourse Specific Issues/ Objectives	Option Description	Assessment
SWM Facility Location	1. On-site SWM facilities (Water Quality & Erosion) 1A – distributed facilities 1B – centralized facility 2. Off-site Treatment in combination with the retrofit of SWM Facility S36	Stormwater management considerations: • Discharge of untreated (water quality) urban drainage to the watercourse should be avoided. This approach would require that water quality treatment be provided within the developing area. • There would be potential to provide the required erosion control storage within the existing facility (S36) subject to a retrofit the facility. However, based on the potential erosion impacts on the N-2-B tributary, as well as the requirement for on-site water quality controls, incorporation of erosion control storage within the on-site facilities would be recommended • Stormwater quantity (Flood) control would be provided within the existing facility east of Regional Road 25 Stormwater quality management facilities should be facility located adjacent to the N-2-B tributary watercourse along the east limit of the Watercourse. A network of distributed facilities along the N-2-B tributary would be compatible with the topography of the site and the enhancement objectives for Tributary N-2-B.
SWM Facility Sizing		Facility sizing to follow requirements: Water Quality - Level 1 habitat Erosion – Apply Requirements (from Subwatershed Plan) -within retrofitted facility or within on-site facilities Flood Control – Flood control volume of existing facility (s36) would be adequate to provide required “post” to “pre-development” control as per flow rates.
SWM Facility Type	1. Wetland 2. Wet pond	Based on the proximity of the facility to the tributary watercourse N-2-B a wetland system would be preferred. A linear facility alignment, or a number of smaller wetland facilities located adjacent to the N-2-B tributary would be preferred
Storm servicing	Deep Sewer System vs. Shallow	Based on the OBM 1:10 000 scale mapping it would appear that areas north of the N-2-B tributary would not require fill to achieve a deep storm sewer
Drainage Boundary	1. Maintain Drainage boundaries 2. Allow minor system diversion of for land to the west of the tributary N-2-B watercourse to the south	Diversion of minor system flow to the south would reduce the requirement for water quality facilities along the west limit of the watercourse channel. Maintaining major system drainage to the tributary would allow optimal use of thew existing facility Proposed Grading Plans for this area should consider the potential for spill from Tributary N-2-B
Outlet Bridge/Culvert Capacity	Proposed James Snow Parkway	Note: A preliminary estimate of the required watercourse crossing indicates that a 1.5 to 2 m high x 5 m single span bridge would provide adequate hydraulic and stream morphology performance

TABLE 6.6
DEVELOPMENT AREA STORMWATER MANAGEMENT ASSESSMENT SUMMARY
HIGHPOINT WEST (DRAINING TO SOUTH)

Total Drainage Area (ha)	External Area (ha)	Development Area (ha)
9806	0	98.6

Future Conditions
Primary Proposed Land Uses (ha)

Other	Industrial	Employment	Business Park	Roads
2.1	45.6	19.8	22.4	8.7

Comment:	

Aquatic Habitat and Stream Management

On-site Watercourses to remain	Habitat Ranking	Beltwidth (m)	Description of Enhancement Objectives
N/A	N/A	N/A	No watercourses within this area have been recommended to remain as open systems however the function of the existing watercourses would need to be replicated through the design of site drainage systems

Stormwater Management

Watercourse Specific Issues/ Objectives	Option Description	Assessment
SWM Facility Location	Recommended facility location (ref. S34)	The proposed facility location is in general accordance with the location recommended in previous studies (ref. Milton Industrial Area – Implementation Policy, R.V. Anderson, 1981)
SWM Facility Sizing		Facility sizing to follow requirements: Water Quality - Level 1 habitat Erosion – Apply Requirements (from Subwatershed Plan) Flood Control – Apply Requirements (from Subwatershed Plan
SWM Facility Type	1. Wetland 2. wet pond	Based on the proximity of the facility to the 401 landscape corridor a wetland system would be preferred. Conversely, the “gateway” function of this location and the urban character proposed for this location may be more compatible with a wet pond. Both wetlands or wet ponds would be considered acceptable
Storm servicing	Deep Sewer System vs. Shallow	Based on the OBM 1:10 000 scale mapping it would appear that there would be would be areas in the vicinity of the 401 within this development which would require fill material in order allow a deep sewer system (fill requirements ranging from (3.0-3.5m). The north sector of the site may be serviced with gravity foundation. Hence a hybrid shallow/deep storm sewer should be considered The elevation of the development area adjacent to the 401 in the vicinity of the SWM facility is low relative to the expected maximum water level hence filling of the this area (1.0 to 1.3 metres) may be required .
Outlet Culvert Capacity	Highway 401	Assessment of limiting culvert capacity (i.e. H/D = 2.7) as follows: Q(culvert capacity) = 9.4 m^3/s (culvert 9) Q(100 future with stormwater management) = 1.87 m^3/s Based on the foregoing, adequate the culvert capacity would not impose a significant hydraulic constraint. Proposed grading for this area should consider the potential for spill from Tributary N-2-B under Regional storm conditions.

TABLE 6.7
DEVELOPMENT AREA STORMWATER MANAGEMENT ASSESSMENT SUMMARY
EMERY LANDS

Total Drainage Area (ha)	External Area (ha)	Development Area (ha)
62.5	18.7	43.8

Future Conditions
Primary Proposed Land Uses (ha)

Other	Industrial	Employment	Business Park	Roads
10	8.6		23	1.6

Comment:

Aquatic Habitat and Stream Management

On-site Watercourses to remain	Habitat Ranking	Beltwidth (m)	Description of Enhancement Objectives
N-4-A Length = 450m	High	30-40	Protect existing Watercourse Form Maintain external baseflow contribution Protection of water quality (potential to redirect urban discharge along north limit of 401 corridor to discharge to culverts 9 &10)

Stormwater Management

Watercourse Specific Issues/ Objectives	Option Description	Assessment
SWM Facility Location	1. In vicinity of local drainage outlet (ref. S40) 2. Combine with facility S34	The proposed facility location is compatible with the 401landscape corridor. Combination of this facility with S34 is an option and would be in accordance with the location recommended in previous studies (ref. Milton Industrial Area – Implementation Policy, R.V. Anderson, 1981). Use of location S40 would be recommended with the potential to direct controlled minor system drainage along the north limit of the 401 corridor to the S34 outlet (Culvert 9 and 10). Diversion of this drainage has been suggested as an measure to protect the water quality of the sensitive red side dace habitat of Tributary NW-2-G
SWM Facility Sizing		Facility sizing to follow requirements: Water Quality - Level 1 habitat Erosion – Apply Requirements (from Subwatershed Plan) Flood Control – Apply Requirements (from Subwatershed Plan
SWM Facility Type	1. Wetland 2. wet pond	Based on the proximity of the facility to the 401 landscape corridor a wetland system would be preferred with a proposed alignment parallel to the highway 401 corridor, however, both wetlands or wet ponds are considered acceptable
External Drainage	3. Combine with on-site drainage 4. Separate conveyance to the system outlet	There is an opportunity to convey external drainage separately across the site or divert along discharge along the north limit of the highway 401 corridor
Storm servicing	Deep Sewer System vs. Shallow	Based on the OBM 1:10 000 scale mapping it would appear that there would be areas in the vicinity of the 401 within this development which would require engineered fill material in order allow a deep sewer system (fill requirements ranging from (1.0- 2.5m). Hence a shallow storm sewer should be considered
Outlet Culvert Capacity	Highway 401	Assessment of limiting culvert capacity (i.e. H/D=1.5) as follows: Q(culvert capacity) = 16.85 m^3/s (culverts 12 & 13) Q(100 predevelopment target) = 4.45 m^3/s Based on the foregoing, adequate the culvert capacity would not impose a significant hydraulic constraint. Consideration should be given to utilizing existing culverts along the Highway 401 culvert.

TABLE 6.8
DEVELOPMENT AREA STORMWATER MANAGEMENT ASSESSMENT SUMMARY
875 529 ONTARIO INC

Total Drainage Area (ha)	External Area (ha)	Development Area (ha)
363	320	42.6

Future Conditions
Primary Proposed Land Uses (ha)

Other	Industrial	Employment	Business Park	Roads
9.2	30.4	0	0	3.0

Comment:

Aquatic Habitat and Stream Management

On-site Watercourses to remain	Habitat Ranking	Beltwidth (m)	Description of Enhancement Objectives
N-2-G Length = 700m	High	30-40	Enhance channel form Maintain and protect red side dace habitat Maintain external baseflow contribution

Stormwater Management

Watercourse Specific Issues/ Objectives	Option Description	Assessment
SWM Facility Location	1. In vicinity of local Drainage outlet (ref. S32) 2 At east limit of development (ref S33)	Facility location S33 would be preferred as it is compatible with the 401 landscape corridor and tributary N-2-G Depending on the limits of development area south a tributary NW-2-Gthere may be a requirement for a supplemental SWM facility on the south side of the tributary.
SWM Facility Sizing		Facility sizing to follow requirements: Water Quality - Level 1 habitat Erosion – Apply Requirements (from Subwatershed Plan) Flood Control – Apply Requirements (from Subwatershed Plan)
SWM Facility Type	1.Wetland 2. wet pond	Based on the proximity of the facility to the 401 landscape corridor and N-2-G tributary a wetland system would be preferred. Locating the facility adjacent to the watercourse system would be preferred.
Storm servicing	Deep Sewer System vs. Shallow	Based on the OBM 1:10 000 scale mapping it would appear that this development would require engineered fill material in order allow a deep sewer system (fill requirements ranging from (2.25 - 3.0m). Hence, a shallow storm sewer should be considered.
Outlet Culvert Capacity	N/A	N/A
External Drainage	1.Combine with on-site drainage, or 2. Separate conveyance to the system outlet	Based on the size of the upstream drainage area and objective of protecting and enhancing tributary N-2-G, it is recommended that external flow be conveyed separately along tributary N-2-G and that urban discharge be collected and conveyed to stormwater management facilities

TABLE 6.9
DEVELOPMENT AREA STORMWATER MANAGEMENT ASSESSMENT SUMMARY
EAST AREA (MILTON BUSINESS PARKS)

Total Drainage Area (ha)	External Area (ha)	Development Area (ha)
170+/-	110+/-	60 +/-

Future Conditions
Primary Proposed Land Uses (ha)

Location	Industrial	Employment	Business Park
A	33	5	10
B	Utility Corridor		
C	10		

Comment: This area has largely been developed, stormwater management infrastructure has been constructed including a stormwater management quantity control facility. (ref. Milton Business Parks Industrial Subdivision, Milton/401 Stormwater Management Study, F .J. Reinders, 1988)

Aquatic Habitat and Stream Management

On-site Watercourses to remain	Habitat Ranking	Beltwidth (m)	Description of Enhancement Objectives
N-5-A			This tributary of Sixteen Mile Creek has been retained with the existing industrial subdivision

Stormwater Management

Watercourse Specific Issues/ Objectives	Option Description	Assessment	
SWM Facility Location	Facility location for the primary development S41 has been set (Existing – Constructed) There appears to be an area south of the Milton Business Parks that may require separate SWM Facility (not shown on plan)	Location A	The facility location (S41) is in accordance with the location recommended in previous studies (ref. Milton Industrial Area – Implementation Policy, R.V. Anderson, 1981 and F. J. Reinders).
		Location B	Any supplemental facility should be located to integrate with the Highway 401 landscape corridor if possible. A minimum of 5 ha of drainage area for facilities should be attained.
		Location C	A small area east of the utility corridor and James Snow Parkway would drain to a SWM Facility proposed within the Town of Halton Hills (ref. 401 Corridor Integrated Planning Project- Scoped Subwatershed Study Facility #2)
SWM Facility Sizing		Location A	The existing SWM facility currently provides stormwater quantity (flood control) function only There may be opportunities to retrofit the outlet controls within this facility to provide water quality and erosion control function.
		Location B	Supplemental facilities should be sized in accordance with the 401 Corridor Integrated Project Planning Scoped Subwatershed Study recommendations.
		Location C	Any supplemental SWM facilities should be sized in accordance with the 401 Corridor Integrated Project Planning Scoped Subwatershed Study recommendations. Although the 401 Corridor Integrated Planning Project Scoped Subwatershed Study did not consider future development of this area, application of unit storage and outflow rates developed for that study are recommended for development of this area [critical outflow rate 0.103 L/s/ha, Erosion Control Storage = 520m^3/impervious ha, Flood Control Storage (100 year) = 870 m^3/impervious ha

TABLE 6.9
DEVELOPMENT AREA STORMWATER MANAGEMENT ASSESSMENT SUMMARY
EAST AREA (MILTON BUSINESS PARKS)

Watercourse Specific Issues/ Objectives	**Option Description**	**Assessment**
External Drainage	1. Combine with on-site drainage 2. Separate conveyance to the system outlet	There is an opportunity to convey external drainage separately: 1. across the site 2. diversion to Subwatershed 3 (recommended in earlier reporting) Based on examination of aerial photography the existing development plan appears to maintain the drainage boundaries between Subwatershed 3 and 7, and external drainage is conveyed separately to the system outlet. There may also be opportunities to combine drainage with the Phase 1 External Area to a single facility with outlets to balance flow to the respective outlets
SWM Facility Type	Dry pond (existing) wet pond (requires retrofit)	The existing facility has been constructed as a Dry detention pond; it has not been designed formally to provide water quality Treatment. Retrofit of this facility could be considered to address water quality from this site or as a compensatory measure. Wetland system would be preferred for supplemental facilities along the Highway 401 corridor
Storm servicing	N/A	The industrial subdivision ***(Milton Business Parks)*** appears to be fully serviced ***and is Registered***

6.2 Natural Heritage Systems

In addition to the specifics detailed in Section 6.1 with respect to stormwater and watercourse management, the following outlines recommendations associated with the Natural Heritage System:

Terrestrial Resources and Linkages

i) Protect 'significant woodlands' exceeding 4 ha in size; protect woodlands 2 ha or larger in future development areas.
ii) Protect other medium to high constraint woodlands, and locally significant wetlands.
iii) Enhance naturalized linkages along Main Branch of Sixteen Mile creek – corridor width target – min. 100 m.
iv) Provide/Enhance naturalized linkages along tributaries identified to be retained or modified. Corridor width targets: min. 50 m along tributaries with medium fisheries constraints; minimum 15 m along tributaries with low fisheries constraints.
v) Encourage consolidation of fragmented habitats
vi) Establish wetland and terrestrial habitat elements along stream channels to enhance opportunities for amphibians and other wildlife.
vii) Provide additional linkages, particularly those oriented east to west, utilizing existing terrestrial features and hedgerows, utility easements and/or new plantings.
viii) Locate Stormwater Management facilities in vicinity of terrestrial woodlots, channels or remnant wetlands.
ix) Promote regeneration and reforestation to improve linkages and increase availability of forest interior habitat.
x) Promote the widespread use of native plant materials indigenous to the Sixteen Mile Creek watershed
xi) 'Recycle' existing bio-diversity materials through salvage of seed banks and plant materials that would otherwise be lost during development

Figure 8 identifies potential terrestrial resource linkages in the Milton North Study Area. The linkages should encompass and integrate:

(a) low to high constraint terrestrial features (woodlots, wetlands, successional areas, plantations, hedgerows)
(b) priority streamcourses (as rated by the team fluvial geomorphologist and fisheries biologist)
(c) potential stormwater management facilities
(d) linkages and habitat enhancement areas to provide East-West and North-South linkages at strategic locations where natural features are fragmented or lacking.

Additional terrestrial linkages will be accomplished along other priority streamcourses through the adoption of natural channel design and naturalization. These channel-based linkages are not currently associated with substantive terrestrial habitats due to a history of agricultural or urban land use. Minimum corridor width goals ranging from 15 to 100 metres are recommended based on the associated stream categories (see above). It is anticipated that some trails and other recreational infrastructure will be incorporated within stream and valley features.

In order to successfully integrate identified natural features, site specific studies are required to identify:

- reliance of features on local overland flows and groundwater conditions
- protection needs of the features and their natural functions and attributes, likely by means of buffers, fencing, development setbacks and other site specific management approaches
- locations for augmentation or restoration of natural cover to improve habitat connectivity and ecosystem functions after development
- suitable locations and standards for trails and infrastructure (e.g. utilization of boardwalks and 'soft' engineering approaches to protect woodland and wetland functions).

Normally, buffers and other protective measures for features are determined on the basis of site specific environmental impact studies. For smaller woodlots and tributary features, the Subwatershed Planning Study for Areas 2 & 7 presented a tiered buffer system adapted to typical urban development situations. It employs "protection" and "adjustment" zones (normally 5 m each), in conjunction with fencing and edge management, to integrate successional or woodland habitats. This system is not intended to protect from broader scale landscape impacts associated with urban development, that gradually alter native flora and fauna. Avoidance of these impacts requires more extensive measures including larger spatial buffers and strategic management of natural landscape processes at watershed or subwatershed scale.

7. RECOMMENDED FUTURE WORK

7.1 Subwatershed Impact Studies

The January 2000 Subwatershed Planning Study identified the potential need for Subwatershed Impact Studies. This intermediate level of study would be required in areas where multiple land ownership within the subwatershed occurs. This level of study would focus on integrating servicing and stormwater management of adjacent development to a greater level of detail than is normally achieved through the Subwatershed Plan or Functional Plans for Secondary Plans. Typically this study would be required if the Subwatershed Plan has been completed prior to the development of preferred land use and lot plans as is the case for the Milton North Secondary Plan. The objectives of this level of study would be to determine:

- Preferred servicing plan
- Road layout
- Integration of stormwater management facilities
- Opportunities to integrate recreation opportunities with stormwater management
- Phasing and cost sharing in areas of multiple ownership.

The decision as to whether a Subwatershed Impact Study is warranted would be determined through consultation between the various development proponents, the Town of Milton, and would depend on:

- level of planning information completed in the Secondary Plan process such as road layout, facility locations, and municipal servicing concept
- number of development proposals/proponents involved in the study area and opportunity to integrate facilities and phase developments

The objectives and criteria outlined herein as well as the Subwatershed Planning Study should for the basis for any Subwatershed Impact Study.

7.2 Monitoring and Adaptive Management Plan

The Subwatershed Planning Study outlines numerous guidelines and protocol for establishing a monitoring plan to assess the impact of proposed development in the natural environment.

The monitoring plan provides mechanisms through which the performance of the Subwatershed Management Plan may be evaluated with respect to the overall goals of the plan. Monitoring should occur on two levels; basic monitoring of the important qualities of the Study Area, and site-specific monitoring of particular development areas or specific mitigative works. Monitoring of the successes (and failures) will provide input to the design of future mitigative works. The ability to adjust or modify the impact mitigation program forms the basis of Adaptive Management.

Effective monitoring is essential for an Adaptive Management program, as this involves, by definition, determining the results of previous actions in order to evaluate effectiveness and to incorporate the knowledge gained through evaluation into the decision making process. Monitoring programs should include pre-development characterization, characterization of effected or potentially effected habitats and/or communities, and characterization of reference habitats/communities.

Natural Heritage System

Site specific monitoring will be used to provide more detailed monitoring information for specific development areas and/or specific works.

These plans should:

- Effectively and efficiently monitor the terrestrial and aquatic environment components that are most likely to detect environmental change at that site.
- Be initiated once the pattern of development is determined, and at an appropriate time as to include meaningful pre-development monitoring, where possible.
- Include monitoring intervals and seasonal timing that are appropriate for the monitoring components being characterized.
- Continue for an appropriate amount of time, until the information being acquired is deemed adequate to ensure that impacts have been addressed.
- Include reference to the *Fisheries Act* and *Planning Act*, or other relevant legislation, so that the results can be used to address issues that may arise under these.

Monitoring data must be analyzed to yield results that can be formulated into recommendations that can:

- Be used to direct the actions of the Adaptive Management Plan.
- Provide the rationale and terms-of-reference for long-term monitoring plans.
- Provide the rationale and terms-of-reference for site-specific investigations.
- Address concerns related to the application of the *Fisheries Act* and *Planning Act*, or other relevant legislation.

The Adaptive Management Plan is only useful if information and recommendations are forthcoming from the monitoring plans, and if these recommendations are acted upon. The Adaptive Management Plan must be able to respond quickly to the recommendations from monitoring studies. Long periods between plans reviews are inappropriate.

Hydrogeology (Groundwater)

The groundwater monitoring program should consider the potential impacts from a reduction in groundwater recharge and the potential for degraded stormwater infiltrating into the groundwater system.

As major developments proceed, shallow piezometers would normally be installed to confirm the water table. A number of piezometers should remain in each major development area. These piezometers should be cased and locked for security. Water levels and water chemistry should be monitored at least on a five year schedule. The actual schedule is dependent to a large degree on the pace of development. Chemical analysis should include inorganic parameters, nitrogen species, and metals. The chemical analysis for groundwater within the local municipal wells at Kelso should be reviewed in conjunction with the overall groundwater program. Water level trends correlated to rainfall are necessary to assess changes on the recharge resulting from development.

Spot baseflow measurements will give an indication of changes in groundwater discharge to the local watercourses and along with water levels provide data to assess changes in recharge. Groundwater discharge areas within the streams can vary over time due to the stream dynamics. It is important to correlate the spot baseflow measurements with the continuous stream flow measurements. It is recommended that water quality and temperature measurements be taken at a number of spot baseflow locations. The spot baseflow measurements are to be taken during periods when only groundwater is expected to be providing flow to the stream, such as in between rainfall events, or subsequent to spring runoff. Future baseflow measurements outside the study area and during times of higher groundwater levels, as discussed in Section 3.1, are necessary for the subwatershed water balance.

Stormwater Management

Objectives should be:

- Verify whether performance target is being met for:
  - Flood control
  - Erosion/Stream stability
  - Water quality
  - Low flow augmentation

- Determine whether the overall ecosystem health is being optimized – are there trade offs that could/should be considered (i.e. pollutant removal) thermal or particular contaminants – can facility performance be modified to focus on these?
- Are there other factors that are influencing ecosystem health that were not identified at the time of studies?

- Monitoring and Adaptive Management Plan needs to provide the process to feedback into on-going development:
  - Periodic Review of Subwatershed Plan findings with mechanism to trigger Subwatershed Impact Study
  - Ability to alter/refine targets
  - Incorporate new science/policy
  - Management Structure (Steering Committee)

Stream Morphology

The collection of field data from similar sites over an extended period of time can provide great insight on channel processes and function. This monitoring can also yield information regarding the response of channel to a change in land use from upstream areas. Typically, a land use change will result in some alteration in the hydrologic regime (increase flow volumes) and sediment regime (initially more sediment being supplied to the channel followed by an overall decrease in loadings). These alterations can result in changes in the channel planform, bank erosion, cross-sectional area and substrate composition, which in turn may locally affect aquatic habitat and water quality.

The proposed fluvial geomorphology monitoring plan consists of two components. The first, involves annual cross-sectional measurements from the erosion monitoring sites. The second, consists of repeating the fluvial geomorphological field work at key sites within the study area. The frequency of the data collection should be once every two years and collected a minimum of three times. The monitoring should be undertaken at approximately the same time of the year with late spring before the vegetation is in full growth, being ideal.

This monitoring could be undertaken by a variety of parties including the Town of Milton, Region of Halton and Conservation Halton. However, a fluvial geomorphologist should be used to interpret the findings and assess whether substantial change has occurred. The geomorphologist should also be able to link any change with the causative factors and processes.

Specific Monitoring

Cool water temperatures are essential for the trout populations in the Kelso and Main branches of Sixteen Mile Creek. Temperature is not a concern in the upper intermittent reaches of the north tributary; these could not support species which require cool water temperatures during the summer. Temperature is a concern downstream in the main branch, where trout are present.

It is not known what the impact of the north branch is on water temperature in the downstream reaches. The general absence of riparian vegetation and the on-line pond upstream from the 401 would both be expected to result in high water temperatures. Conversely, passage through the long culvert beneath the correctional facility may have a cooling effect.

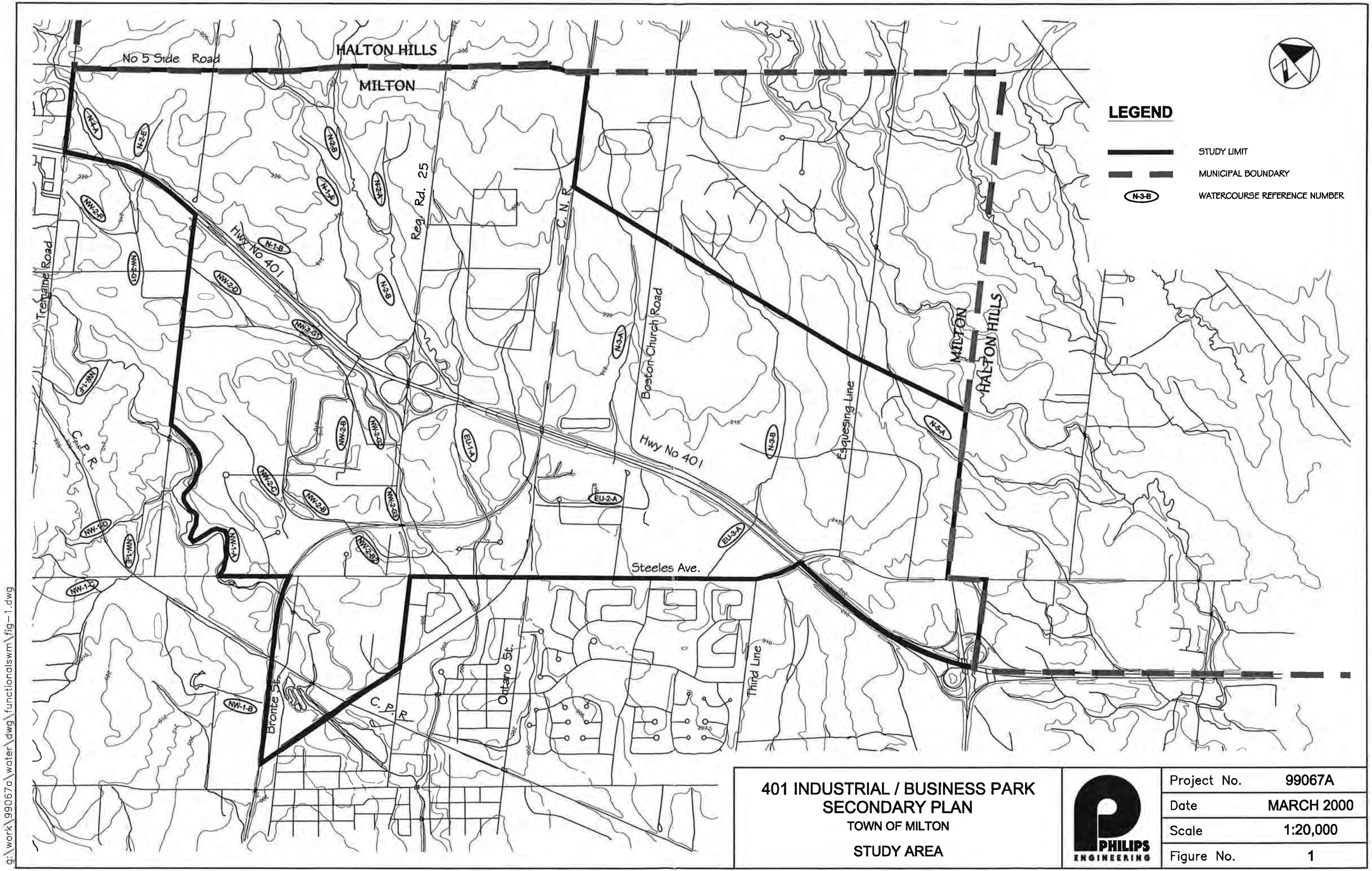
A study should be undertaken to determine what the water temperature is at various points along this tributary, and how various features (ponds, culverts, concrete channels), effect it. This could be achieved by installing temperature recorders during warm weather at key locations. The results would determine whether or not temperature control should be an issue for upstream stormwater management facilities, and whether retrofits of existing facilities would be worthwhile.

7.3 Conceptual Fisheries Compensation Plan

During the course of preparing the Subwatershed Planning Study, the Technical Steering Committee advised that the Subwatershed Study along with a Conceptual Fisheries Compensation Plan (focussed on the Phase 1 development lands) would facilitate a conceptual approval by DFO. Terms of Reference for the Conceptual Compensation were prepared and supported by the Technical Steering Committee. The Conceptual Fisheries Compensation Plan has to date been completed (Philips Engineering Ltd., June 2000); it is proposed to be a companion to the Subwatershed Plan for the Phase 1 area.

The preferred management strategies (outlined herein for Milton North) have been developed to be consistent with the requirements of the Fisheries Act and the "No Net Loss" policy. It is considered appropriate that a similar process, whereby an holistic, comprehensive Fisheries Compensation Plan be prepared for the Milton North area, analogous to the Phase 1 process. The proposed Conceptual Fisheries Compensation Plan will provide specific criteria for activities, facilities and structures which will impact, or could potentially impact, upon fish habitat. Final plans or designs will still require approval by the appropriate agencies, however, adherence to the design criteria will facilitate both planning and design, as well as agency review. Conservation Halton staff has recommended that a comprehensive fisheries management plan be prepared for the watercourse system comprised of tributaries N-4-A, N-2-E, NW-2-D and NW-2-G1. Supplementary discussion between the Town, Conservation Halton and DFO will be required to resolve the scope of any comprehensive Fisheries Compensation Plan.

It is proposed that the Compensation Plan form a companion document to this study and the Subwatershed Plan for Areas 2 and 7. Component recommendations of the Compensation Plan should be considered for Development Charges contributions by the developing land base, since the impact being compensated for is caused by the development.



401 INDUSTRIAL / BUSINESS PARK SECONDARY PLAN
TOWN OF MILTON
STUDY AREA

PHILIPS ENGINEERING

Project No.	99067A
Date	MARCH 2000
Scale	1:20,000
Figure No.	1

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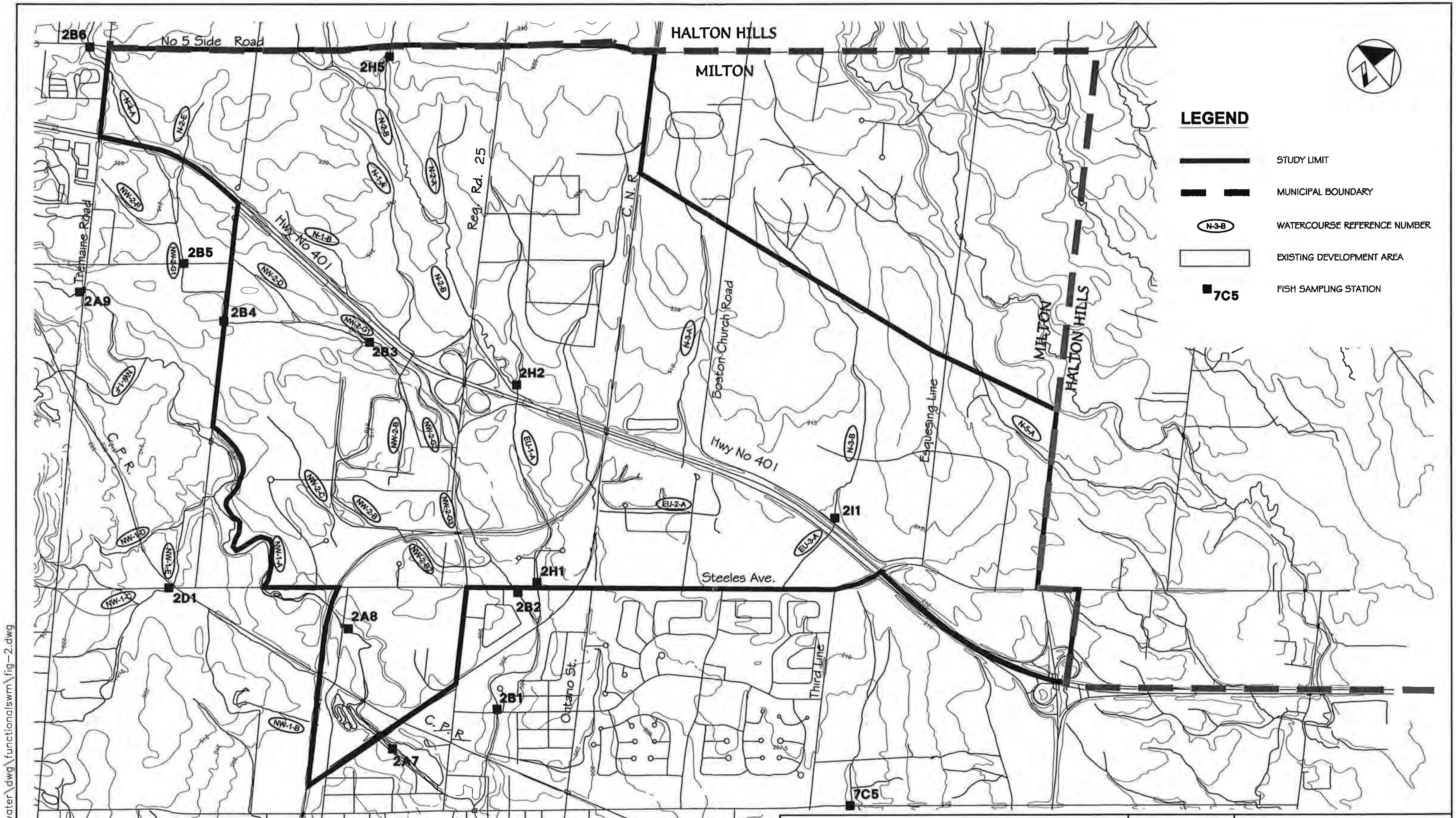
March 31/00 – mbk



401 INDUSTRIAL / BUSINESS PARK SECONDARY PLAN

TOWN OF MILTON

EXISTING DEVELOPMENT

PHILIPS ENGINEERING

Project No.	99067A
Date	MARCH 2000
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Figure No.	2

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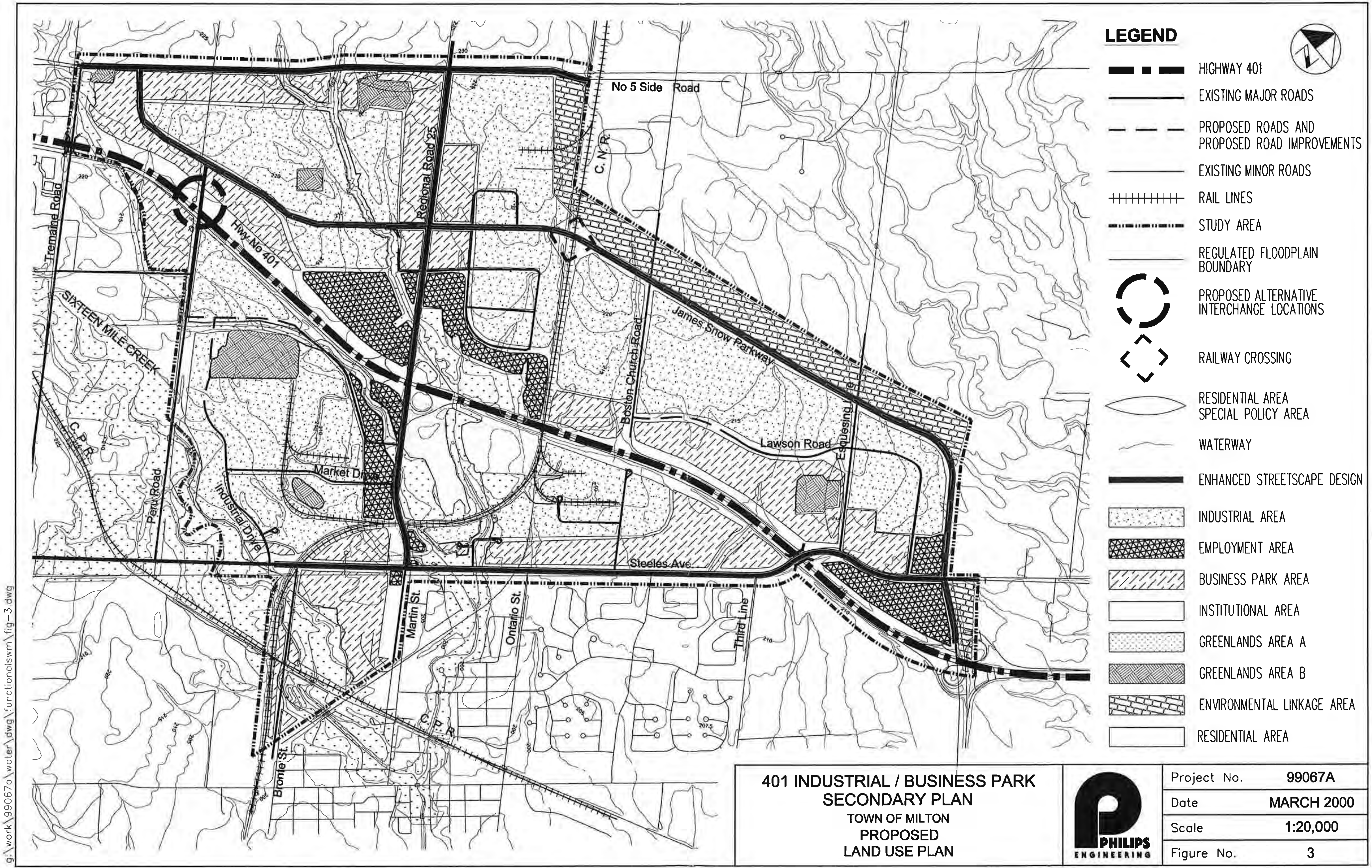

401 INDUSTRIAL / BUSINESS PARK SECONDARY PLAN

TOWN OF MILTON

PROPOSED
LAND USE PLAN

PHILIPS ENGINEERING

Project No.	99067A
Date	MARCH 2000
Scale	1:20,000
Figure No.	3

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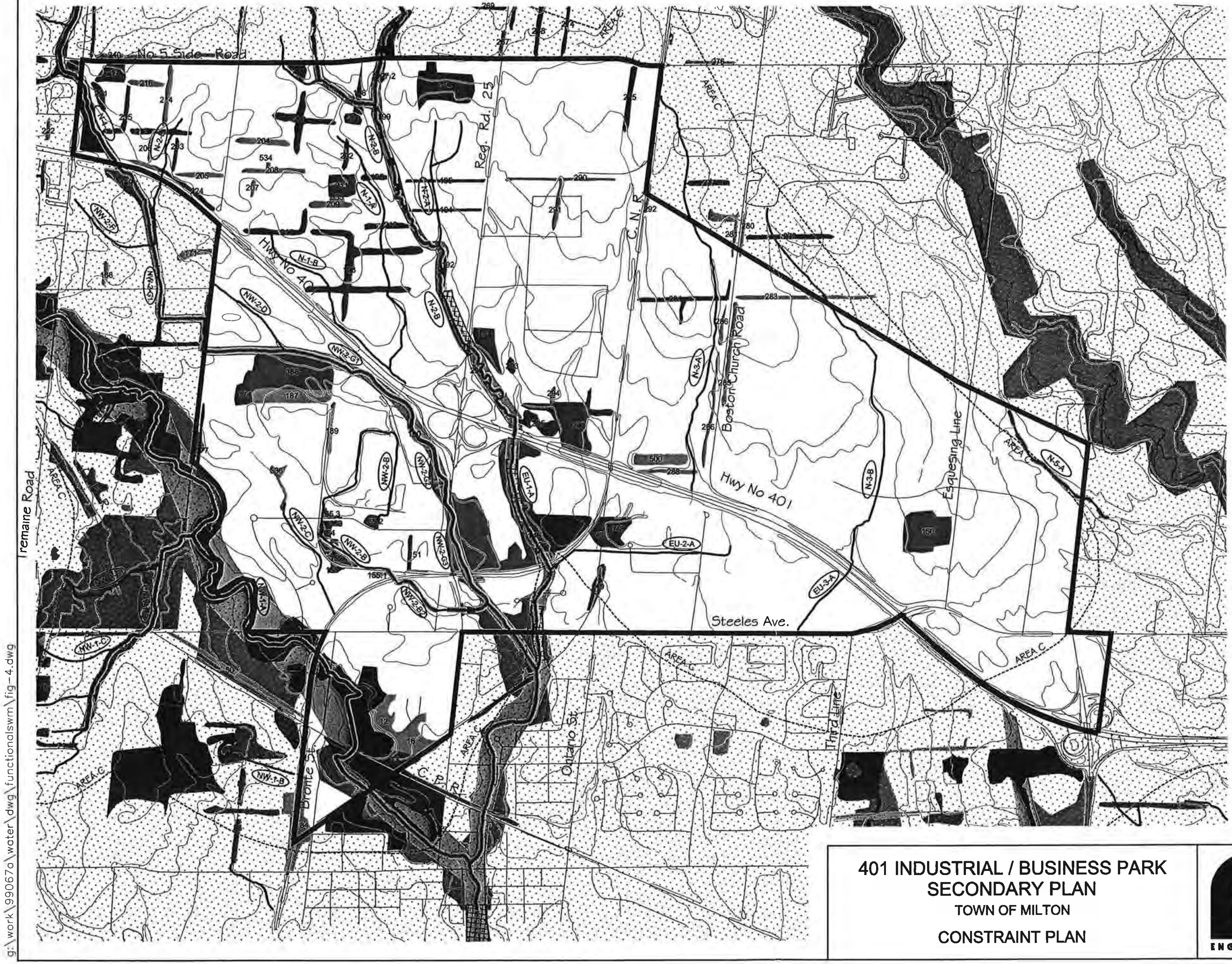

LEGEND

▬	STUDY LIMIT
▨	BELTWIDTH
■	FLOODPLAIN AS CURRENTLY MAPPED FLOODPLAINS ALSO OCCUR ALONG LOCAL WATERCOURSES ALTHOUGH NOT SHOWN
▬	FISHERIES - HIGH CONSTRAINT
■ ■	FISHERIES - MEDIUM CONSTRAINT
▦	SENSITIVE REACH (STREAM MORPHOLOGY)
■	TERRESTRIAL FEATURES - HIGH CONSTRAINT
■	TERRESTRIAL FEATURES - MEDIUM CONSTRAINT
■	TERRESTRIAL FEATURES - LOW CONSTRAINT
275	TERRESTRIAL UNIT REFERENCE NUMBER
∼	WATERCOURSE TO BE PROTECTED/ENHANCED IN CURRENT FORM AND LOCATION
∼	WATERCOURSE TO REMAIN OPEN REALIGNMENT MAY BE ACCEPTABLE
∼	WATERCOURSE MAY BE ELIMINATED SUBJECT TO REPLICATION OF FUNCTION
N-3-B	WATERCOURSE REFERENCE NUMBER
AREA A	HYDROGEOLOGIC AREA A - LOCALIZED AREAS OF SURFICIAL SAND/GRAVEL, INCREASED INFILTRATION POTENTIAL
AREA B	HYDROGEOLOGIC AREA B - LOCALIZED AREAS OF FRACTURED TILL, INCREASED INFILTRATION POTENTIAL
AREA C	HYDROGEOLIGIC AREA C - LOCALIZED AREAS OF NEAR SAND/GRAVEL, INCREASED INFILTRATION POTENTIAL

NOTE:

LAND USE, ENVIRONMENTAL FEATURES AND TOPOGRAPHIC OVERLAYS ARE REFERENCED TO BASE MAPPING WHICH HAVE SEPARATE DATUMS. HENCE MINOR ANOMALIES IN MAPPING REPRESENTATION MAY BE PRESENT. DETAILED SITE SPECIFIC MAPPING OF FEATURES SHOULD BE VERIFIED TO SOURCE INFORMATION AVAILABLE FROM THE TOWN OF MILTON, CONSERVATION HALTON AND REGION OF HALTON.

401 INDUSTRIAL / BUSINESS PARK SECONDARY PLAN
TOWN OF MILTON
CONSTRAINT PLAN

PHILIPS ENGINEERING

Project No.	99067A
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Figure No.	4

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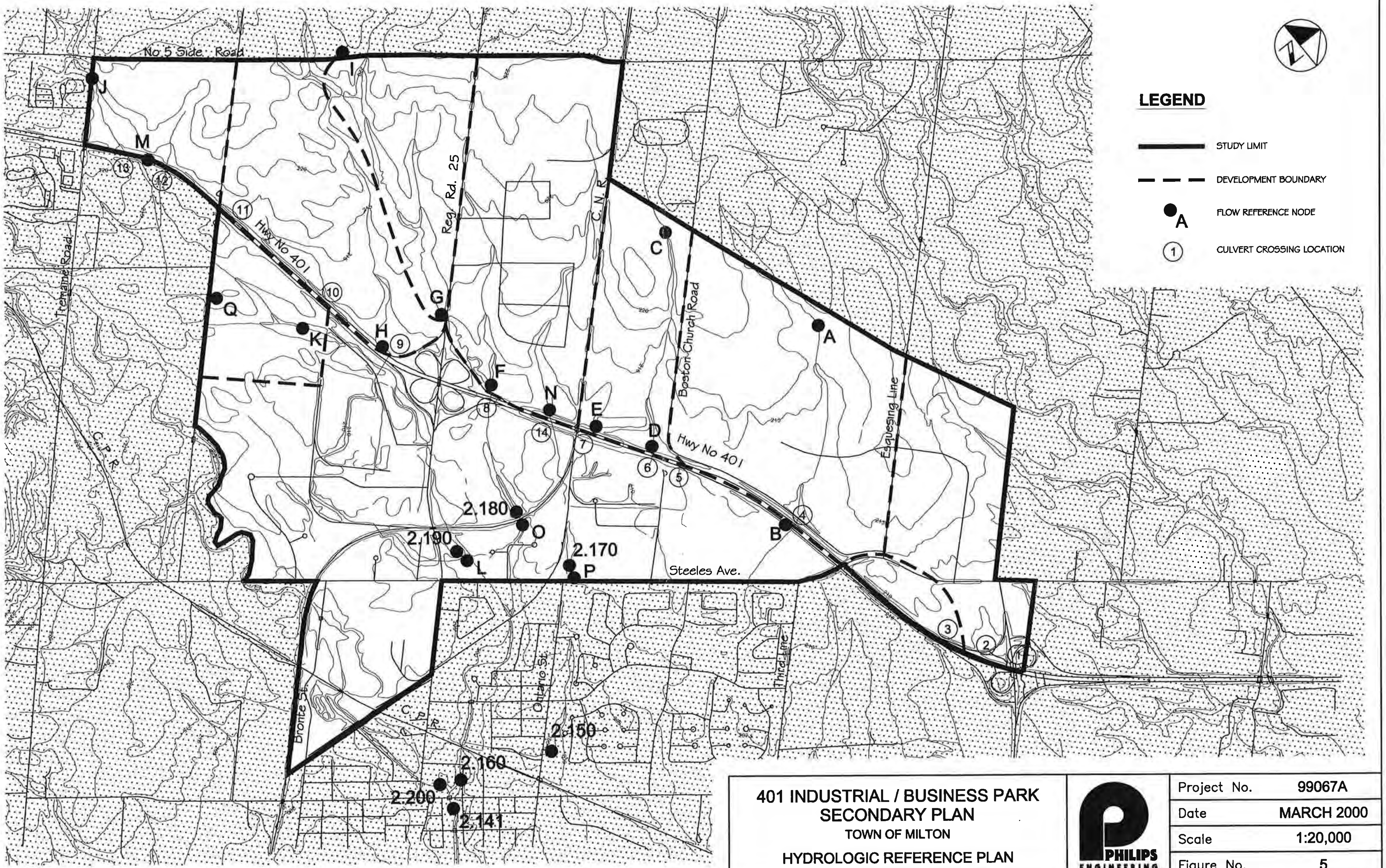

401 INDUSTRIAL / BUSINESS PARK SECONDARY PLAN

TOWN OF MILTON

HYDROLOGIC REFERENCE PLAN

PHILIPS ENGINEERING

Project No.	99067A
Date	MARCH 2000
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Figure No.	5

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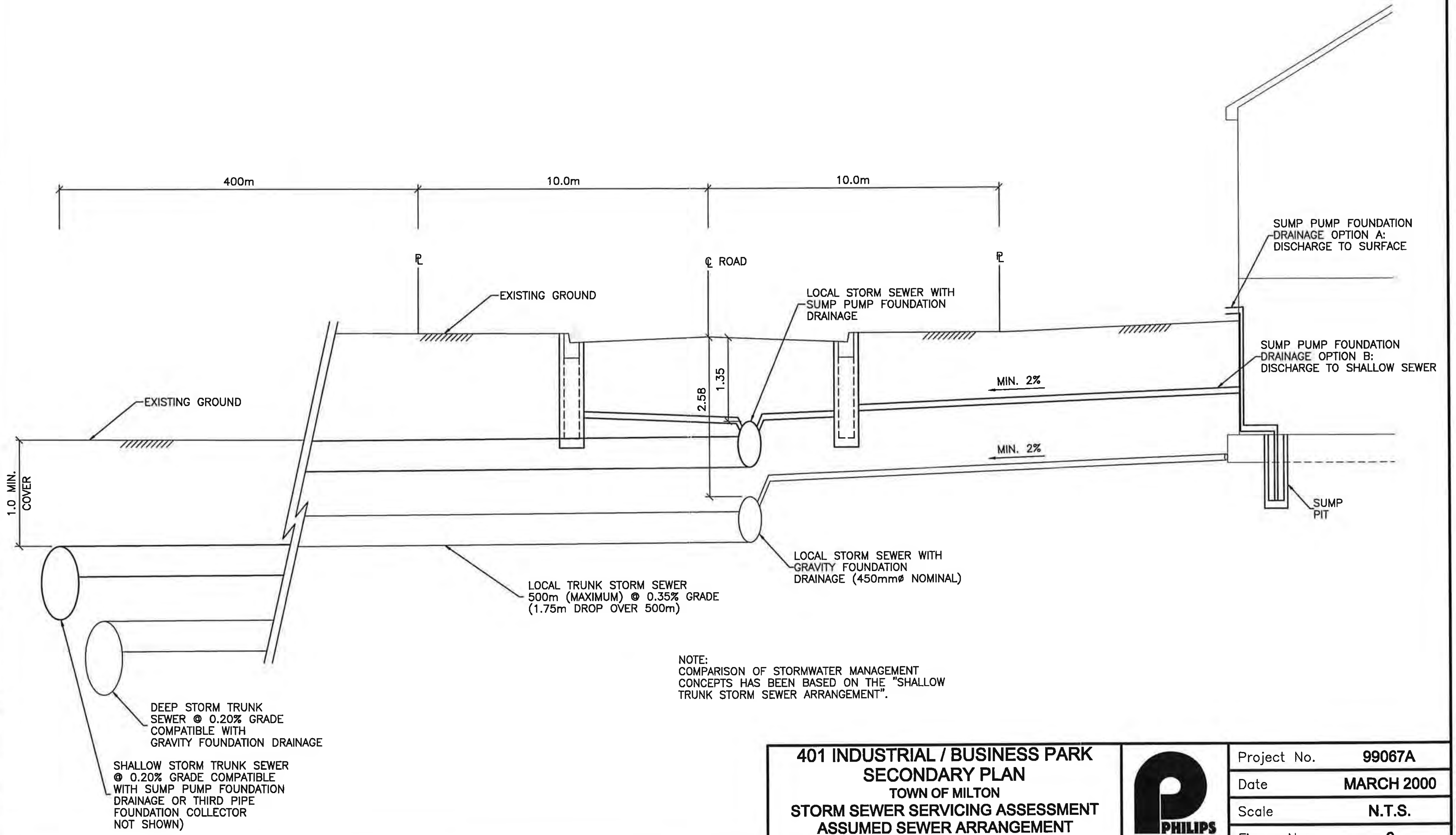

NOTE:
COMPARISON OF STORMWATER MANAGEMENT CONCEPTS HAS BEEN BASED ON THE "SHALLOW TRUNK STORM SEWER ARRANGEMENT".

401 INDUSTRIAL / BUSINESS PARK
SECONDARY PLAN
TOWN OF MILTON
STORM SEWER SERVICING ASSESSMENT
ASSUMED SEWER ARRANGEMENT
AND FOUNDATION DRAINAGE OPTIONS

PHILIPS ENGINEERING

Project No.	99067A
Date	MARCH 2000
Scale	N.T.S.
Figure No.	6

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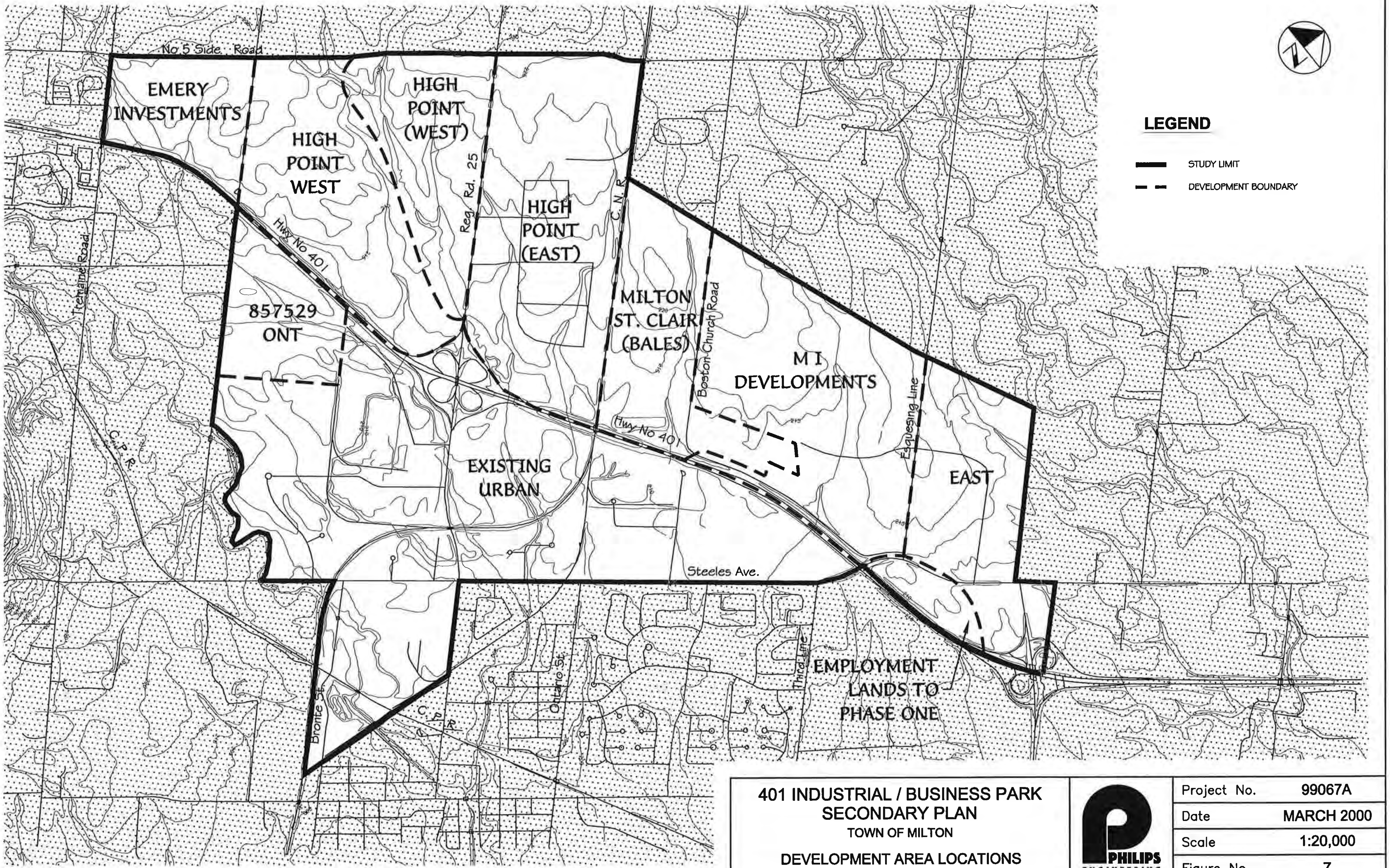

401 INDUSTRIAL / BUSINESS PARK SECONDARY PLAN

TOWN OF MILTON

DEVELOPMENT AREA LOCATIONS

PHILIPS ENGINEERING

Project No.	99067A
Date	MARCH 2000
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Figure No.	7

March 31/00 – mbk

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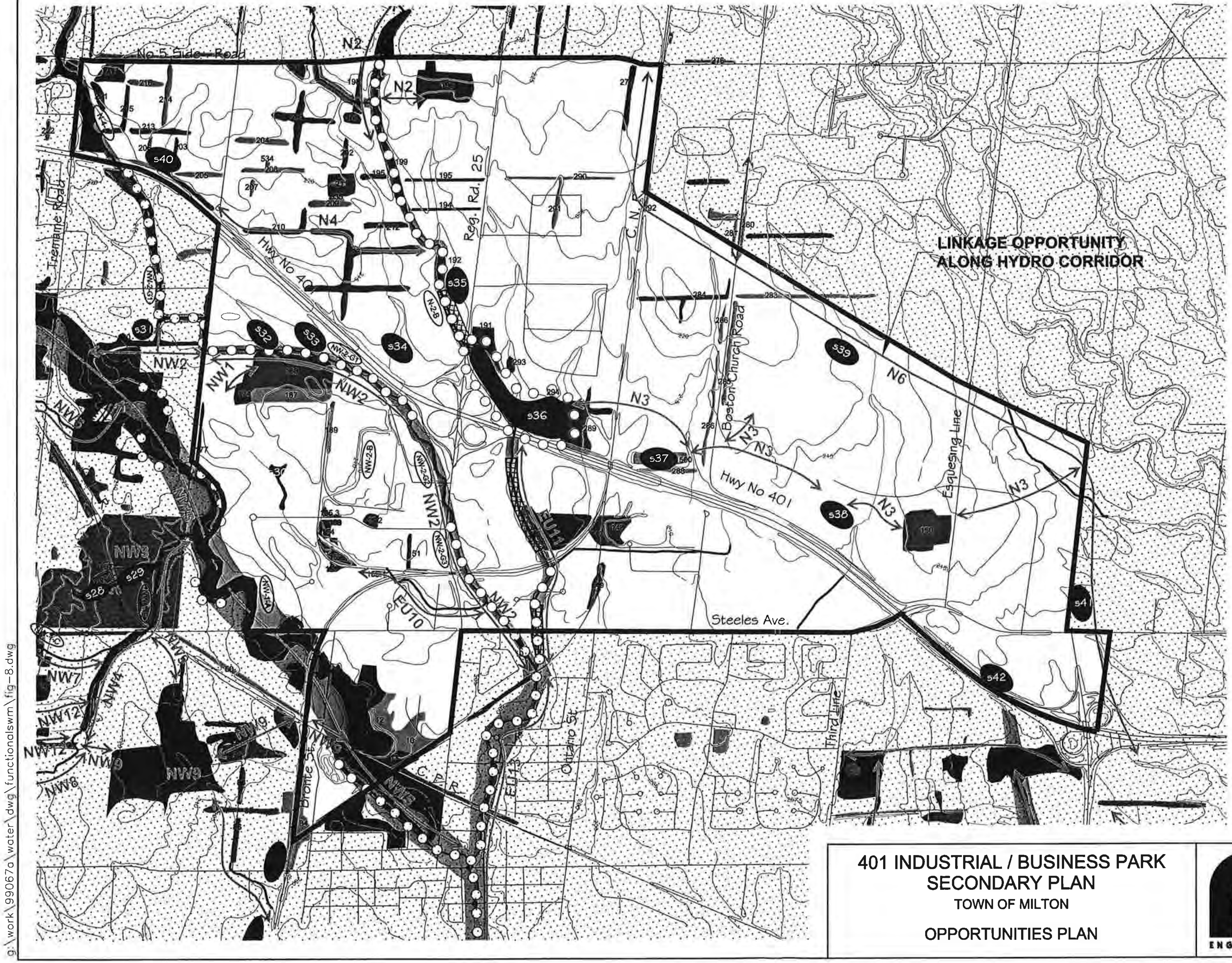

LEGEND

▬	STUDY LIMIT
▨	BELTWIDTH
▦	SENSITIVE REACH (STREAM MORPHOLOGY)
■	TERRESTRIAL FEATURES - HIGH CONSTRAINT
■	TERRESTRIAL FEATURES - MEDIUM CONSTRAINT
■	TERRESTRIAL FEATURES - LOW CONSTRAINT
275	TERRESTRIAL UNIT REFERENCE NUMBER
～	WATERCOURSE TO BE PROTECTED/ENHANCED IN CURRENT FORM AND LOCATION
～	WATERCOURSE TO REMAIN OPEN REALIGNMENT MAY BE ACCEPTABLE
N-3-B	WATERCOURSE REFERENCE NUMBER
s23	STORMWATER MANAGEMENT FACILITY LOCATION AND NUMBER
N ↔	POTENTIAL TERRESTRIAL LINKAGE/ ENHANCEMENT OPPORTUNITIES
○ ○ ○	STREAM REHABILITATION OPPORTUNITIES

NOTE:

LAND USE, ENVIRONMENTAL FEATURES AND TOPOGRAPHIC OVERLAYS ARE REFERENCED TO BASE MAPPING WHICH HAVE SEPARATE DATUMS. HENCE MINOR ANOMALIES IN MAPPING REPRESENTATION MAY BE PRESENT. DETAILED SITE SPECIFIC MAPPING OF FEATURES SHOULD BE VERIFIED TO SOURCE INFORMATION AVAILABLE FROM THE TOWN OF MILTON, CONSERVATION HALTON AND REGION OF HALTON.

401 INDUSTRIAL / BUSINESS PARK SECONDARY PLAN
TOWN OF MILTON

OPPORTUNITIES PLAN

PHILIPS ENGINEERING

Project No.	99067A
Date	MARCH 2000
Scale	1:20,000
Figure No.	8

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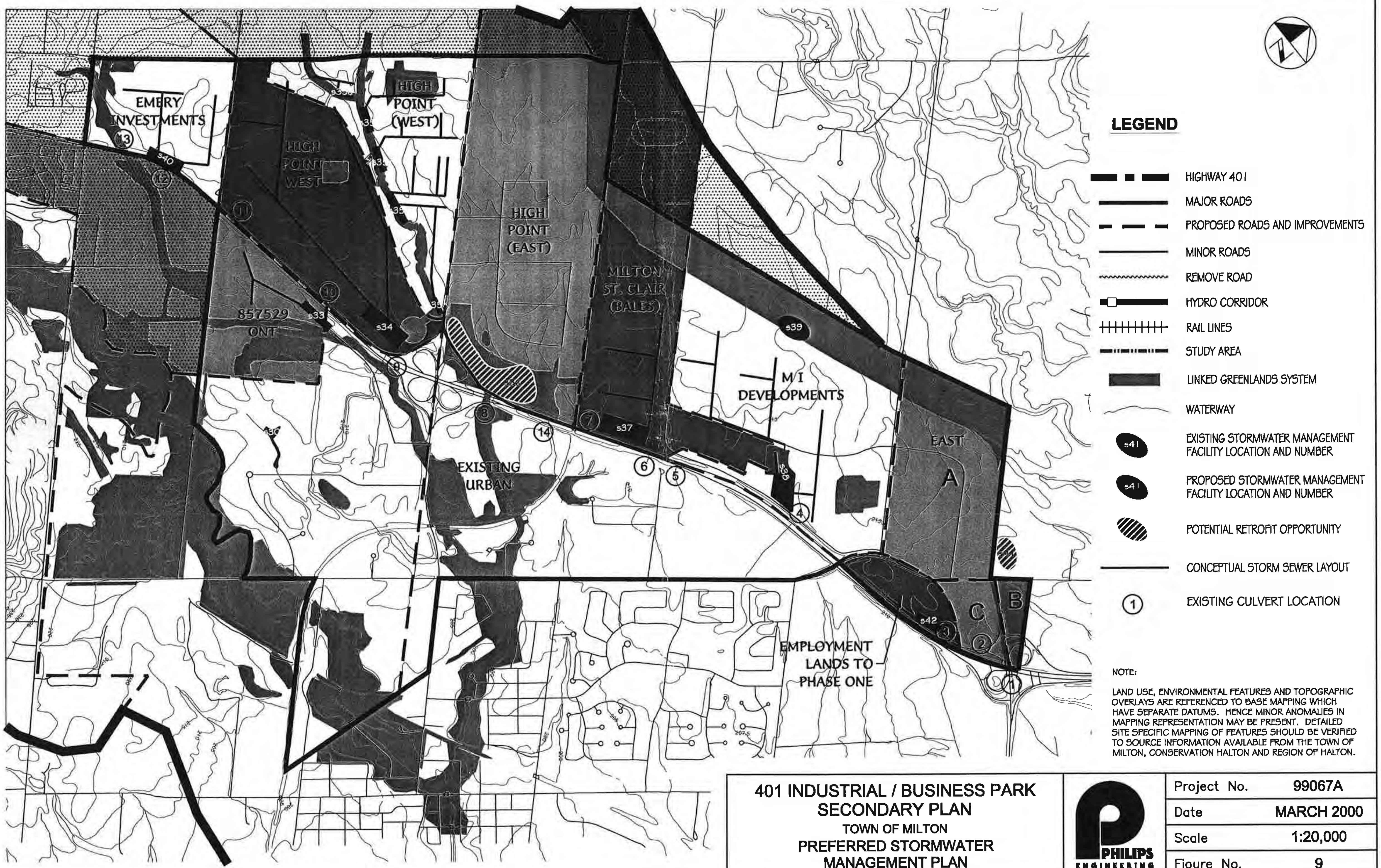

NOTE:

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401 INDUSTRIAL / BUSINESS PARK
SECONDARY PLAN
TOWN OF MILTON
PREFERRED STORMWATER
MANAGEMENT PLAN

PHILIPS ENGINEERING

Project No.	99067A
Date	MARCH 2000
Scale	1:20,000
Figure No.	9

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March 31/00 – mbk

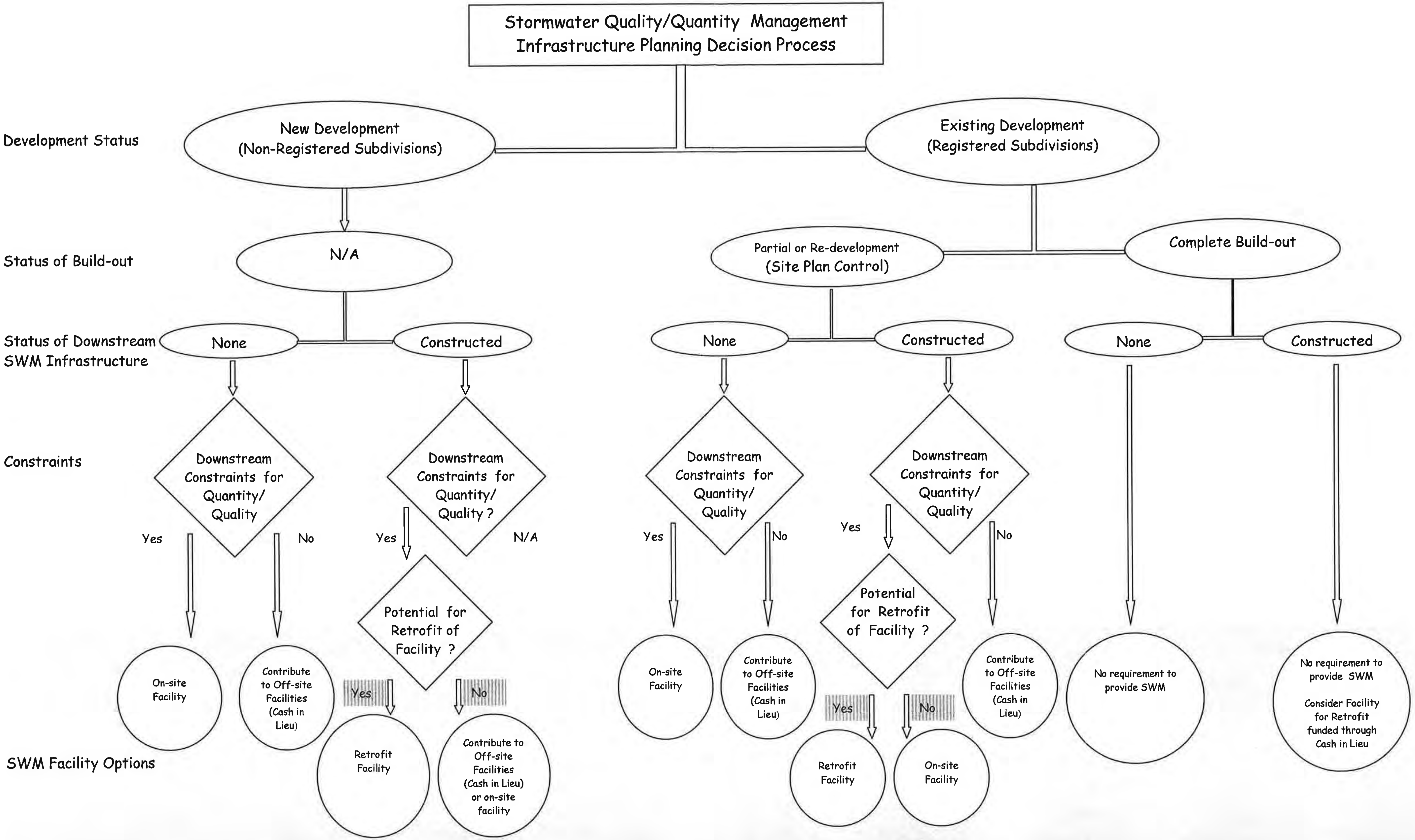

Stormwater Quality/Quantity Management Infrastructure Planning Decision Process
Development Status
New Development (Non-Registered Subdivisions)
Existing Development (Registered Subdivisions)
Status of Build-out
N/A
Partial or Re-development (Site Plan Control)
Complete Build-out
Status of Downstream SWM Infrastructure
None
Constructed
None
Constructed
None
Constructed
Constraints
Downstream Constraints for Quantity/ Quality
Downstream Constraints for Quantity/ Quality ?
Downstream Constraints for Quantity/ Quality
Downstream Constraints for Quantity/ Quality
Yes
No
Yes
N/A
Yes
No
Yes
No
Potential for Retrofit of Facility ?
Potential for Retrofit of Facility ?
Yes
No
Yes
No
SWM Facility Options
On-site Facility
Contribute to Off-site Facilities (Cash in Lieu)
Retrofit Facility
Contribute to Off-site Facilities (Cash in Lieu) or on-site facility
On-site Facility
Contribute to Off-site Facilities (Cash in Lieu)
Retrofit Facility
On-site Facility
Contribute to Off-site Facilities (Cash in Lieu)
No requirement to provide SWM
No requirement to provide SWM
Consider Facility for Retrofit funded through Cash in Lieu

Figure 10

APPENDIX A

CONSULTATION

MGM
CONSULTING INC.

October 12, 1999 PN 96025

Philips Planning and Engineering Limited
3215 North Service Road
Box 220, Burlington
Ontario
L7R 3Y2

RECEIVED
PHILIPS PLANNING &
ENGINEERING LTD
OCT 27 1999
FILE NO. 98053E

copy 99067A-1004

Attention: Mr. Ronald B. Schekenberger, M. Eng., P. Eng

Dear Sir:

Re: Sixteen Mile Creek - Subwatershed Study
401 Industrial / Business Park Secondary Plan
Sixteen Mile Creek – Scoped Subwatershed Study

We would like to take this opportunity to thank you for your time in meeting with us on Friday October 8th, 1999. The meeting was clearly beneficial to both parties and should have probably occurred long before now.

By way of copy of this letter we trust the Town and Conservation Authority will recognize the coordination efforts put forth by both our offices to ensure a consistent approach to finalizing the stormwater management requirements for the lands west of Regional Road 25 (formerly Highway 25). To this end MGM will be providing Philips with available digital information to assist Philips in completing their modelling for the purpose of the Milton 401 Secondary Plan. In turn Philips will be providing MGM with the output from their model. It is recognized this will be used to finalize the Scoped Subwatershed Study such that it is consistent with the Subwatershed Study prepared by Philips to be adopted by the Region, Town and Conservation Authority. This approach is deemed to be of value to all stakeholders as it will provide the various agencies with a complete continuous model, which ultimately reflects the actual land uses and can be used as an effective planning and engineering tool for years to come *(a stormwater geographic information system).*

By way of this letter we wish to confirm the following points as discussed at the meeting:

1. Both parties explained their current status with respect to their various reports and the need to ensure consistency between these documents.

MGM Consulting
6513D Mississauga Road
Mississauga, Ontario
L5N 1A6
Tel: (905) 567-8678 Fax: (905) 567-3047 Email: mgm@mgm.on.ca

2. MGM provided Philips with an overview of the modelling, and work completed to-date, including the fact that the on-site controls originally recommended for the lands west of Highway 25 were no longer being recommended, due to close proximity of the development lands to the pond system and associated timing impacts.

3. The initial modelling carried out by Philips appears to be consistent with the modelling carried out by MGM to the extent the pond east of Highway 25 has sufficient capacity for flood control, with respect to the lands west of Highway 25 *(including Bestpipe)*. The facility however does not provide water quality or erosion control storage. Philips are of the opinion that there may be opportunities to retrofit the facility to provide an erosion control function subject to consideration of local erosion /stream design considerations. We recognize this modelling will be taken to a higher level as part of the Secondary Plan process, which we understand will be carried out based on the detailed information provided during and subsequent to our meeting. It is further understood that this modelling cannot be finalized until the road pattern, currently under review is fixed. It is anticipated if the Town are going to meet their December 1999 completion date for the Secondary Plan the road pattern should be fixed by the end of October 1999.

4. Philips further indicated that pond S35 shown on the northeast corner of the McKinlay Transport property has been shown as an optional facility, at the request of the Town and Conservation Halton, to address water quality, erosion and potentially flood control (relating to local constraints – ie: Regional Road 25 culvert capacity / spill). This pond (S35) shown schematically is consistent with the linear ponds proposed by MGM Consulting that would provide for quality controls at the storm sewer outlets and prevent untreated water, under low flow conditions, entering the watercourse.

5. With respect to the quality ponds shown by MGM, Philips are not of the opinion these ponds need to be protected from the 100 year flows; however, they should be protected from the 25 year flows in the watercourse in accordance with current Ministry of Environment design guidelines (ref. MOEE, 1994 – Stormwater Management Practices Planning and Design Manual). Philips advised that based on consultation with the Town of Milton and Conservation Halton during the Subwatershed Planning Process, there are environmental, economy of scale and maintenance benefits to limiting the total number of SWM facilities through consolidation of drainage areas, where possible. Hence it was suggested that opportunities for such consolidation should be explored further. In addition, there may be opportunities to allow isolated areas to discharge without treatment, where the overall system achieves required performance objectives.

6. It is understood the finding's of Jim Dougan and Owen Scott with respect to the environmental issues are similar; however it is recommended the two parties discuss the environmental issues to ensure consistency with respect to the environmental sections of the two reports.

7. In a brief review of the drainage areas established by MGM, Philips commented that while they understood our original intent (as required by the Conservation Authority) was to maintain total drainage areas approximately equal to that of the predevelopment drainage areas, and it is recognized that this was done with some balancing to reflect road and servicing patterns. Philips suggested that there appears to be opportunities to simplify the drainage system, and would advocate an approach whereby drainage boundaries, would be set based on the local constraints [i.e. topography, fisheries constraints, and riparian (flood and erosion control) objectives]. This approach may warrant allowing minor adjustments to the total drainage to each tributary watercourse.

8. A brief discussion was had regarding the unit rates published in the Philips report for flood control, erosion and quality controls and MGM indicated that the required unit flood and erosion control volumes reported by Philips are in general agreement with MGM's most recent calculations. The required permanent pool (water quality) would change as a result of the revised Habitat Protection Level (i.e. Level 2 to Level 1).

As discussed and agreed upon during the meeting both parties believe that once the road pattern has been fixed and Philips have had a chance to add further detail to their model a joint meeting of both Consulting Teams and the various stakeholders with an opportunity to provide input into finalizing both the Philips Subwatershed Study and MGM Scoped Subwatershed Study with respect to the subject area. We trust all parties share our opinion with respect to the value of such a meeting and by way of copy of this letter extend an invitation to all stakeholders to meet in the near future to finalize the stormwater requirements for the development area north of Highway 401 west of Highway 25 east of Dublin Line.

By way of this letter we wish to confirm that we have forwarded to your office digital information relating to topographic information on the former CIBC property and the culvert constructed by MTO under Regional Road 25 immediately north of Highway 401, in 1998. We trust this information will assist you with your more detailed modelling.

We believe it is in the interest of not only the development community but also the Town and Region to finalize this process as a priority recognizing the fact there is a limited supply of serviced land now available east of Highway 25. To address this issue all parties must move forward with the registration of the former CIBC Lands this winter.

If you have any further questions or comments with respect to the above please call either Matt Stairs or the undersigned.

Yours truly,

Grahame Rice, C.E.T.
MGM Consulting Inc.

c/c Pat Murphy, M.C.I.P., Commissioner of Public Works and Planning, Region of Halton
Mel Iovio, M.C.I.P., Director of Planning and Development, Town of Milton
John Hall, P.Eng., Manager, Conservation Halton
Glen Switzer, P. Eng., Conservation Halton
Jennifer Reynolds, Director of Leisure Services and Public Works, Town of Milton
Phil Antoniow, C.E.T., Public Works, Town of Milton
Harry Snoek, President, Harry Snoek Limited

MGM
CONSULTING INC.

RECEIVED
PHILIPS PLANNING &
ENGINEERING LTD
NOV 24 1999
FILE NO. 990670-04

SENT BY FAX
ORIGINAL MAILED

November 15, 1999

PN 99001

Philips Planning and Engineering Limited
3215 North Service Road
Box 220, Burlington
Ontario
L7R 3Y2

Attention: Mr. Ronald B. Schekenberger, M. Eng., P. Eng

Dear Sir:

Re: Servicing Study
Milton Secondary Plan

Further to the Landowners meeting of November 10, 1999 we are enclosing with this letter a copy of the topographic survey information for the southwest corner of the CIBC Lands (a disk with the entire survey has been included with the mailed copy). The source of this topographic information is a survey (1996) carried out by D.B. Searles Limited O.L.S. in 1996. As we discussed in the meeting we are very concerned with the sanitary sewer inverts and topographic information shown at Point 7 on Figure 4. At Point 7 the invert is shown at 213.5 m and the top of grate is shown at 217.5 m, which would mean the invert is very close to existing grade and there would be approximately 4m of fill required over an extensive area. The elevations on both the MTO and McKinlay properties to the south both drop off approximately another 1 to 2 m as they approach Highway 401. In light of this it is imperative that the servicing be re-evaluated in order the inverts are made considerably lower.

As discussed, in the late 1980's when the servicing on the east side was completed, in recognition of the above concern there was an easement granted to the Region of Halton along side the channel running northwest to Highway 25. This easement is shown as Part 2 on Plan 20R-9316, and is 11.0m wide, running along and inside the northerly edge of the SWM (channel) block. The purpose of this easement was to permit a sanitary sewer to be constructed westerly under Highway 25 from the manhole at the southerly end of the walkway. While we originally thought we may have more information relating to this future sewer, we have checked our files and unfortunately do not have any further information. Our recollection from our involvement in the late 1980's when this sewer was constructed is that the portion from the south to the above manhole was constructed under a Regional contract. Drainage plans and general plans would likely depict the intentions of this easement and sewer.

If you have any further questions or comments with respect to the above please call either Matt Stairs or the undersigned.

Yours truly,

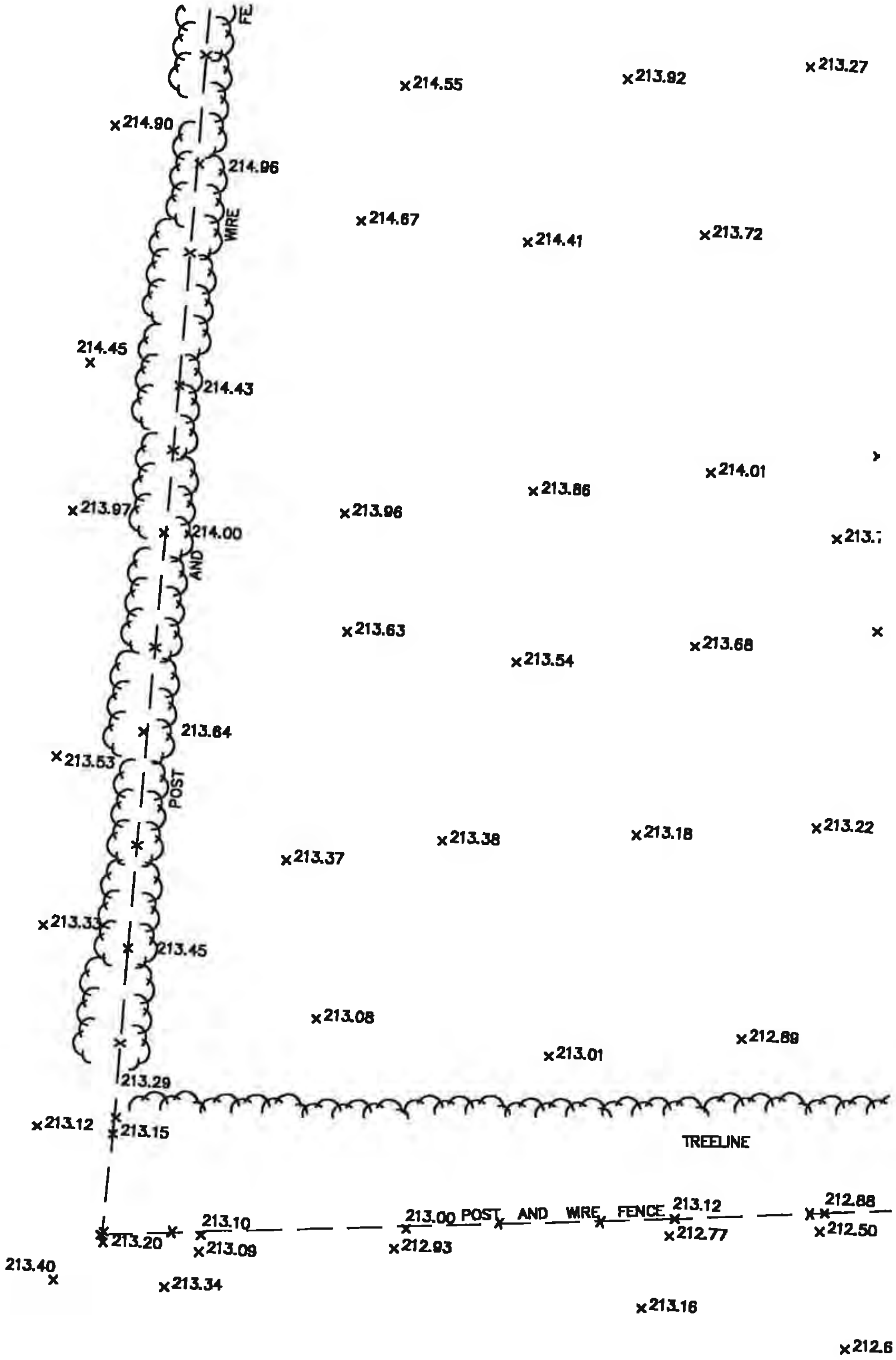
Grahame Rice

Grahame Rice, C.E.T.
MGM Consulting Inc.

c/c Bill Mann, M.C.I.P., Planning and Development, Town of Milton
Harry Snoek, President, Harry Snoek Limited

South west Corner of
CIBC Property

Scale 1: 1000



**Marshall
Macklin
Monaghan**
CONSULTING ENGINEERS · SURVEYORS · PLANNERS

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FAX (905) 882-0055

COPY

November 23, 1999
File No. 30-99023-01-P01

Bill Mann
Planning Department
Town of Milton
Victoria Park Square
43 Brown Street
P.O. Box 1005
Milton, Ontario L9T 4B6

Subject: Comments and Suggested Modifications to 401 Industrial / Business Park Draft Secondary Plan Background

We act as consultants on behalf of the Empire Company (Sobey's). Our client owns a 71 acre parcel of land located at the northern edge of the 401 Industrial / Business Park Secondary Plan area, specifically at the south-eastern corner of No. 5 Side Road and Regional Road 25, legally described as Part of Lot 6, Concession 3. We attended the November 10, 1999 Open House held at the Town of Milton, and have reviewed the 401 Industrial / Business Park Draft Secondary Plan in relation to our clients' property.

Our client intends to sever the 71acre parcel into approximately four lots ranging in size from approximately 15 acres to 25 acres for industrial uses. In fact, our client is actively marketing the lots to industrial users and a high degree of interest from potential industrial users has been generated. An *Industrial* designation coupled with direct access to Regional Road 25, Side Road No. 5, and the CN rail line are of paramount importance in order to meet the development objectives for the land.

Although the Secondary Plan states the Draft Land Use Plan reflects the Industrial option put forth in the Background Report, the designations applied to our clients' lands are, unfortunately, primarily *Business Park Area* and reflect the business park option in the Background Report. I have attached a copy of the Draft Secondary Plan's Land Use Schedule and have roughly indicated our client's property boundaries. Clearly, the majority of our client's lands are designated *Business Park Area.*

As we stated in our November 4, 1999 letter to you, our client's property should be designated *Industrial* and urban design controls applied to the corridor alongside Regional Road 25 and Side Road No. 5 for the following reasons:

Industrial Designation Coupled with Urban Design Guidelines
We understand the importance of high design standards and aesthetics along Regional Road 25 Side Road No. 5 and recommend coupling the *Industrial* designation with urban design guidelines for development along these boundary roads. By doing this, the Town will be assured that any development with frontage on the Regional Road will be held to a high standard of design and any outside storage, if required by users, will be directed away and screened from Regional Road 25 and Side Road No. 5.

At the Open House I discussed this idea with Cochrane Brook staff and they concurred that not only is it feasible to apply urban design standards to industrial uses, but they have been effectively used in the past and the example of Meadowvale Industrial Park in Mississauga was mentioned. The urban design guidelines can employ some of the following techniques to achieve high quality development along Regional Road 25 and Side Road No. 5:

- Direct accessory office component to front of building;
- Minimize building setbacks from street;
- limit parking in front of building to visitor spaces only;
- direct loading to side(s) and/or rear of building;
- employ effective landscape screening; and,
- Direct outside storage to rear of property, screened from view from boundary roads.

Our November 4, 1999 letter also noted that:

- The property is currently zoned M2-7-H which permits a wide range of Industrial uses. An Industrial designation is in keeping with the existing zoning on the property and the surrounding industrial uses.

- The property contains no significant environmental constraints such as woodlots, streams, wetlands, endangered species or any other environmental constraint. The absence of environmental features on our clients' property makes it ideal for industrial development and will help to reduce conflict between industrial activity and the environment.

- The strategic location of the property at the southeastern corner of Regional Road 25 and Side Road No. 5 provides easy access to Highway 401 for the type of traffic generated by industrial uses. Additionally, the property offers access to the CN rail line located to the east of the property.

- There are no nearby conflicting residential or other sensitive land uses. Surrounding land uses are industrial and commercial in nature and compatible with additional industrial development. An industrial park, including a recycling depot, is located south of the property, commercial uses are located to the west, a second recycling facility is located to the north, and the lands are vacant to the east.

Delete Special Policy Area 8
We request that Special Policy Area 8 in the Town of Milton Official Plan, which specifies a 15m wide open space buffer be incorporated into the development of the property adjacent to Side Road No. 5, be deleted. The proposed urban design guidelines for the Secondary Plan area will effectively address landscaping and will offer more appropriate screening solutions for the area as it becomes more urban in nature as opposed to rural.

Thank you for the opportunity to review the Draft Secondary Plan. We respectfully request the modifications outlined above be incorporated into the Secondary Plan.

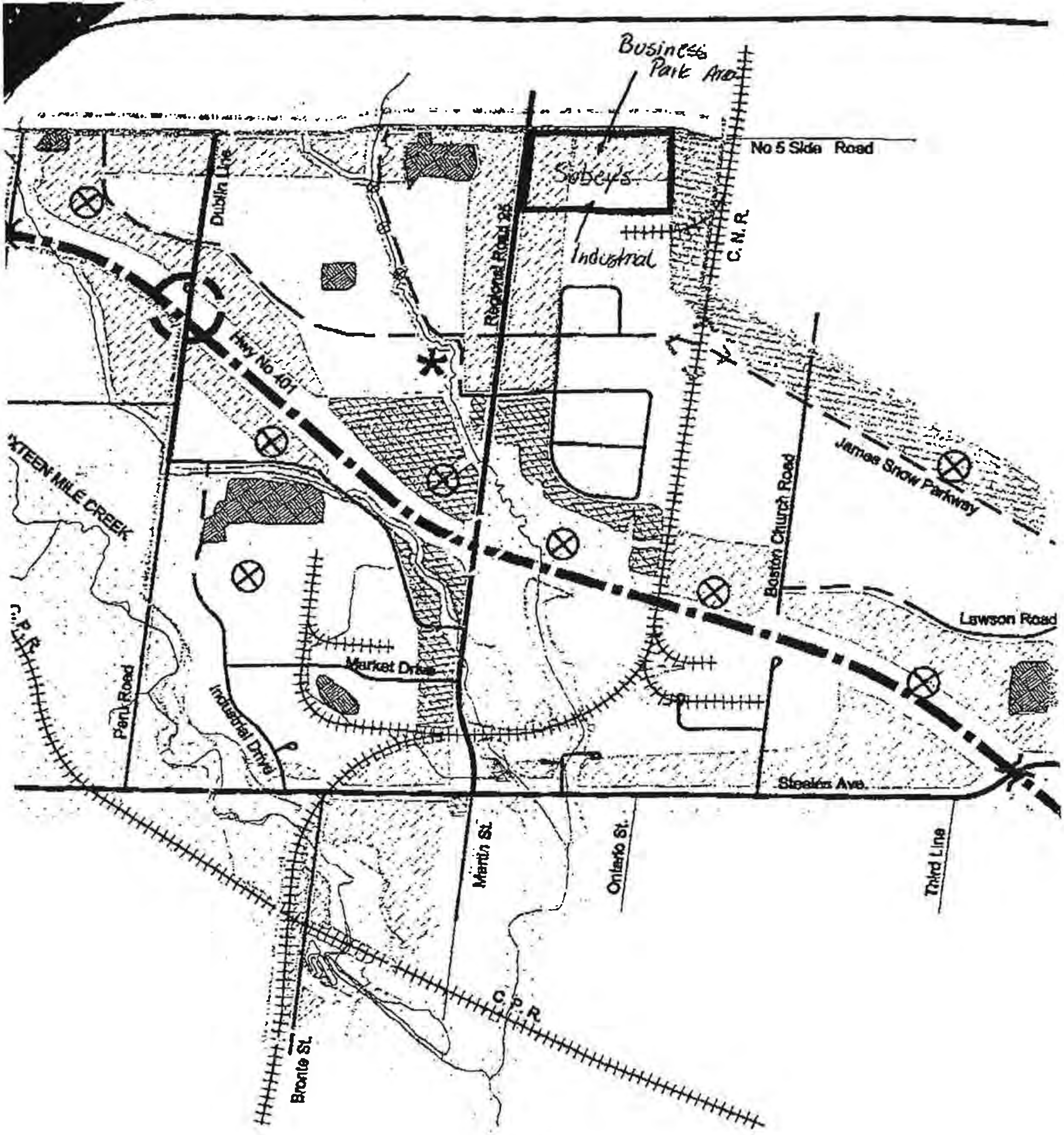
Yours truly

MARSHALL MACKLIN MONAGHAN LIMITED

Anastazia Aziz.

Anastazia Aziz, B.E.S.
Project Planner
Planning Department

cc. Mr. Pat Martin, Empire Company
Mr. Bill Bolender, Colliers
Liz Howson, Macaulay Shiomi Howson
Anne McIlroy, Cochrane Brook


Business Park Area
Sobeys
Industrial
No 5 Side Road
C.N.R.
Dublin Line
Regional Road 25
Hwy No 401
James Snow Parkway
XTEEN MILE CREEK
Boston Church Road
Lawson Road
Market Drive
Industrial Drive
Park Road
C.P.R.
Steeles Ave.
Martin St.
Ontario St.
Third Line
C.P.R.
Bronte St.

PHILIPS
ENGINEERING

Meeting Minutes

November 30, 1999
Our File 99067A

Date: November 25, 1999

Time: 1:30 p.m.

Location: Philips Engineering - Burlington

Subject: Functional Stormwater and Environmental Management Plan
Highway 401 – Industrial/Business Corridor

In Attendance:

Bill Mann	➢	Town of Milton
Martin Bateson	➢	Town of Milton
Jennifer Lawrence	➢	Conservation Halton
Glenn Switzer	➢	Conservation Halton
Suzanne McInnes	➢	Region of Halton
Dan Thompson	➢	DFO
Ray Guther	➢	Philips Engineering
Ron Scheckenberger	➢	Philips Engineering

MATTERS DISCUSSED **ACTION BY:**

General

1. Ron Scheckenberger introduced the meeting outlining the process to date, which has included the preparation of the Conceptual Secondary Land Use Plan by Macaulay Shiomi Howson. The plan, along with supporting documentation, including the draft of the Functional Stormwater Environmental Management Report, Servicing Report, and Urban Design Guidelines was presented to the property owners and general public in early November.

   All stakeholders (including agencies) have until December 17, 1999 to comment on the plan, after which it will be finalized in January 2000. **All**

   A statutory public meeting will be held December 13, 1999.

Constraints and Opportunities

2. Ron Scheckenberger provided an overview of constraints and opportunities related to the respective development area management.

MATTERS DISCUSSED **ACTION BY:**

The Milton North area is distinct from Phase 1, in that a considerable portion is already developed and as such integration of new development, with existing development, with infill development will be required for overall management of stormwater management.

Other distinguishing features from Phase 1 include the hydraulic constraint posed by Highway 401, as well as the higher potential for infiltration/recharge.

Similarities include a preponderance of minor watercourse systems, one central watercourse (to be protected) bordering on the Sixteen Mile Creek, Main Branch an extremely flat lands and limited terrestrial habitat.

Functional Stormwater Management Plans

3. Ray Guther provided a detailed overview of stormwater and environmental management strategies within each developing area. Numerous comments arose including the following:

   i) Martin Bateson to contact Dave Ashfield, consultant for Shipp, to discuss the opportunity of centralized water quantity control for the employment area which drains to the Phase 1 area. **Town**

   ii) Martin Bateson to provide stormwater management plans to Philips for Gordon Foods. Bill Mann estimated this was prepared two years ago and that there is an on-site facility in this location. **Town**

   iii) Martin Bateson to provide any plans of infrastructure for the Highpoint Development. It was noted, that the stormwater management plan in this area was produced by F. J. Reinders (Tom Hogenbirk). **Town**

   iv) Glenn Switzer is to provide plans of the stormwater management facility (Highpoint). **C.H.**

   v) Glenn Switzer indicated that he discourages significant basin diversion, however, those in the range of 10 ha and less would be supportable.

   vi) Bill Mann suggested that the low-flow diversion of the Highpoint facility as a retrofit, would be a *"cost of doing business"* for future development, tributary to a retrofitted Highpoint facility.

   vii) Martin Bateson questioned how future maintenance of stormwater management facilities would be paid for. Ron Scheckenberger indicated that the type of maintenance would be prescribed within the plan, however, financing would be beyond the terms of reference for the current study.

   Bill Mann added that C. N. Watson is producing an overall economic assessment, which may address this topic further.

MATTERS DISCUSSED	ACTION BY:
viii) Glenn Switzer requested that estimated costs of retrofits be identified within the report, including such elements as low-flow bypasses.	**Philips**
ix) Warren May questioned the orientation of watercourse N-5-A with respect to the study area. Philips to verify further.	**Philips**
x) Glenn Switzer stated a concern regarding the potential spill from Highpoint West channel to the proposed stormwater management facility south of McKinley Transport. Philips to investigate this aspect further.	**Philips**
xi) There is some discrepancy between the various plans as they relate to the location of the study limit, Town of Milton boundary on the eastern limit of the study area. Bill Mann will follow-up and confirm the correct limit of the study.	**Town**
4. Ray Guther distributed a handout citing outstanding information necessary to complete the functional plan (reference attached).	
In so far as the foregoing, Bill Mann recommended that Philips contact David Ohashi from the Region of Halton to determine whether or not there has been a Highway 401 culvert survey. Philips to provide an estimate to Town to complete the necessary work.	**Philips**
5. Philips distributed a decision making process regarding stormwater management for various developments related to their planning status and availability of stormwater management infrastructure. Due to time constraints, this was not discussed in detail. Follow-up discussions will be held with the Town of Milton, Tuesday, November 30, 1999 and Conservation Halton (date pending). All have been requested to provide input.	**All**

Minutes prepared by,

PHILIPS ENGINEERING LTD

Per: Ronald B. Scheckenberger, M. Eng., P. Eng.

c.c. All Present
Mel Iovio, Town of Milton
Liz Howson, Macaulay Shiomi Howson

RBS/mp

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HALTON REGION
CONSERVATION AUTHORITY
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Internet Address: http://www.hrca.on.ca E-Mail: admin@hrca.on.ca

November 29, 1999

Mr. Ron Schekenberger
Philips Engineering Ltd.
3215 North Service Road, Box 220
Burlington, Ontario
L7R 3Y2

Dear Mr. Schekenberger:

Re: Draft Functional Stormwater and Environmental Management Strategy
Highway 401 Industrial/Business Park Secondary Plan Area
Town of Milton

Staff of the Halton Region Conservation Authority have reviewed the above noted document and offer the following comments which pertain solely to the ecological aspect of the report. Comments with respect to the engineering aspect of the report will follow at a later date.

- Watercourses N-2-C and N-2-D should be identified on Figure 1 to confirm the locations.
- The following watercourses, within the study area, did not have a description provided within the document: N-5-A (Mansewood tributary), EU-1-A, EU-2-A, EU-3-A (Magna tributary), NW-1-A. Authority staff note that most of the watercourses are altered/intermittent with the exception of N-5-A and EU-1-A which both support fish habitat.
- Staff are unclear as to why the reference numbers for watercourses change downstream of Highway 401 (i.e., EU-1-A is the downstream reach of N-2-B).
- Figure 3 - an "enhanced streetscape design" overlies Unit 156. Redesign of the streetscape must take into account the high constraint rating of this feature.
- Figure 4 - Kelso branch should be identified as a high fisheries constraint. Tributaries N-5-A (Mansewood) and NW-2-B2 should be identified as medium fisheries constraints.
- Authority staff are supportive of taking the High Point East stormwater management facility off-line, as recommended in the report.
- Woodlot NW-1 is one of the largest intact features in the study area and likely provides habitat for a variety of wildlife. Figure 3 shows that the contiguous marsh (Unit 187) will be converted to an industrial use. Staff recommend that this marsh be retained as it likely has significant wildlife value associated with its proximity to the larger woodlot (i.e., amphibian breeding and bird nesting) and would buffer the woodlot from adjacent development impacts.

- Please provide staff with details with respect to the significant breeding bird species which were identified in the two wetlands. This is required in order to ensure their protection (i.e., buffer requirements).
- Given that the existing natural coverage is 5.01%, a minimum target of 15% natural cover is a commendable target for Milton North.
- As previously noted, staff are supportive of the proposed interchange at Peru Road rather than Tremaine Road and Highway 401 as it would minimize impacts to NW-2-G1 (redside dace habitat) and avoid impacting the Milton Heights Wetland.
- It is likely that herpetofauna are under-documented (page 26) based on documentation of only five species within the Milton North lands. Staff are reasonably sure that Dougan and Associates found additional species during their field work for Subwatersheds 2 & 7.

The majority of the study area lies within Subwatersheds 2 and 7 however, the easternmost portion of the study area lies within the Highway 401 Corridor Study Area of Halton Hills. The northeast corner of this area actually lies outside both the Subwatersheds 2 & 7 and Highway 401 Study Areas. From an ecological perspective, the report provides good documentation of the Subwatershed 2 & 7 portion of the study area with minimal coverage of the remainder of the Study Area. Fencerow features and portions of two woodlots that lie along the east/northeast boundary of the Study Area are not documented in the report. Linkages within, and adjacent to, the Study Area to the east and northeast are not described in as much detail as are the linkages within Subwatersheds 2 & 7. Staff recommend that these linkages be explored and documented in further detail.

We trust the above is of assistance. If you have any further questions, please contact Jennifer Lawrence, Environmental Planner (ext. 235).

Yours truly,

John D. Hall, MCIP, RPP
Director, Watershed Management Services

cc: Mr. Bill Mann, Town of Milton, fax: 878-5639
Ms Ruth Victor, Region of Halton, fax: 825-8822
Mr. Warren May, MNR-Aurora, fax: 1-905-713-7361
Ms Elizabeth Howson, Macaulay, Shiomi, Howson Limited, fax: 1-416-487-5489
Mr. Dan Thompson, DFO, fax: 639-3549

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HALTON REGION
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Internet Address: http://www.hrca.on.ca E-Mail: admin@hrca.on.ca

November 30, 1999

Mr. Bill Mann
Town of Milton
Planning Department
43 Brown Street
Milton, Ontario
L9T 5H2

Dear Mr. Mann:

**Re: Draft 401 Industrial/Business Park Secondary Plan,
Design Guidelines and Servicing Reports
Town of Milton**

Staff of the Halton Region Conservation Authority have reviewed the above noted draft documents and offer the following comments. Please be advised that comments with respect to the Draft Functional Stormwater and Environmental Management Strategy were provided under separate cover in a letter to Mr. Ron Scheckenberger, Philips Engineering Ltd., dated November 29, 1999.

Draft Amendment No. 7

Within Part 1, the Purpose (i) states that Greenlands A Areas will be designated to Business Park Area. A review of Schedule B (Urban Area Land Use Plan) identifies those areas for which this re-designation is proposed. This basically involves the refinement of the Regional Storm flood plain limits on the Maplehurst property (Greenlands A to Institutional) and at the end of Chisholm Drive (Greenlands A to Business Park). Based on a review of the Draft Functional Stormwater and Environmental Management Strategy, these minor revisions are appropriate.

Secondary Plan

Authority staff are appreciative of the proposed interchange at Dublin Line/Peru Road rather than Tremaine Road. A proposed interchange at Tremaine Road would have eliminated the Milton Heights Wetland and potentially impacted upon redside dace habitat.

With respect to the proposed Landmark Local Road (Section 2.4.1.3) adjacent to the Greenlands System in the High Point West area, staff are supportive of this concept and interested to see how the proposed road will enhance the local development.

Section 2.5.11.1 indicates that stormwater management facilities will be permitted in all land use designations. Authority staff are concerned with the potential impact that this may have on woodlots designated as Greenlands B.

Urban Design Guidelines - Draft November 1999

Section 2.3.1 details the character and approach recommended for the North East Quadrant 1 (NEQ1). This quadrant is on the north side of Highway 401, west of the railway tracks and east of Highway 25. The third point noted in the "Approach" reads as follows:

> Redirect the alignment of the stream channel to accommodate the new south service road extension and provide a larger site area for development facing Highway 401.

Authority staff are unsure as to which stream channel is being recommended for realignment and whether it is on the north or south side of Highway 401. In addition, the Schedules to the Secondary Plan do not identify a south service road in the vicinity of NEQ1. This requires clarification.

The last sentence of the first paragraph on page 33 states that the guidelines recommend that stream corridors be protected and enhanced as visual and recreational features. Staff recommend that the stream corridors should also be protected and enhanced as natural linkage systems.

On page 39 it is recommended that the layout of local roads should respect the significant natural features including woodlots, hedgerows, creek valleys, and character properties by locating the road network around these areas. Staff agree with this statement however, this should apply to all roads, not just local roads.

The landscaping guidelines, within Section 4.3, should identify that indigenous non-invasive species should be utilized, especially when adjacent to a Greenlands A or B designation. This is consistent with Section 6.2(x) of the Environmental Management Strategy which recommends the promotion of the widespread use of native plant material indigenous to the Sixteen Mile Creek Watershed.

We trust the above is of assistance. If you have any further questions, please contact Jennifer Lawrence, Environmental Planner (ext. 235).

Yours truly,

JLawrence

for John D. Hall, MCIP, RPP
Director, Watershed Management Services

cc: Ms Ruth Victor, Region of Halton, fax: 825-8822
Mr. Warren May, MNR-Aurora, fax: 1-905-713-7361
Ms Elizabeth Howson, Macaulay, Shiomi, Howson Limited, fax: 1-416-487-5489
Mr. Dan Thompson, DFO, fax: 639-3549
Mr. Ron Schekenberger, Philips Engineering Ltd., fax: 335-1414

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99067A-10A

HALTON REGION
CONSERVATION AUTHORITY
2596 Britannia Road, West
R.R. #2 Milton, Ontario L9T 2X6
(905) 336-1158 Fax (905) 336-7014
Internet Address: http://www.hrca.on.ca E-Mail: admin@hrca.on.ca

December 1, 1999

Mr. Ron Schekenberger
Philips Engineering Ltd.
3215 North Service Road, Box 220
Burlington, Ontario
L7R 3Y2

Dear Mr. Schekenberger:

Re: Draft Functional Stormwater and Environmental Management Strategy
Highway 401 Industrial/Business Park Secondary Plan Area
Town of Milton

Further to the Conservation Authority's letter of November 29, 1999, staff request that the following additional comments be taken into consideration with respect to the draft report. Staff apologize for the fragmented comments however, these were overlooked when writing the original letter.

- Table 3.7 - Summary of Watercourse Functional Characteristics requires the following revisions:

  1. Based on Figure 4, NW-1-E should be listed as "Red";
  2. Based on Figure 4, NW-2-B is both "Blue" and "Green";
  3. NW-2-E, NW-3-A, NW-3-C and N-2-C are not shown on Figure 4;
  4. N-2-E and all EU watercourses are missing from Table 3.7.

- The report ends at page 64. Was it intended that any further information be included subsequent to this page?

- Figure 2 identifies existing development in the Study Area. Staff note that there is existing development at the northwest corner of Steeles and Industrial Drive (Hands Fireworks), that is not shown on the Figure.

- Figure 3 - the woodlot designation on the Toronto Auto Auctions property should be removed. In addition, staff question whether it is intended to maintain the woodlot within the central portion of the High Point West lands as it is not identified on Figure 3.

- Figure 3 identifies two proposed interchange locations along Highway 401. It was staff's understanding that only the interchange at Dublin Line/Peru Road was being proposed.

- The ponds on the Robertson-Whitehouse property, on Bronte Street, are being rehabilitated to function as a wetland feature. Staff recommend that Figure 5 should identify this area as a medium constraint terrestrial feature at a minimum.

- Figure 9 - there is an existing "quantity" control facility at the northwest corner of Steeles Avenue and Industrial Road however, it is unclear as to the exact function of the facility. Staff recommend that it may be appropriate to indicate the location of the existing facility. Also, as per the comments regarding Figure 3, the woodlot designation on the Toronto Auto Auctions property should be removed.

We trust the above is of assistance. If you have any further questions, please contact Jennifer Lawrence, Environmental Planner (ext. 235).

Yours truly,

for John D. Hall, MCIP, RPP
Director, Watershed Management Services

cc: Mr. Bill Mann, Town of Milton, fax: 878-5639
Ms Ruth Victor, Region of Halton, fax: 825-8822
Mr. Warren May, MNR-Aurora, fax: 1-905-713-7361
Ms Elizabeth Howson, Macaulay, Shiomi, Howson Limited, fax: 1-416-487-5489
Mr. Dan Thompson, DFO, fax: 639-3549

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PHILIPS
ENGINEERING

Fax Memorandum

December 10, 1999

TO: *Dave Leighton* *(905) 474 –9887*

COMPANY: *Cosburn Patterson Mather*

FROM: *Ron Scheckenberger*
Ray Guther

RE: *Milton – 401 Industrial/Business Park – Secondary Plan*
Project No: 99067A-26 copy to 98053-E

Cc: *Martin Bateson, Town of Milton 878- 5639*
Glenn Switzer, Conservation Halton 336-7014

3 pages

Further to you e-mail inquiry regarding future drainage patterns within the study area, we have reviewed the existing and proposed drainage patterns for the Bales Property (formerly Milton St. Clair), with respect to the some of the recent Stormwater Management Studies completed for on-going development.

In particular, the *Stormwater Managment Plan (Revised) for MI Developments, Thorbum Penny, October 1998*. This report, (ref. Figure ES-1 and Figure 2 attached) which we understand has been approved by the Town and Conservation Halton indicates that approximately 15.87 ha of development area has been proposed to discharge to the west of Boston Church Road (Third Line) to the "Dreschel Pond". Further, we understand that this scenario had been proposed in order to maintain a balance to some extent of the overall existing drainage area.

Initially when reviewing this report, we (Philips) had incorrectly interpreted this plan and understood that all lands to the east of Boston Church Road drained to the SWM facility on the MI development lands.

In light of fact that the MI Development SWM plan has been approved prior to this study, and that the intention of the current study is to build on previous planning study recommendations, we would propose to revise the Milton St. Clair Development Area boundary to include this area.

Please contact us if you have any questions or wish to discuss this issue further.

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PRE DEVELOPMENT DRAINAGE SCHEMATIC

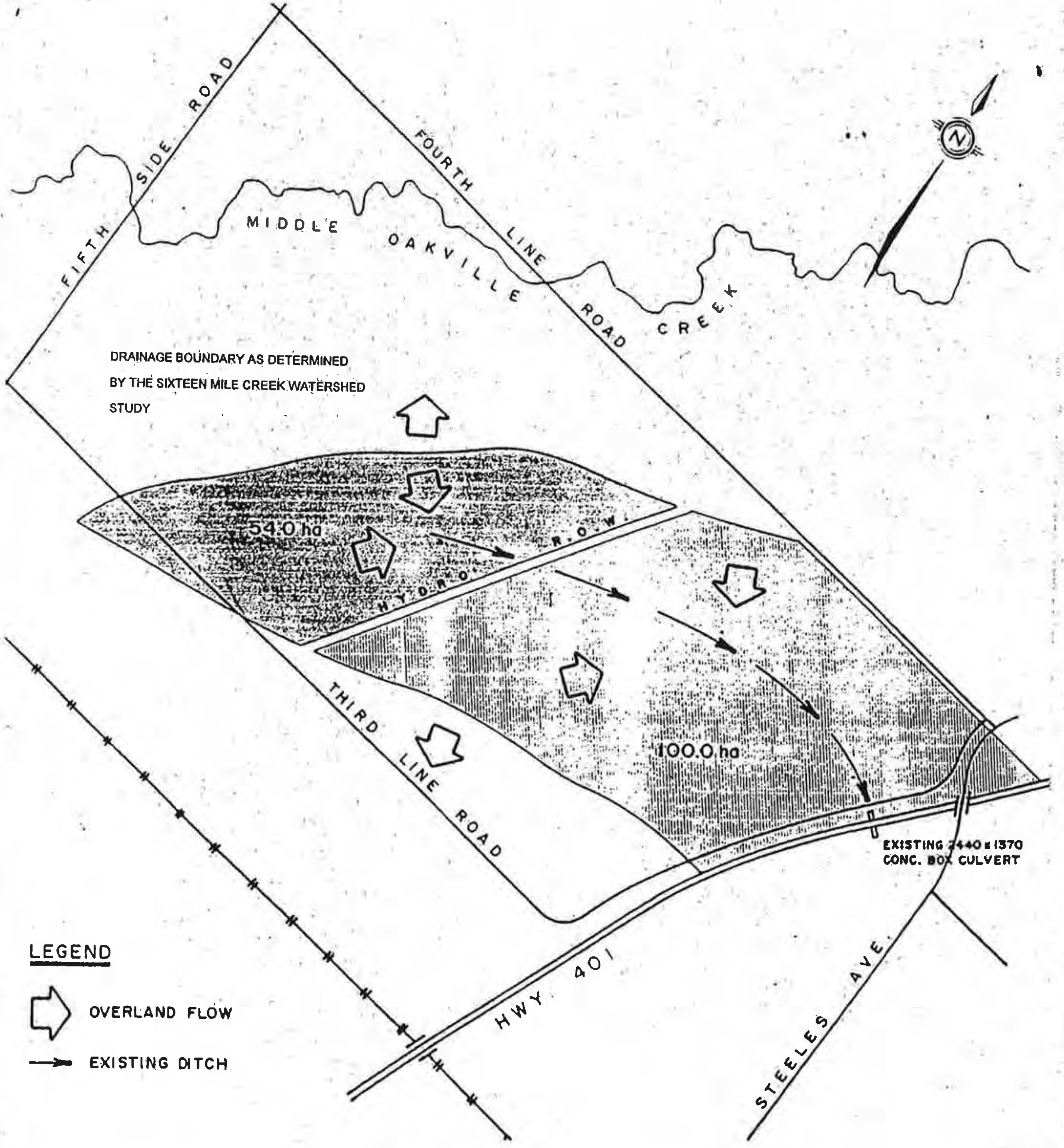

FIGURE 1

DRAINAGE SCHEMATIC

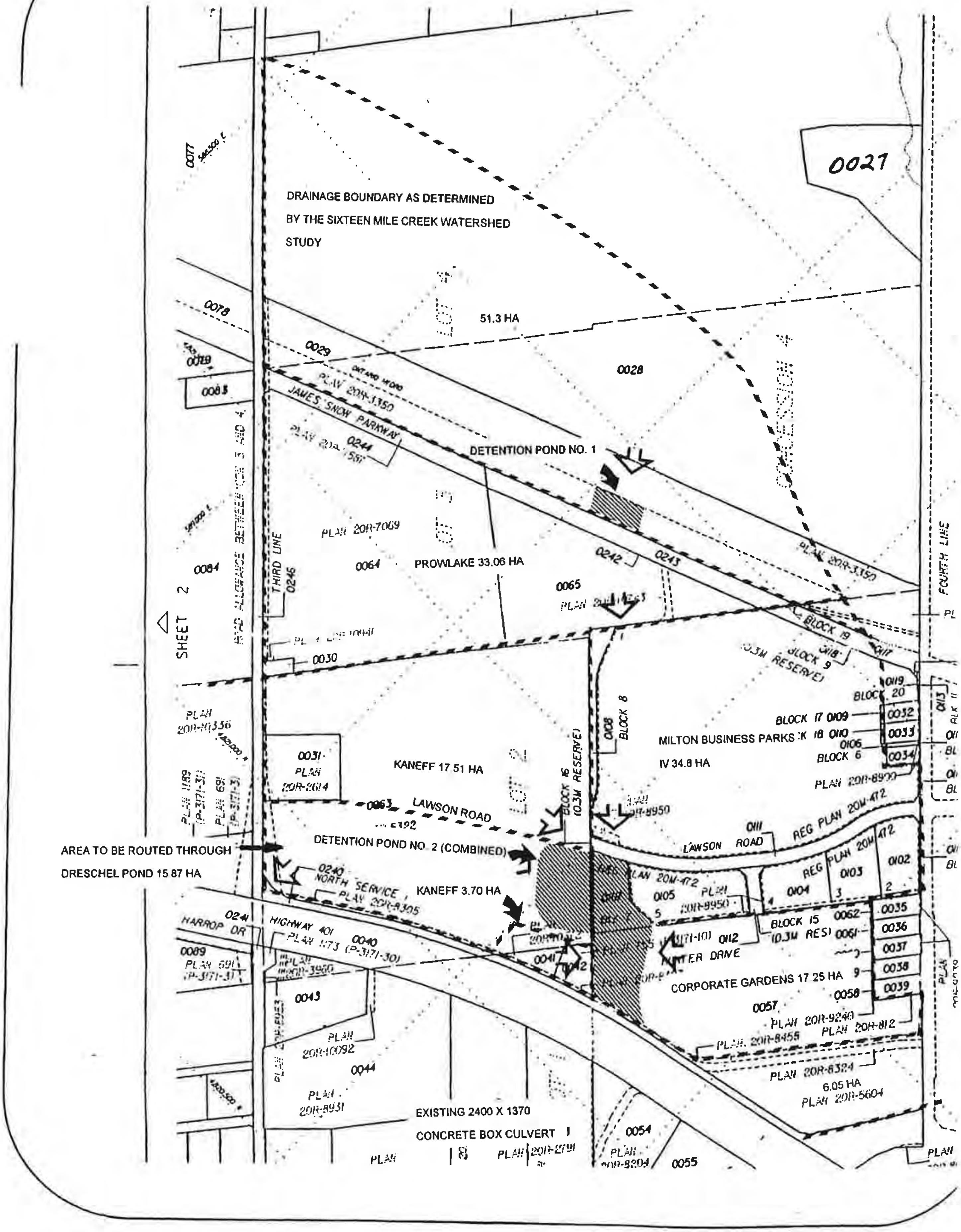

FIGURE 2

99067A-10

Fisheries and Oceans
Pêches et Océans

Fish Habitat Management
3027 Harvester Road, Suite 304
Burlington, Ontario
L7R 4K3

Gestion des peches et de l'habitat
3027 Harvester Road, Suite 304
Burlington, Ontario
L7R

Your file Votre référence

Our file Notre référence
525-3042

December 15, 1999

The Corporation of the Town of Milton
43 Brown Street
Milton, Ontario L9T 5H2

Dear Mr. M. Iovio:

RE: Highway 401 Industrial/Business Park—Functional Stormwater and Environment Management Strategy

Thank you for providing me the opportunity to review the contents of the draft report entitled "*Functional Stormwater and Environmental Management Strategy, Highway 401 Industrial/Business Park, Secondary Plan Area, Town of Milton*." As indicated in our November 3, 1999 letter, it will be necessary for the submission of a formal mitigation and compensation proposal before Fisheries and Oceans Canada, Fish Habitat Management (DFO-FHM) can provide the town of Milton with a conceptual letter of agreement.

My review of the draft report is confined to areas relating to fish and fish habitat and are as follows:

- Based on Figure 4, NW1E should be coded RED in Table 3.7
- Based on Figure 4, NW2B should be coded GREEN in Table 3.7
- Under Section 5.4-Fisheries; It may appropriate to add a point that indicates that the enhancement of fish habitat values for all fish species, which includes baitfish, sportfish, and vulnerable species be a priority. The *Fisheries Act* and the Policy for the Managment of Fish Habitat (1986) pertains to the fish community as a whole and is not species specific.
- Section 6.2-Terrestrial Resources; title needs to be broadened to reflect fisheries resources. You may wish to separate out aquatic resource management tactics in a separate section.
- Section 6.2-Naturalized linkages, term is unclear in aquatic context; suggest use of riparian zone contiguousness or similar.

I hope the foregoing comments are of use to you in the development of this exciting initiative. Please call me at (905) 639-5760 if you have any questions.

Dan Thompson
Fish Habitat Biologist
Fish Habitat Management-Ontario Area

c.c. R. Scheckenberger, Phillips Engineering
C. Portt and Associates
B. Axton, Conservation Halton

COSBURN PATTERSON MATHER
Consulting engineers to municipalities and the development industry

99067A-10A
Copy to 98053E-10A

MEMORANDUM

To: Ron Scheckenberger, Philips Engineering
VIA FAX 1-905-335-1414

Date: December 16, 1999

From: Greg Rapp

Subject: **Bales Holdings formerly Milton St. Clair Lands**
Highway 401 Industrial/Business Park

File No. : 98687

Further to our telephone conversation, we have reviewed the Functional Stormwater, and Water and Wastewater reports prepared by your office and prepared the following list of issues to discuss at our meeting with the Town.

Stormwater Management

The Functional Stormwater report indicates the following drainage areas to the existing farm pond:

- Total drainage area = 140ha
- External area = 73ha
- Development area = 109ha

We would like to confirm:

- that the entire 67ha drainage area within the secondary planning area is the "Bales" property located between the CNR and Boston Church Road;
- the allocation of the 109ha development area within the 140ha drainage area;
- the existing external drainage area prior to development outside the secondary planning area; and
- that only drainage from the Bales property will contribute to the ultimate pond (depending on how the upstream external area is treated).

In addition, the drainage area shown in the stormwater management summary in the Background and Options Report for the 401 Industrial/Business Park Secondary Plan is 90ha with a total upstream drainage area of 170ha. Could you please confirm that we should be using the drainage area presented in the Functional Stormwater Report.

The report also suggests that a wetland would be preferred to a wet pond for this site. This would involve significant filling of the existing pond on the site, which has an approximate depth of 6.5m.

Terrestrial Features

The opportunities plan presented in the report shows the existing hedgerow near the northern limit of the site as a medium constraint. Bales Holding Corp. has retained Bird and Hale to review the hedgerow and they have concluded that it is in poor condition and does not provide a substantial corridor for wildlife use. We would like to discuss this further with you and the Town.

Sanitary and Watermain Servicing

We would like to confirm the watermain and sanitary servicing strategies for the site. In addition, any existing information that you can provide would be of assistance.

THE REGIONAL MUNICIPALITY OF HALTON
1151 BRONTE ROAD
OAKVILLE, ONTARIO, CANADA L6M 3L1

PLANNING & PUBLIC WORKS DEPARTMENT
PLANNING AND DEVELOPMENT SERVICES
TEL: 905-825-6161 FAX: 905-825-8822

Please fax
to Liz
Howson.
Thanks
Bill
416-487-5489

Mr. Bill Mann
Town of Milton

Dear Mr. Mann

Re: Milton 401 Industrial/Business Park Secondary Plan and Associated Documents

---

Processing of the Proposed Local Official Plan Amendment

The Regional Municipality of Halton has reviewed the above 401 Industrial/Business Park Secondary Plan and associated reports and is providing the following initial comments in accordance with Halton Region By-law No. 18-99. These documents were received from the Town of Milton on November 11, 1999; consequently, Halton Region By-law No. 18-99 applies to the processing of this proposed LOPA application. Should the Town of Milton Council decide to adopt this LOPA, the adopted LOPA is automatically Exempt from Halton Region approval, unless the Chief Planning Official for the Regional Municipality of Halton, or the Local Planning Director or the Local Council determines that the LOPA is NOT exempt in accordance with those conditions outlined in Halton Region By-law No.18-99.

Based on the Regional Municipality of Halton's initial review of the proposed LOPA, it appears that this application may not be exempt from Halton Region approval. In accordance with By-law No. 18-99, Section 2 vi) REGIONAL CONDITIONS FOR DECLARING A LOPA NOT EXEMPT states as follows:

2. That any LOPAs which do not comply with any of the following Regional conditions for exemption may be declared not exempt from Regional Municipality of Halton approval:

   For an LOPA to comply with Regional conditions for exemption it must:

vi. Incorporate all Halton Region concerns regarding Halton's assigned and/or delegated responsibilities;

We have been advised by letter that the Halton Region Conservation Authority has a number of concerns and has requested revisions to the Official Plan Amendment. These matters must be resolved for this amendment to be exempt from Halton Region approval.

We anticipate that a revised version of the OPA and associated reports will be prepared addressing the outstanding issues itemised below and the concerns of the HRCA. Following review of the revised documents, Regional Planning staff will determine if this LOPA is exempt from Halton Regional Approval in accordance with By-law No. 18-99.

Amendment No. 7

Page ii, First Paragraph, Schedule 1 appears to be missing from the amendment.

Page ii, Third Paragraph - change '... sewer and water services...' to '... water and wastewater services...'

Page ii – Paragraph 3 - It is suggested for clarity that this section refer to the fact that all of this growth will not occur in the 401 Industrial/Business Park but will also occur in the later stages of the period in the Milton Business Park as well.

Item 6 - The addition of this section raises a number of concerns. Through Regional Official Plan Amendment No. 8, the requirement for phasing as part of the overall requirement for secondary plans was incorporated as a requirement for industrial areas. This proposed revision would eliminate this requirement from the Town of Milton Official Plan, which would be contrary to the Regional Official Plan policies. From my previous discussion with you, the questions of the relevancy of phasing for this area as significant portions have been already developed is a valid issue. However, the Town of Milton has another large industrial area within the expansion area where phasing will be appropriate. This proposed policy change is not acceptable to the Region and an alternative policy approach will need to be developed.

Section 2.4.1.1 Potential 401 Interchange and Section 2.5.10.1 - The approach outlined in these two sections regarding securing land is problematic. It will very difficult to protect lands for an interchange if development is allowed to proceed in this area. The lands for the interchange should be secured prior to permitting development. The specific location of the interchange will not be known until the EA is completed. Schedules C.2.A, C.2.B, Schedule B, should be revised by removing the "Potential Interchange" symbol and replace it with a box with a text note (similar to James Snow Parkway south of 401 in the approval of the Milton Official Plan). The box should include Hwy 401 west of Regional Road 25 to Tremaine Road and indicate the Town's interest in locating an additional interchange.

Section 2.4.1.2 James Snow Parkway - On page C.2-7, 4th paragraph - The report indicates that the Town will work with Region to evaluate access control and may consider provisions for direct access to specific development applications. This statement is contradictory with the original functional engineering study prepared by McCormick Rankin, which indicated that the proposed roadway would be developed with no private access in order to maintain a high level of service. N. Zervos has indicated that the issue of access to the JSP has not been discussed with Regional staff relative to the preparation of the secondary plan. Given the potentially high truck traffic that may be using this roadway and the Region's desire to preserve the functional integrity of the JSP, it is premature for the OPA to be indicating that direct access may be considered along the JSP. It is requested that the last paragraph of this section (Further, notwithstanding......) be removed.

Section 2.5.1 Employment Areas -The Draft Aquifer Management Plan was received by Council on December 8, 1999 (PPW113-99). It sets the proposed direction for Halton's future groundwater management program. Included in the Draft Aquifer Management are several recommendations regarding drinking water quality protection and planning for groundwater management. The Regional Hydrogeologist has reviewed at the Secondary Plan. A list of Best Management Practices for the lands in the Milton 401 Industrial Park has been prepared. The Region is requesting that consideration be given for including policies regarding these best management practices in OPA 7 and that the implementing Zoning By-law and the subwatershed plan address these matters as well.

The areas surrounding the Milton/401 Industrial Park have a number of varying land uses that all utilize private wells to obtain drinking water from the shallow groundwater system. Recently, it has been found that there is a strong potential for a regionally significant aquifer to be found beneath this proposed industrial area. The following Best Management Practices will be required as standard practices for businesses locating in the industrial park.

1) Liquid storage areas must have secondary containment to hold any spills or leaks at 10% of the total volume of the containers or 110% of the largest container, whichever is larger.

2) Design of in-ground protection channels for transfer hoses to minimize damage from vehicles and to catch leaks or spills is required.

3) Any areas used for cleaning parts, machinery, etc. must be located within a containment area with an impermeable floor. There must be no direct access to outside.

4) New and waste material storage areas must be roofed, isolated from floor drains and have sealed surfaces.

5) Underground storage tanks are discouraged, however where used, they must have secondary containment, a monitoring system incorporating high level and leak sensing audio/visual alarms, level indicators and overfill protection. A protective plate will be placed in the bottom of the tank if a dip stick is to be used.

6) Untreated rinse waters and floor drains must not discharge to a sanitary sewer, septic system, storm drain, or surface water.

7) Waste collection stations, with labeled containers for each kind of waste, must be provided throughout the work area for spent chemicals, soiled rags, etc.

8) Uncovered receiving areas must be designed with a spill sump to catch and store any spilled chemicals with a manual operation for emptying.

9) Wastewater from any laboratory operation must be discharged to a lab drain system that is separate from the sanitary wastewater drains. Lab drains must lead to a neutralization system prior to discharge to the sanitary sewer.

10) Uncovered scrap metal storage areas must have a separate storm water collection system with an oil/grit separator which discharges to a sanitary sewer or a holding tank.

11) Hazardous materials must not be put down drains, but rather must be properly disposed of by a licensed hazardous waste hauler.

Page 4

Section 2.5.5 & 2.5.6 Greenlands A and B & Schedules B & C.2.B -It is difficult to tell from Schedule B what areas of Greenlands A and B are being added and deleted. More detail is found on Schedule on C.2.B but it is not clear what maps from the Functional Stormwater Management Plan were used to recommend changes to the Greenlands A and B System. Figure 9-Preferred Stormwater Management Concept Plan (November 1999) as shown in the Functional Stormwater Management Plan includes a "Linked Greenlands System"(no distinction between Greenlands A & B). Some of the elements of the "Linked Greenlands System" within the study area are shown on Schedule C.2.B but not all of them (e.g. in the area bounded by Market Drive and the Railway tracks, area just north of Steeles, opposite Ontario Street). Schedule B does not include all of the new Greenlands B areas that are shown on Schedule C.2.B. Town staff should clarify what information was used as the basis for revisions to Greenlands A and B and ensure that all of the Greenlands A and B areas are shown on Schedules B and C.2.B.

Page C.2-19, Point c- word missing- "Where development is proposed on lands abutting..."

Page 2.2 -22, Section 2.6.4 – We are requested that this section be revised as it does not reference the 1999 Master Plan Review or make any provisions for subsequent updates. Section 2.6.4.2 is too broad in providing outright exemptions for projects not identified in our servicing documents or this Secondary Plan.

Schedule C.2.A - In the legend, "Trial" should by "Trail" (typo).

Urban Design Guidelines

Top of Page 11 (Character) -The site referenced as "Marshall Steel" is now the Co-steel Recycling facility.

Page 25, Section 3.3.3 – The report should also note water and wastewater services, as well as Hydro and Bell.

Page 29, Section 3.3.6 - The comment regarding the James Snow Parkway interchange having only southerly access is incorrect.

Page 31, Section 3.3.7 - Steeles Avenue right of way information is repeated.

Page 33, Second Last Bullet - The figure number is missing.

There is frequent mention of promoting and providing for a high-quality, pedestrian-oriented streetscape plan for roads such as Steeles, Bronte, JSP and 5 Sideroad. Transportation staff has some difficulty in this vision for encouraging pedestrian activity on roadways carrying high volumes including high percentages of commercial/industrial type traffic that will be travelling at high speeds on roadways where we are trying to maintain a fairly high level of service.

Water and Wastewater Servicing Report

Page 1, Section 1.2 - The report indicates that the Milton 401 Industrial/Business Park encompasses 1297.5 hectares. It is our assumption that this is a total area including greenlands, roads, railways, etc. since the stormwater report (see page 1) notes that it encompasses an area of 945 hectares. The report should be clarified.

Page 2, Paragraph 1 - The 1999 Master Plan Review should be referenced.

Page 2, Paragraph 2 - Change 'trunk sewers' to 'trunk wastewater mains'.

Page 4, Section 2.1 - The report should note that the Lawson Road area is only partially serviced (i.e. municipal water services are available but municipal wastewater services are not).

Page 8, Section 3.1 - The comment regarding some areas being partially serviced should be re-iterated in this section.

Page 8, Section 3.1, Paragraph 3 - The reference to '4,000 m3' should be '4,000 m3/d'. Also, the report should note that once the flows from new growth exceed this value, flows in excess of the Milton Wastewater Treatment Plant capacity will be diverted to the trunk wastewater main at Derry Road and Commercial Street for treatment at the Mid-Halton Wastewater Treatment Plant.

Page 8, Section 3.1, Paragraph 5 - The Milton Water Supply Report will recommend that the lake water zone initially include the area north of Steeles Avenue from Harrop Drive (including McGeachie Drive) east to Lawson Road/Fourth Line with full extension west for the lands north of Hwy. 401 contingent upon the construction of the James Snow Parkway watermain (with planned looping to include those lands supplied from the Chisholm Drive watermain). As such, the paragraph as written needs some modification to accurately summarize our long term plan and how we plan to accomplish same. The Region will need development projections by quadrant to confirm that the demands removed from the groundwater zone in east Milton can support the level of growth planned in west Milton before the James Snow Parkway watermain is constructed. This watermain is currently budgeted for design in 2003 and construction in 2004. The growth projections will confirm whether this timing is appropriate or whether it should be accelerated.

Page 8, Section 3.1, Paragraph 5 and other places throughout the report - Change "Chisolm" to "Chisholm".

Page 9, Paragraph Following Point 8 – It is our understanding from Philips Engineering that Warren May from the Ministry of Natural Resources has expressed concern with the text in the last sentence of this paragraph. Technically speaking, it is our understanding that the implementation of the Zenon process will result in reduced loadings to the stream as a result of the addition of 1000 cubic metres of flow.

Bottom of Page 11, Section 5.3 - The Philips analysis does not include flows generated from the Highpoint Development, which is in Traffic Zone 1536. The text as written is therefore incorrect. It is recommended they re-do their calculations including all existing and future development areas.

Page 12, Line 2 - Change "east if Parkhill Drive" to "east of Parkhill Drive".

Page 12 and Figure 4 - The drainage boundaries proposed on Figure 4 need to be reviewed and revised accordingly per the updated topography provided by MGM Engineering for the area west of Regional Road 25. In addition, Philips should drain the area west of Regional Road 25 south-easterly towards the stormwater management pond via the 11 metre easement previously provided for same. The easement terminates at a manhole (MH-7A) with an invert elevation of 203.43 m. Any additional textual information can be added on page 12.

Additional changes to Figure 4 include:

i) The Pumping Station is proposed to be located in Halton Hills in the vicinity of Fifth Line - not in Milton where it is currently shown on this figure. Also, the wastewater main entering the station from the east side should be shown.
ii) The HUSP projects were identified at a conceptual level in 1995 as part of the Master Servicing Plan. These projects will obviously change in length, location, etc. as more detailed information is made available. As such, Philips should delete the 'Future Wastewater Main - HUSP' item from the legend (i.e. all future wastewater mains should be identified using one colour - preferably green for wastewater). The Region will summarize what constitutes a development charges main once sizes have been established and confirmed.
iii) There is no local wastewater collection system shown for the area north of the Co-steel facility. How is this area planned to be serviced? The drawing should also show the wastewater main extension required to service the Co-steel facility via the Highpoint development.
iii) A north arrow should be included on the figure.
iv) There are no 'waterways' or 'remove road' items shown on the figure therefore these items should be deleted from the legend.

Page 12, Paragraph 5 - The location and slope of the pipe draining the area west of Regional Road 25 needs to be confirmed per the comment above before a conclusion can be made on the size of HUSP Project 3-16.

Page 12, Paragraph 7 - This paragraph should be moved to Section 5.2 (Design Constraints).

Page 12, Last Paragraph - What is the basis for the statement that "a surcharge situation would be created in the wastewater trunk on Martin Street at Manhole 2890"?

Page 14, Section 5.4, Paragraph 2 - Please provide the basis for the statement that "Based on the current land use plan, approximately 19.9 hectares of industrial land can be serviced through this main." Also, Philips should re-do their calculations using all existing and future development areas rather than just adding in what they expect will generate additional flow.

Page 14, Section 5.4, Paragraph 3 and 4 - These paragraphs deal with Traffic Zone 1519A which is outside the study area. It may be more prudent to simply say that the design of the Chisholm and Market Drive wastewater mains should have regard for the requirements of Traffic Zone 1519A when they are extended without getting into sizing details.

Page 14, Section 5.5 - The report recommends that the Harrop Drive crossing service the area west of Boston Church and half of the area between Boston Church and Esquesing Line. We support this recommendation because it starts to go counter-grade if the Region extend the service area further east. With this service area, the wastewater main on Lawson Road only needs to be a 375 mm rather than the 450 mm they have identified. This should be confirmed. Also, the adoption of this recommendation means that the Magna lands would be required to discharge to the Pumping Station at Fifth Line.

Page 15, Section 5.6, Paragraph 2 - The Philips design is currently premised on two wastewater mains discharging to the pumping station for the Milton developments. This is unlikely to happen because the Milton flows will be combined on Steeles Avenue and directed to Fifth Line where the pumping station is proposed to be located. As such, Philips should revise their design to reflect one wastewater main discharging to the pumping station from the Milton developments. In addition, their design should make allowances for the area north of the Hydro Corridor to 5 Sideroad as this area was included in the HUSP. Once this is done, a size can be confirmed for HUSP Project 3-15. We expect it will be a 600 mm diameter pipe and hence will remain as a development charges project. It is currently budgeted for design in 2006 and construction in 2007. It was identified as a HUSP Stage 2 project and hence is not on the HUSP Stage One project list. As such, the likelihood of accelerating this project is low unless the Developers agree to front-end it or Finance agrees to another arrangement. The text in this paragraph is correct in that it does not indicate the potential for the acceleration of works as noted on page 12.

Page 16, Section 6.2, Paragraph 4 - The text should be modified to reflect that the lands east of Harrop Drive (including McGeachie Drive) and north of Steeles Avenue would be switched to a lake-based water supply. Also, change "... approximately one million gallons of water..." to "... approximately 4,600 m3/d of water..."

Page 16, Section 6.2, Paragraph 5 - We need development projections by quadrant to confirm the year when for all lands north of Hwy. 401 will be on the lake-based system.

Figure 5 - Sizes assumed by Philips should be included on the drawing (i.e. all 300 mm except 3-1B/C and 4-1, which are 500 mm). A footnote summarizing the assumptions noted in the last paragraph on Page 17 should be provided on the drawing. The Region will summarize what constitutes a development charges main once sizes have been established and confirmed. Philips should therefore delete the 'Future Watermain - HUSP' item from the legend (i.e. all future watermains should be identified using one colour - preferably blue for water).

Additional comments on Figure 5 include:

i) With regards to HUSP Project 4-1, please show it as one straight section on the first street south of 5 Sideroad from Dublin Line to Regional Road 25.
ii) There is a section of pipe missing on the first ring road west of Regional Road 25.
iii) There is no local water distribution system shown for the area north of the Co-steel facility. How is this area planned to be serviced?
iv) A north arrow should be included on the figure.
v) There are no 'waterways' or 'remove road' items shown on the figure therefore these items should be deleted from the legend.

Appendix C - Comments include:

i) Capacities have been provided for PVC pipe. This should be noted under pipe type.
ii) Flows to the pumping station need to account for Halton Hills development. Also, additional sections of pipe need to add on the Milton side to direct the flow to Fifth Line.
iii) The total area north of Hwy. 401 accounted for in the design calculations is approximately 440 hectares not including the Highpoint development. This compares to a total area of 405.3 hectares including the Highpoint development provided by Macaulay Shiomi Howson as part of the Phasing Study process. This represents a significant increase in area that was not previously analysed by Regional staff and is, in part, the basis of our request to have a detailed inventory of the various land use areas in the Milton 401 Industrial/Business Park.

Stormwater Report

Page 1 - Development area issue discussed above.

Pages 62 to 64 - Who will be responsible for the suggested monitoring?

Figure 9 - The existing stormwater pond appears to be shown much larger than its current size is and it is identified as a potential retrofit opportunity. Any changes to this stormwater pond must have regard for the fact that an 11 metre easement was preserved in the area to allow wastewater servicing of the area west of Regional Road 25.

Health and Social and Community Services Departments

The Milton 410 Industrial/Business Park Secondary Plan identifies growth in the Maplehurst facility. Halton staff that the increase in the size of the facility from currently servicing 400 approx. to potentially 1700 approx. people will have an impact on the provision of a number of our health and social services. Health services including, ambulance calls, infectious disease control, sexual health and reproductive health, through services directly to the facility population, will be increased. This will impact staff and funding of the services.

Regarding the provision of Social Services, the specific concerns relate to the potential impact to Regional social assistance caseload and requests for emergency shelter. At this time, Halton has a severe shortage of emergency shelter facilities and the Region must frequently refer individuals to resources outside of Halton. While we can provide services to individuals in the Milton sub-office location, transportation will likely be a barrier to these clients gaining employment expeditiously. Their recent release from a correctional facility may also become a barrier to employment and point to a longer stay on social assistance. In addition, Halton's vacancy rate for rental housing is less than 1% and the Region would like to ensure that individuals are not released and ultimately find themselves homeless.

Conclusion

Upon receipt of the revised documents, Regional Staff will provide updated comments with regards to the 401Industrial/Business Park Secondary Plan and associated reports/.

For your information and following final comments from the Region, should the Region determine that this application will be exempt from Halton Region approval, Regional By-law No. 18-99 requires the following:

> "The Area Municipalities shall keep the Region apprised of the file including:.. Substantive revision of the official plan amendment and/or application; appeal to the OMB; and any such matter required by the Chief Planning Official for the Regional Municipality of Halton."
>
> "At least 12 days prior to the presentation of a report to the Local Council regarding possible adoption of the LOPA, the Director of Planning for the Town of Halton Hills shall advise the Chief Planing Official for the Regional Municipality of Halton of his intentions and recommendations and shall forward a copy of his draft LOPA Report to the Chief Planning Official for the Regional Municipality of Halton."

Should the above proposed LOPA be adopted by the Town of Milton Council, the Direct of Planning shall provide the Region with a written declaration advising that the LOPA has been processed in accordance with all Provincial and Regional requirements.

If you have questions regarding the above or require any additional information, please contact me at extension 7183.

Yours truly,

Ruth Victor

Ruth Victor, MCIP RPP
Principal Planner

MGM
CONSULTING INC.

January 7, 2000

PN 96001
99001

Town of Milton
Victoria Park Square
43 Brown St.
Milton, Ontario
L9T 5H2

RECEIVED
PHILIPS ENGINEERING LTD.
JAN 19 2000
FILE NO.: 99067A-10 A

Attention: Mr. Bill Mann, M.C.I.P., R.P.P.
Planning and Development

Dear Mr. Mann,

Re: Milton 401 Secondary Plan and Registration of Draft Plan 24T-75508M (former C.I.B.C. Property)

This letter is by way of a follow-up to our meeting of January 5, 2000 also attended by Ron Scheckenberger of Philips Engineering, John Parish, our joint geofluvialmorphologist and Grahame Rice of this office. The purpose of the meeting was to establish a direction for detailed engineering design of the former C.B.I.C. property, and particularly as it relates to the form and function of the watercourse through this property and that of Mckinlay Transport. We identified a common objective to facilitate registration of Draft Plan 24T-75508 as a priority in the context of the Town's current Secondary Plan process for the Milton 401 Industrial Park.

We understand the detailed design of the watercourse will be in accordance with the criteria established by Philips Engineering in their report "Milton Urban Boundary Expansion Sub Watershed Planning Study Sixteen Mile Creek Watershed Areas 2 and 3. In this regard the ultimate belt-width is determined only on the basis of environmental and engineering requirements although, in due course, certain open space/recreational facilities might also be accommodated within the channel block to be dedicated. In association with John Parish we are initiating this detailed engineering design process as a priority and seek your assistance in the formal review of our submission by the various authorities.

In the meantime, it was agreed that Mr. Scheckenberger would formally recommend to Mr. Iovio the Scoped Sub-Watershed Study prepared by this office will not be finalized as its findings have already been incorporated, where appropriate, into the Philips reports and study

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recommendations. On this basis, the developer would not be seeking a credit against future Town Development Charges for this study work which it has financed to date.

Based on our informal discussions of the other Secondary Plan issues and to assist you and the Town's consulting team, we are submitting for review a (revised) Land-Use Concept Plan and Roads Plan which reflects our understanding of current municipal objectives relating to the James Snow Parkway extension as a "multi-purpose arterial" west of Regional Road 25 and a full interchange with Highway 401 in the vicinity of Dublin Line. I confirm that the major landowners (Snoek, Emery, Magna and Bales Holdings) are currently addressing the Town's challenge to establish an appropriate basis and location for a "high-tech" Business Park component within the overall Industrial Park. We will advise you of the outcome in the near future.

In a similar vein, as a priority I will review the notion of a District Park, as currently proposed, directly with Jennifer Reynolds with a view to reaching some consensus on its desirability and feasibility prior to any formal, public/political review process of a recommended Secondary Plan. In this regard, we understand there may be some revised scheduling of a formal Public Hearing and you will no doubt advise us of any changes in this regard.

Recognizing your own personal work timetable in the immediate future, I invite you to have your consultants respond to us directly with any comments they may have on this correspondence and enclosures. In the alternative, we are available on short notice to meet with you directly and address outstanding Secondary Plan issues.

Yours truly,

M. Welch M.C.I.P., R.P.P.
MGM Consulting Inc.

c/c Harry Snoek, Harry Snoek Limited
Ron Scheckenberger, Philips Engineering
John Parish

FOR DISCUSSION ONLY

LEGEND
Secondary Plan Designation

▨	Employment M1 Zoning
☐	Business Park M2 Zoning
▒	General Industrial M3 Zoning
■	Environmental Linkage Greenlands
• • • • •	Additional Restrictions on Uses & Open Storage for James Snow Parkway west of R.R. 25

PROPOSED LAND USE/ZONING

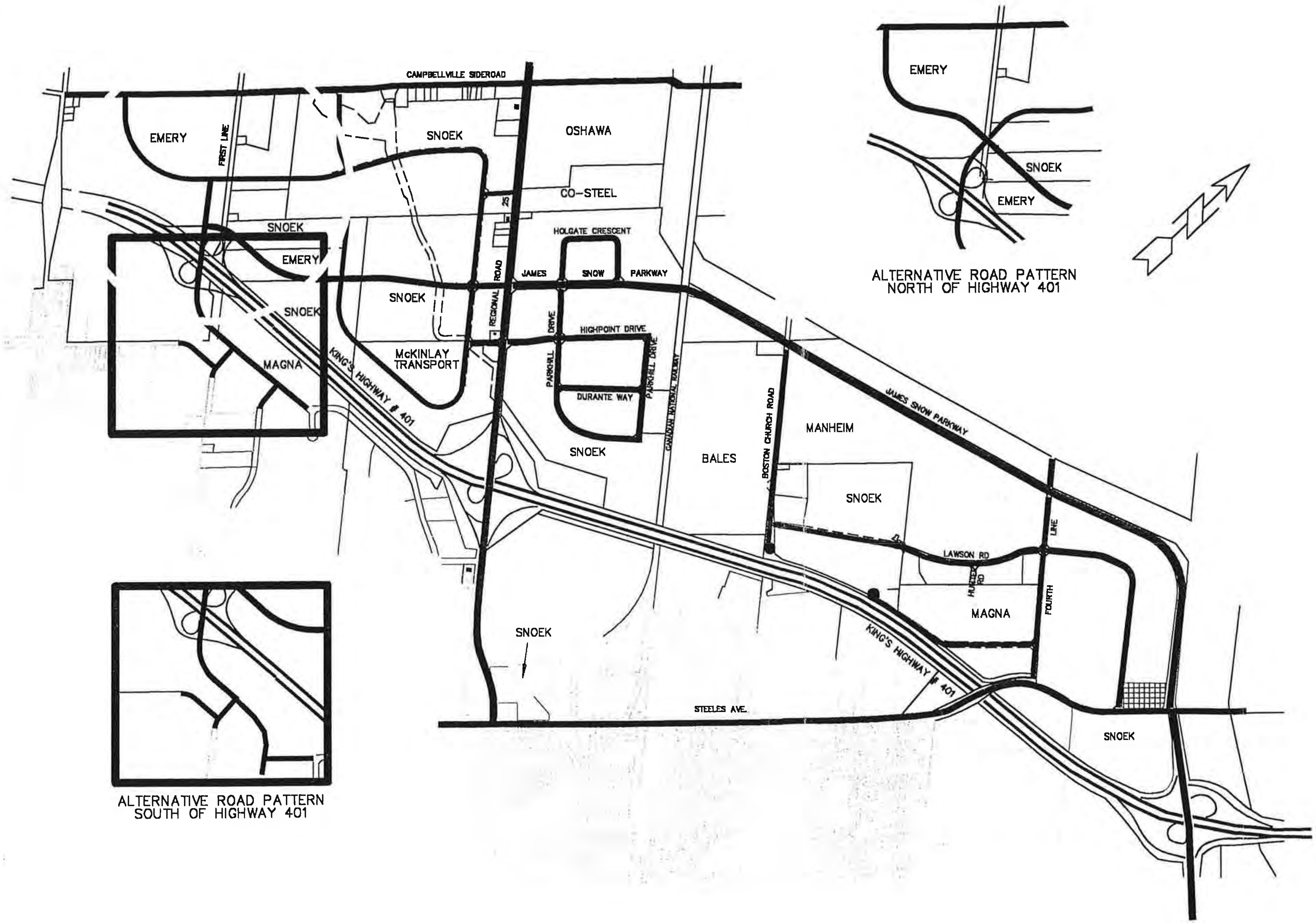
SCALE 0 100 300 500 m

PREPARED BY:

MGM CONSULTING INC.

PROJECT NO. 99001

January 7, 2000



FOR DISCUSSION ONLY

LEGEND

Arterial Road

Collector Road

PROPOSED ROADS

0 100 300 500 m
SCALE:

PREPARED BY:

MGM CONSULTING INC.

PROJECT NO. 99001 January 7, 2000

COSBURN PATTERSON MATHER

Consulting engineers to municipalities and the development industry

98053E

MEETING REPORT

Attendees: Martin Bateson, Town of Milton
Ron Schekenberger, Philips Engineering Ltd.
Paul Husson, Cosburn Patterson Mather
Dave Leighton, Cosburn Patterson Mather

Date of Meeting: January 10, 2000

Location: Philips Engineering Limited

Project: Bales Holdings

Project Number: 98687

Purpose: **Review Municipal Servicing Schemes Proposed in the Philips Engineering Studies for the Milton Industrial Secondary Plan**

Any omissions or errors in these notes should be forwarded in writing to the author immediately.

ACTION

1. R. Schekenberger provided an overview of the preferred municipal servicing and stormwater management identified in the Draft Functional Stormwater Management Strategy and Functional Water and Wastewater Servicing Report for the Highway 401 Industrial/Business Park specific to the Bales Property.

Water Supply

The existing system is well based and the new system will be Lake Ontario based. It is not clear if new development in the Secondary Plan will require the construction of the James Snow water tower. CPM

There is an existing 300 mm diameter watermain on Harrop Road that will be used to service the Bales land.

Sanitary

There is adequate capacity in the existing Harrop Road sanitary sewer to service the Bales land.

Stormwater Management

	ACTION
The retrofit of the existing farm pond to a permanent wetland stormwater management facility. The pond will service the Bales lands and a small drainage area from east of Boston Church Road. An approved report prepared for MI Developments in October 1998 identifies a small drainage directed to the future Bales stormwater management pond. Cosburn Patterson Mather will obtain a copy of the report from the Town of Milton.	CPM
R. Scheckenberger will provide clarification on the "Development Area Stormwater Management Assessment Summary- Milton St. Clair Lands" area discrepancies.	Philips
D. Leighton noted that the existing pond is approximately 6 metres deep and to create a wetland would require more earthworks than creating a wet pond. D. Leighton suggested a wet pond be proposed instead of a wetland. R. Scheckenberger stated that the wetland designation was to enhance the landscape corridor along Hwy 401. D. Leighton will review the merits of a wet pond versus and wetland and respond to Philips.	CPM
D. Leighton asked if there were any background studies prepared for the design of the existing sanitary sewer and watermain on Harrop Drive. R. Scheckenberger replied that there was very little design information on the existing infrastructure.	
M. Bateson stated that Phil Antoniow has been involved with the Industrial area for years and we should speak with him.	CPM
R. Scheckenberger and M. Bateson stated that Boston Church Road will ultimately be a 26 metre urban R.O.W and that 3 metres are required from the Bales property.	Bales
A future grade separation between James Snow Parkway and the CNR will be constructed and the appropriate land will be required from Bales to accommodate the grade separation. (James Snow will travel overtop of the CNR).	Bales
Prior to finalizing the stormwater management plan a soils investigation must be completed to determine if there are any opportunities for infiltration.	Bales
A DFO compensation plan will be required for development of the lands within the Secondary Plan area. The implementation will need to be discussed with the Town and Halton Region Conservation Authority.	CPM

Cc:
Terry Alexander, Bales Holdings
Lorelei Jones, Lorelei Jones and Associates

Ministry of Transportation
Ministère des Transports

Ontario

Phone: (416) 235-4269
Fax: (416) 235-4267
E-mail: mikolajc@mto.gov.on.ca

Central Region Operations
Corridor Management Office
1st Floor, Atrium Tower
1201 Wilson Avenue
Downsview, Ontario
M3M 1J8

January 18, 2000

Philips Planning
And Engineering Limited
P.O. Box 220
3215 North Service Road
Burlington, Ontario
L7R 3Y2

File# 6104.21

RECEIVED
PHILIPS ENGINEERING LTD.
JAN 27 2000
FILE NO. 99067A-10

Attention: Ronald B. Scheckenberger,

RE: Functional SWM and Environmental Management Plan (Draft)
Hwy 401 Industrial Business Park, Town of Milton.

Dear Sir:

We have completed our review of the Functional Stormwater Report (Draft) submitted in November 1999 and have following comments to offer:

- The development will take place along Highway 401 corridor. All stormwater management facilities must have a set back of 14m from the future Highway 401 property limits.
- Hydrologically, the flows at the culverts will have to be maintained at the pre-development levels, up to the 100 year level. It is expected that the detailed SWM report will contain details of hydrologic modelling for pre and post development conditions. Any diversions of flows between subwatershed areas will have to be approved by the conservation authorities.
- Hydraulically, details of the analysis to demonstrate that MTO culverts can convey post development flows up to the 100 year level with 1.0m freeboard have to be provided. The analysis must include inlet and outlet conditions.
- The Ministry is concerned about downstream impacts as a result of this future major development. We would require the calculations to demonstrate that there are no increases to flooding and erosion downstream.

The Consultant has indicated that there will be a final report issued after the Draft one. This Ministry must be circulated with the final report for our review and approval.

If you have any questions or require further clarification, please contact me at the number listed above at your earliest convenience.

Sincerely,

Margaret Mikolajczak

Margaret Mikolajczak, CET
Corridor Management Office

cc. Bill Mann Town of Milton
Susan Boot HE
Rick Ness CMO

CONSERVATION HALTON
PROTECTING THE NATURAL ENVIRONMENT FROM LAKE TO ESCARPMENT

2596 Britannia Road West
R.R.#2 Milton Ontario L9T 2X6
(905) 336-1158 Fax (905) 336-7014
Internet Address: www.hrca.on.ca E-mail: admin@hrca.on.ca

June 6, 2000

Mr. Bill Mann
Town of Milton
43 Brown Street
Milton, Ontario
L9T 5H2

Dear Mr. Mann:

Re: Draft Functional Stormwater and Environmental Management Strategy Highway 401 Industrial/Business Park Secondary Plan Area Town of Milton

Staff of Conservation Halton have reviewed the above noted draft document, dated March 2000, and offer the following comments. Staff apologize for the delay in sending comments.

Highlighted in Section 6.1

Section 3.2 provides an assessment of the existing land use flow rate. Staff note that there is some increase in flow rate and that the management strategy suggests optimization of storage through site specific hydrological modeling in order to meet target flow rates. Staff of Conservation Halton support this requirement.

✓ On page 14 three tributaries are identified as requiring further flood line mapping to be prepared. Staff question whether the second bullet should be "Tributary NW-2-G1" as NW-2-G2 and NW-2-G3 already have flood plain mapping prepared. In addition, the third bullet identifies the tributary downstream of MI Developments (south of Highway 401). Figure 1 of the report identifies this watercourse as EU-3-A.

✓ On page 18 there is a description of watercourse N-4-A. Within the description it is stated that the west fork of the north branch passes through a wetland. Staff recommend that this wetland be referred to as the Milton Heights Marsh.

The first paragraph on page 19 indicates that watercourse N-5-A, the Mansewood tributary, has been altered as part of the Milton Business Parks Development and that its location varies from that shown on the current base plan. Staff recommend that the base plan be modified to identify the existing location of the tributary.

Base plan modifications are not recommended nor would they be accurate without a survey; hence the digital plan has not been edited.

There are no watercourse descriptions for those watercourses in the existing urban (EU) area.

These were deemed rehab opportunities as development has already occurred.

With respect to the requirement for an Overall Fisheries Compensation Plan for the Milton 401 Secondary Plan Area, staff recommend that the Town may wish to consider the requirement for a

✓ comprehensive plan however, staff suggest that it may be appropriate to require a plan to be prepared for the watercourse that consists of N-4-A, N-2-E, NW-2-D and NW-2-G1. This watercourse has been identified on page 23 as a watercourse which has been previously altered and which could be improved through restoration of a natural channel form. Due to the fact that the majority of the lands surrounding these tributaries are currently undeveloped, the tributaries have been identified as fish habitat and contain redside dace, the future restoration of this reach will require a comprehensive approach which may best be served through the preparation of a Comprehensive Fisheries Compensation Plan. This may require further discussion between the Town, Conservation Halton and the Department of Fisheries and Oceans.

✓ The table on page 26 provides a terrestrial features and constraint summary for the north and north west development areas. The woodland comprised of Vegetation Units 174, 187 and 188 is identified as not having the potential for forest interior habitat. Vegetation Units 537(M), 538(AQ) and 287(W) are not identified on Figure 4. With respect to the Legend for this Table, under the heading "Linkage", staff recommend that the first square block should be darkened. Agreed

✓ The last bullet on page 27 identifies that significant plant species were encountered within the evaluated wetlands however, the table on page 26 suggests that no significant species were identified in the study area. This requires clarification.

✓ Section 3.8 summarizes the constraints and issues with the key general constraints listed on page 30. With respect to terrestrial constraints it is identified that Highway 401 is a barrier which prevents migration. Staff recommend that Highway 401 is a barrier which "impedes" migration. Certainly the highway restricts mammal and herpetofauna however, it does not affect most birds. With respect to stormwater constraints it is identified that some areas of increased infiltration potential (Area C ref. Figure 4), potential requirement to infiltrate 'clean' runoff. Area C on Figure 4 appears to incorporate most of the study area however the text seems to imply that only minor portions of the study area are affected by Area C. Some clarification on Figure 4 would be helpful as it relates to point (c) on page 31 within "Key Storm Servicing and Environmental Management Issues/Opportunities".

✓ Table 5.6 identifies terrestrial resources and linkage opportunities. Staff recommend that in the text above the table or within the table itself there should be reference to Figure 8. Also, within Table 5.6, the considerations listed under Development Area EU-11 are in italics. Is there are reason for the difference in font?

✓ Table 5.7 provides a summary of aquatic habitat considerations for the Milton North Area. Staff question which Figure the reference numbers (i.e., NW1) refer to.

Section 5.5 describes the Retrofit/Cash-in-Lieu decision process for areas which are partially developed, infill development or redevelopment. Conservation Halton has not accepted cash-in-lieu in the past for stormwater management however, staff would be supportive of the Town utilizing cash-in-lieu specifically for those areas as described above (i.e., partially developed, infill development, redevelopment). The application of this decision process would be done on a site by site basis. The stormwater infrastructure planning decision process is also outlined in Figure 10. Staff recommend that a meeting between the Town, Conservation Halton and Philips

✓ Engineering may be appropriate in order to ensure that the approval agencies are clear on how the recommendation for retrofit and cash-in-lieu apply to existing registered subdivision with partial or redevelopment.

Most recent MSH figure used

Figure 3, Proposed Land Use Plan, watercourses EU-3-A and N-3-B should be shown as a Greenlands A Area as the watercourse is fill regulated by Conservation Halton and will most likely not be eliminated, especially south of Lawson Road, as there are existing plans for the construction of an on-line stormwater facility between Lawson Road and Highway 401.

✓ Figure 4, Constraint Plan, within the Legend, the two symbols for fisheries – high constraint and fisheries-medium constraint are the same.

✓ Figure 8, Opportunities Plan, staff question why some of the terrestrial units are not numbered.

Figure 9, there is an existing stormwater quantity facility at the corner of Industrial Drive and Steeles Avenue which is not identified on the plan. The function of this facility should be confirmed with the Town. As noted in the text of the report, there may be potential for retrofitting the channels within the existing urban area of Milton. These opportunities should also be highlighted on Figure 9.

Opportunities shown on Figure 8

We trust the above is of assistance. If you have any further questions, please contact Jennifer Lawrence, Environmental Planner (ext. 235).

Yours truly,

JLawrence.

for Robert Edmondson
Director, Watershed Management Services

cc: Mr. Ron Scheckenberger, Philips Engineering, fax: 335-1414
Ms Ruth Victor, Region of Halton, fax: 825-8822
Ms Jennifer Thomas, DFO, fax: 336-4819
Mr. Warren May, MNR, fax: 1-905-713-7361
Ms Elizabeth Howson, Macaulay, Shiomi, Howson Limited, fax: 1-416-487-5489

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APPENDIX B

HYDROLOGIC MODEL PARAMETERS

APPENDIX B
Summary of Modeled SWM Facility Characteristics

Development Area: 875 529 Ontario
Reservoir Reference: s33 - Subarea 2044

Elevation (m)	Volume (m^3)	Discharge (m^3/s)
0	0	0
1	4375	0.0323
2	9666	0.3341
3	11366	0.4768
4	11367	10

Development Area: High Point (East of Regional Road 25) - Subarea 2022 and 2042
Reservoir Reference: s36 - Existing Facility Retrofit for Erosion Control

Elevation (m)	Volume (m^3)	Discharge (m^3/s)
0	0	0
0.5	6114	0.07
0.71	10000	2.06
0.9	14860	2.55
1.2	23120	3.16
1.5	32060	3.72
1.8	41680	4.76
1.96	47000	5.44
2.4	62980	7.65
2.63	71800	8.95
3	87000	11.68
3.25	97400	15.5
3.5	100000	50

Development Area: Emery Investments (Subarea 2025)
Reservoir Reference: s40

Elevation (m)	Volume (m^3)	Discharge (m^3/s)
0	0	0
1	5938	0.075
2	13121	0.7755
3	15429	1.107
3.5	15430	30

Development Area: High Point West (Draining to South)
Reservoir Reference: s34

Elevation (m)	Volume (m^3)	Discharge (m^3/s)
0	0	0
0.05	15690	0.12
0.1	34670	1.22
0.2	40770	1.74
0.3	40780	30.08

Development Area: High Point West (Draining to South)
Reservoir Reference: Spill Assumptions based on (HEC-2) calculations

Elevation (m)	Volume (m3)	Discharge to culvert (m3/s)	Discharge to South (m3/s)
0	0	0	0
1	2710	0.25	0
2	2720	0.5	0
3	2730	0.75	0
4	2740	1	0
5	2860	2.5	0
6	3340	5	0
7	3910	7.5	0
8	4490	10	0
9	5530	14.98	0.02
10	6460	19.47	0.53
11	7640	25.77	4.23
12	8040	27.16	12.84
13	15310	27.48	32.52

Development Area: High Point West (west of Regional Road 25) - Subarea 2040
Reservoir Reference: s35 - Subarea 2040 sized to provide erosion control storage only

Elevation (m)	Volume (m^3)	Discharge (m^3/s)
0	0	0
1	11979	0.1023
2	11980	10

Development Area: MI Developments (Subarea 2027)
Reservoir Reference: s38 - as per MI Developments SWM Report (Thornburn Penny, 1998)

Elevation (m)	Volume (m^3)	Discharge (m^3/s)
0	0	0
1	5	0.44
2	14200	1.2
3	28670	1.32
4	62250	2.44
5	62260	30

Development Area: MI Developments (Subarea 2032)
Reservoir Reference: s39 - Proposed Quantity facility - modeled as per MI Developments SWM Report (Thornburn Penny, 1998)

Elevation (m)	Volume (m^3)	Discharge (m^3/s)
0	0	0
1	5550	0.25
2	8000	1
3	8010	10

Development Area: Milton St. Clair (Bales) - Subarea 2031
Reservoir Reference: s37 - Subarea 2031 - modeled as two SWM facilities with Area 2030

Elevation (m)	Volume (m^3)	Discharge (m^3/s)
0	0	0
1	4878	0.0352
2	10779	0.3641
3	12675	0.5197
3.5	12676	30

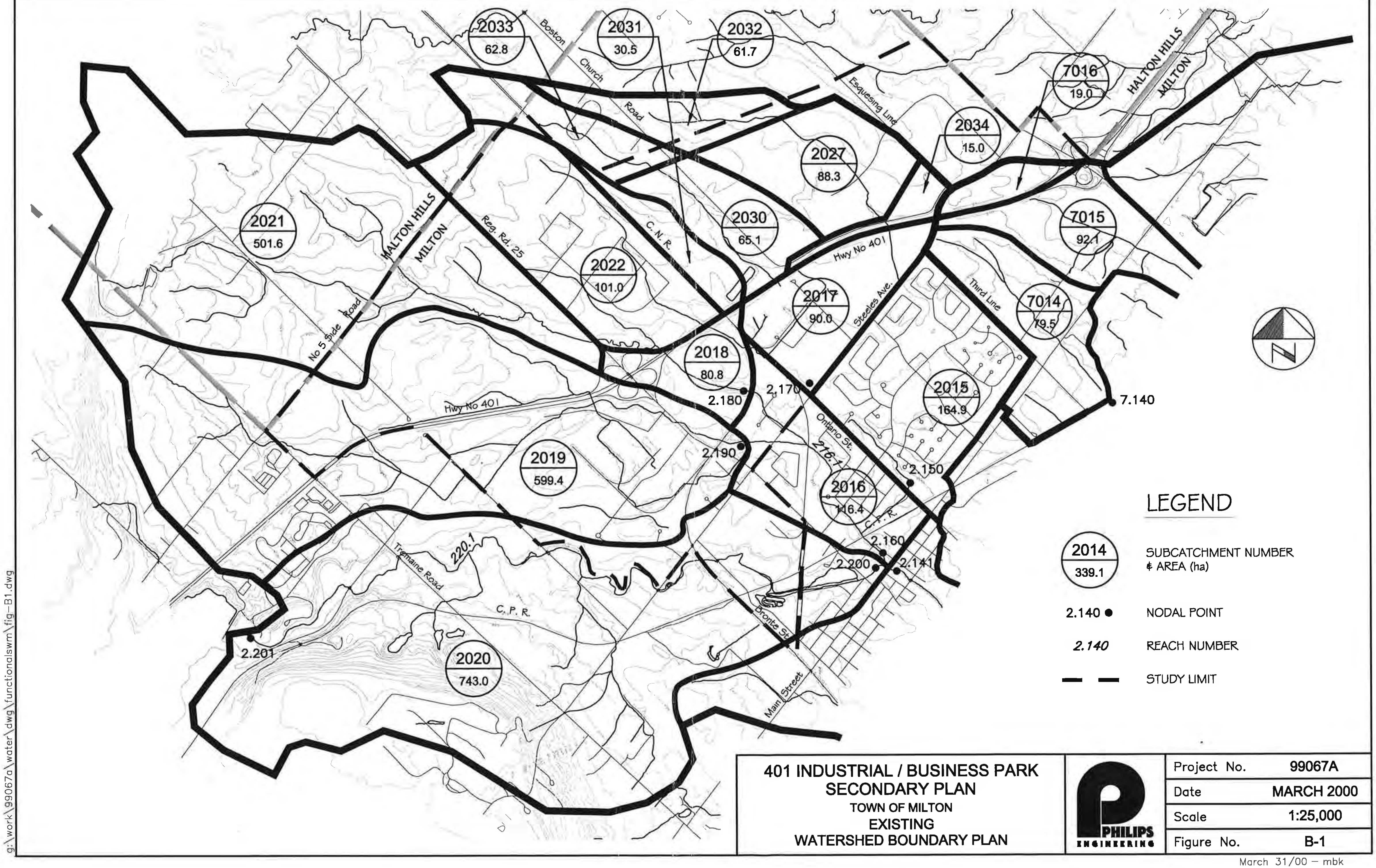
Development Area: Milton St. Clair (Bales) - Subarea 2030
Reservoir Reference: s37 - Subarea 2030 - modeled as two SWM facilities with Area 2031

Elevation (m)	Volume (m^3)	Discharge (m^3/s)
0	0	0
1	7918	0.1384
2	17495	1.4306
3	20572	2.042
4	20573	10

Milton Industrial/Business Park Secondary Plan

Future Land Use - Impervious Coverage/Land Use Assumptions for HSP-F Model

Catchment	Total Area (ha)	Area by Land Use (ha)--Revised Land Use Plan									Impervious Area (ha)	Pervious Area (ha)	Percent Change in Impervious Coverage
		Industrial	Industrial Business Park	Employment	Business Park	Institutional	Roads	Residential	401 Corridor/ Interchanges	Undeveloped			
2025	43.84	8.55	0	0	23.59	0	1.56	0	0	10.14	25.37	18.47	4.22
2024	98.57	45.59	0	19.79	22.41	0	8.78	0	0	2	68.52	30.05	0.46
2027	105.72	66.36	0	0	18.01	0	17.08	0	0	4.27	75.84	29.88	18.89
2030	43.80	20.28	0	0	19.54	0	3.98	0	0	0	32.43	11.37	9.44
2031	29.36	16.28	0	0	9.12	0	2.54	0	1.42	0	21.30	8.06	19.64
2034	15.05	0	0	0	6.09	0	0.61	0	8.25	0.1	10.13	4.92	21.27
2040	85.22	32.72	0	5.57	26.44	0	6.47	0	0	14.02	52.31	32.91	7.05
2022	99.04	47.03	0	11.56	15.78	0	7.44	0	0	17.23	58.71	40.33	8.35
2042	76.78	36.37	0	6.41	0	0	5.28	0	2.64	26.08	36.22	40.56	2.09
2044	26.94	24.49	0	0	0	0	2.45	0	0	0	19.10	7.84	13.40
2045	15.66	5.36	0	0	0	0	0.54	0	0	9.76	4.48	11.18	-35.58



401 INDUSTRIAL / BUSINESS PARK SECONDARY PLAN

TOWN OF MILTON

EXISTING
WATERSHED BOUNDARY PLAN

PHILIPS ENGINEERING

Project No.	99067A
Date	MARCH 2000
Scale	1:25,000
Figure No.	B-1

March 31/00 – mbk

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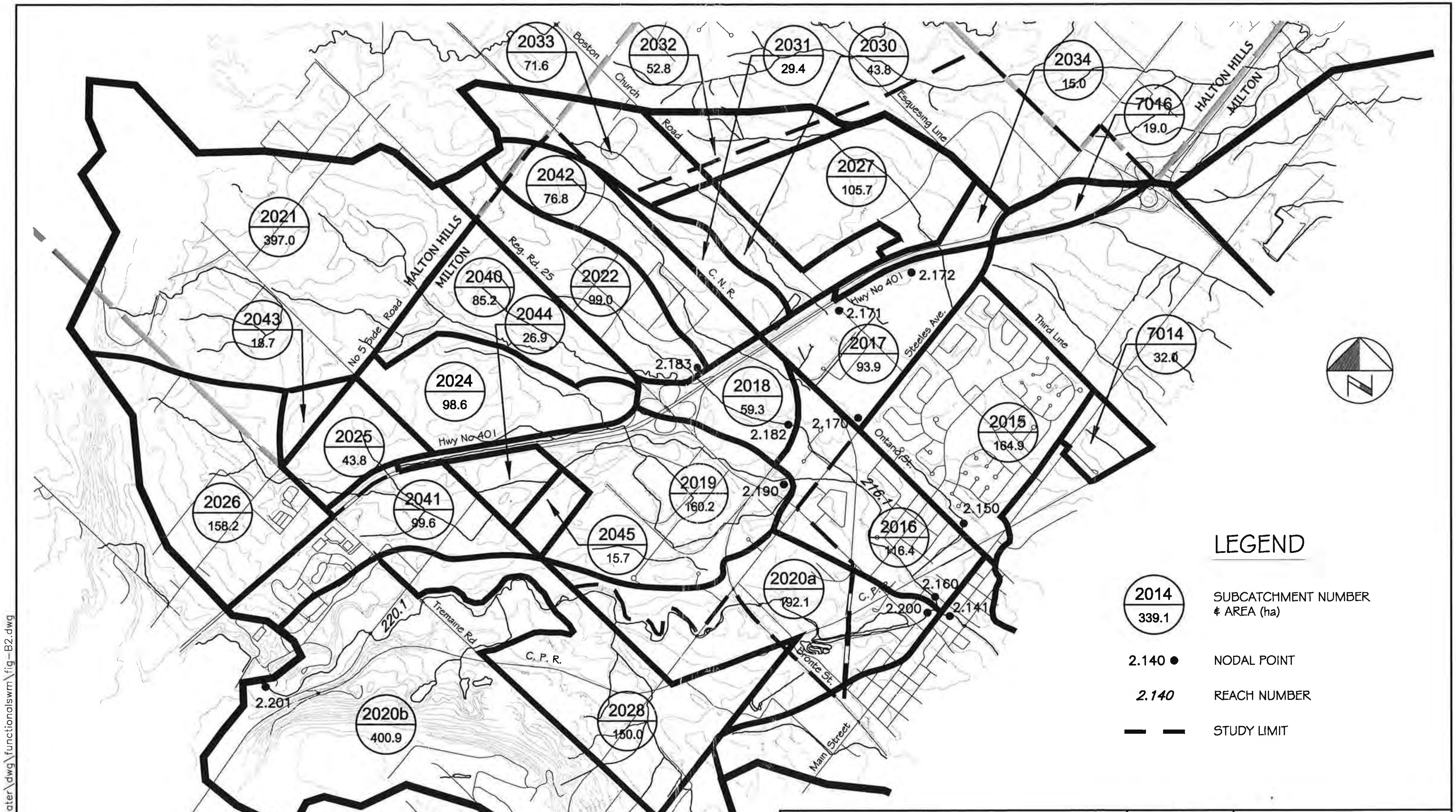

401 INDUSTRIAL / BUSINESS PARK
SECONDARY PLAN
TOWN OF MILTON
FUTURE
WATERSHED BOUNDARY PLAN

PHILIPS
ENGINEERING

Project No.	99067A
Date	MARCH 2000
Scale	1:25,000
Figure No.	B-2

March 31/00 – mbk

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APPENDIX C

PRELIMINARY COST ESTIMATES FOR STORMWATER MANAGEMENT INFRASTRUCTURE

APPENDIX C

Preliminary Cost Estimate for Stormwater Management Infrastructure

A preliminary Cost Estimate has been completed for Communal Stormwater management infrastructure required for the 401 Industrial/Business Park Secondary Plan. The cost estimate has been broken down as follows:

(a) Storm Sewer Systems
(b) Stormwater Management Facilities
(c) Culverts
(d) Tributary N-2-B - Watercourse Relocation/Reconstruction
(e) Retrofit of the Existing High Point Facility

Storm Sewer Systems

Cost sharing for storm sewer systems is typically determined based on the magnitude of oversizing required to convey excess flows from upstream areas through the development areas. In order to accurately determine these costs, more detailed plans which specify the internal road and storm sewer locations, and the proposed method of conveying flow for lands upstream of the Secondary Plan must be known. Hence, at this time preliminary cost estimates are not available. In lieu of cost estimates, perhaps the method of cost allocation could be defined.

Stormwater Management Facilities

A preliminary estimate of SWM facility cost has been provided based on a volumetric unit cost approach. This unit cost includes provisions for:

- Outfall structures
- Facility excavation
- Landscaping and Stabilization Costs
- 25% Engineering and Contingency

The cost for individual facility construction will vary based on a number of factors including:

- Facility type
- Depth of Excavation
- Landscaping requirements
- Local topography

Table C.1 provides a summary of the expected SWM Facility Costs (ref. Figure 9)

TABLE C.1
PRELIMINARY ESTIMATE OF SWM FACILITY COSTS

Facility Reference (Development Area)	Facility Type	Development Area (ha) (ha)	External Area (ha)	Total Storage (m^3)	Estimated Construction Cost including 25% Engineering and Contingency ($)	Estimated Facility Footprint Area (ha)	Estimated Land Cost [1.] ($)	Estimated Total Cost ($)
s40 (Emery Investments)	Wetland	41.4	20.5	20993	$524,819	1.6	$202,193	$727,012
s34 (Highpoint West)	Wetland	105.0	0.0	45241	$1,131,027	3.7	$461,700	$1,592,727
s35 [Highpoint (West)]	Wetland	85.2	0.0	11979	$299,475	1.0	$125,000	$474,475
s36 (Existing Pond)	Wet pond (retrofit)	161.0	11.0	Cost of Retro-it or New Facility within the upstream development is subject to further detailed assessment Total Cost of retrofitting would be based on outlet structure modifications and local slope grading/revegetation along the existing facility perimeter				
s37 (Milton St. Clair)	Wetland	78.2	71.6	36691	$917,287	1.9	$236,175	$1,153,462
s38 (MI Developments)	Wet pond	105.7	51.3	This development and SWM facility expansion has been previously approved				
s33(857529 Ont)	Wetland	23.0	5.0	10728	$268,206	1.5	$187,550	$455,756
s42(To Phase 1 Area)	Wetland	19.0	0.0	10393	$259,825	0.7	$87,638	$347,463
Totals		**623.3**	**159.4**	**161027**	**$4,025,686**	**14.1**	**$1,758,005**	**$5,783,692**

Note: 1. Based on $125,000/ha

Culvert/Bridge Crossings

Culvert/bridge crossings would be required along the tributary watercourse N-2-B which traverses the High Point Development Site West of Regional Road 25 (ref. *Figure 4 - Draft - Functional Stormwater Environmental Management Strategy Report, Philips Planning and Engineering, November, 1999)*. The proposed crossing would essentially all be new structures required for internal subdivision access, or those required for the James Snow Parkway.

No upgrades or replacement of culverts, due to insufficient hydraulic capacity have been identified through the Functional Stormwater and Environmental Management Planning Process (i.e. specifically at Highway 401 and Regional Road 25).

As such, the cost of culvert/bridge crossings is proposed to be accounted for as follows:

- As part of James Snow Parkway construction
- As land use plans are developed cost sharing for internal access can be determined between various participating landowners.

Tributary N-2-B - Watercourse Relocation/Reconstruction

A preliminary cost estimate for the proposed watercourse reconstruction of Tributary N-2-B has been developed based on the Design Plan (MGM Consulting/Parish Geomorphic, Feb 2000), for the section of stream from Regional Road 25 to approximately 300 metres north of the Proposed James Snow Parkway (1000 metres), as well as estimated proposed channel form for the section of the watercourse upstream to Campbellville Sideroad (650 metres).

The Cost Estimate has been based on the following assumptions:

- Channel/ and flood Plain would be fully excavated (i.e. relocated channel)
- Earthworks, Stabilization, and Landscaping costs have been included
- Cost of Bankfull channel construction of $ 200/m has also been included

Based on these assumptions the following preliminary cost estimate has been developed as outlined in Table C.2

TABLEC.2
SUMMARY OF PRELIMINARY CHANNEL COST ESTIMATE

Location/Type	Typical Depth	Total Width (including Side Slopes) (m)	Channel Length (m)	Estimated Land Requirement (ha)	Full Channel Unit Cost ($/m)	Estimated Total Construction Cost including 25% Engineering and Contingency ($)	Estimated Land Cost [1] ($)	Estimated Total Cost ($)
Region Road 25 to Internal Rd 1 (Coventry Drive)	3.5	49	310	1.519	1,707	$575,922	$135,625	$711,547
Internal Rd 1 (Coventry Drive) to J S Pkwy	2.5	45	340	1.53	1,346	$486,094	$148,750	$634,844
J S Pkwy to 350 m u/s	1.5	36	350	1.26	902	$323,750	$131,250	$455,000
350 m u/s of JS Pkwy to Campbellville Sideroad	1.5	31	650	2.015	798	$535,234	$203,125	$738,359
Totals			**1,650.0**			**$1,921,000**	**$618,750**	**$2,539,750**

Note: 1. Based on $125,000/ha

Retrofit Cost Estimate

An estimated cost of retrofitting the existing facility to provide stormwater quality and erosion control has been completed based on the following:

- Land cost of $125,000/ha – estimate 0.5 hectares required
- Excavation cost of $10.00/m^3 - approximately 14,000 m^3 required
- Revegetation cost of $20.00/m^2 - approximately 5000 m^2 required
- Outlet alterations - estimated to be $50,000

Based on the foregoing the total cost of retrofitting the existing facility has be estimated to be $352,000 plus engineering and contingencies.

Appendix A1.iii

Background

Natural Heritage Constraints Memo for Town Initiated Official Plan Amendment (Dougan, March 2021)

DOUGAN & ASSOCIATES
ECOLOGICAL CONSULTING & DESIGN
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March 24, 2021

To: Jill Hogan

Town of Milton
150 Mary Street
Milton, Ontario
L9T 6Z5

RE: Natural Heritage Constraints Memo for Town Initiated Official Plan Amendment Milton 401 Industrial/Business Park Secondary Plan - North Porta Lands

Dear Ms. Hogan:

Thank you for retaining Dougan & Associates (D&A) to conduct a natural heritage screening as part of the above-referenced Town-initiated Official Plan Amendment (OPA). This memo summarizes our findings from the background and policy review, and scoped roadside assessment.

INTRODUCTION & SITE CONTEXT

The subject lands are located in Milton, comprising approximately 150 ha. The lands are bounded in the south by James Snow Parkway, CN Railway to the west, No. 5 Side Road to the north, and the Sustainable Halton Plan (SHP) Urban Area Boundary to the north and east in the Town of Milton. The lands are primarily comprised of Agricultural land cover, with limited woodland, wetland, hedgerows and watercourses (permanent and intermittent) present on the landscape. Adjacent land use to the north and east is agricultural, and industrial to the south and west. The subject lands are targeted for post-2021 development.

This memo was prepared in support of a proposed Town-initiated Official Plan Amendment (OPA) that would adjust the boundary of the Milton 401 Industrial/Business Park Secondary Plan to include the subject lands. According to the Town's RFP for this assignment: "The amendment would guide future development within the Subject Lands in a comprehensive manner by establishing the appropriate local land use designation as part of the Milton 401 Industrial/Business Park Secondary Plan."

The objectives of this study were to identify Key Natural Heritage Features, Significant Species and Significant Wildlife Habitat (SWH) on the subject lands and adjacent 120 m (i.e. 'the study area') and determine next steps.

METHODS

REVIEW OF EXISTING DATA

D&A collected and consolidated existing natural heritage data for the subject lands, including:

- NHIC (Natural Heritage Information Centre) tracked species records;
- Watercourses (Ontario Hydro Network);
- Ecological Land Classification (ELC) vegetation communities (Conservation Halton);
- Wooded Areas (MNRF (Ministry of Natural Resources and Forestry));
- Provincially mapped wetlands (LIO);
- Conservation Halton regulation floodplain and regulation mapping; and
- Region of Halton Official Plan (ROP) Map 1G.

Available spatial data was compiled into a comprehensive Geographical Information System (GIS) database with appropriate attribute information and metadata. Vegetation community mapping acquired from Conservation Halton was only available for adjacent lands, therefore ELC communities were reviewed via aerial photography interpretation and confirmed where possible during a roadside visit.

POLICY REVIEW

The following natural heritage information and policy was reviewed, in accordance with the RFP:

- Planning Act, R.S.O, 1990, c. P.13, as amended June 6, 2019; Provincial Policy Statement, 2020;
- A Place to Grow – Growth Plan for the Greater Golden Horseshoe Growth Plan, 2020;
- Greenbelt Plan, 2017;
- Region of Halton Official Plan, 2016;
- Town of Milton Official Plan; and
- Conservation Halton Regulations and Revised Floodplain Mapping.

Applicable policy areas and designations were overlain onto a map of the subject lands to present the policy constraints, and potential areas for opportunity, within the study area. Relevant and applicable policies are discussed in the findings section.

SITE VISIT

A roadside assessment of the subject lands was undertaken on March 10th, 2021. The main objective of the roadside assessment was to confirm the presence and extent of vegetation cover and features identified via background mapping and policy review.

NATURAL HERITAGE CHARACTERIZATION & CONSTRAINTS

Characterization of the subject lands was carried out based on the background and policy review, and subsequent roadside assessment.

POLICY FRAMEWORK

The following is a summary of site implications related to the policies and/or designations that apply to the subject lands. For a summary of each policy, please refer to Appendix A.

Planning Act, R.S.O, 1990, c. P.13, as amended June 6, 2019; Provincial Policy Statement (2020)

In accordance with section 2.1.8, development and site alteration on adjacent lands to natural heritage features identified in Section 2.1.4, 2.1.5 and 2.1.6 are not permitted unless there has been an evaluation of the ecological function of the adjacent lands and it has been demonstrated that there will be no negative impacts on the natural features or on their ecological functions.

A Place to Grow – Growth Plan for the Greater Golden Horseshoe Growth Plan (2020)

Section 4.2.2 of the Plan focuses on the *Natural Heritage System for the Growth Plan,* which has been provincially mapped to support long-term planning. It is important to note that the *Natural Heritage System for the Growth Plan* excludes lands within *settlement area* boundaries that were approved as of July 1, 2017. Policies under section 4.2.2.3 relate to permitted uses within the *Natural Heritage System for the Growth Plan.* Section 4.2.4 identifies policies regarding development proposals for lands that are adjacent to (i.e. within 120 m of) key natural heritage and key hydrologic features. Proposals for development or site alterations within 120 m of these features require a natural heritage evaluation of hydrologic evaluation that identified an appropriate vegetation protection zone (VPZ). Certain exceptions to this requirement are provided in sections 4.2.4.4 and 4.2.4.5.

Greenbelt Plan (2017)

The property is partially located within the Protected Countryside boundaries of the Greenbelt, specifically associated with the natural feature present along the northern boundary of the subject lands, east of Boston Church Road (ref. Map 1). Certain policies apply relating to the natural heritage features present on and adjacent to the property. Any future development proposal within 120m of the key natural heritage features within the Protected Countryside require a natural heritage evaluation and hydrologic evaluation to identify an appropriate vegetation protection zone (VPZ) that protects the existing features from the impacts of the change. Within the Greenbelt Plan area, these VPZ buffers are required to be at least 30m from the edge of significant natural features, including woodlands and wetlands.

As per section 3.2.4 of the Plan, no development or site alteration is permitted within the VPZ, and further, this area must be established and maintained as natural self-sustaining vegetation.

Region of Halton Official Plan (ROP, 2016)

Section 77(5) of the ROP require the Town to prepare an area-specific plan for the Subject Lands in order to permit future development to occur on the lands.

Section 118 of the ROP requires municipal OPs, Zoning By-laws, and certain other planning studies to recognize the RNHS, and protect Key Features. Section 118.2 reinforces that development and site alteration is not permitted within components of the RNHS unless it has been demonstrated that there will be no negative impacts to the natural features and areas, or their functions. Section 118.3 describes the purpose and requirements of an EIA (Environmental Impact Assessment) for proposed site alterations or developments within 120 m of the RNHS.

According to Map 1G of the ROP, the following components of the RNHS are currently mapped within and/or adjacent to the subject lands (ref. Map 1):

- Key Features;
- Enhancement Areas, Linkages and Buffers; and
- Prime Agricultural Areas in NHS Enhancements, Linkages, Buffers.

Town of Milton Official Plan

The Subject Lands are identified as Agricultural Area on Schedules A & B of the Town's OP (2008). The drainage features that traverse the study area are mapped as watercourses. Greenlands A run along the eastern boundary of the site. Per section 4.8.1.3, general setbacks of 7.5 m from stable top of channel bank or 15 m from stable top of valley bank, whichever is greater, is required for any proposed development unless a more appropriate setback is determined through an EIA or SWS. Agricultural Area policies are described in section 4.4, aimed at recognizing and protecting Milton's agricultural industry.

The Town of Milton OPA #31 identified the subject lands as being incorporated into the Region's SHP (Sustainable Halton Process) Urban Areas designation under ROPA 38. For future development to proceed in these lands, the Town's OP sets out policies under sections 5.4.3.2 and 5.4.3.3 that require the preparation of a Secondary Plan as part of a comprehensive area-specific planning exercise. The ROP also sets out policies in section 77(5) requiring the completion of an area-specific plan.

Conservation Halton Regulations and Revised Floodplain Mapping

Conservation Halton's regulation limits are shown on Map 1 and correspond generally with Key Features mapped in the ROP. Conservation Halton (CH) is authorized under Section 28 of the Conservation Authorities Act to implement and enforce the Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses (Ontario Regulation 42/06). Permits are required to identify potential interference in areas within the 100-year floodline, 15 metres of the shoreline, 15 metres within a valley's top of bank, hazard lands, 120 metres around all PSWs and ELC wetlands greater than 2 ha, and 30 metres around ELC wetlands greater than 0.5 ha.

SUMMARY OF NATURAL HERITAGE CONSTRAINTS

Based on the desktop review and windshield assessment, the subject lands and 120 m adjacent lands (i.e. the study area) contain the following natural heritage features:

- Key Features (Wetlands and Woodlands;
- Hedgerows;
- Watercourse, regulated floodplain and Headwater Drainage Features (HDFs);
- Significant Species; and
- Significant Wildlife Habitat (SWH).

These features are described below.

Key Features

Key Features of the RNHS within the study area include woodlands and wetlands (Map 1) as described below.

- **Polygon 1** is located east of Boston Church Road along the northern boundary of the subject lands, primarily outside of the study area. It is over 1390 ha in size, of which 8.75 ha are located in the study area. In addition to being an RNHS Key Feature, it is within the Greenbelt Plan Area, designated by MNRF as a Wooded Area, and contains CH regulated wetlands (mapped as Deciduous Swamp by CH). The CH Approximate Regulation Limit extends into the subject lands. Less than 0.02 ha of this Key Feature are located within the subject lands proper (<0.001% of the feature). The roadside visit confirmed that the section of woodland closest to Boston Church road was comprised of predominantly young growth including upland species such as American Beech (*Fagus grandifolia*), Shagbark Hickory (*Carya ovata*), Sugar Maple (*Acer saccharum*), American Basswood (*Tilia americana*) and Bur Oak (*Quercus macrocarpa*).

- **Polygon 2** is a small (approximately 0.12 ha), isolated wetland located in the northeast portion of the subject lands. This community appears to be Meadow Marsh (MAM) based on orthoimagery interpretation. It is located outside of the Greenbelt but mapped as a Key Feature in the RNHS and identified as a CH regulated feature. It does not appear to be associated with an HDF or watercourse. This feature was unable to be studied during the roadside assessment because of its distance to the road.

- **Polygon 3** is located directly north of Polygon 2. It is also a small (approximately 0.25 ha) and isolated feature that appears to be Meadow Marsh. Similar to Polygon 2 it is located outside of the Greenbelt but is mapped as a Key Feature in the RNHS and identified as a CH regulated feature. Most of this feature is located on adjacent lands within the study area; only 7.3% is located on the subject lands proper. It does not appear to be directly associated with an HDF or watercourse. This feature was unable to be studied during the roadside assessment because of its distance to the road.

Hedgerows

The hedgerows within the study area are provincially mapped by MNRF as Wooded Area but are not included as components of the RNHS. During the site visit, hedgerows were noted to be composed of mature trees with a shrub understory. Species recorded from the roadside included American Ash (*Fraxinus americana*), Bur Oak, American Basswood and Manitoba Maple (*Acer negundo*). More species are likely present but could not be viewed from the roadside. Shrubs observed included Common Buckthorn (*Rhamnus cathartica*), Gray Dogwood (*Cornus racemosa*) and Hawthorn (*Crataegus sp.)*

Watercourse, Floodplain and Headwater Drainage Features (HDFs)

The Sixteen Mile Creek is present north of the subject lands, along with CH-regulated floodplain and meander belt hazard lands. There are drainage features present on the east and west sides of Boston Church road that run generally north-south through the subject lands and appear to carry water from the Employment Lands to the south. The roadside visit in March 2021 confirmed that the HDFs on the east and west sides of Boston Church road appear to be intermittent, although some sections may be wet all year which is indicated by the presence of Cattails (*Typha sp.*).

The presence of bed and bank definition within these features may be attributed to anthropogenic intervention (e.g. cutting a drainage feature into the surface), or seasonally as spring freshet concentrates flows in depressions, causing channel development into surfaces lacking vegetated cover. The drainage features that bisect the subject lands are currently not identified as CH regulated features, and it is unclear whether fish may be found within these reaches. One of the drainage features is associated with polygon 1 (Map 1). An HDF assessment (HDFA) to determine management strategies has not yet been completed for these features.

Significant Species

A desktop review of available species records for the area was conducted to identify species that have important policy implications, including Species at Risk (SAR), species of conservation concern, and SWH indicator species. The NHIC (Natural Heritage Information Centre) database was queried on March 3, 2021 to acquire provincially tracked species records within approximately 1km of the subject lands. The results are provided in Table 1 identify species that were included in the query, and an interpretation of likelihood of occurring within the study area.

Table 1 Results of NHIC Query (March 2021)

Element Type	Common Name	Scientific Name	SRank	SARO Status	COSEWIC Status	Likelihood of occurring on subject lands
WILDLIFE CONCENTRATION AREA	Colonial Waterbird Nesting Area	*n/a*	-	-	-	Low
WILDLIFE CONCENTRATION AREA	Mixed Wader Nesting Colony	*n/a*	-	-	-	Low
SPECIES	Redside Dace	*Clinostomus elongatus*	S1	END	END	Low
SPECIES	Eastern Milksnake	*Lampropeltis triangulum*	S4	NAR	SC	Medium
SPECIES	Midland Painted Turtle	*Chrysemys picta marginata*	S4	-	SC	Medium
SPECIES	Snapping Turtle	*Chelydra serpentina*	S4	SC	SC	Medium
SPECIES	Wood Thrush	*Hylocichla mustelina*	S4	SC	THR	Low

Element Type	Common Name	Scientific Name	SRank	SARO Status	COSEWIC Status	Likelihood of occurring on subject lands
SPECIES	Eastern Meadowlark	*Sturnella magna*	S4	THR	THR	Medium
SPECIES	Bobolink	*Dolichonyx oryzivorus*	S4	THR	THR	Medium
SPECIES	Butternut	*Juglans cinerea*	S2	END	END	Medium
SPECIES	Narrow-leaved Puccoon	*Lithospermum incisum*	S1	-	-	Low

The majority of species identified through the NHIC query are likely to occur in the RNHS north of the subject lands associated with the Middle Tributary of Sixteen Mile Creek. Rationale for each species' likelihood of occurring on the subject lands or adjacent 120 m is provided below.

The Wildlife Concentration Areas for Colonial Waterbird Nesting Area and Mixed Wader Nesting Colony are unlikely to occur on the subject lands. These concentration areas would require large swaths of wetland which may be present within the RNHS associated with Sixteen Mile Creek to the north.

Redside Dace is found in pools and slow-moving areas of small streams and headwaters with a gravel bottom, often with overhanging riparian vegetation (MECP, 2021). It is highly unlikely to occur in the drainage features on site but may occur in Sixteen Mile Creek to the north.

Eastern Milksnake can be found in a variety of natural or human-altered environments including open fields, rocky hillsides and forests. Given the proximity of the subject lands to the extensive forested habitats to the north, this species may occur on the subject lands. This species is no longer considered At Risk in Ontario and is listed as Special Concern federally.

Midland Painted Turtle and Snapping Turtle are likely to be associated with Sixteen Mile creek and associated marsh / open wetlands present northwest of the subject lands. It is possible that these species could nest within the agricultural lands on the subject lands. It should be noted that Midland Painted Turtle is only considered Special Concern at the federal level.

Wood Thrush are forest interior birds that typically nest, breed, and forage within relatively large forested habitat. This species is unlikely to be found on the subject lands, but likely occurs in the RNHS woodlands to the north.

Eastern Meadowlark and Bobolink are both open country bird species that breed, nest and forage in large patches of meadow or grasslands. The subject lands and adjacent 120 m appear to be actively cropped and maintained as agricultural land, which does not provide suitable habitat for these species. Eastern Meadowlark and Bobolink may be observed foraging or flying over the subject lands due to the presence of suitable habitat nearby, although it is highly unlikely that they would breed or nest on site or on immediately adjacent lands.

Butternut can be found in a variety of habitats, including along hedgerows. It is possible that Butternut exists on site and/or on adjacent lands.

Narrow-leaved Puccoon is a perennial flower that inhabits dry sandy or rocky soil common in prairie, savanna, or rocky outcrop habitats. Suitable habitat for this species does not exist on the subject lands or adjacent lands.

Significant Wildlife Habitat

The habitats on site were screened against the SWH categories contained within the Significant Wildlife Habitat Technical Guide (OMNR 2000) and the Significant Wildlife Habitat Criteria Schedules for Ecoregion 7E (OMNRF 2015). In total, 11 candidate SWH categories were identified in the study area including:

Seasonal Concentration Areas of Animals

- Bat Maternity Colonies – adjacent lands only
- Turtle Wintering areas – adjacent lands only
- Reptile Hibernaculum – subject lands and adjacent lands
- Colonially Nesting Bird Breeding Habitat (Trees/Shrubs) – adjacent lands only

Specialized Habitat for Wildlife

- Turtle Nesting Areas – subject lands and adjacent lands
- Seeps and Springs – adjacent lands only
- Amphibian Breeding Habitat (Woodland) – adjacent lands only
- Amphibian Breeding Habitat (Wetland) – subject lands and adjacent lands

Habitats for Species of Conservation Concern:

- Terrestrial Crayfish – subject lands and adjacent lands
- Special Concern and Rare Wildlife Species:
    - Snapping Turtle – subject lands and adjacent lands
    - Monarch – subject lands and adjacent lands
    - Eastern Wood-Pewee – adjacent lands only
    - Wood Thrush – adjacent lands only

Animal Movement Corridors

- Amphibian Movement Corridors – adjacent lands only

The full SWH screening is provided in Appendix B.

POLICY/CONSTRAINTS REVIEW

KEY NATURAL HERITAGE FEATURES

As shown on Map 1, RNHS Key Features and Enhancements to Key Features are identified within the study area. The Key Features identified include woodlands and wetlands.

Section 276.5 of the ROP defines **significant wetlands** as:

> *(1) for lands within the Niagara Escarpment Plan Area, Provincially Significant Wetlands and wetlands as defined in the Niagara Escarpment Plan that make an important ecological contribution to the Regional Natural Heritage System;*
> *(2) for lands within the Greenbelt Plan Area but outside the Niagara Escarpment Area, Provincially Significant Wetlands and wetlands as defined in the Greenbelt Plan;*
> *(3) **for lands within the Regional Natural Heritage System but outside the Greenbelt Plan Area, Provincially Significant Wetlands and wetlands that make an important ecological contribution to the Regional Natural Heritage System** ; and,*
> *(4) outside the Regional Natural Heritage System, Provincially Significant Wetlands.*

Polygons 2 and 3 are small, isolated wetlands mapped as Key Features that are also regulated by CH. These wetlands are not Provincially Significant and are outside of the Greenbelt Plan Area; therefore they should only be considered Key Features if they make an important contribution to the RNHS.

Significant woodlands are defined in section 277 of the ROP:

> *277. SIGNIFICANT WOODLAND means a Woodland 0.5ha or larger determined through a Watershed Plan, a Sub-watershed Study or a site-specific Environmental Impact Assessment to meet one or more of the four following criteria:*
>
> > *(1) the Woodland contains forest patches over 99 years old,*
> > *(2) the patch size of the Woodland is 2 ha or larger if it is located in the Urban Area, **or 4 ha or larger if it is located outside the Urban Area but below the Escarpment Brow**, or 10 ha or larger if it is located outside the Urban Area but above the Escarpment Brow,*
> > *(3) the Woodland has an interior core area of 4 ha or larger, measured 100m from the edge, or*
> > *(4) the Woodland is **wholly or partially within 50 m of a major creek or certain headwater creek** or within 150m of the Escarpment Brow*

Polygon 1 is a contiguous forest / treed wetland greater than 4 ha that is associated with Sixteen Mile Creek (i.e. a major watercourse) and therefore meets at least two of the significance criteria under section 277, qualifying it as significant woodland.

SIGNIFICANT SPECIES

Based on the review of NHIC species records and available habitats on site, the following significant species may occur within the study area.

Endangered & Threatened species (protected under the provincial ESA, 2007):

- Butternut (Endangered) – subject lands and adjacent lands
- Redside Dace (Endangered) – adjacent lands only

Provincially Special Concern species (protected under the province's SWH provisions):

- Wood Thrush – adjacent lands only
- Snapping Turtle- subject lands and adjacent lands
- Eastern Wood-Pewee – adjacent lands only

SIGNIFICANT WILDLIFE HABITAT

As discussed previously, 11 candidate SWH categories may occur within the study area (subject lands and/or adjacent lands). If confirmed SWH is identified, habitat protection under the PPS (2020) will apply.

OPPORTUNITIES FOR RNHS REFINEMENTS

Based on the desktop screening of existing policy and mapping, and the windshield assessment, the following opportunities exist for refining the RNHS and other features present on the subject lands:

Wetlands

- **Confirmation of wetland boundary and evaluation of significance:** It is recommended that the extent, species composition and significance of the Key Feature wetlands on the subject lands (polygons 2 and 3) be confirmed through on-site investigations including: boundary delineation with CH, amphibian call surveys, and botanical inventory. Where these features are not determined to be key features, they may be candidates for removal and replication as part of an enhancement/restoration plan elsewhere in the RNHS; management would require confirmation with the appropriate agencies.

Woodlands

- **Confirmation of Significant Woodland boundary:** It is recommended that the Key Feature boundary (Polygon 1) be delineated in the field in order to determine the extent of the feature and to apply accurate VPZ buffers in accordance with provincial and regional policy.
- **Refinement of hedgerow mapping & potential linkage:** Hedgerows are currently mapped by MNRF on the eastern portion of the subject lands (Map 1). Hedgerows are not considered components of the RNHS. The MNRF-mapped extent of these features do not appear to match existing conditions on the landscape and may be further refined. During the roadside assessment it was confirmed that the southernmost hedgerow extends almost to the intersection of Boston Church Road and James Snow Parkway. The hedgerows overall appear to be made up of mature trees with an understory of shrubs. Tree species observed included American Basswood (*Tilia americana*), Burr Oak (*Quercus macrocarpa*), White Ash (*Fraxinus americana*) and Manitoba Maple (*Acer negundo*), likely among other species that could not be identified from the roadside. The southernmost portion of the hedgerow, near the intersection of Boston Church Road and James Snow Parkway appears to be more cultural and composed of shrubs like Common Buckthorn (*Rhamnus cathartica*), Hawthorn (*Crataegus* sp.) and Gray Dogwood (*Cornus racemosa*). Further investigation is required to determine if the existing hedgerows could be incorporated into the RNHS as potential Linkages between the Sixteen Mile Creek corridor and Polygons 2/3 if they are determined to remain as Key Features.

Watercourse, Floodplain and Headwater Drainage Features (HDFs)

- **Confirmation of HDF Management Strategy:** It is recommended that an HDFA be completed for the drainage features that bisect the study area in order to determine appropriate management strategies, per the TRCA/CVC protocol (i.e. No Management, Mitigation, Conservation, Protection). Once HDF reaches are characterized, opportunities for protecting in-situ, realignment, or removal can be explored. These features are not currently mapped as part of the RNHS.

Significant Species

- **Confirm presence / absence of significant species** within the study area through seasonally appropriate field surveys:
    - Butternut – site walk / screening for species
    - Redside Dace – confirm survey needs with MECP
    - Snapping Turtle – turtle basking (spring) and nesting (summer) surveys
    - Wood Thrush & Eastern Wood-Pewee – breeding bird surveys (spring)

Significant Wildlife Habitat

- **Confirm presence / absence of candidate SWH** within the study area through seasonally appropriate field surveys:
    - Reptile Hibernaculum – site walk / screening (early spring)
    - Turtle Nesting Areas – turtle nesting surveys (summer)
    - Amphibian Breeding Habitat (woodland & wetland) – amphibian call surveys (spring)
    - Terrestrial Crayfish – search for crayfish burrows (early spring or fall)
    - Special Concern and Rare Wildlife Species:
        - Snapping Turtle – turtle basking (spring) and nesting (summer) surveys
        - Monarch – assume presence; no surveys required
        - Eastern Wood-Pewee & Wood Thrush – breeding bird surveys (spring)

CONCLUSION

We trust the above preliminary constraints memo addresses the objectives of the study and we look forward to discussing the findings and recommended next steps with you.

Best Regards,

Steve Hill, PhD	Christina Myrdal, HBSc, Eco. Mgmt. Tech., ISA
Senior Ecologist, Director	Ecologist

APPENDIX A. POLICY SUMMARIES

PROVINCIAL POLICY & LEGISLATION

Planning Act, R.S.O, 1990, c. P.13, as amended June 6, 2019; Provincial Policy Statement (2020)

The Provincial Policy Statement (PPS) is issued under the authority of Section 3 of the Planning Act (Government of Ontario, 1990a).

Section 2.1 of the Provincial Policy Statement, which relates specifically to natural heritage, establishes clear direction on the adoption of an ecosystem approach, and the protection of resources that have been identified as 'significant': wetlands, woodlands, valleylands, wildlife habitat, areas of natural and scientific interest, and coastal wetlands.

Natural heritage systems are currently defined under the Provincial Policy Statement (PPS) as follows: "…a system made up of natural heritage features and areas, and linkages intended to provide connectivity (at the regional or site level) and support natural processes which are necessary to maintain biological and geological diversity, natural functions, viable populations of indigenous species, and ecosystems. These systems can include natural heritage features and areas, federal and provincial parks and conservation reserves, other natural heritage features, lands that have been restored or have the potential to be restored to a natural state, areas that support hydrologic functions, and working landscapes that enable ecological functions to continue. The Province has a recommended approach for identifying natural heritage systems, but municipal approaches that achieve or exceed the same objective may also be used."
Relevant portions of the Section 2.1 include the following:

Section 2.1.4 of the PPS states that development and site alteration of the following features is not permitted in:

a) Significant wetlands in Ecoregions 5E, 6E and 7E; and
b) Significant coastal wetlands.

Section 2.1.5 states that development and site alteration is not permitted in the following features, unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions:

a) Significant wetlands in the Canadian Shield north of Ecoregions 5E, 6E and 7E1;
b) Significant woodlands in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Marys River);
c) significant valleylands in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Marys River);
d) significant wildlife habitat;
e) significant areas of natural and scientific interest; and
f) coastal wetlands in Ecoregions 5E, 6E and 7E1 that are not subject to policy 2.1.4(b)

Per section 2.1.6 and 2.1.7, development and site alterations within the following features are not permitted, except in accordance with provincial and federal requirements:

g) Fish habitat; and
h) Habitat of Endangered and Threatened species.

In accordance with section 2.1.8, development and site alteration on adjacent lands to natural heritage features identified in Section 2.1.4, 2.1.5 and 2.1.6 are not permitted unless there has been an evaluation of the ecological function of the adjacent lands and it has been demonstrated that there will be no negative impacts on the natural features or on their ecological functions.

A Place to Grow – Growth Plan for the Greater Golden Horseshoe Growth Plan (2020)

The Places to Grow Act (2005) allows for regional growth plan development to guide government investments and land use policies. *A Place to Grow – Growth Plan for the Greater Golden Horseshoe Growth Plan* (Growth Plan) is Ontario's initiative to plan growth and development within the Greater Golden Horseshoe (GGH), while protecting the environment and establishing *complete communities* which allow for a high quality of life. The overarching vision for the GGH places a focus on maintaining sustainable infrastructure, transportation, environment, and cultural heritage which will allow the GGH to continue functioning as "Canada's principal international gateway". The guiding principles of the Growth Plan listed in section 1.2.1 are as follows:

- *Support the achievement of complete communities that are designed to support healthy and active living and meet people's needs for daily living throughout an entire lifetime.*
- *Prioritize intensification and higher densities in strategic growth areas tomake efficient use of land and infrastructure and support transit viability.*
- *Provide flexibility to capitalize on new economic and employment opportunities as they emerge, while providing certainty for traditional industries, including resource-based sectors.*
- *Support a range and mix of housing options, including additional residential units and affordable housing, to serve all sizes, incomes, and ages of households.*
- *Improve the integration of land use planning with planning and investment in infrastructure and public service facilities, including integrated service delivery through community hubs, by all levels of government.*
- *Provide for different approaches to manage growth that recognize thediversity of communities in the GGH.*
- *Protect and enhance natural heritage, hydrologic, and landform systems, features, and functions.*
- *Support and enhance the long-term viability and productivity of agriculture by protecting prime agricultural areas and the agri-food network.*
- *Conserve and promote cultural heritage resources to support the social,economic, and cultural well-being of all communities, including FirstNations and Métis communities.*
- *Integrate climate change considerations into planning and managinggrowth such as planning for more resilient communities andinfrastructure – that are adaptive to the impacts of a changing climate –and moving towards environmentally sustainable communities byincorporating approaches to reduce greenhouse gas emissions.*

Section 4.2.2 of the Plan focuses on the *Natural Heritage System for the Growth Plan,* which has been provincially mapped to support long-term planning. It is important to note that the *Natural Heritage System for the Growth Plan* excludes lands within *settlement area* boundaries that were approved as of

July 1, 2017. Policies under section 4.2.2.3 relate to permitted uses within the *Natural Heritage System for the Growth Plan*, as follows:

a) *new development or site alteration will demonstrate that:*
   - i. *there are no negative impacts on key natural heritage features or key hydrologic features or their functions;*
   - ii. *connectivity along the system and between key natural heritage features and key hydrologic features located within240 metres of each other will be maintained or, where possible, enhanced for the movement of native plants and animals across the landscape;*
   - iii. *the removal of other natural features not identified as key natural heritage features and key hydrologic features is avoided, where possible. Such features should be incorporated into the planning and design of the proposed use wherever possible;*
   - iv. *except for uses described in and governed by the policies in subsection 4.2.8, the disturbed area, including any buildings and structures, will not exceed 25 per cent of the total developable area, and the impervious surface will not exceed10 per cent of the total developable area;*
   - v. *with respect to golf courses, the disturbed area will not exceed 40 per cent of the total developable area; and*
   - vi. *at least 30 per cent of the total developable area will remain or be returned to natural self-sustaining vegetation, except where specified in accordance with the policies in subsection4.2.8; and*

b) *the full range of existing and new agricultural uses, agriculture-related uses, on-farm diversified uses, and normal farm practices are permitted. However, new buildings or structures for agricultural uses, agriculture-related uses, or on-farm diversified uses are not subject to policy 4.2.2.3 a), but are subject to the policies in subsections 4.2.3and 4.2.4.*

Further, section 4.2.2.6 of the Plan allows for municipalities to protect any additional natural heritage features and areas outside of the Growth Plan NHS, that are consistent with the PPS. Section 4.2.3 of the Plan limits what can occur outside of settlement areas, and within key natural heritage or key hydrologic features of the Growth Plan NHS. Permitted uses include:

a) *forest, fish, and wildlife management;*
b) *conservation and flood or erosion control projects, but only if they have been demonstrated to be necessary in the public interest and after all alternatives have been considered;*
c) *activities that create or maintain infrastructure authorized under an environmental assessment process;*
d) *mineral aggregate operations and wayside pits and quarries;*
e) *expansions to existing buildings and structures, accessory structures and uses, and conversions of legally existing uses which bring the use more into conformity with this Plan, subject to demonstration that the use does not expand into the key hydrologic feature or key natural heritage feature or vegetative protection zone unless there is no other alternative, in which case any expansion will be limited in scope and kept within close geographical proximity to the existing structure;*
f) *expansions or alterations to existing buildings and structures for agricultural uses, agriculture-related uses, or on-farm diversified uses and expansions to existing residential dwellings if it is demonstrated that:*

   i. *there is no alternative, and the expansion or alteration in the feature is minimized and, in the vegetation protection zone, is directed away from the feature to the maximum extent possible; and*
   ii. *the impact of the expansion or alteration on the feature and its functions is minimized and mitigated to the maximum extent possible; and*

g) small-scale structures for recreational uses, including boardwalks, footbridges, fences, docks, and picnic facilities, if measures are taken to minimize the number of such structures and their negative impacts.

Section 4.2.4 identifies policies regarding development proposals for lands that are adjacent to (i.e. within 120 m of) key natural heritage and key hydrologic features. Proposals for development or site alterations within 120 m of these features require a natural heritage evaluation of hydrologic evaluation that identified an appropriate vegetation protection zone (VPZ). Certain exceptions to this requirement are provided in sections 4.2.4.4 and 4.2.4.5.

Greenbelt Plan (2017)

Ontario's Greenbelt, with authority from *The Greenbelt Act* (2017), protects farmland, communities, forests, wetlands and watersheds, and preserves cultural heritage. It also supports recreation and tourism in Ontario's Greater Golden Horseshoe. The Greenbelt Plan establishes the Protected Countryside and Urban River Valley designations and includes the Niagara Escarpment and Oak Ridges Moraine Conservation Plan Areas. Finally, the Greenbelt land use plans work together with *"A Place to Grow: Growth Plan for the Greater Golden Horseshoe"* to protect the natural environment and ascertain how to accommodate growth in the region.

The Plan indicates that site alterations in the Natural Heritage System shall demonstrate that there will be no negative effects on key natural heritage or hydrologic features (i.e. significant valleylands, woodlands, or wetlands). It establishes minimum Vegetation Protection Zones (VPZ) for key natural heritage features, and states that connectivity between features must be maintained.

REGIONAL & LOCAL POLICY

Region of Halton Official Plan (2018)

The Region's Official Plan (ROP) is intended to direct future development in Halton, while reflecting and preserving the character of the landscape and quality of life. The ROP sets out goals, objectives, and policies to pursue the long-term vision for the Region, which centralizes around three principal categories of land use which are complementary to each other:

1. Settlement areas;
2. Rural countryside (agriculture); and
3. Natural heritage system.

Sections 113-118 reflect the Region's policies on the Natural Heritage System (NHS), which consists of the Greenbelt Natural Heritage System and the Regional Natural Heritage System. Section 114.1 lists the following objectives of the NHS:

(1) To maintain the most natural Escarpment features, stream valleys, wetlands and related significant natural areas and associated Cultural Heritage Resources.

(2) To maintain and enhance the landscape quality and open space character of Escarpment features.
(3) To provide a buffer to prominent Escarpment features.
  (3.1) To support agriculture as a complementary and compatible use outside the Key Features.
  (3.2) To recognize and support agriculture as a primary activity within Prime Agricultural Areas, in accordance with Sections 139.9, 139.9.1 and 139.9.2.
(4) To direct developments to locations outside hazard lands.
(5) To protect or enhance the diversity of fauna and flora, ecosystems, plant communities, and significant landforms of Halton.
(6) To protect or enhance Key Features, without limiting the ability of existing agricultural uses to continue.
(7) To protect or enhance fish habitats.
(8) To preserve and enhance the quality and quantity of ground and surface water.
(9) To contribute to a continuous natural open space system to provide visual separation of communities and to provide continuous corridors and inter-connections between the Key Features and their ecological functions.
(10) To protect significant scenic and heritage resources.
(11) To protect and enhance the Halton waterfront as a major resource that is part of the Provincially significant Lake Ontario and Burlington Bay shoreline.
(12) To preserve native species and communities that are rare, threatened or endangered based on regional, provincial or national scales of assessment.
(13) To preserve examples of the landscape that display significant earth science features and their associated processes.
(14) To preserve examples of original, characteristic landscapes that contain representative examples of bedrock, surface landforms, soils, flora and fauna, and their associated processes.
(15) To preserve and enhance air quality.
(16) To provide opportunities for scientific study, education and appropriate recreation.
(17) To preserve the aesthetic character of natural features.
(18) To provide opportunities, where appropriate, for passive outdoor recreational activities.

The Regional Natural Heritage System is comprised of the following components, per section 115.3:

1. *Key Features* which include:
    a) *significant habitat of endangered and threatened species,*
    b) *significant wetlands,*
    c) *significant coastal wetlands,*
    d) *significant woodlands,*
    e) *significant valleylands,*
    f) *significant wildlife habitat,*
    g) *significant areas of natural and scientific interest,*
    h) *fish habitat,*
2. *enhancements to Key Features* including *Centres for Biodiversity;*
3. *linkages*
4. *buffers;*
5. *watercourses that are within a Conservation Authority Regulation Limit or that provide a linkage to a wetland or a significant woodland, and*
6. *wetlands other than those considered significant under Section 115.3(1)b).*

The RNHS also includes:

(1) *Escarpment Natural Area and Escarpment Protection Area as identified in the Niagara Escarpment Plan, and*
(2) *Regulated Flood Plains as determined, mapped and refined from time to time by the appropriate Conservation Authority.*
(3) *Parts of the Agricultural System, being those areas of the Regional Natural Heritage System outside the Key Features or where the only Key Feature is a significant earth science area of natural and scientific interest, where agricultural operations are promoted and supported as compatible and complementary uses in the protection of the Regional Natural Heritage System in accordance with policies of the Agricultural System.*

Section 118 of the ROP requires municipal OPs, Zoning By-laws, and certain other planning studies to recognize the RNHS, and protect Key Features. Section 118.2 reinforces that development and site alteration is not permitted within components of the RNHS unless it has been demonstrated that there will be no negative impacts to the natural features and areas, or their functions. Section 118.3 describes the purpose and requirements of an EIA (Environmental Impact Assessment) for proposed site alterations or developments within 120 m of the RNHS.

Town of Milton Official Plan (2008)

The Town's Official Plan (OP) establishes a framework for addressing how future planning and development will meet community goals and objectives.

Section 5.4.3 outlines the Town's policies on the secondary planning process. Section 2.2 contains policies regarding the establishment and enhancement of an environmental management system; policies related to the Agricultural Area designation are described in section 4.4, aimed at recognizing and protecting Milton's agricultural industry.

Policies related to the Town's proposed Greenlands System are found in sections 4.8 and 4.9. The 'Greenlands A' designation refers to natural features and areas in the Urban Area that are to be preserved, including:

a) *Regulatory Flood Plains;*
b) *Provincially Significant Wetlands; and*
c) *Significant Valleylands or significant portions of the habitat of endangered and threatened species as determined by the Town, the Region, the appropriate Conservation Authority and the Ministry of Natural Resources.*

The 'Greenlands B' designation includes the following:

a) *Environmentally Sensitive Areas;*
b) *Public Open Space and Buffer Area as identified in The Parkway Belt West Plan;*
c) *Regionally Significant Wetland, as refined from time to time;*
d) *Provincially and Regionally Significant Areas of Natural and Scientific Interest (both Life Science and Earth Science);*
e) *Carolinian Canada sites*
f) *Halton Agreement Forests;*
g) *Significant Woodlands;*
h) *Significant Wildlife Habitat; and,*
i) *Fish Habitat.*

Environmental Linkage Areas area described under section 3.13 and include the following:

a) *wooded areas;*
b) *areas which have the potential to link lands in the Greenlands A Area designation with major roads, the Existing Urban Area or other major natural or open space areas; and,*
c) *the North Hydro Corridor.*

Conservation Halton Regulations and Revised Floodplain Mapping

Conservation Halton (CH) is authorized under Section 28 of the Conservation Authorities Act to implement and enforce the Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses (Ontario Regulation 42/06). Permits are required to identify potential interference in areas within the 100-year floodline, 15 metres of the shoreline, 15 metres within a valley's top of bank, hazard lands, 120 metres around all Provincially Significant Wetlands (PSW) and ELC wetlands greater than 2 ha, and 30 metres around ELC wetlands greater than 0.5 ha.

PROJECT: DA20-056-01

CLIENT: City of Milton

DATE: 23, March 2021

DRAWN BY: N. White

Map 1
Existing Policy Constraints
Orlando North-Porta OPA

- ▭ Study Area
- ⬚ Study Area 120m Buffer
- ▨ Greenbelt Designation
- — OHN Watercourse
- ▫ Approximate Regulation Limit

Natural Features [1]

- 🟩 Wooded Area
- ▭ Wetland

Regional Natural Heritage System [2]

- ▭ Key Features
- 🟫 Prime Agricultural Areas in NHS Enhancements/Linkages/Buffers
- 🟥 Enhancement Areas, Linkages and Buffers

Data Sources:
1. Ontario Ministry of Natural Resources and Forestry
2. Region of Halton Official Plan
Base map imagery: Map data © OpenStreetMap contributors, Map layer by Esri, Conservation Halton, Town of Oakville, USDA FSA, GeoEye, Maxar

0 125 250 500
Metres
SCALE: 1:14,000

N
NAD 1983 UTM Zone 17N

DOUGAN & ASSOCIATES
ECOLOGICAL CONSULTING & DESIGN

Appendix A1.iv

Background

Geotechnical Investigation (Proposed Roads, Drainage Channels, and Stormwater Management Ponds), North Porta, Milton (Terrapex, February 22 2021)

ORLANDO CORPORATION

PROPOSED ROADS, DRAINAGE CHANNELS, AND STORMWATER MANAGEMENT PONDS

North Porta, Milton, Ontario

DRAFT REPORT

February 22, 2021

Terrapex Environmental Ltd.
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DISTRIBUTION: **ORLANDO CORPORATION** **PROJECT # CT3003.40**

TABLE OF CONTENTS

1.0 INTRODUCTION

On behalf of Orlando Corporation, Mr. David Moores authorized Terrapex Environmental Ltd. (Terrapex) to carry out a geotechnical investigation for a proposed industrial development located in Milton, Ontario (the Site).

The Site is irregular shaped and is located on the north side of a hydro corridor, which runs east-west approximately 100 m North of James Snow Parkway. Esquesing Line and a railway corridor located about 500 m west of Boston Church Road outline the east and west boundaries of the Site respectively.

We understand that it is proposed to develop the property with several above grade industrial buildings surrounded with asphaltic concrete pavements. We further understand that the development will include four stormwater management ponds (SWMPs) and two or more drainage channels. The location of the Site as well as the locations of the proposed channels and SWMs are shown on plan prepared by TMIG and provided for our use; shown on Drawing 1 attached in Appendix A of this report. This drawing also shows 15 boreholes requested by TMIG to be advanced at the locations of the proposed features. TMIG also provided drawings showing the details of the ponds and the channels. These drawings are attached to this report in Appendix D.

The purpose of this investigation was to characterize the subsurface soil and groundwater conditions, to determine the relevant geotechnical properties of encountered soils, and to provide recommendations on the geotechnical aspects for the design and construction of the roads, drainage corridors and SWMPs.

This report presents the results of the investigation performed in accordance with the general terms of reference outlined above and is intended for the guidance of the client and the design engineers only. It is assumed that the design will be in accordance with the applicable codes and standards.

2.0 FIELDWORK

The fieldwork for this investigation was carried out during the period between December 17 and 29, 2021. It consisted of 14 boreholes designated as Boreholes BH500 through BH514, advanced by a drilling contractor commissioned by Terrapex.

- Three (3) boreholes; Boreholes BH500 through BH502 were advanced within the proposed footprint of SWMP F4 and extended to depths ranging from 3.5 to 6.6 m below ground (mbg).
- Five (5) boreholes; Boreholes BH503 through BH507 were advanced within the proposed roadway and extended to a depth of 8.1 mbg.

- Three (3) boreholes; Boreholes BH508 through BH510 were advanced within the proposed drainage channel along the north property line and extended to depths ranging from 2.3 to 4.3 mbg.
- Two (2) boreholes; Boreholes BH511 and BH512 were advanced within the footprint of the proposed SWMP F1 and extended to a depth of 3 mbg.
- Two (2) boreholes: Boreholes BH513 and BH514 were extended within the proposed drainage channel running along the west property line and extended to depths of 2 and 2.3 mbg.

The number and locations of the boreholes were determined by TMIG and are shown on the Borehole Location Plan as Drawing 1; attached in Appendix B. The boreholes were extended approximately 2 m below the proposed excavation depths.

The boreholes were laid out and the ground elevations at the borehole locations were established by David B. Searles Surveying Ltd.

Standard penetration tests (SPT) were carried out in the course of advancing the sampled boreholes to take representative soil samples and to measure penetration index (N-values) to characterize the condition of the various soil materials. The number of blows of the striking hammer required to drive the split spoon sampler to 300 mm depth was recorded and these are presented on the borehole log sheets as penetration index values. Additionally a pocket penetrometer (PP) was used to estimate the shear strength of cohesive soils. Results of SPT and PP are shown on the borehole log sheets in Appendix B of this report.

Monitoring wells were installed in Boreholes BH501, BH509, BH510, BH511, and BH514. Groundwater level observations were made in all boreholes during and upon completion of drilling of each borehole, and subsequently in the monitoring wells installed in the boreholes on January 7, 2021.

The fieldwork for this project was carried out under the supervision of an experienced geotechnical technician from this office who arranged locates of buried services; effected the drilling, sampling and in situ testing; observed groundwater conditions; and prepared field borehole log sheets.

3.0 LABORATORY TESTS

The soil samples recovered from the split spoon sampler were properly sealed, labelled and brought to our laboratory. They were visually classified and water content tests were conducted on all soil samples retained from Boreholes BH501, BH502, BH504, BH506, BH508, BH509, BH510, BH511, BH513, and BH514. Grain size distribution tests were performed on 11 soil samples and Atterberg Limits tests were carried out on four soil samples. The results of the classification and water contents are presented on the borehole log sheets attached in Appendix B of this report. The results of the grain size distribution and Atterberg Limits tests are attached in Appendix C of the report.

4.0 SITE AND SUBSURFACE CONDITIONS

Full details of the subsurface soil and groundwater conditions at the site are given on the borehole log sheets enclosed in Appendix B.

The following sections present a description of the site and a commentary on the engineering properties of the various soil materials contacted in the boreholes.

It should be noted that the boundaries of soil types indicated on the borehole logs are inferred from non-continuous soil sampling and observations made during drilling. These boundaries are intended to reflect transition zones for the purpose of geotechnical design, and therefore, should not be construed as exact planes of geological change.

The subsurface stratigraphy as revealed in the boreholes generally comprises topsoil underlain by glacial deposit consisting of predominantly reddish brown clayey silt till and silt till, occasionally interbedded with thin layers of wet silt.

4.1 SITE DESCRIPTION

The Site is irregular shaped and is located on the north side of a hydro corridor, which runs east-west approximately 100 m North of James Snow Parkway. It consists of two parcels of land; the east parcel extends between Esquesing Line and Boston Church Road, and the west parcel extends between Boston Church Road and a CPR corridor located about 500 m west of Boston Church Road.

The parcel between Boston Church Road and Esquesing Line is undulating with shallow rolling hills while the parcel west of Boston Church Road is relatively flat.

The site is used for agricultural purpose; cultivated with corn at the time of the investigation. Near the southeast corner at the site; at 8350 Esquesing line is a medium sized farm that collects and distributes the harvest as well as a homestead. Running, east-west between Boston Church Road and Esquesing Line is a tree line, approximately 10 meters thick. A tree line of similar thickness branches off along the middle of the east-west tree line and extends north forming a “T”. There are several watercourses traversing the site; the main watercourse starts on the north end of the site between Boston Church Road and Esquesing Line and runs south-east towards Esquesing Line, it is approximately 1m deep and 2 to 3 m wide channel with visible shallow water flowing. Other smaller watercourses approximately 0.5 m deep and 1m wide or smaller are present throughout the site.

The ground surface within the property is not level; it slopes down from the west to the east. The ground surface elevations at the borehole locations range from 221.5 m near the west end of the property; at Borehole BH514, to a low of 213.8 m near the east end of the property; at Boreholes BH500 and BH508.

4.2 TOPSOIL

The uppermost stratum of the soil profile across the borehole locations consists of topsoil. It ranges in thickness from 150 mm to 600 mm, more typically being in the range of 150 to 300.

It should be noted that the topsoil thickness will vary between boreholes. Thicker topsoil than that found in the boreholes may be present in places. This renders it difficult to estimate the quantity of topsoil to be stripped. In order to prevent over-stripping, diligent control of the stripping operation will be required. It is recommended that prior to topsoil stripping, shallow test pits be excavated at the site in the presence of a geotechnical engineer to determine the depth of topsoil that should be stripped.

4.3 CLAYEY SILT TILL

Clayey silt till is the predominant type of soil present at all boreholes advanced at the site.

The clayey silt is a glacial deposit and consists of a random mixture of soil particles ranging from clay to gravel, with clay and silt being the predominant fractions. Cobbles and boulders are probably present but would not be representatively sampled with the equipment used in this investigation

The near surface thin layer of the clayey silt till is disturbed/remoulded due to tilling and grading activities.

The till is moist in appearance and reddish brown in color. The water content of the silty clay samples range from approximately 8 to 21 % by weight, more typically being in the range of 8 to 12%.

Penetration resistance in the till soil provided N-values ranging from 8 to 68, indicating stiff to hard consistencies; more typically being very stiff to hard. The softer zones are limited to the shallow wet soils.

Measurements made with a pocket penetrometer on the split spoon samples of the clayey silt retained from the boreholes provided undrained shear strength values of in excess of 225 kPa, except for a couple of shallow samples retained from two of the boreholes that provided an undrained shear strength value of about 150 kPa.

Grain size analyses were carried out on eight (8) clayey silt samples and Atterberg Limits tests were carried out on three (3) representative samples. The test results are enclosed in Appendix C and are summarized in the following table.

Borehole No.	Sample Depth (mbg) and No.	Sample Location	Gravel %	Sand %	Silt %	Clay %	Liquid Limit	Plasticity Index
BH502	1.0 (Sample 3)	Proposed SWMP F4	11	17	51	21	25	8
BH502	4.0 (Sample 6)	Proposed SWMP F4	13	20	49	18		
BH503	1.5 (Sample 3A)	Proposed Road	2	38	47	13		
BH508	1.5 (Sample 3)	Proposed drainage channel	10	18	51	21		
BH509	1.0 (Sample 2)	Proposed drainage channel	11	16	52	21		
BH510	1.5 (Sample 3)	Proposed drainage channel	12	18	49	21	26	7
BH511	1.5 (Sample 3)	Proposed SWMP F1	8	13	57	22	27	10
BH514	1.0 (Sample 2)	Proposed drainage channel	8	13	55	24		

Based on the grain size distribution, the tested sample can be described as clayey silt with some sand and trace to some gravel. Based on the Atterberg Limits test results, the sample can be classified as inorganic clay, silty clay, sandy clay of low plasticity.

Based on the grain size analysis results, the Coefficient of Permeability (k) of the clayey silt (till) is estimated to be less than 10^{-7} cm/sec, corresponding to very low relative permeability.

4.4 SILT TILL

Silt till is present underlying the clayey silt till in the boreholes advanced within the proposed roadway; at Boreholes BH503, BH504, BH505, and BH506, below depths of 3.5 to 7 mbg. The silt till is a glacial deposit and consists of a random mixture of soil particles ranging from clay to gravel, silt being the predominant fraction. Cobbles and boulders are probably present but would not be representatively sampled with the equipment used in this investigation

The till is moist to wet in appearance and reddish brown and grey in color. The water content of the silt samples range from approximately 8 to 16 % by weight.

Penetration resistance in the till soil provided N-values ranging from 31 to 84, indicating dense to very dense compactness condition.

Measurements made with a pocket penetrometer on the split spoon samples of the clayey silt retained from the boreholes provided undrained shear strength values of in excess of 225 kPa

Grain size analysis was carried out on one representative sample obtained from Borehole BH505.

The test result is enclosed in Appendix C and are summarized in the following table.

Borehole No.	Sample Depth (mbgs) and No.	Sample Location	Gravel %	Sand %	Silt %	Clay %
BH505	3.8 (Sample 7A)	Proposed Road	1	6	82	11

Based on the grain size distribution, the tested sample can be described as silt with some clay and traces of sand and gravel.

Based on the grain size analysis results, the Coefficient of Permeability (k) of the silt (till) is estimated to be about 10^{-6} cm/sec, corresponding to very low relative permeability.

4.5 SILT

Silt is present in Boreholes BH505 and BH507 advanced within the proposed road, and in Boreholes BH508 and BH509 advanced within the proposed drainage channel along the north perimeter of the site. Borehole BH509 was terminated in the silt soil. It is less than 1 m in thickness in the remaining three boreholes.

The silt is wet in appearance and brown in color; changing to reddish brown generally below depths of 1 to 1.5 mbgs. The water content of two silt samples were determined to be 17 and 21% by weight.

Penetration resistance in the silt soil provided N-values ranging from 5 to 27, indicating loose to compact compactness condition.

Grain size analysis were carried out on two (2) representative samples obtained from Boreholes BH508 and BH509, and Atterberg Limits test was carried out on the sample retained from BH508. The test results are enclosed in Appendix C and summarized in the following table.

Borehole No.	Sample Depth (mbgs) and No.	Sample Description	Gravel %	Sand %	Silt %	Clay %	Liquid Limit	Plastic Limit
BH508	1.2 (Sample 2)	Proposed drainage channel	0	2	82	16	28	7
BH509	3.8 (Sample 5)	Proposed drainage channel	7	11	68	14		

Based on the grain size distribution, the tested sample can be described as silt with some clay and traces of sand and gravel. Based on the Atterberg Limits test results, the sample can be classified as inorganic clay, silty clay, sandy clay of low plasticity.

Based on the grain size analysis results, the Coefficient of Permeability (k) of the silt is estimated to be about 10^{-6} cm/sec, corresponding to medium to low relative permeability.

4.6 GROUNDWATER

Groundwater level and cave-in of the unlined sidewalls of the boreholes were measured upon completion of the boreholes.

As part of this geotechnical investigation, monitoring wells were installed in six (6) of the boreholes. The groundwater level measurements made in the monitoring wells on January 7 and open boreholes made upon completion of advancement of the boreholes were recorded and are summarized in the table below.

Borehole / Monitoring Well Location	**Well Screen Details**		**Groundwater Observations**	
	Screened Interval mbg (elev.)	**Screened Subsoil**	**Water Level mbg (elev.)**	**Date**
BH500	-	-	Dry	December 28, 2020
BH501	1.5 – 3.0 (213.1 – 211.6)	Clayey Silt Till	Dry	December 28, 2020
			0.24 (214.4)	January 7, 2021
BH502	-	-	Dry	December 22, 2020
BH503	-	-	7.0 (209.5)	December 21, 2020
BH504	-	-	7.3 (208.5)	December 18, 2020
BH505	-	-	6.7 (210.9)	December 18, 2020
BH506	-	-	1.5 (219.1)	December 18, 2020
BH507	-	-	5.5 (213.7)	December 17, 2020
BH508	0.8 – 2.3 213.1 – 211.6)	Silt and Clayey Silt	1.2 (212.8) 0.12 (213.8)	December 22, 2020 January 7, 2021
BH509	1.5 – 3.0 (215.3 - 213.8)	Clayey Silt	Dry Dry	December 22, 2020 January 7, 2021
BH510	2.3 – 3.8 (216.6 – 214.8)	Clayey Silt	2.7 (215.8) 1.87 (216.6)	December 22, 2020 January 7, 2020
BH511	1.5 – 3.0 (219.0 – 217.5)	Clayey Silt	Dry 1.45 (219.0)	December 29, 2020 January 7, 2020
BH512	-	-	Dry	December 29, 2021
BH513	-	-	Dry	December 29, 2021
BH514	0.8 – 2.3 (220.8 – 219.3)	Clayey Silt	1.8 (219.8) 0.19 (2221.4)	December 29, 2020 January 7, 2021

5.0 DISCUSSION AND RECOMMENDATIONS

The following discussions and recommendations are based on the factual data obtained from the boreholes advanced at the Site by **Terrapex** and are intended for use by the client and design engineers only.

It should be noted that while TMIG provided drawings showing the details of the ponds and the channels, the proposed road grades were not provided to Terrapex at the time of preparation of this report.

Contractors bidding on this project or conducting work associated with this project should make their own interpretation of the factual data and/or carry out their own investigations.

The subsurface stratigraphy as revealed in the boreholes generally comprises topsoil underlain by glacial deposit consisting of predominantly reddish brown clayey silt till and silt till, occasionally interbedded with thin layers of wet silt.

Groundwater was encountered in majority of the boreholes. On the basis of our fieldwork and laboratory tests, the following comments and recommendations are made.

5.1 EXCAVATION AND GROUNDWATER CONTROL

Based on the field results, excavations for the drainage corridor, SWMPs, and site servicing trenches, and utilities are not expected to pose any difficulty. Excavation of the soils at this site can be carried out with heavy hydraulic excavators.

All excavation work must be carried out in accordance with the Occupational Health and Safety Act (OHSA). With respect to OHSA, the topsoil and underlying disturbed native soil are expected to conform to Type 3 soil. The stiff to hard clayey silt till can be classified as Type 2 soil. Wet sandy and silty soil are classified as Type 4 soil.

Excavation side-slopes should not be unduly left exposed to inclement weather.

Temporary excavation for slopes in Type 3 soil should not exceed 1.0 horizontal to 1.0 vertical. Locally, where loose or soft soil is encountered at shallow depths, it may be necessary to flatten the side slopes as necessary to achieve stable conditions. Excavations in Type 2 soil may be cut with vertical side-walls within the lower 1.2 m height of excavation and 1.0 horizontal to 1.0 vertical above this height. Excavations extended below tin Type 4 soils may have to be sloped as flat as 3.0 horizontal to 1.0 vertical.

Where workers must enter excavations extending deeper than 1.2 m below grade, the excavation side-walls must be suitably sloped and/or braced in accordance with the Occupational Health and Safety Act and Regulation for Construction Projects.

The clayey silt (till) possesses a very low hydraulic conductivity; the groundwater yield from this soil is expected to be insignificant. The wet silt layers present in some of the boreholes will yield small volumes of water. Based on observations made during the drilling of the boreholes and close examination of the soil samples extracted from the boreholes, significant groundwater problems are not anticipated within the presumed excavation depths and adequate control of groundwater seepage can be achieved by pumping from properly filtered sumps in the base of the excavations.

Surface water should be directed away from open excavations.

It should be noted that the glacial deposit is non-sorted sediment and therefore may contain boulders. Provisions must be made in the excavation and foundation installation contracts for the removal of possible boulders.

5.2 REUSE OF ON-SITE EXCAVATED SOIL

On-site inorganic excavated soils may be reused as backfill material, provided their water content is within 2% of their optimum moisture contents as determined by Standard Proctor test, and the materials are effectively compacted with heavy vibratory pad-type rollers. The compactors must be of sufficient size and energy to break down the lumps and to knead the soil into a homogeneous mass as water and compaction effort is applied.

Measured water contents within the native soil ranged from 8 to 21%. These water contents are generally close to and locally on the wet side of the material's optimum moisture content. In the event these soils are to be used as structural fill, they should be stockpiled in a manner that prevents significant changes in their water content from occurring. During warm weather, drying of the native soils may become acute; therefore, the lift thickness for compaction and the moisture content of the soils must be properly controlled during the backfilling. Alternatively, imported suitable material should be used.

5.3 PROPOSED DRAINAGE CHANNELS

The locations of the proposed drainage channels are shown on the Borehole Location Plan attached in Appendix A of this report. Figures 4-3 through 4-5, and Figures 4-9 and 4-10 prepared by TMIG; attached to this report in Appendix D present details of the drainage channels proposed for the west (west of Boston Church Road) and east (east of Boston Church Road) sections of the site respectively.

Boreholes BH508, BH509 and BH510 were advanced along the alignment of the east channel, and Boreholes BH513 and BH514 were advanced along the alignment of the west channel.

Elevations along the base of the channels near the locations of the boreholes as well as the elevations at the bases of the boreholes and existing grade are tabulated in the following table.

Borehole No.	Proposed Elevation at base of channel (m)	Existing ground elevation (m)	Elevation at bottom of Borehole (m)
BH508	213.6	213.93	211.6
BH509	215.1	216.76	213.3
BH510	216.5	218.54	214.3
BH513	220.8	220.46	218.5
BH514	221.4	221.56	219.3

Based on these elevations, the grade at the Site in the area of the west drainage channel will be raised and the base of the channel will be situated near or above existing grade; the channel will be constructed by fill soil. The subsoil at Boreholes BH513 and BH514 consist of a layer of topsoil as thick as 600 mm, underlain by clayey silt till.

Along the east drainage channel, the base of the channel will be close to existing grade near Borehole BH508, about 1.7 m below grade near Borehole BH509 and about 2 m below existing grade at BH510.

The subsurface conditions at these boreholes below a surficial layer of topsoil consists of clayey silt till. At Boreholes BH509 and BH510 the till is interbedded with layers of wet silt. Based on proposed east grades, the base of the channel will be well above the wet silt layer at Borehole BH509, and about 0.3 m above the silt layer near Borehole BH508.

Based on the borehole findings, it is expected that following topsoil stripping, excavation for the proposed drainage corridor will be carried out through stiff to hard clayey silt till. The eastern section of the channel will be constructed above existing grade. Where wet silt is encountered within or near the base of the channel, the silt will have to be removed and replaced woth clayey soil.

A liner system is not anticipated to be required for the construction of the proposed drainage channels.

It is recommended that side slopes of the channel be formed at gradient not exceeding 1V:3H (i.e. 18.4° angle to the horizontal).

Groundwater seepage from wet silt seams is expected to be discontinuous and minimal, and adequate control of groundwater can be achieved by pumping from properly filtered sumps in the base of the excavations.

5.4 PROPOSED SWMPS

The subsurface conditions at the location of the proposed SWMP1 are presented by Boreholes BH511 and 512, and the subsurface conditions at the location of the proposed SWMP4 are presented by Boreholes BH500, BH501 and BH502.

Concept Plans of SWMP1 and SWMP4 prepared by TMIG; Figures 3-2 and 3-5, are attached in Appendix D of this report. The plans show elevations at the base of the ponds as well proposed side slopes of the ponds.

The base of SWMF1 will be set at elevation 218.8 m, and the High water level (HWL) is shown to be 223.0 m. The pond will be sloped at 5H : 1V. The two boreholes advanced within the footprint of SWMP1 were extended to elevations 216.8 to 217.0 m.

The base of SWMF4 will be set at elevation 212.3 m, and the HWL is shown to be 216.5 m. The pond will be sloped at 5H : 1V. The three boreholes advanced within the footprint of SWMP4 were extended to elevations 210.2 to 211.1 m.

Based on the borehole findings, the pond side-slopes will be formed in very stiff to hard clayey silt (till) to the design bottom of the ponds.

Groundwater was not encountered in the boreholes at the time of their advancement. Groundwater seepage, if any from the clayey silt till is expected to be insignificant, and adequate control of groundwater can be achieved by pumping from properly filtered sumps in the base of the excavations.

The conditions of subsurface soils are such that the proposed slopes within the ponds will be stable against any sliding failure.

Based on the subsurface soil and groundwater conditions encountered in the boreholes, a liner system is not required for the construction of the SWMP1 and SWMP4.

Construction of the ponds will require that the ground surface surrounding the ponds be raised by as much as 3.5 m. Fill used to raise the grades should consist of clayey silt till excavated from the ponds or other areas of the Site. To be generally consistent with the native cohesive soils at the site, the fill should have the following properties:

- Plasticity Index greater than 7 percent.
- 100 percent of the particles passing 75 mm sieve.
- Not less than 50 percent of the particles, by weight, passing the 0.075 mm sieve.
- Not less than 15 percent of the particles, by weight, greater than 0.002 mm sieve.
- Placed in maximum 300 mm lifts and compacted to a minimum of 98% standard Proctor Maximum Dry Density of the material.

Recommendations for engineered fill construction are provided in Section 5.5 of this report.

5.5 ENGINEERED FILL

The following recommendations regarding construction of engineered fill should be adhered to during the construction stage:

- All surface vegetation, organic materials, softened and disturbed soils must be removed, and the exposed subgrade soils proof-rolled with an inspection by the Geotechnical Engineer prior to any fill placement.
- Engineered fill operations should be monitored and compaction tests should be performed on a full-time basis by a qualified engineering technician supervised by the project engineer.
- Soils used as engineered fill should be free of organics and/or other unsuitable material. The engineered fill must be placed in lifts not exceeding 200 mm in thickness and compacted to at least 98% SPMDD.
- The engineered fill operation should take place in favorable climatic conditions. If the work is carried out in months where freezing temperatures may occur, all frost affected material must be removed prior to the placement of frost-free fill.

5.6 SERVICE TRENCHES

Based on the site grades, sewer pipes and watermains will probably be supported on undisturbed native clayey silt (till) which is considered suitable for supporting water mains, sewer pipes, manholes, catch basins and other related structures.

The type of bedding depends mainly on the strength of the subgrade immediately below the invert levels.

Normal Class ‘B’ bedding is recommended for underground utilities. Granular ‘A’ or 19 mm crusher-run limestone can be used as bedding material; all granular materials should meet OPS 1010 specifications. The bedding material should be compacted to a minimum of 95% SPMDD. Trenches dug for these purposes should not be unduly left exposed to inclement weather.

Pipe bedding and backfill for flexible pipes should be undertaken in accordance with OPSD 802.010. Pipe embedment and cover for rigid pipes should be undertaken in accordance with OPSD 802.030.

If unsuitable bedding conditions occur, careful preparation and strengthening of the trench bases prior to sewer installation will be required. The subgrade may be strengthened by placing a thick mat consisting of 50 mm crusher-run limestone. Field conditions will determine the depth of stone required. Geotextiles and/or geogrids may be helpful and these options should be reviewed by **Terrapex** on a case by case basis.

Sand cover material should be placed as backfill to at least 300 mm above the top of pipes. Placement of additional granular material (thickness dictated by the type of compaction equipment) as required or use of smaller compaction equipment for the first few lifts of native material above the pipe will probably be necessary to prevent damage to the pipe during the trench backfill compaction.

It is recommended that service trenches be backfilled with on-site native soils compacted to 98% SPMDD. Lift thicknesses should not exceed 200 mm in a loose state and the excavated site material should be compacted using heavy, vibratory pad-type rollers.

In areas of narrow trenches or confined spaces such as around manholes, catch basins, etc., imported sand or OPSS Granular ‘B’ should be used and compacted to the specified SPMDD.

5.7 PAVEMENT DESIGN

It is anticipated that the sub-grade material for the road pavement will generally consist of native soils or engineered fill.

The subgrade should be thoroughly proof-rolled and re-compacted to ensure uniformity in subgrade strength and support. Lift thicknesses should not exceed 200 mm in a loose state and the excavated site material should be compacted using heavy vibratory rollers. As an alternative, if suitable on-site native material is not available, the upper part of the subgrade could be improved by placing imported granular material.

Given the frost susceptibility and drainage characteristics of the subgrade soils, the pavement design presented below is recommended.

Minimal Asphaltic Concrete Pavement Structure Design

Pavement Layer	Compaction Requirements	Heavy Duty Asphalt Minimum Component Thickness
Surface Course Asphaltic Concrete	as per OPSS 310	50 mm HL3-HS, (PG58-28)
Binder Course Asphaltic Concrete	as per OPSS 310	70 mm HL8 -MDBC, (PG58-28)
Granular Base	100% SPMDD	150 mm Granular ‘A’ (OPSS 1010) or 19 mm Crusher Run Limestone
Granular Subbase	100% SPMDD	450 mm Granular ‘B’ Type II (OPSS 1010)

The subgrade must be compacted to at least 98% of SPMDD for at least the upper 600 mm and 95% below this level. The granular base and sub-base materials should be compacted to a minimum of 100% SPMDD. The granular pavement structure materials should be placed in lifts not exceeding 150 mm thick and be compacted to a minimum of 100% SPMDD. Asphaltic concrete materials should be rolled and compacted per OPSS 310. The granular and asphaltic concrete pavement materials and their placement should conform to OPSS 310, 501, 1010 and 1150, and the pertinent Municipality specifications.

The long-term performance of the proposed pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure that uniform subgrade moisture and density conditions are achieved as much as practically possible when fill is placed and that the subgrade is not disturbed and weakened after it is exposed.

Control of surface water is a significant factor in achieving good pavement life. Grading adjacent to the pavement areas must be designed so that water is not allowed to pond adjacent to the outside edges of the pavement or curb. In addition, the need for adequate drainage cannot be over-emphasized. The subgrade must be free of depressions and sloped (preferably at a minimum gradient of three percent) to provide effective drainage toward subgrade drains. Sub-drains are recommended to intercept excess subsurface moisture at the curb lines and catch basins. The invert of sub-drains should be maintained at least 0.3 m below subgrade level.

Additional comments on the construction of pavement areas are as follows:

- As part of the subgrade preparation, the proposed pavement areas should be stripped of vegetation, unsuitable earth fill and other obvious objectionable material. The subgrade should be properly shaped and sloped as required, and then proof-rolled. Loose/soft or spongy subgrade areas should be sub-excavated and replaced with suitable approved material compacted to at least 98% of SPMDD.
- Where new fill is needed to increase the grade or replace disturbed portions of the subgrade, excavated inorganic soils or similar clean imported fill materials may be used, provided their moisture content is maintained within 2 % of the soil's optimum moisture content. All fill must be placed and compacted to not less than 98% of SPMDD.
- For fine-grained soils, as encountered at the site, the degree of compaction specification alone cannot ensure distress free subgrade. Proof-rolling must be carried out and witnessed by **Terrapex** personnel for final recommendations of sub-base thicknesses.
- In the event that pavement construction takes place in the spring thaw, the late fall, or following periods of significant rainfall, it should be anticipated that an increase in thickness of the granular sub-base layer will be required to compensate for reduced subgrade strength.

6.0 CLOSURE

The conclusion and recommendations in this report are based on information determined at the inspection locations. Soil and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction which could not be detected or anticipated at the time of the soil investigation.

The design recommendations given in this report are applicable only to the project described in the text, and then only if constructed substantially in accordance with details of alignment and elevations stated in the report. Since all details of the design may not be known to us, in our analysis certain assumptions had to be made as set out in this report. The actual conditions may, however, vary from those assumed, in which case changes and modifications may be required to our recommendations.

This report was prepared for Orlando Corporation by Terrapex Environmental Ltd. The material in it reflects Terrapex Environmental Ltd. judgement in light of the information available to it at the time of preparation. Any use which a Third Party makes of this report, or any reliance on decisions which the Third Party may make based on it, are the sole responsibility of such Third Parties.

We recommend, therefore, that we be retained during the final design stage to review the design drawings and to verify that they are consistent with our recommendations or the assumptions made in our analysis. We recommend also that we be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered in the test holes. In cases when these recommendations are not followed, the company's responsibility is limited to accurately interpreting the conditions encountered at the test holes, only.

The comments given in this report on potential construction problems and possible methods are intended for the guidance of the design engineer, only. The number of inspection locations may not be sufficient to determine all the factors that may affect construction methods and costs. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work.

Respectfully submitted,

TERRAPEX ENVIRONMENTAL LTD.

Vic Nersesian, P. Eng.
Vice President, Geotechnical Services

Appendix A

Borehole Location Plan

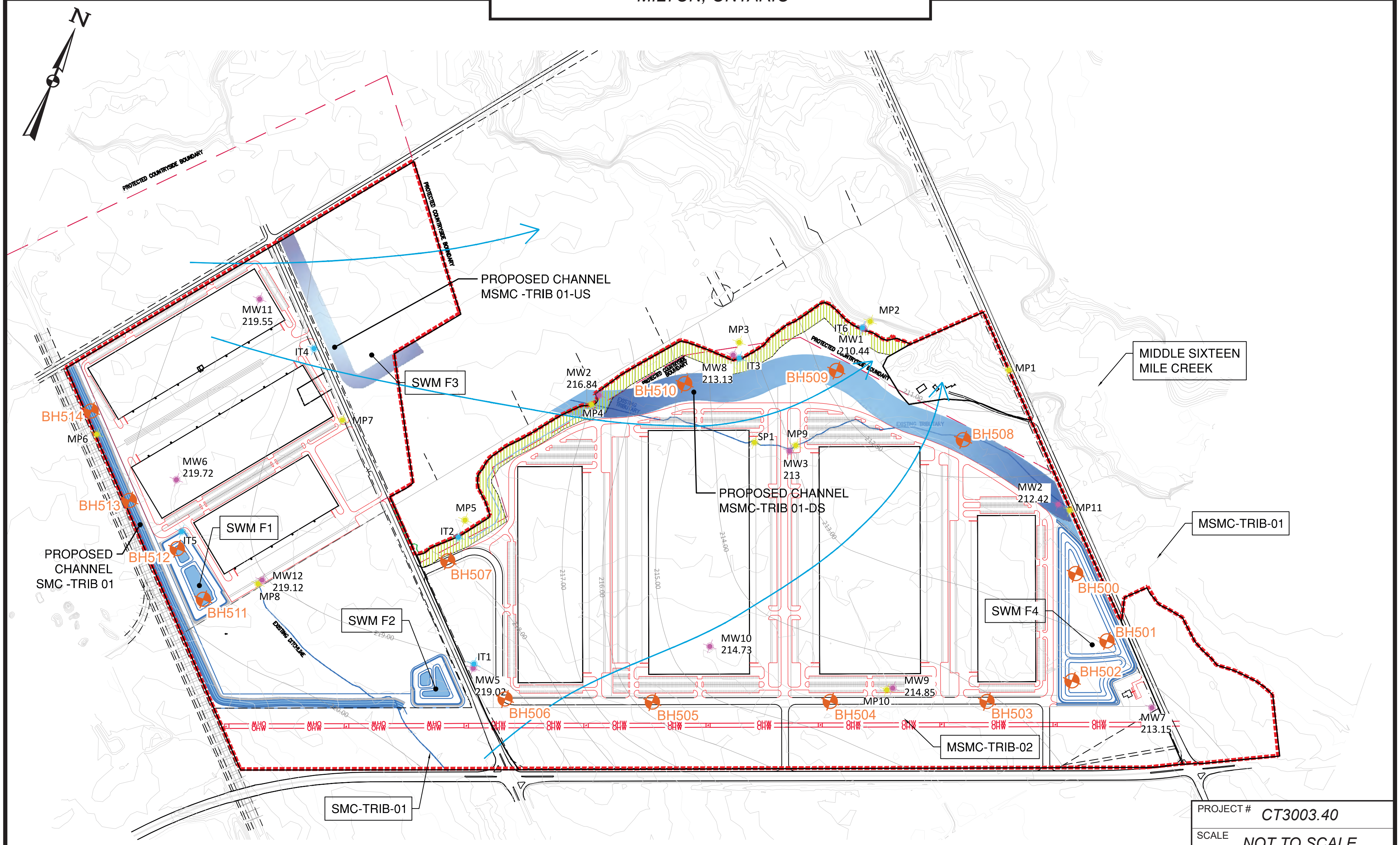
TERRAPEX

BOREHOLE LOCATION PLAN

8350 ESQUESING LINE
MILTON, ONTARIO

CLIENT

ORLANDO CORPORATION



LEGEND

⊕ BOREHOLE

SOURCE: CLIENT PROVIDED SITE PLAN.

PROJECT #	CT3003.40
SCALE	NOT TO SCALE
DATE	FEBRUARY 2021
DRAWN SW	CHECKED
DRAWING #	FIGURE 1

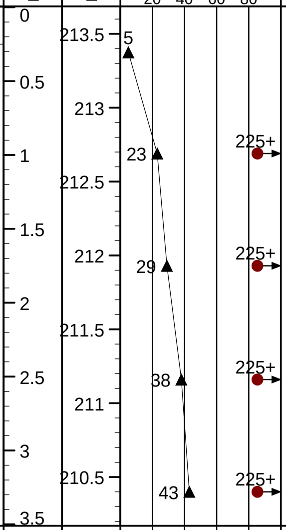
APPENDIX B

BOREHOLE LOG SHEETS

CLIENT: Orlando Corporation	METHOD: Augering and Split Spoon Sampling		**BH No.: 500**
PROJECT: Boston Church Rd and Esquesing Line	PROJECT ENGINEER: VN	ELEV. (m) 213.68	
LOCATION: Milton, Ontario	NORTHING: 4822404.82	EASTING: 589837.54	PROJECT NO.: CT3003.00

SAMPLE TYPE ▮ AUGER ◪ DRIVEN ⧗ CORING ▀ DYNAMIC CONE ▯ SHELBY ⌶ SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) ● 40 80 120 160 / N-Value (Blows/300mm) ▲ 20 40 60 80	Water Content (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		TOPSOIL 250 mm	0	213.68	5		1A	⌶	5		Borehole dry and open upon completion of drilling.
		very stiff to hard, moist, reddish brown CLAYEY SILT some sand, trace gravel (TILL)					1B	⌶			
					23 ▲; 225+ ●		2	⌶	23		
					29 ▲; 225+ ●		3	⌶	29		
					38 ▲; 225+ ●		4	⌶	38		
			3.5		43 ▲; 225+ ●		5	⌶	43		
		END OF BOREHOLE									



LOGGED BY: AD	DRILLING DATE: December 28, 2020
REVIEWED BY: VN	Page 1 of 1

CLIENT: Orlando Corporation

METHOD: Augering and Split Spoon Sampling

PROJECT: Boston Church Rd and Esquesing Line

PROJECT ENGINEER: VN

ELEV. (m) 214.61

BH No.: 501

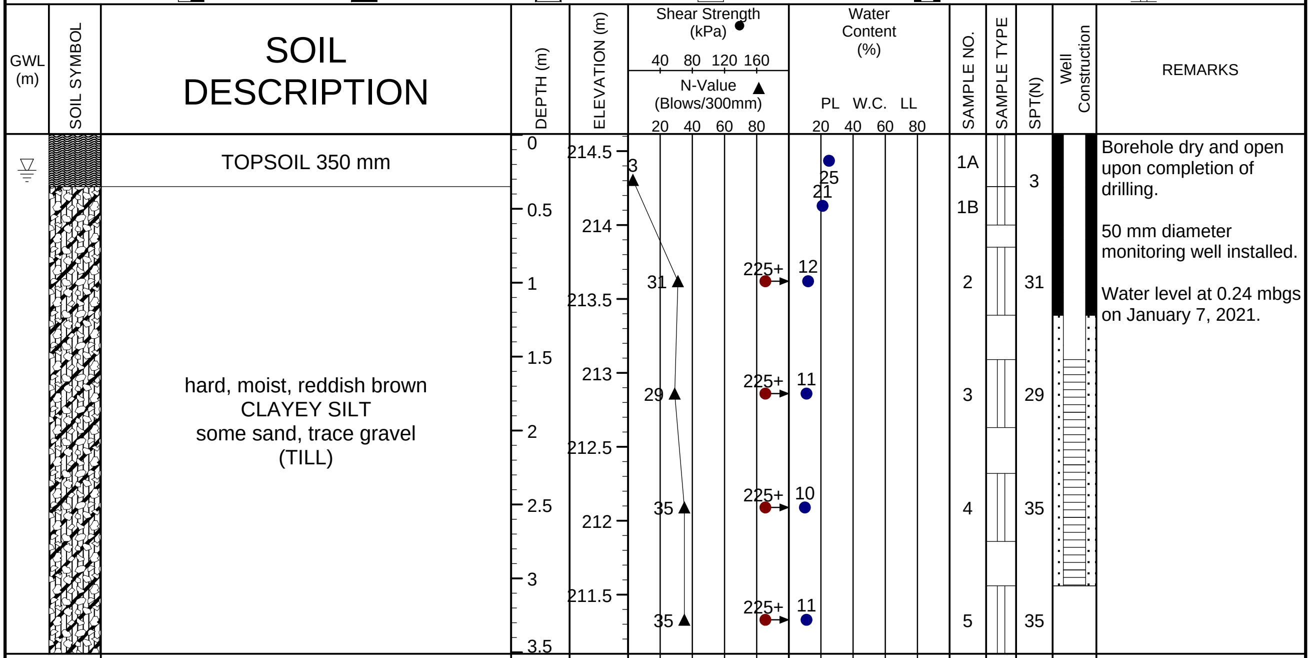
LOCATION: Milton, Ontario

NORTHING: 4822295.46

EASTING: 589950.98

PROJECT NO.: CT3003.00

SAMPLE TYPE: ◨ AUGER ◪ DRIVEN ⧓ CORING ⬒ DYNAMIC CONE ▯ SHELBY ⌶ SPLIT SPOON



SOIL DESCRIPTION	SAMPLE NO.	SPT(N)	N-Value	Shear Strength (kPa)	Water Content (%)
TOPSOIL 350 mm	1A	3	3		25
hard, moist, reddish brown CLAYEY SILT some sand, trace gravel (TILL)	1B				21
	2	31	31	225+	12
	3	29	29	225+	11
	4	35	35	225+	10
	5	35	35	225+	11

END OF BOREHOLE

REMARKS

Borehole dry and open upon completion of drilling.

50 mm diameter monitoring well installed.

Water level at 0.24 mbgs on January 7, 2021.

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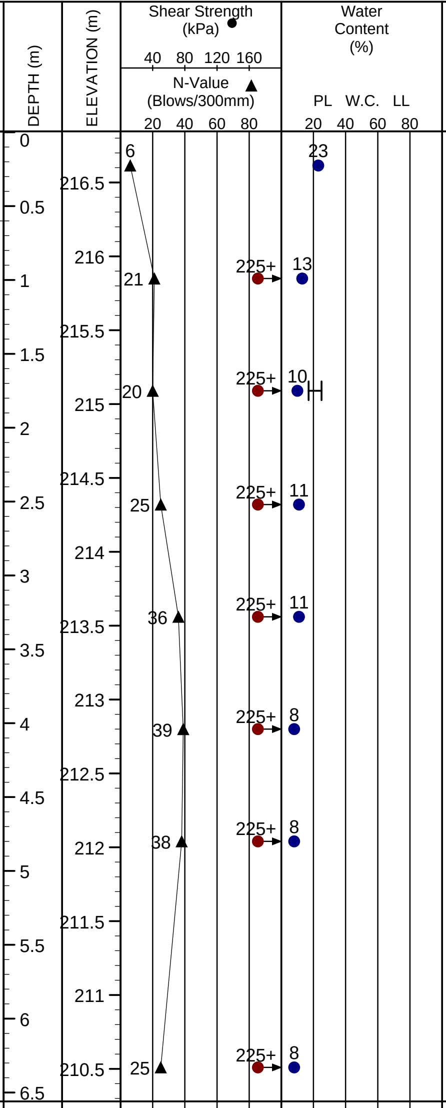
DRILLING DATE: December 28, 2020

REVIEWED BY: VN

CLIENT: Orlando Corporation	METHOD: Augering and Split Spoon Sampling		**BH No.: 502**
PROJECT: Boston Church Rd and Esquesing Line	PROJECT ENGINEER: VN	ELEV. (m) 216.84	
LOCATION: Milton, Ontario	NORTHING: 4822189.71	EASTING: 589912.05	PROJECT NO.: CT3003.00

SAMPLE TYPE: AUGER, DRIVEN, CORING, DYNAMIC CONE, SHELBY, SPLIT SPOON



GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		TOPSOIL 600 mm	1		6		Borehole dry and open upon completion of drilling. completion of drilling.
		very stiff to hard moist, reddish brown CLAYEY SILT some sand, trace gravel (TILL)	2		21		
			3		20		
			4		25		
			5		36		
			6		39		
			7		38		
			8		25		
		END OF BOREHOLE					

TERRAPEX

LOGGED BY: AD	DRILLING DATE: December 22, 2020
REVIEWED BY: VN	Page 1 of 1

CLIENT: Orlando Corporation
METHOD: Augering and Split Spoon Sampling

BH No.: 503

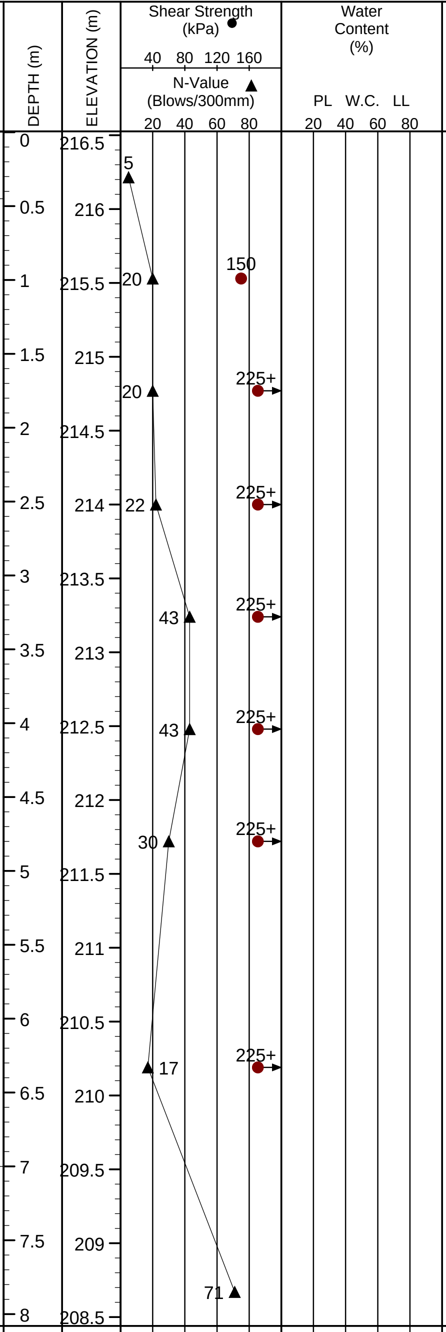
PROJECT: Boston Church Rd and Esquesing Line
PROJECT ENGINEER: VN
ELEV. (m) 216.52
LOCATION: Milton, Ontario
NORTHING: 4822083.72
EASTING: 589759.37
PROJECT NO.: CT3003.00

SAMPLE TYPE: ▮ AUGER ◩ DRIVEN ⧗ CORING ▬ DYNAMIC CONE ▯ SHELBY ⌶ SPLIT SPOON

SOIL DESCRIPTION

Depth (m)	Soil Description
0 – 0.3	TOPSOIL 300 mm
0.3 – 7.0	very stiff to hard moist, reddish brown CLAYEY SILT some sand, trace gravel (TILL)
7.0 – 8.0	very dense, wet, reddish brown SILT traces of sand, clay, and gravel (TILL)
	END OF BOREHOLE

GWL (m): ▽ 7.0



SAMPLE NO.	SAMPLE TYPE	SPT(N)	Shear Strength (kPa)
1A 1B	⌶	5	
2	⌶	20	150
3	⌶	20	225+
4	⌶	22	225+
5	⌶	43	225+
6	⌶	43	225+
7	⌶	30	225+
8	⌶	17	225+
9	⌶	71	

Well Construction

REMARKS

Borehole open and and groundwater level measured at 7.0 m below grade upon completion of drilling.

TERRAPEX

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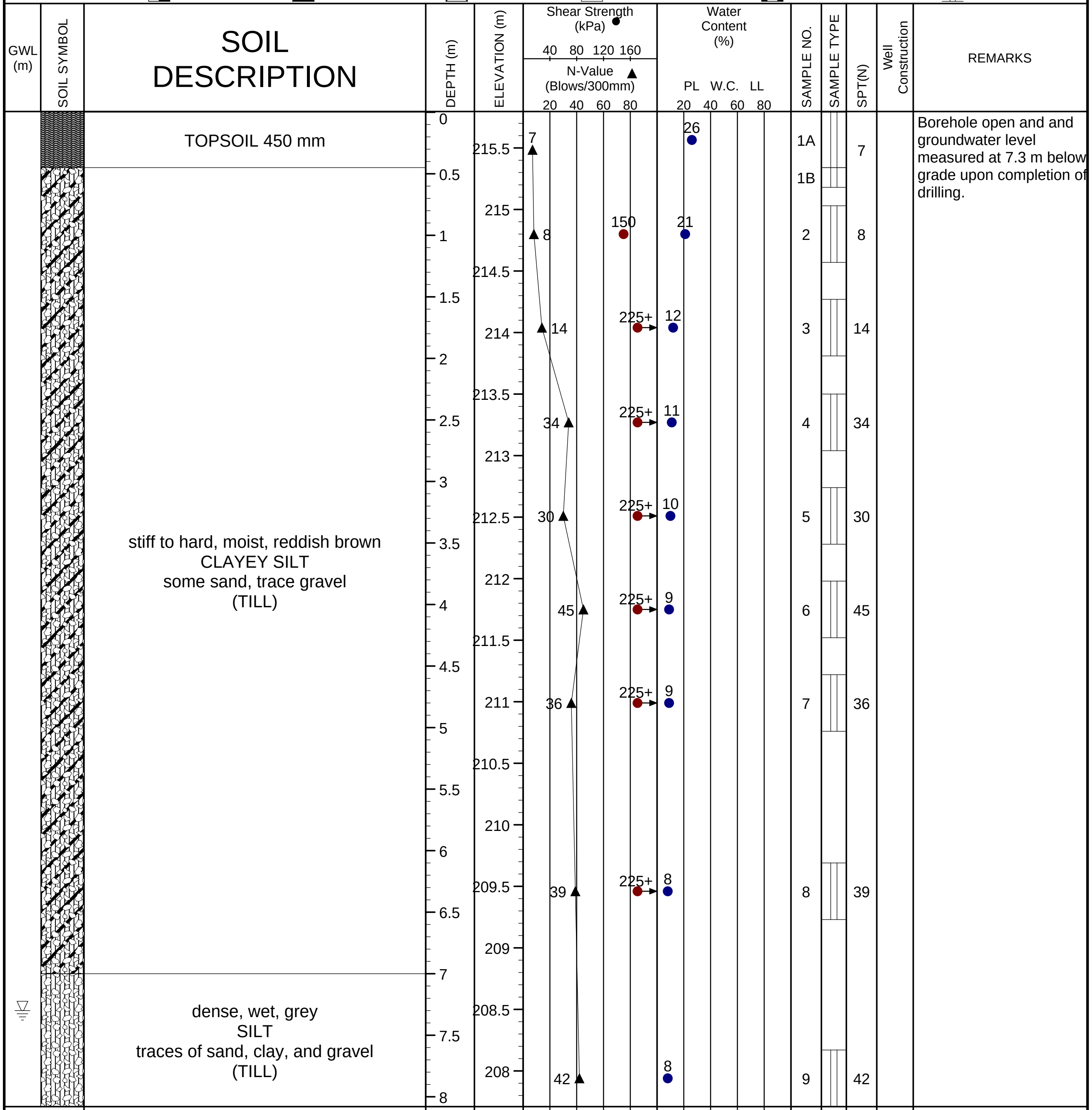
DRILLING DATE: December 21, 2020
REVIEWED BY: VN
Page 1 of 1

CLIENT: Orlando Corporation	METHOD: Augering and Split Spoon Sampling		**BH No.: 504**
PROJECT: Boston Church Rd and Esquesing Line	PROJECT ENGINEER: VN	ELEV. (m) 215.79	
LOCATION: Milton, Ontario	NORTHING: 4821964.38	EASTING: 589448.74	PROJECT NO.: CT3003.00

SAMPLE TYPE ▮ AUGER ◩ DRIVEN ⧓ CORING ▬ DYNAMIC CONE ▯ SHELBY ⌶ SPLIT SPOON



SOIL DESCRIPTION

TOPSOIL 450 mm

stiff to hard, moist, reddish brown
CLAYEY SILT
some sand, trace gravel
(TILL)

dense, wet, grey
SILT
traces of sand, clay, and gravel
(TILL)

END OF BOREHOLE

SAMPLE NO.	SPT(N)	Shear Strength (kPa)	Water Content (%)
1A	7		26
1B			
2	8	150	21
3	14	225+	12
4	34	225+	11
5	30	225+	10
6	45	225+	9
7	36	225+	9
8	39	225+	8
9	42		8

REMARKS

Borehole open and and groundwater level measured at 7.3 m below grade upon completion of drilling.

LOGGED BY: AD	DRILLING DATE: December 18, 2020
REVIEWED BY: VN	Page 1 of 1

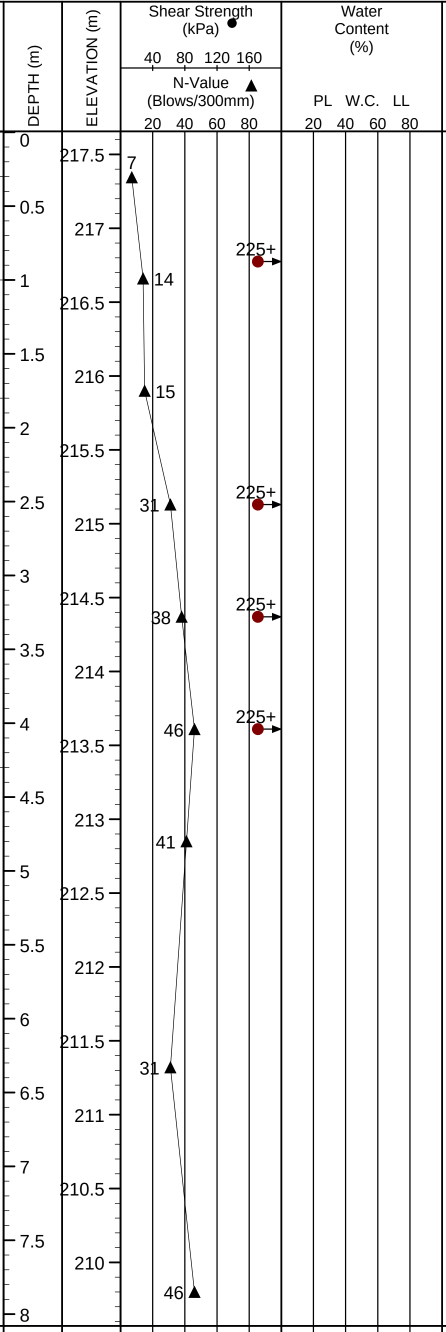
CLIENT: Orlando Corporation
PROJECT: Boston Church Rd and Esquesing Line
LOCATION: Milton, Ontario
METHOD: Augering and Split Spoon Sampling
PROJECT ENGINEER: VN
ELEV. (m) 217.65
NORTHING: 4821827.48
EASTING: 589096.73

BH No.: 505

PROJECT NO.: CT3003.00

SAMPLE TYPE: AUGER · DRIVEN · CORING · DYNAMIC CONE · SHELBY · SPLIT SPOON

SOIL DESCRIPTION
TOPSOIL 300 mm
stiff, moist, reddish brown CLAYEY SILT some sand, trace gravel (TILL)
very dense, moist, reddish brown SANDY SILT
hard, moist, reddish brown CLAYEY SILT some sand, trace gravel (TILL)
dense, moist, grey SILT some clay, traces of clay and gravel (TILL)
END OF BOREHOLE



SAMPLE NO.	SPT(N)
1A 1B	7
2A 2B	14
3A 3B	15
4	31
5	38
6	46
7	41
8	31
9	46

GWL (m): ▽

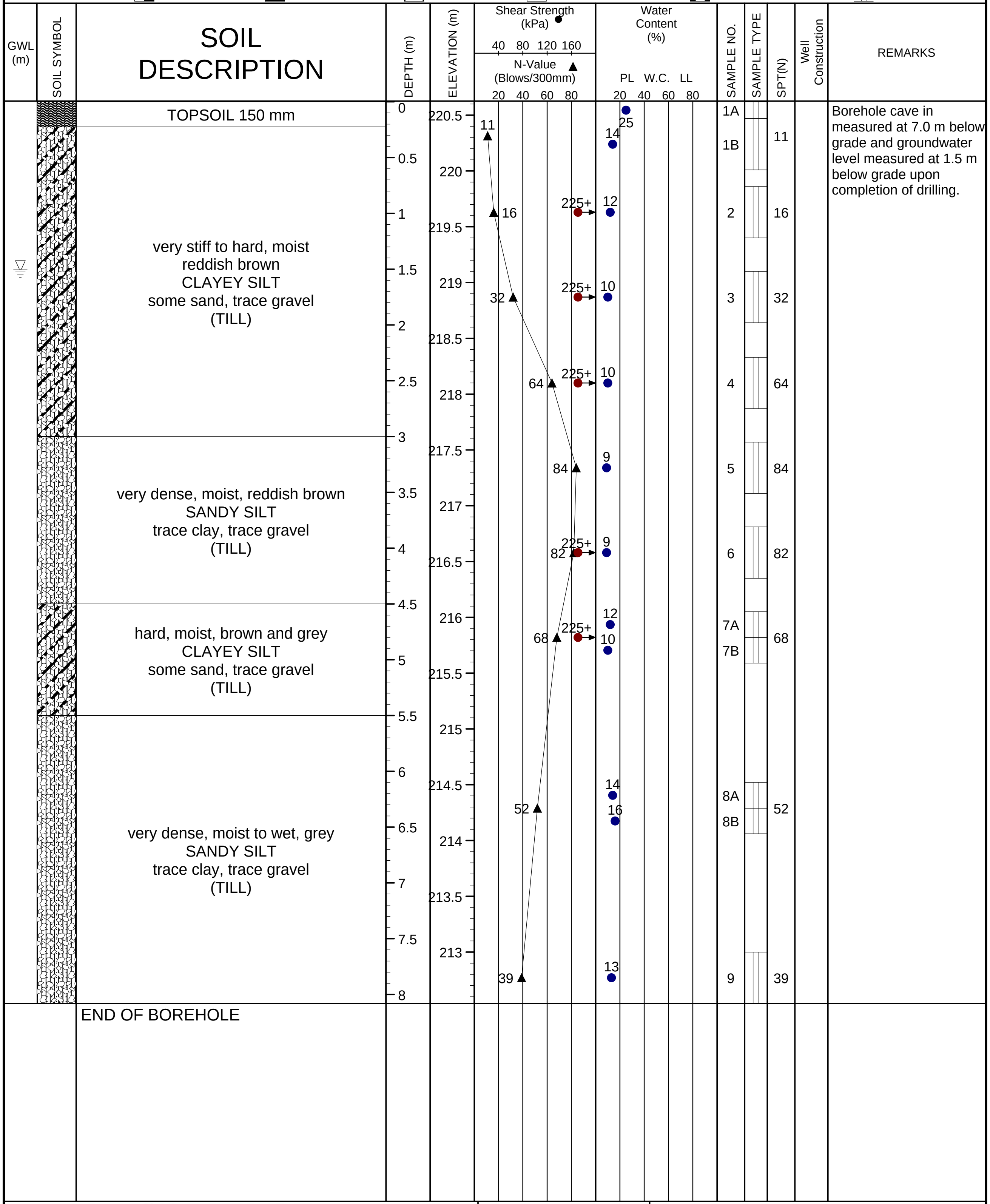
REMARKS: Borehole open and and groundwater level measured at 6.7 m below grade upon completion of drilling.

TERRAPEX

LOGGED BY: AD
REVIEWED BY: VN
DRILLING DATE: December 18, 2020
Page 1 of 1

CLIENT: Orlando Corporation	METHOD: Augering and Split Spoon Sampling	**BH No.: 506**
PROJECT: Boston Church Rd and Esquesing Line	PROJECT ENGINEER: VN ELEV. (m) 220.62	
LOCATION: Milton, Ontario	NORTHING: 4821721.43 EASTING: 588802.29	PROJECT NO.: CT3003.00

SAMPLE TYPE: AUGER, DRIVEN, CORING, DYNAMIC CONE, SHELBY, SPLIT SPOON



SOIL DESCRIPTION

TOPSOIL 150 mm

very stiff to hard, moist
reddish brown
CLAYEY SILT
some sand, trace gravel
(TILL)

very dense, moist, reddish brown
SANDY SILT
trace clay, trace gravel
(TILL)

hard, moist, brown and grey
CLAYEY SILT
some sand, trace gravel
(TILL)

very dense, moist to wet, grey
SANDY SILT
trace clay, trace gravel
(TILL)

END OF BOREHOLE

SAMPLE NO.	SPT(N)
1A	
1B	11
2	16
3	32
4	64
5	84
6	82
7A	68
7B	
8A	52
8B	
9	39

REMARKS

Borehole cave in measured at 7.0 m below grade and groundwater level measured at 1.5 m below grade upon completion of drilling.

TERRAPEX

LOGGED BY: AD

REVIEWED BY: VN

DRILLING DATE: December 18, 2020

CLIENT: Orlando Corporation

METHOD: Augering and Split Spoon Sampling

PROJECT: Boston Church Rd and Esquesing Line

PROJECT ENGINEER: VN

ELEV. (m) 219.18

BH No.: 507

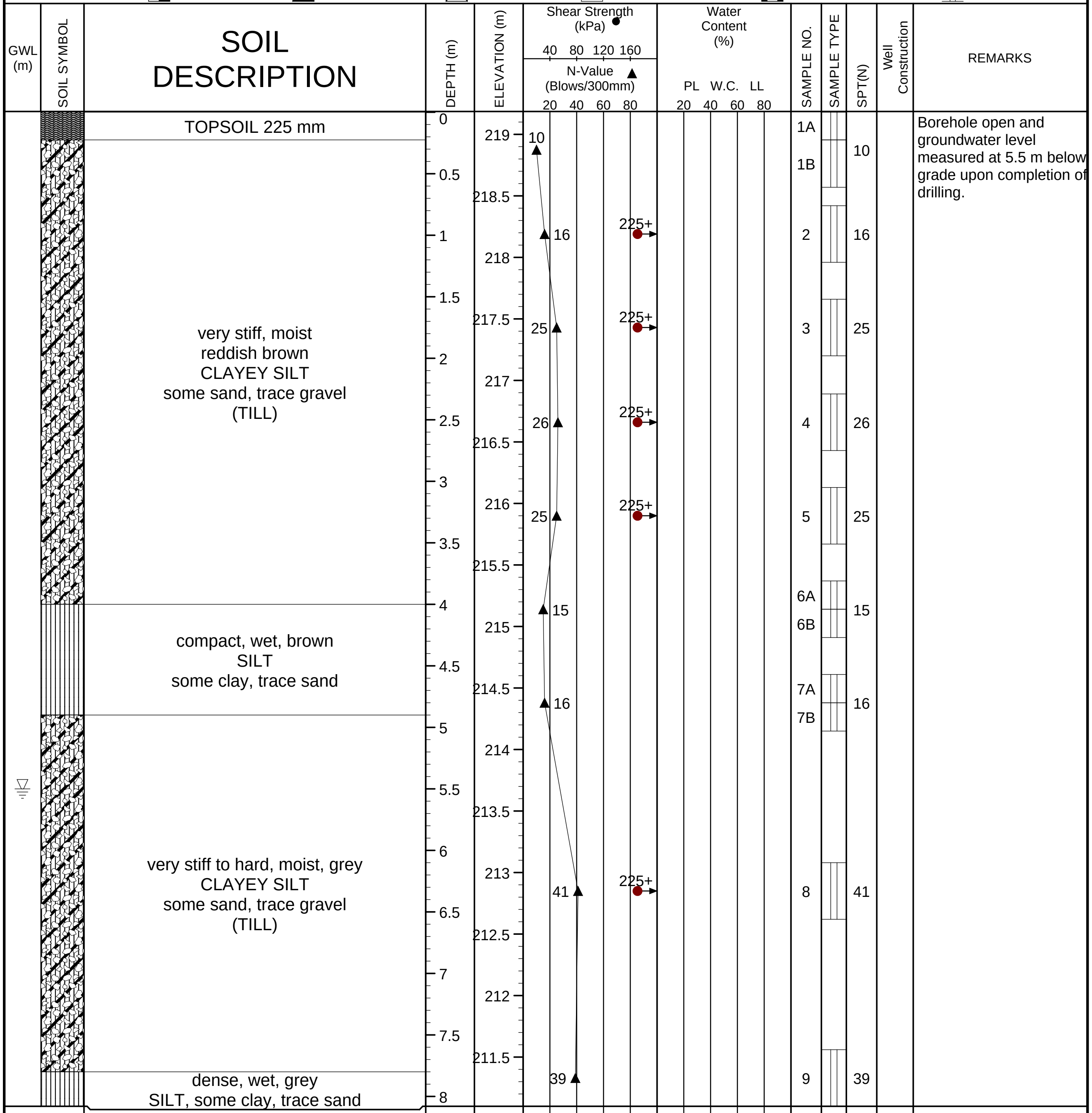
LOCATION: Milton, Ontario

NORTHING: 4821951.31

EASTING: 588583.46

PROJECT NO.: CT3003.00

SAMPLE TYPE ▌ AUGER ◢ DRIVEN ⧗ CORING ▀ DYNAMIC CONE ▐ SHELBY ⌶ SPLIT SPOON



SOIL DESCRIPTION

TOPSOIL 225 mm

very stiff, moist
reddish brown
CLAYEY SILT
some sand, trace gravel
(TILL)

compact, wet, brown
SILT
some clay, trace sand

very stiff to hard, moist, grey
CLAYEY SILT
some sand, trace gravel
(TILL)

dense, wet, grey
SILT, some clay, trace sand

END OF BOREHOLE

SAMPLE NO.	SPT(N)	Shear Strength (kPa)
1A	10	
1B		
2	16	225+
3	25	225+
4	26	225+
5	25	225+
6A	15	
6B		
7A	16	
7B		
8	41	225+
9	39	

REMARKS

Borehole open and groundwater level measured at 5.5 m below grade upon completion of drilling.

TERRAPEX

LOGGED BY: AD

DRILLING DATE: December 17, 2020

REVIEWED BY: VN

Page 1 of 1

CLIENT: Orlando Corporation	METHOD: Augering and Split Spoon Sampling	**BH No.: 508**
PROJECT: Boston Church Rd and Esquesing Line	PROJECT ENGINEER: VN ELEV. (m) 213.93	
LOCATION: Milton, Ontario	NORTHING: 4822584.32 EASTING: 589512.66	PROJECT NO.: CT3003.00

SAMPLE TYPE ▮ AUGER ◪ DRIVEN ⧗ CORING ▀ DYNAMIC CONE ▯ SHELBY ⌶ SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) ● 40 80 120 160 N-Value (Blows/300mm) ▲ 20 40 60 80	Water Content (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
∇		TOPSOIL 600 mm	0 0.5	213.5	5	21	1	⌶	5		Groundwater level measured at 1.2 m below grade upon completion of drilling. 50 mm diameter monitoring well installed. Water level at 0.12 mbgs on January 7, 2021.
		loose, moist, reddish brown SILT some clay, trace sand	1	213	5	21	2	⌶	5		
		very stiff, moist, reddish brown CLAYEY SILT some sand, trace gravel (TILL)	1.5 2	212.5 212	225+ 24	11	3	⌶	24		

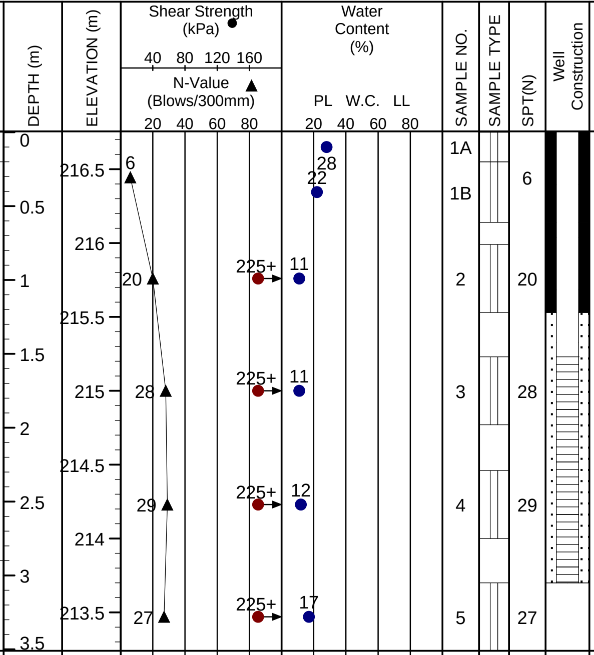
END OF BOREHOLE

LOGGED BY: AD	DRILLING DATE: December 22, 2020
REVIEWED BY: VN	Page 1 of 1

CLIENT: Orlando Corporation	METHOD: Augering and Split Spoon Sampling	**BH No.: 509**
PROJECT: Boston Church Rd and Esquesing Line	PROJECT ENGINEER: VN ELEV. (m) 216.75	
LOCATION: Milton, Ontario	NORTHING: 4822624.71 EASTING: 589208.62	PROJECT NO.: CT3003.00

SAMPLE TYPE ◧ AUGER ◪ DRIVEN ⧓ CORING ▀ DYNAMIC CONE ▯ SHELBY ⌶ SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION
		TOPSOIL 200 mm
		very stiff moist, reddish brown CLAYEY SILT some sand, trace gravel (TILL)
		compact, moist, reddish brown SILT some clay, trace sand
		END OF BOREHOLE



SAMPLE NO.	N-Value	Shear Strength (kPa)	Water Content (%)	SPT(N)
1A			28	
1B	6		22	6
2	20	225+	11	20
3	28	225+	11	28
4	29	225+	12	29
5	27	225+	17	27

REMARKS

Borehole dry and open upon completion of drilling.

50 mm diameter monitoring well installed.

Monitoring well dry on January 7, 2021.

TERRAPEX

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CLIENT: Orlando Corporation

METHOD: Augering and Split Spoon Sampling

PROJECT: Boston Church Rd and Esquesing Line

PROJECT ENGINEER: VN

ELEV. (m) 218.54

BH No.: 510

LOCATION: Milton, Ontario

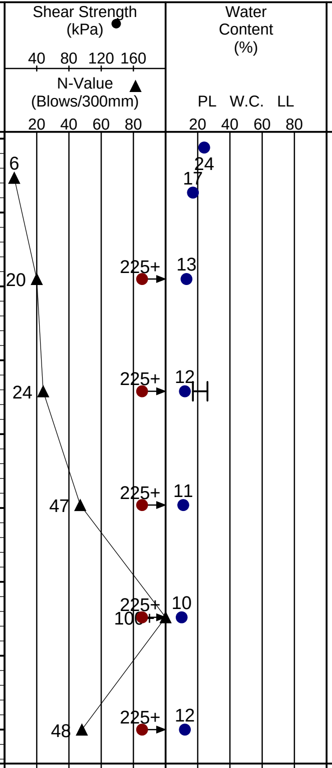
NORTHING: 4822482.74

EASTING: 588918.25

PROJECT NO.: CT3003.00

SAMPLE TYPE AUGER DRIVEN CORING DYNAMIC CONE SHELBY SPLIT SPOON

GWL (m)	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SAMPLE NO.	SPT(N)
	TOPSOIL 200 mm	0	218.5	1A	
	very stiff to hard moist CLAYEY SILT some sand, trace gravel (TILL)	0.5	218	1B	6
		1	217.5	2	20
∇		1.5	217	3	24
		2	216.5	4	47
		2.5	216	5	100+
		3	215.5		
	reddish brown ----- grey	3.5	215	6	48
		4	214.5		
	END OF BOREHOLE				



REMARKS

Groundwater level measured at 2.7 m below grade upon completion of drilling.

50 mm diameter monitoring well installed.

Water level at 1.87 mbgs on January 7, 2021.

TERRAPEX

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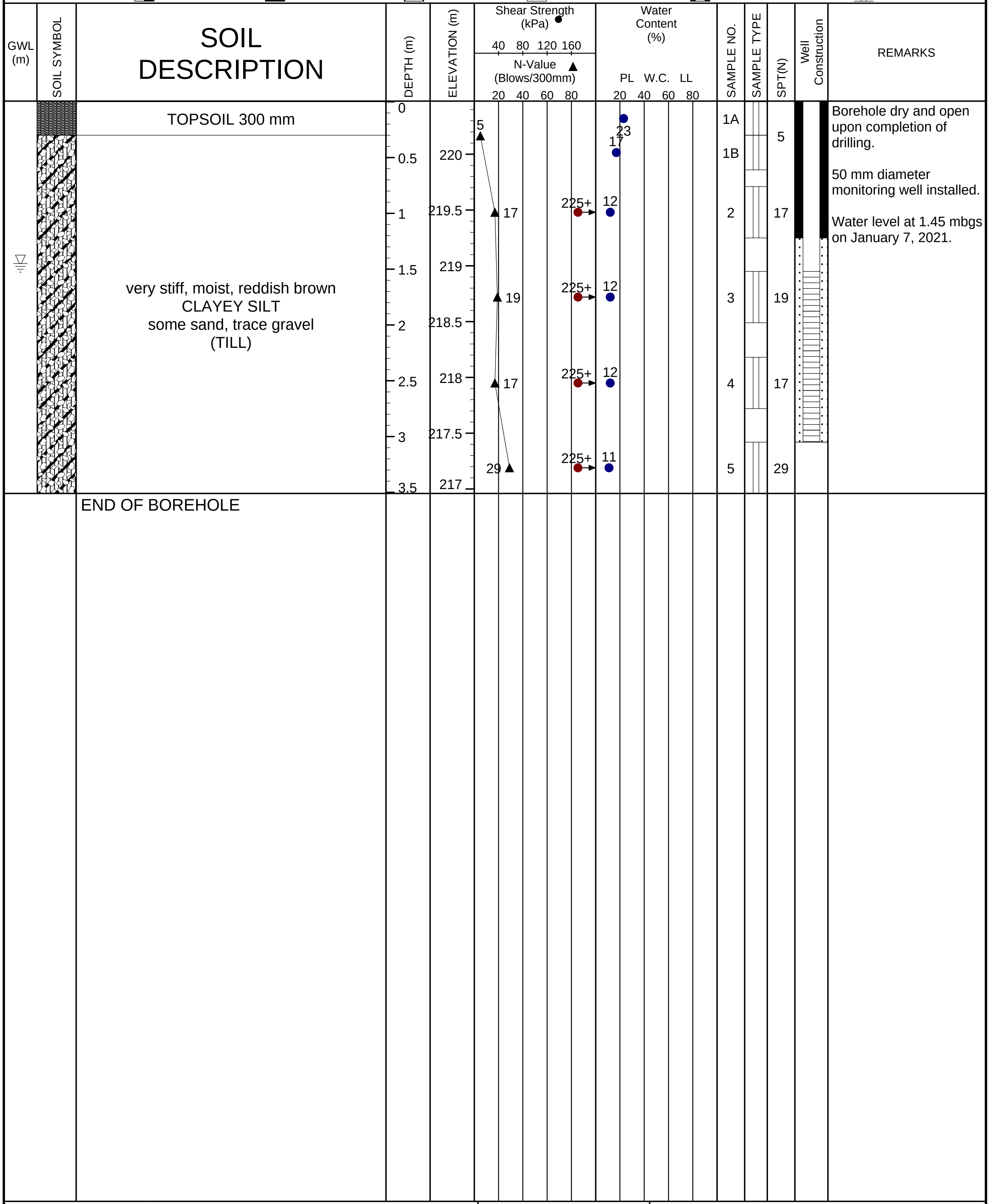
CLIENT: Orlando Corporation
METHOD: Augering and Split Spoon Sampling

BH No.: 511

PROJECT: Boston Church Rd and Esquesing Line
PROJECT ENGINEER: VN
ELEV. (m) 220.47
LOCATION: Milton, Ontario
NORTHING: 4821688.71
EASTING: 588128.30
PROJECT NO.: CT3003.00

SAMPLE TYPE ▮ AUGER ◪ DRIVEN ⧗ CORING ▀ DYNAMIC CONE ▯ SHELBY ⌶ SPLIT SPOON



SOIL DESCRIPTION	REMARKS
TOPSOIL 300 mm	Borehole dry and open upon completion of drilling.
very stiff, moist, reddish brown CLAYEY SILT some sand, trace gravel (TILL)	50 mm diameter monitoring well installed. Water level at 1.45 mbgs on January 7, 2021.

SAMPLE NO.	SPT(N)	N-Value	Shear Strength (kPa)	Water Content (%)
1A	5	5		23
1B				17
2	17	17	225+	12
3	19	19	225+	12
4	17	17	225+	12
5	29	29	225+	11

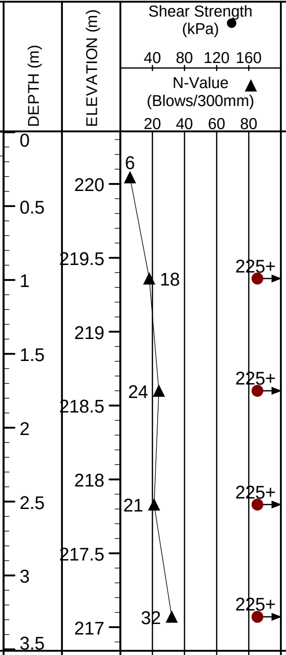
END OF BOREHOLE

TERRAPEX

LOGGED BY: AD
DRILLING DATE: December 29, 2020
REVIEWED BY: VN

CLIENT: Orlando Corporation	METHOD: Augering and Split Spoon Sampling		**BH No.: 512**
PROJECT: Boston Church Rd and Esquesing Line	PROJECT ENGINEER: VN	ELEV. (m) 220.35	
LOCATION: Milton, Ontario	NORTHING: 4821769.12	EASTING: 588038.12	PROJECT NO.: CT3003.00

SAMPLE TYPE ◧ AUGER ◪ DRIVEN ⧓ CORING ⬒ DYNAMIC CONE ▯ SHELBY ⌶ SPLIT SPOON



GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	Water Content (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		TOPSOIL 150 mm		1A				Borehole dry and open upon completion of drilling.
		very stiff, moist, reddish brown CLAYEY SILT some sand, trace gravel (TILL)		1B		6		
				2		18		
				3		24		
				4		21		
				5		32		
		END OF BOREHOLE						

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REVIEWED BY: VN	Page 1 of 1

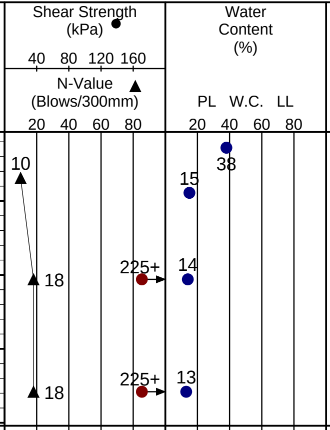
CLIENT: Orlando Corporation
METHOD: Augering and Split Spoon Sampling

BH No.: 513

PROJECT: Boston Church Rd and Esquesing Line
PROJECT ENGINEER: VN
ELEV. (m) 220.46
LOCATION: Milton, Ontario
NORTHING: 4821828.03
EASTING: 587906.52
PROJECT NO.: CT3003.00

SAMPLE TYPE: AUGER, DRIVEN, CORING, DYNAMIC CONE, SHELBY, SPLIT SPOON

GWL (m)	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) ●	N-Value (Blows/300mm) ▲	Water Content (%)	SAMPLE NO.	SPT(N)	Well Construction	REMARKS
	TOPSOIL 200 mm	0	220.46			38	1A			Borehole dry and open up on completion of drilling.
	very stiff, moist, reddish brown CLAYEY SILT some sand, trace gravel (TILL)	0.5	220		10	15	1B	10		
		1	219.5	225+	18	14	2	18		
		1.5	219	225+	18	13	3	18		
			218.5							
	END OF BOREHOLE									



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DRILLING DATE: December 29, 2020
REVIEWED BY: VN
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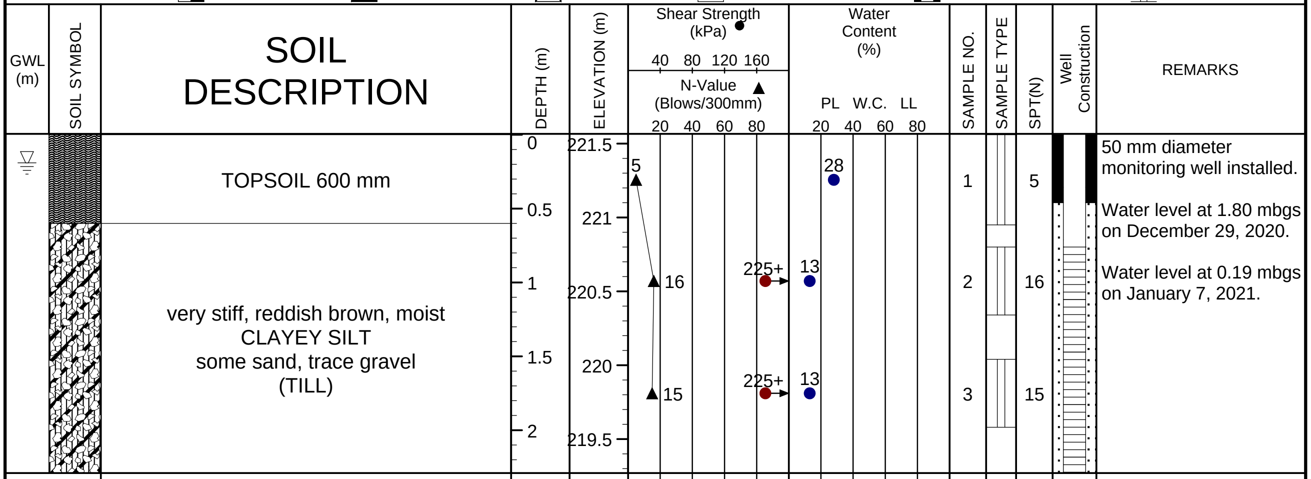
CLIENT: Orlando Corporation
METHOD: Augering and Split Spoon Sampling

BH No.: 514

PROJECT: Boston Church Rd and Esquesing Line
PROJECT ENGINEER: VN
ELEV. (m) 221.56
LOCATION: Milton, Ontario
NORTHING: 4821975.99
EASTING: 587762.37
PROJECT NO.: CT3003.00

SAMPLE TYPE: ◨ AUGER ◢ DRIVEN ⧓ CORING ⬒ DYNAMIC CONE ▯ SHELBY ⌶ SPLIT SPOON



TOPSOIL 600 mm

very stiff, reddish brown, moist
CLAYEY SILT
some sand, trace gravel
(TILL)

END OF BOREHOLE

50 mm diameter monitoring well installed.

Water level at 1.80 mbgs on December 29, 2020.

Water level at 0.19 mbgs on January 7, 2021.

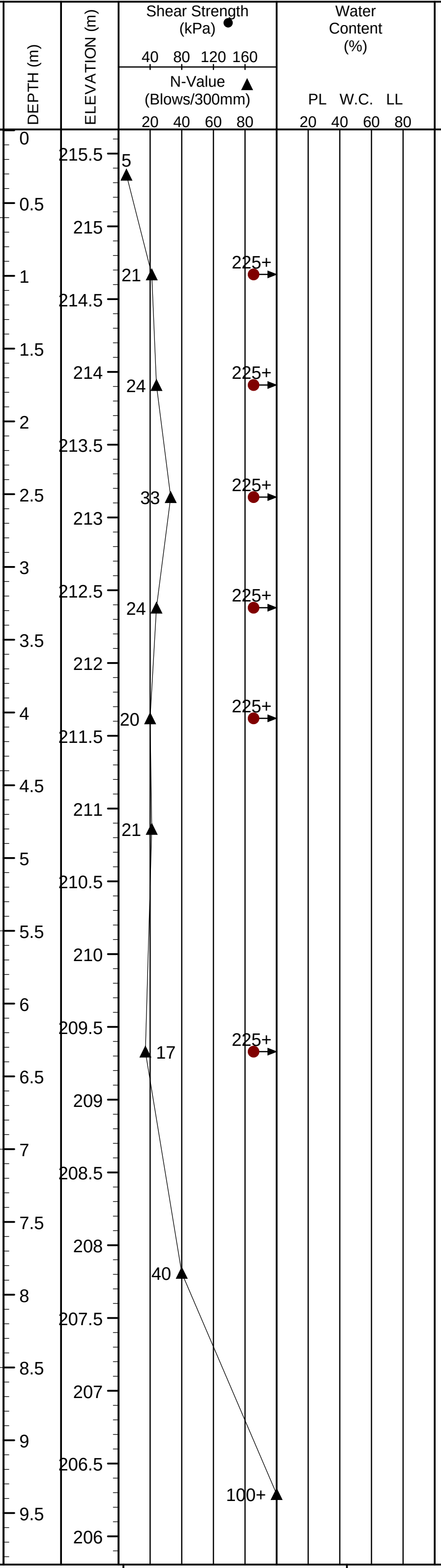
TERRAPEX

LOGGED BY: AD
DRILLING DATE: December 29, 2020
REVIEWED BY: VN
Page 1 of 1

CLIENT: Orlando Corporation	METHOD: Augering and Split Spoon Sampling		**BH No.: 515**
PROJECT: Boston Church Rd and Esquesing Line	PROJECT ENGINEER: VN	ELEV. (m) 215.66	
LOCATION: Milton, Ontario	NORTHING: 4822256.08	EASTING: 589449.11	PROJECT NO.: CT3003.00

SAMPLE TYPE: AUGER, DRIVEN, CORING, DYNAMIC CONE, SHELBY, SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION
		TOPSOIL 600 mm
		very stiff to hard, moist CLAYEY SILT some sand, trace gravel (TILL) reddish brown ----- grey
		compact, wet, grey SILT trace sand, trace clay
		very stiff, moist, reddish brown CLAYEY SILT some sand, trace gravel
		dense, moist, reddish grey SILT trace sand, trace clay
▽		very dense, wet, reddish grey SILTY SAND



SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction
1	SPLIT SPOON	5	
2	SPLIT SPOON	21	
3	SPLIT SPOON	24	
4	SPLIT SPOON	33	
5	SPLIT SPOON	24	
6	SPLIT SPOON	20	
7	SPLIT SPOON	21	
8	SPLIT SPOON	17	
9	SPLIT SPOON	40	
10	SPLIT SPOON	100+	

REMARKS

Borehole cave-in and groundwater water level measured at 9.1 mbgs upon completion of drilling.

TERRAPEX

LOGGED BY: AD	DRILLING DATE: December 28, 2020
REVIEWED BY: VN	Page 1 of 2

CLIENT: Orlando Corporation	METHOD: Augering and Split Spoon Sampling		**BH No.: 515**
PROJECT: Boston Church Rd and Esquesing Line	PROJECT ENGINEER: VN	ELEV. (m) 215.66	
LOCATION: Milton, Ontario	NORTHING: 4822256.08	EASTING: 589449.11	PROJECT NO.: CT3003.00

SAMPLE TYPE ▐ AUGER ◢ DRIVEN ⧓ CORING ▀ DYNAMIC CONE ▯ SHELBY ⌶ SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) ● 40 80 120 160 N-Value ▲ (Blows/300mm) 20 40 60 80	Water Content (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
	▥	very dense, wet, reddish grey SILTY SAND	10 10.5	205.5 205	100+ ▲		11A 11B	⌶ ⌶	100+		
	▨	hard, moist, reddish grey CLAYEY SILT some sand, trace gravel (TILL)	11 11.5 12 12.5	204.5 204 203.5	100+ ▲		12A 12B	⌶ ⌶	100+		
		END OF BOREHOLE									

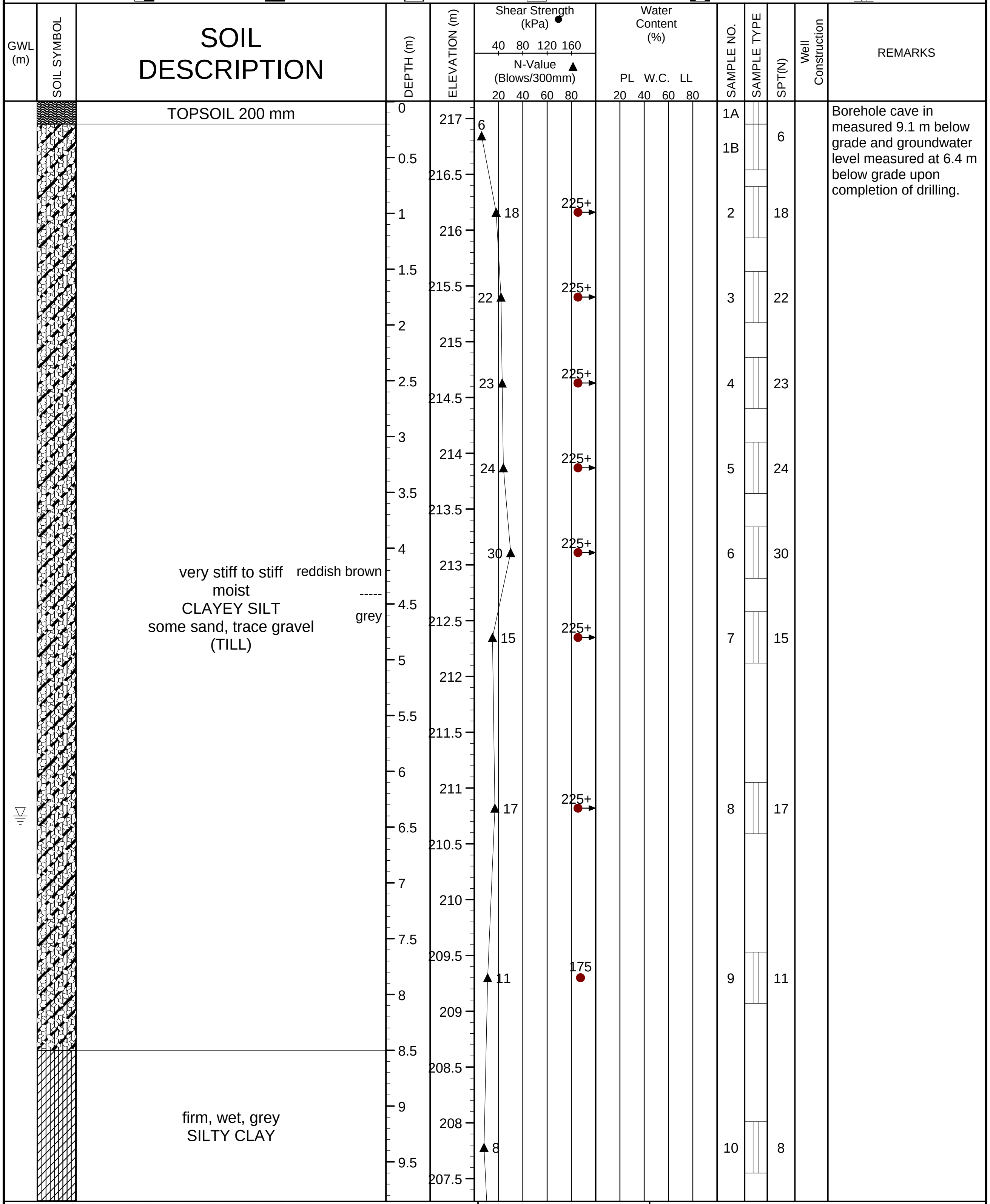
TERRAPEX	LOGGED BY: AD	DRILLING DATE: December 28, 2020
	REVIEWED BY: VN	Page 2 of 2

CLIENT: Orlando Corporation
METHOD: Augering and Split Spoon Sampling
PROJECT: Boston Church Rd and Esquesing Line
PROJECT ENGINEER: VN
ELEV. (m) 217.15

BH No.: 516

LOCATION: Milton, Ontario
NORTHING: 4822081.03
EASTING: 588985.74
PROJECT NO.: CT3003.00

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON



Depth (m)	SOIL DESCRIPTION	SAMPLE NO.	SPT(N)	Shear Strength (kPa)
0 – 0.2	TOPSOIL 200 mm	1A		
0.2 – 8.3	very stiff to stiff, moist, CLAYEY SILT, some sand, trace gravel (TILL); reddish brown ----- grey	1B	6	
		2	18	225+
		3	22	225+
		4	23	225+
		5	24	225+
		6	30	225+
		7	15	225+
		8	17	225+
		9	11	175
8.3 –	firm, wet, grey SILTY CLAY	10	8	

REMARKS: Borehole cave in measured 9.1 m below grade and groundwater level measured at 6.4 m below grade upon completion of drilling.

TERRAPEX

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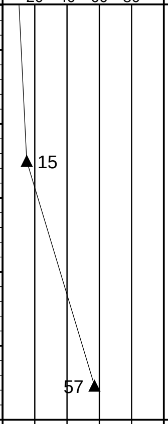
CLIENT: Orlando Corporation
METHOD: Augering and Split Spoon Sampling

BH No.: 516

PROJECT: Boston Church Rd and Esquesing Line
PROJECT ENGINEER: VN
ELEV. (m) 217.15
LOCATION: Milton, Ontario
NORTHING: 4822081.03
EASTING: 588985.74
PROJECT NO.: CT3003.00

SAMPLE TYPE: AUGER, DRIVEN, CORING, DYNAMIC CONE, SHELBY, SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) ● 40 80 120 160 N-Value (Blows/300mm) ▲ 20 40 60 80	Water Content (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
	▨	firm, wet, grey SILTY CLAY	10 10.5	207 206.5	▲15		11A 11B	SPLIT SPOON	15		
	░	compact to very dense, wet, reddish brown GRAVELLY SAND and SAND	11 11.5 12 12.5	206 205.5 205	57▲		12A 12B	SPLIT SPOON	57		
		END OF BOREHOLE									



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LOGGED BY: AD
DRILLING DATE: December 17, 2020
REVIEWED BY: VN
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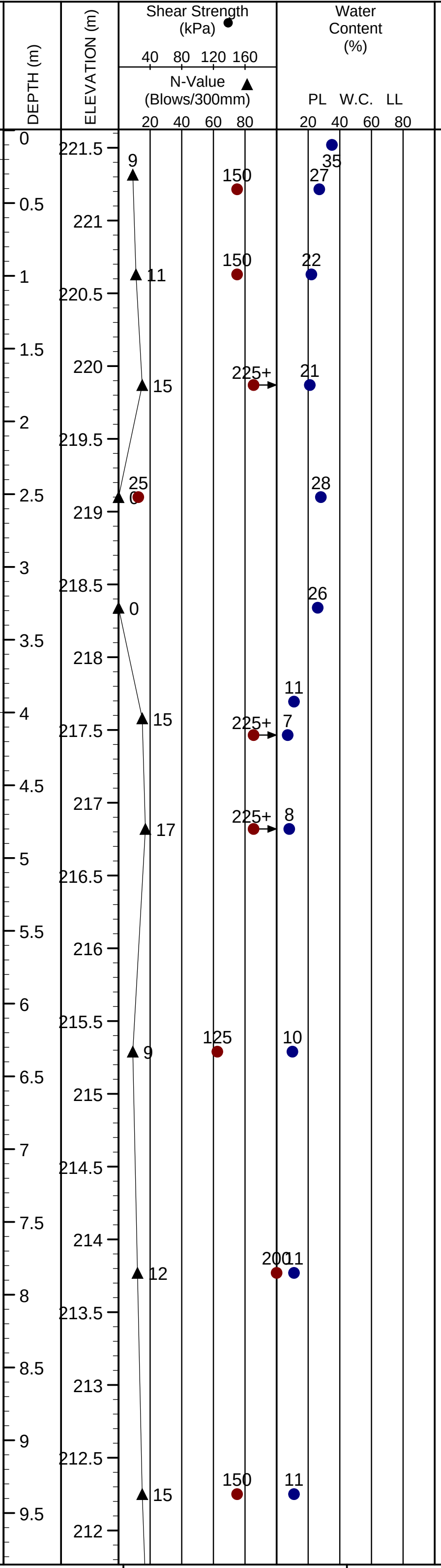
CLIENT: Orlando Corporation
METHOD: Augering and Split Spoon Sampling
PROJECT: Boston Church Rd and Esquesing Line
PROJECT ENGINEER: VN
ELEV. (m) 221.62

BH No.: 517

LOCATION: Milton, Ontario
NORTHING: 4822110.82
EASTING: 588006.36
PROJECT NO.: CT3003.00

SAMPLE TYPE: ▐ AUGER ◢ DRIVEN ⧗ CORING ▀ DYNAMIC CONE ▐▌ SHELBY ⌶ SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	REMARKS
	▤	TOPSOIL 200 mm	0 – 0.2	Borehole open and groundwater level measured at 14.9 m below grade upon completion of drilling.
	▨	SILTY CLAY trace sand, trace gravel stiff / moist, brown ----- very soft / wet, grey	0.2 – 4.0	
	▧	stiff to very stiff moist, reddish brown CLAYEY SILT some sand, trace gravel (TILL)	4.0 –	



SAMPLE NO.	SAMPLE TYPE	SPT(N)	N-Value (Blows/300mm)	Shear Strength (kPa)	Water Content (%)
1A	⌶	9	9		35
1B	⌶			150	27
2	⌶	11	11	150	22
3	⌶	15	15	225+	21
4	⌶	0	0	25	28
5	⌶	0	0		26
6A	⌶	15	15		11
6B	⌶			225+	7
7	⌶	17	17	225+	8
8	⌶	9	9	125	10
9	⌶	12	12	200	11
10	⌶	15	15	150	11

Well Construction

TERRAPEX

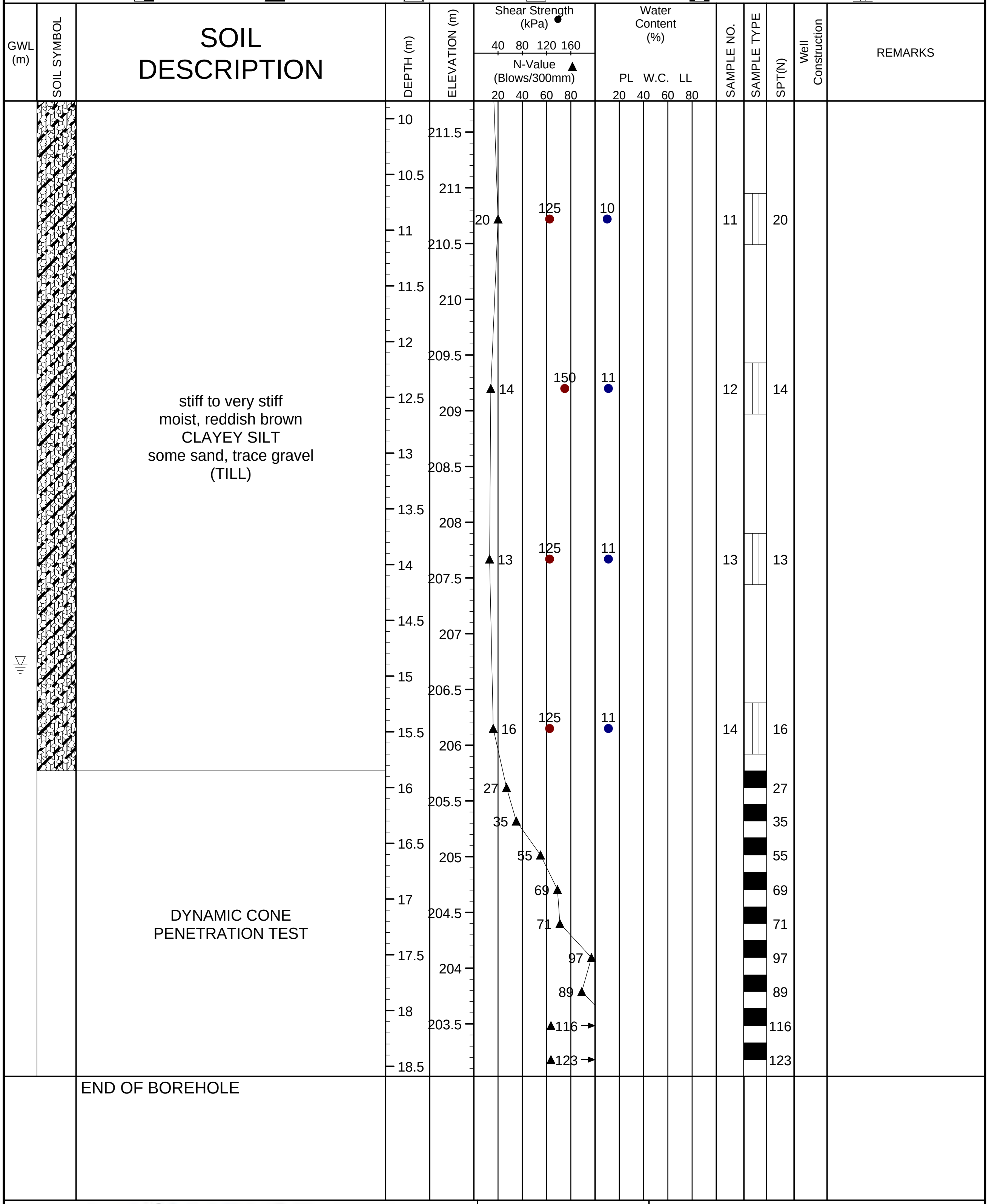
LOGGED BY: AD
DRILLING DATE: December 21, 2020
REVIEWED BY: VN

CLIENT: Orlando Corporation
PROJECT: Boston Church Rd and Esquesing Line
LOCATION: Milton, Ontario
METHOD: Augering and Split Spoon Sampling
PROJECT ENGINEER: VN
ELEV. (m) 221.62
NORTHING: 4822110.82
EASTING: 588006.36

BH No.: 517

PROJECT NO.: CT3003.00

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON



stiff to very stiff
moist, reddish brown
CLAYEY SILT
some sand, trace gravel
(TILL)

DYNAMIC CONE
PENETRATION TEST

END OF BOREHOLE

SAMPLE NO.	SPT(N)	Shear Strength (kPa)	Water Content (%)
11	20	125	10
12	14	150	11
13	13	125	11
14	16	125	11
	27		
	35		
	55		
	69		
	71		
	97		
	89		
	116		
	123		

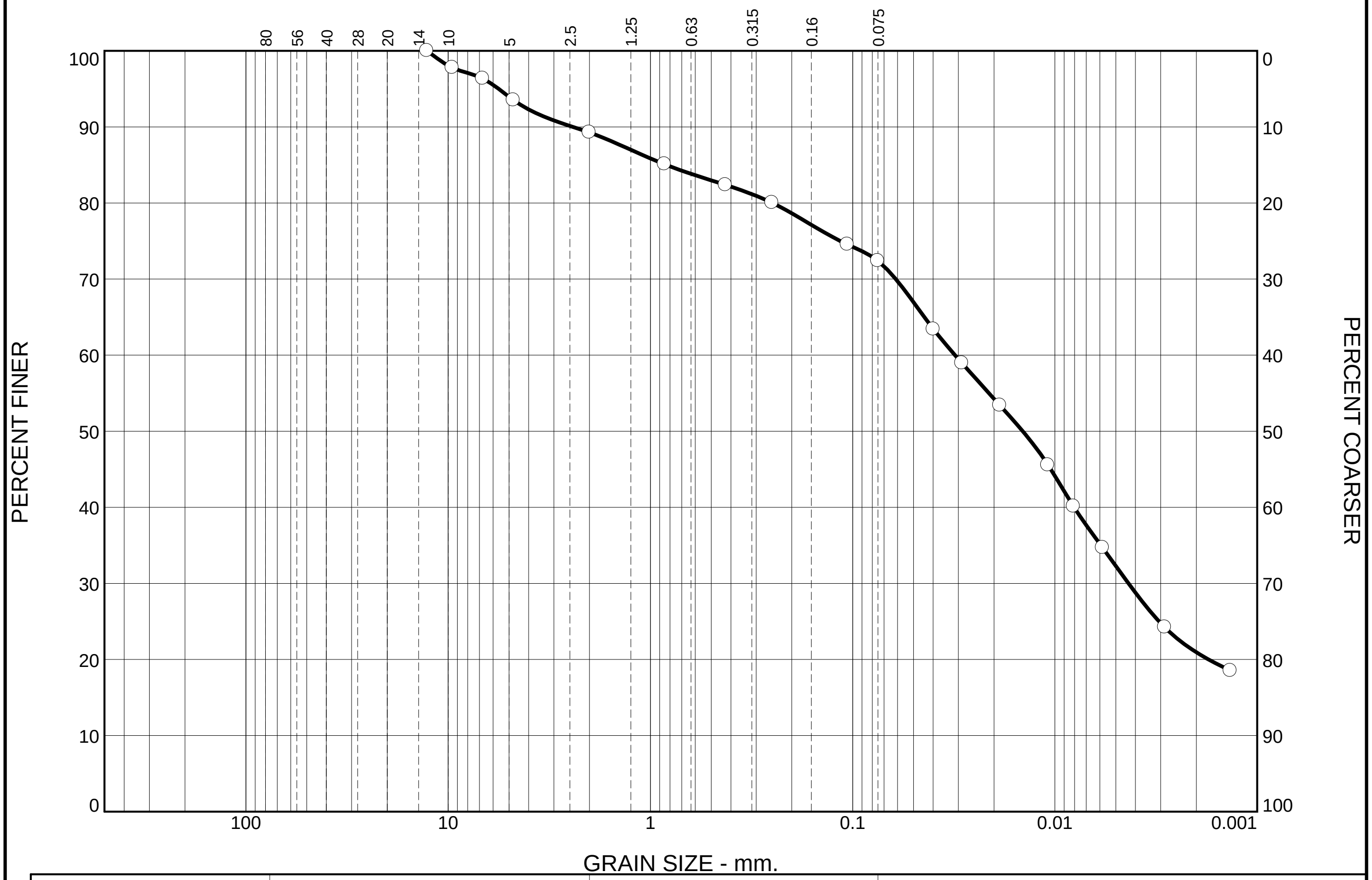
TERRAPEX

LOGGED BY: AD
REVIEWED BY: VN
DRILLING DATE: December 21, 2020

Appendix C

Laboratory Test Results

Particle Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	11	7	10	51	21

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	25	17	0.8344	0.0312	0.0144	0.0043				

Material Description	USCS	AASHTO
○ CLAYEY SILT, some sand, some gravel	CL	A-4(3)

Project No. CT3003.40 **Client:** Orlando Corporation

Project: 8872 & 8880 Boston Church Road and 8350 Esquesing Line Milton

○ **Sample Number:** BH502, SS3

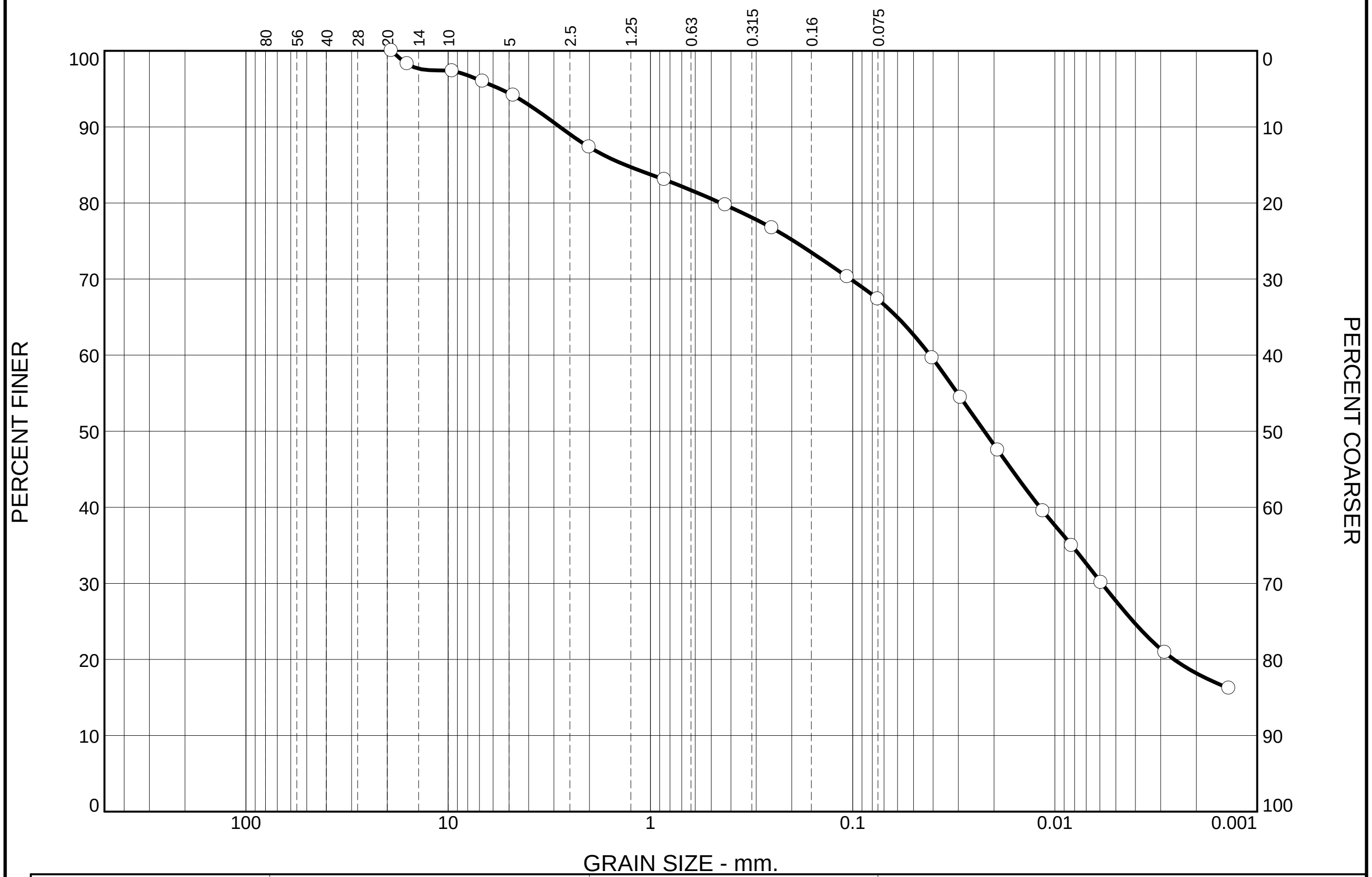
Remarks:

Terrapex

Figure C-1

Tested By: AM **Checked By:** DM

Particle Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	13	7	13	49	18

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			1.3294	0.0414	0.0223	0.0059				

Material Description	USCS	AASHTO
○ SILT, some sand, some clay, some gravel		

Project No. CT3003.40 **Client:** Orlando Corporation

Project: 8872 & 8880 Boston Church Road and 8350 Esquesing Line Milton

○ **Sample Number:** BH502, SS6

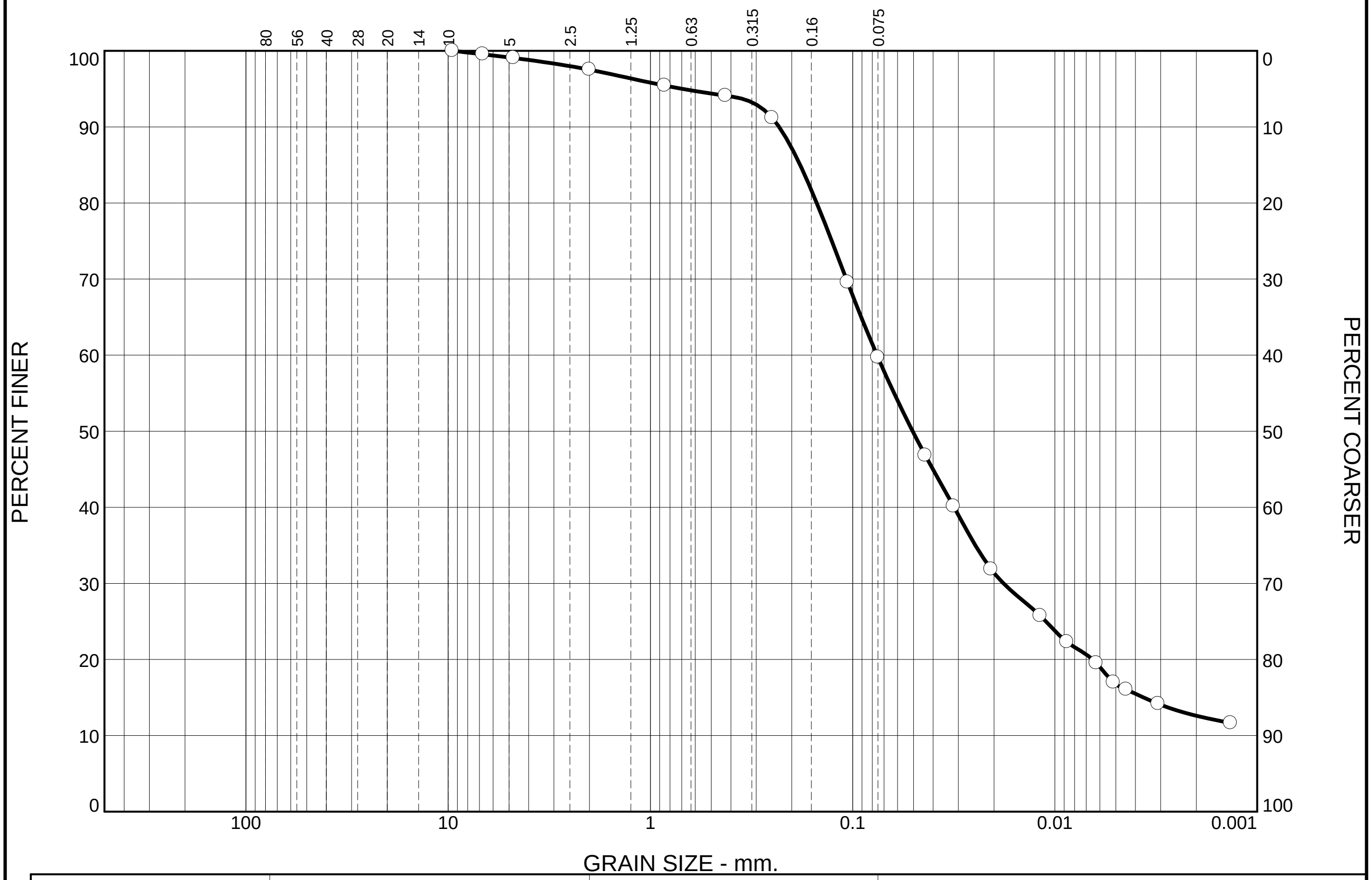
Remarks:

Terrapex

Figure C-2

Tested By: AM **Checked By:** DM

Particle Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	2	4	34	47	13

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.1818	0.0758	0.0505	0.0180	0.0036			

Material Description	USCS	AASHTO
○ SAND AND SILT some clay trace gravel		

Project No. CT3003.40 **Client:** Orlando Corporation

Project: 8872 & 8880 Boston Church Road and 8350 Esquesing Line Milton

○ **Sample Number:** BH503, Sample 3A

Remarks:

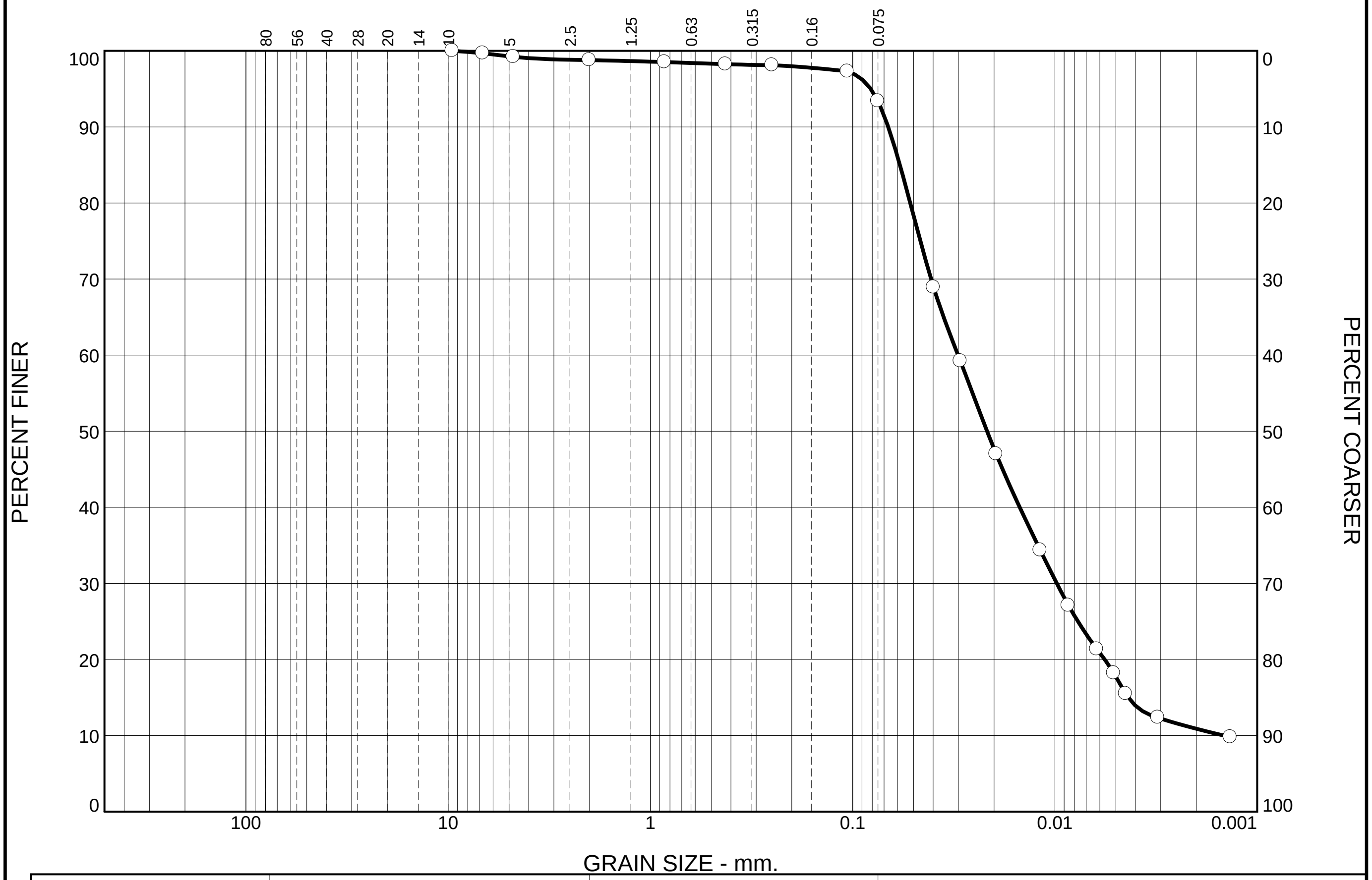
○Tested on January 19, 2021

Terrapex

Figure C-3

Tested By: AM

Particle Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	1	1	5	82	11

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.0584	0.0301	0.0216	0.0098	0.0043	0.0015	2.18	20.60

Material Description	USCS	AASHTO
○ SILT some clay trace sand trace gravel		

Project No. CT3003.40 **Client:** Orlando Corporation

Project: 8872 & 8880 Boston Church Road and 8350 Esquesing Line Milton

○ **Sample Number:** BH505, Sample 7A

Remarks:

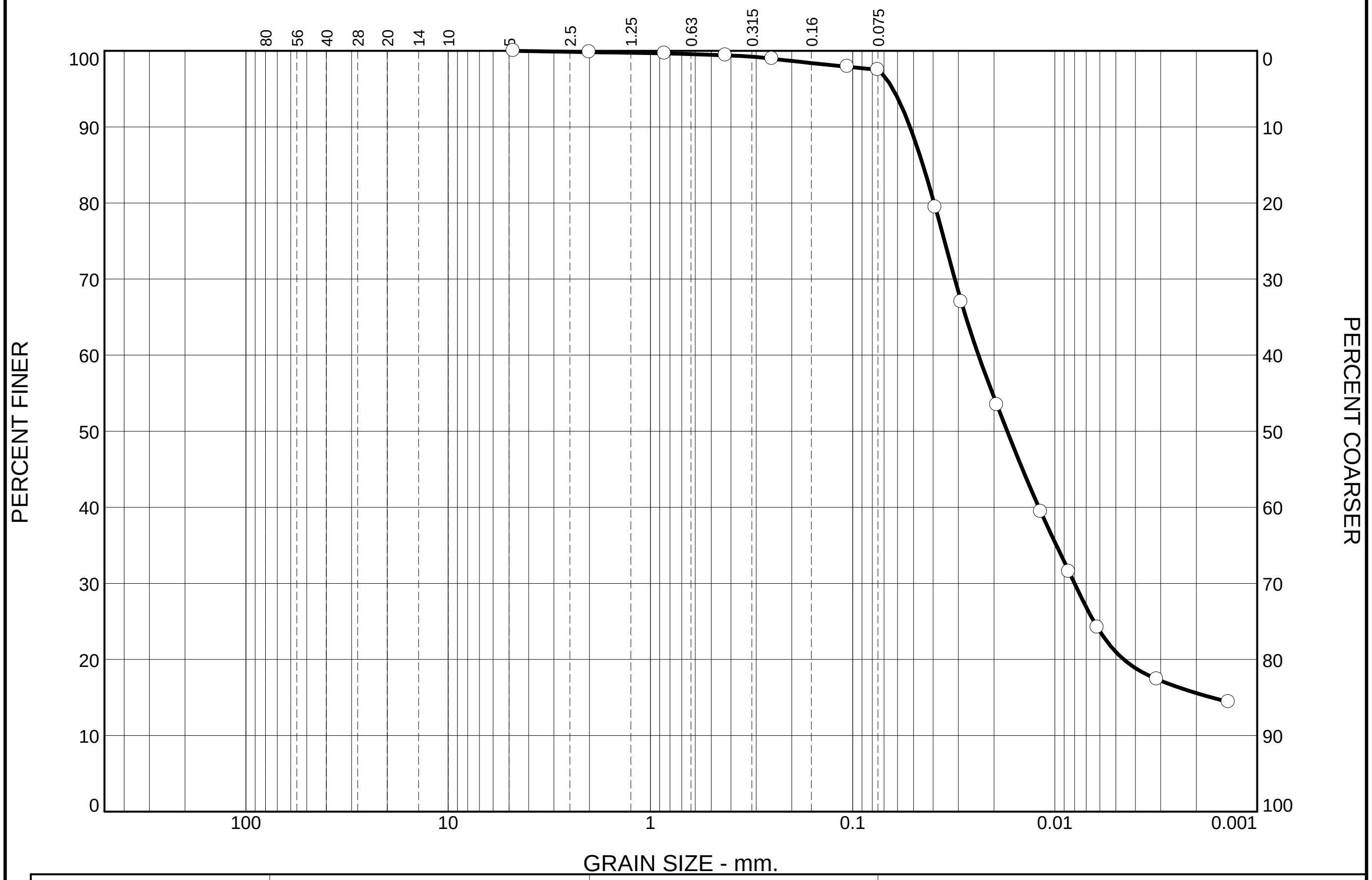
○Tested on January 19, 2021

Terrapex

Figure C-4

Tested By: AM

Particle Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	0	1	1	82	16

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	28	21	0.0449	0.0239	0.0172	0.0080	0.0017			

Material Description	USCS	AASHTO
○ SILT, some clay, trace sand	CL-ML	A-4(6)

Project No. CT3003.40 **Client:** Orlando Corporation

Project: 8872 & 8880 Boston Church Road and 8350 Esquesing Line Milton

○ **Sample Number:** BH508, SS2

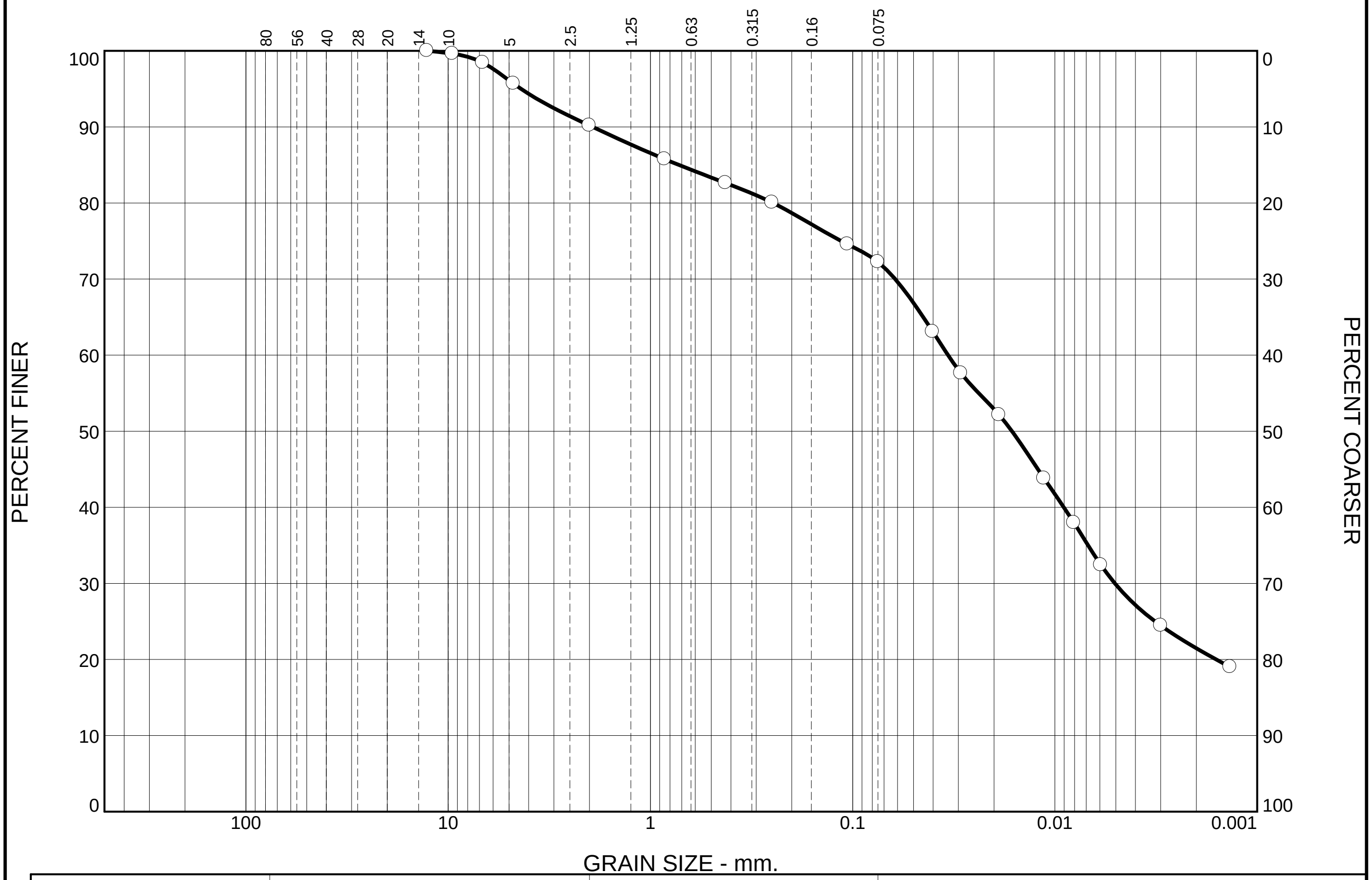
Remarks:

Terrapex

Figure C-5

Tested By: AM **Checked By:** DM

Particle Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	10	7	11	51	21

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.7223	0.0338	0.0163	0.0051				

Material Description	USCS	AASHTO
○ CLAYEY SILT, some sand, trace gravel		

Project No. CT3003.40 **Client:** Orlando Corporation

Project: 8872 & 8880 Boston Church Road and 8350 Esquesing Line Milton

○ **Sample Number:** BH508, SS3

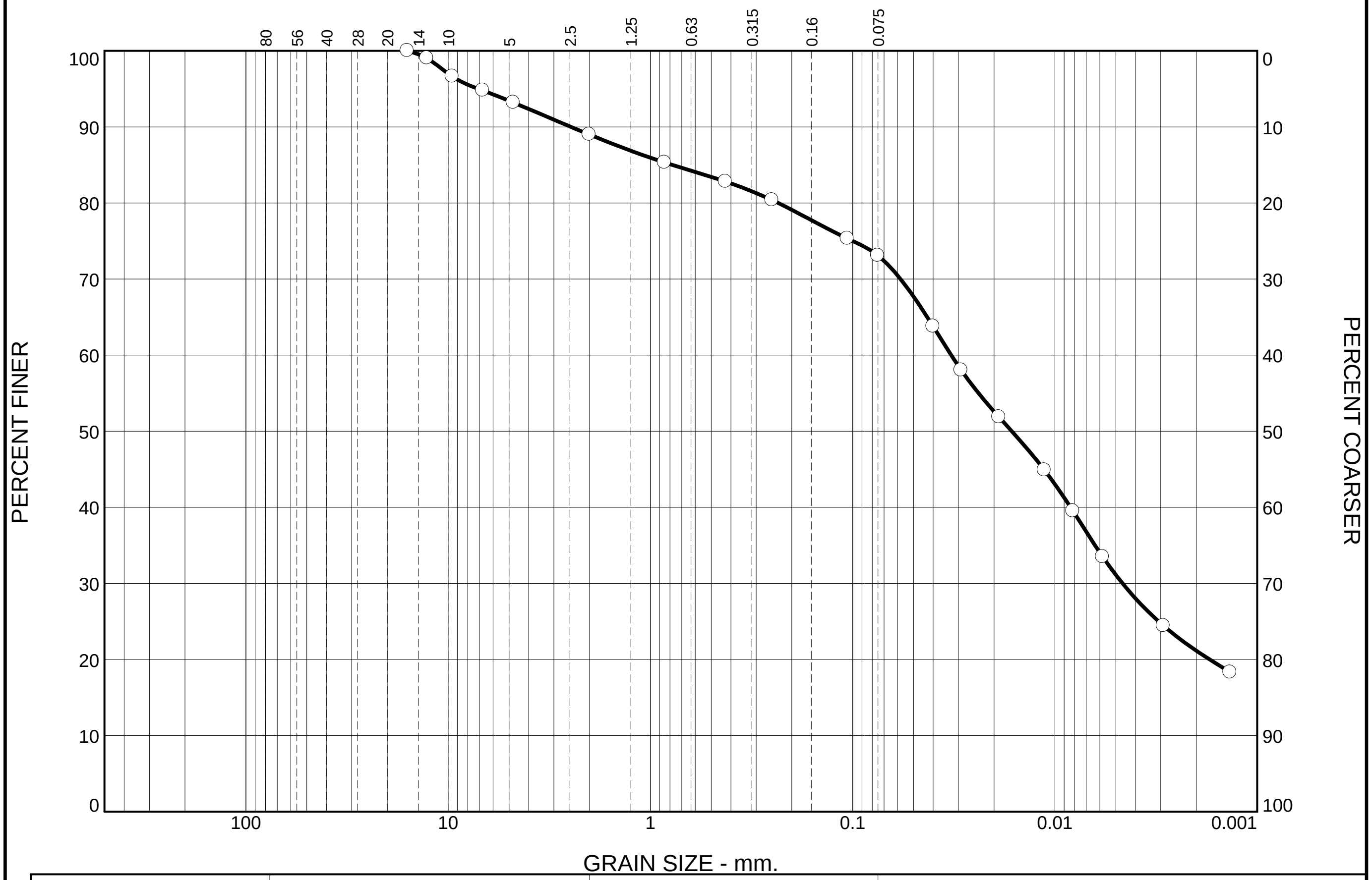
Remarks:

Terrapex

Figure C-6

Tested By: AM **Checked By:** DM

Particle Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	11	6	10	52	21

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.7791	0.0326	0.0163	0.0046				

Material Description	USCS	AASHTO
○ CLAYEY SILT, some sand, some gravel		

Project No. CT3003.40 **Client:** Orlando Corporation

Project: 8872 & 8880 Boston Church Road and 8350 Esquesing Line Milton

○ **Sample Number:** BH509, SS2

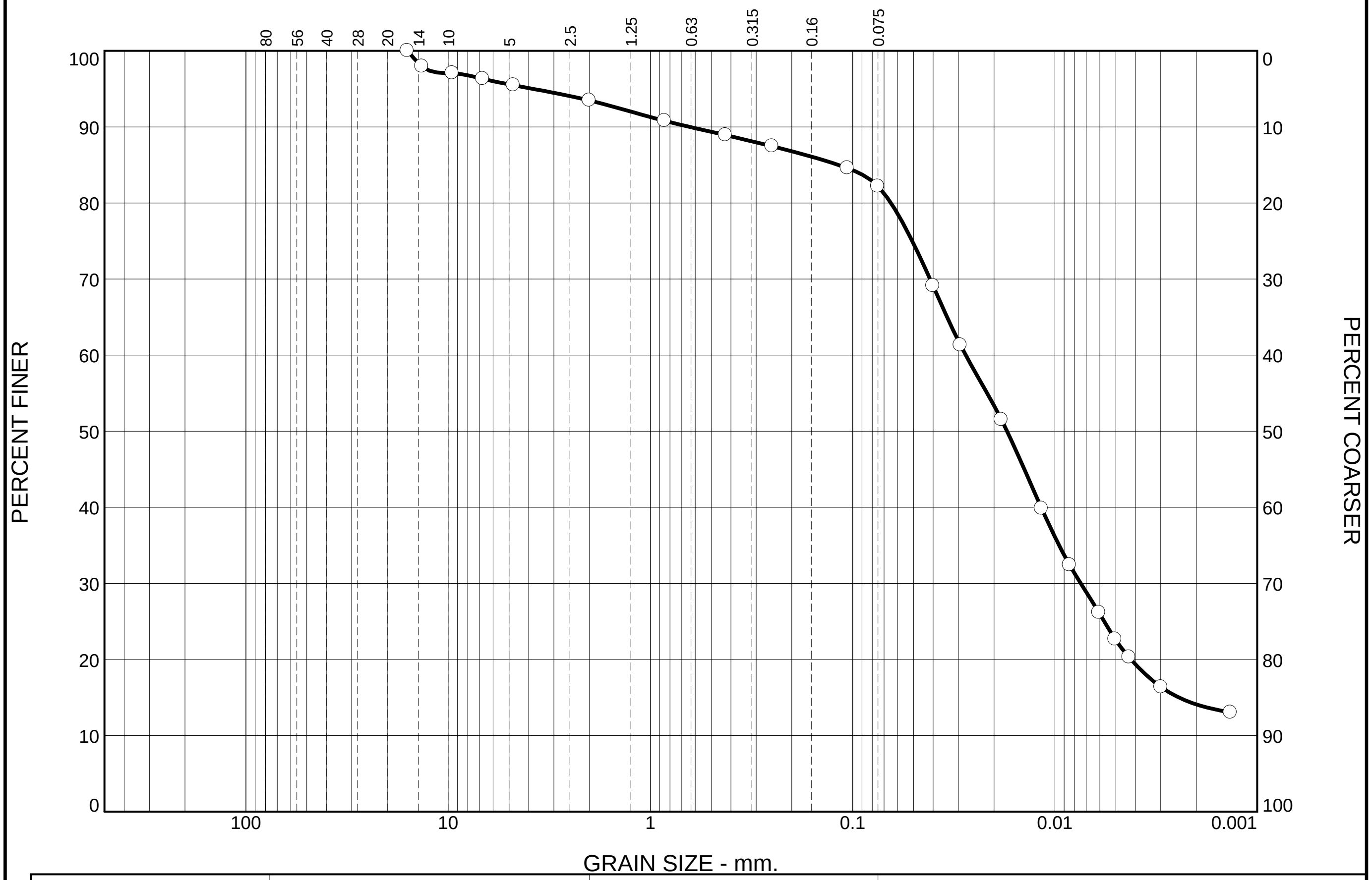
Remarks:

Terrapex

Figure C-7

Tested By: AM **Checked By:** DM

Particle Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	7	4	7	68	14

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	23		0.1179	0.0276	0.0172	0.0075	0.0024			

Material Description	USCS	AASHTO
○ SILT some clay some sand trace gravel		

Project No. CT3003.40 **Client:** Orlando Corporation

Project: 8872 & 8880 Boston Church Road and 8350 Esquesing Line Milton

○ **Sample Number:** BH509, Sample 5

Remarks:

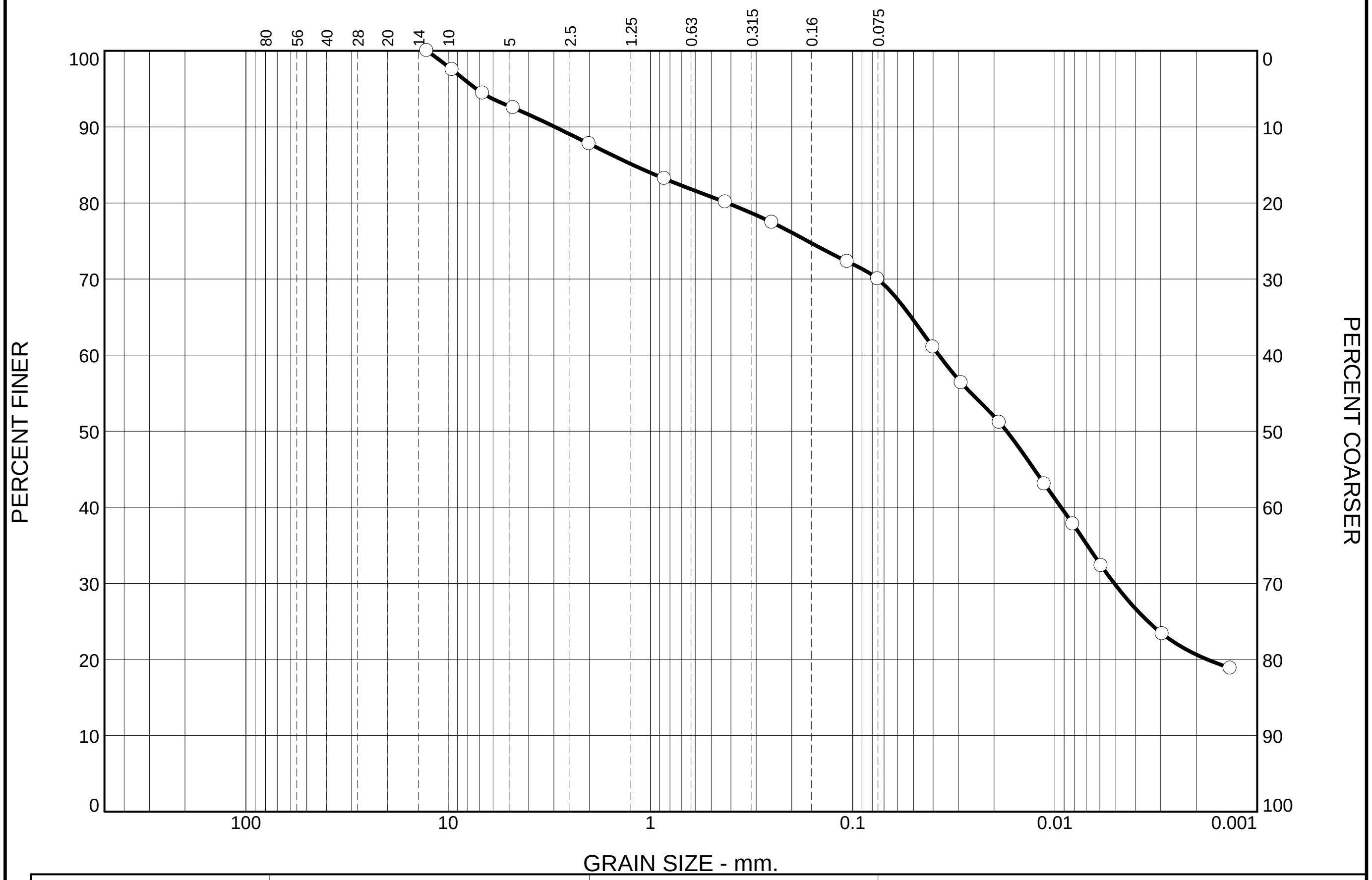
○January 15, 2021

Terrapex

Figure C-8

Tested By: AM

Particle Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	12	8	10	49	21

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	26	17	1.2186	0.0374	0.0173	0.0051				

Material Description	USCS	AASHTO
○ CLAYEY SILT, some sand, some gravel	CL	A-4(4)

Project No. CT3003.40 **Client:** Orlando Corporation

Project: 8872 & 8880 Boston Church Road and 8350 Esquesing Line Milton

○ **Sample Number:** BH510, SS3

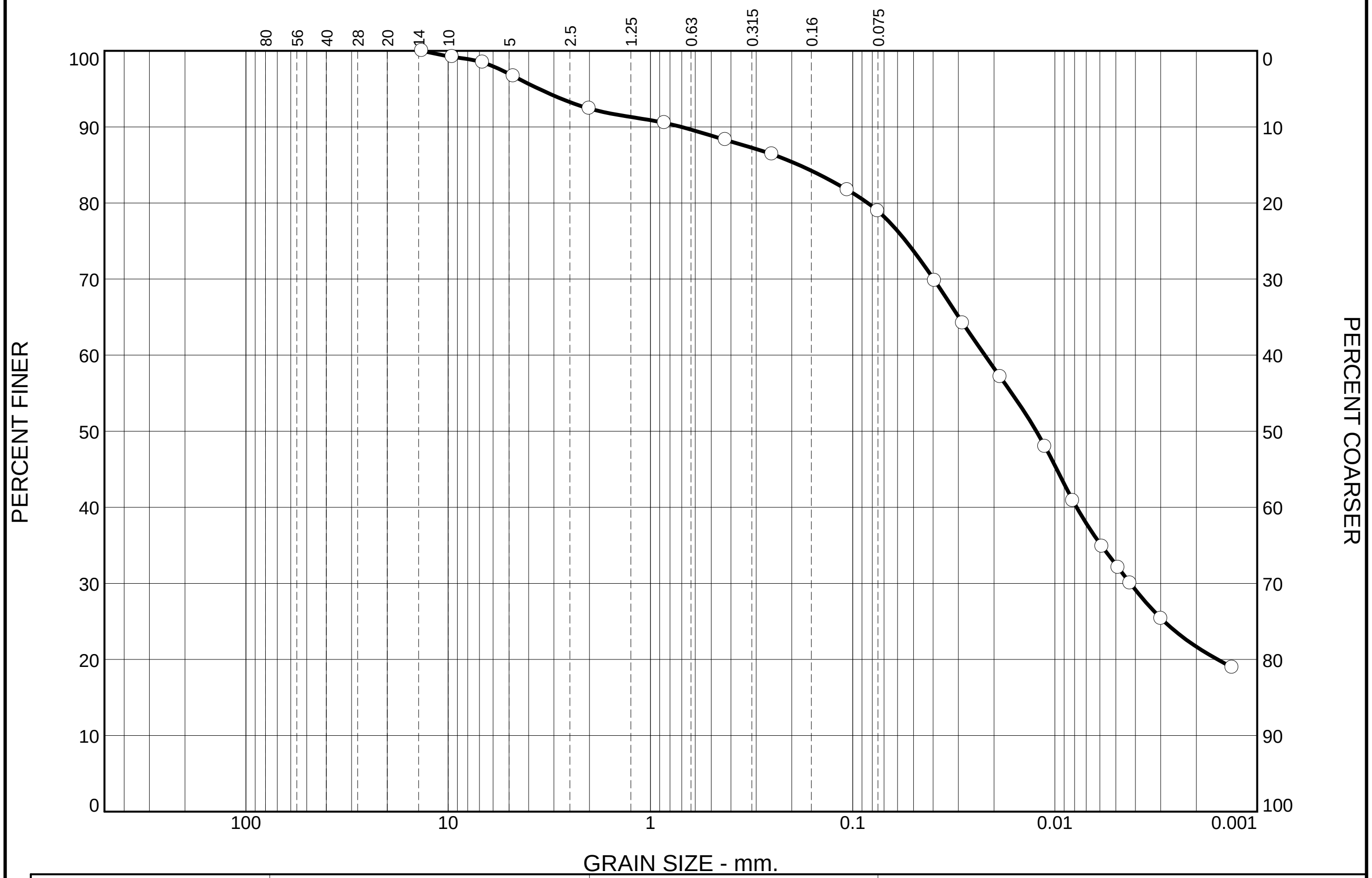
Remarks:

Terrapex

Figure C-9

Tested By: AM **Checked By:** DM

Particle Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	8	4	9	57	22

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	27	17	0.1844	0.0222	0.0124	0.0042				

Material Description	USCS	AASHTO
○ CLAYEY SILT some sand trace gravel	CL	A-4(6)

Project No. CT3003.40 **Client:** Orlando Corporation

Project: 8872 & 8880 Boston Church Road and 8350 Esquesing Line Milton

○ **Sample Number:** BH511, Sample 3

Remarks:

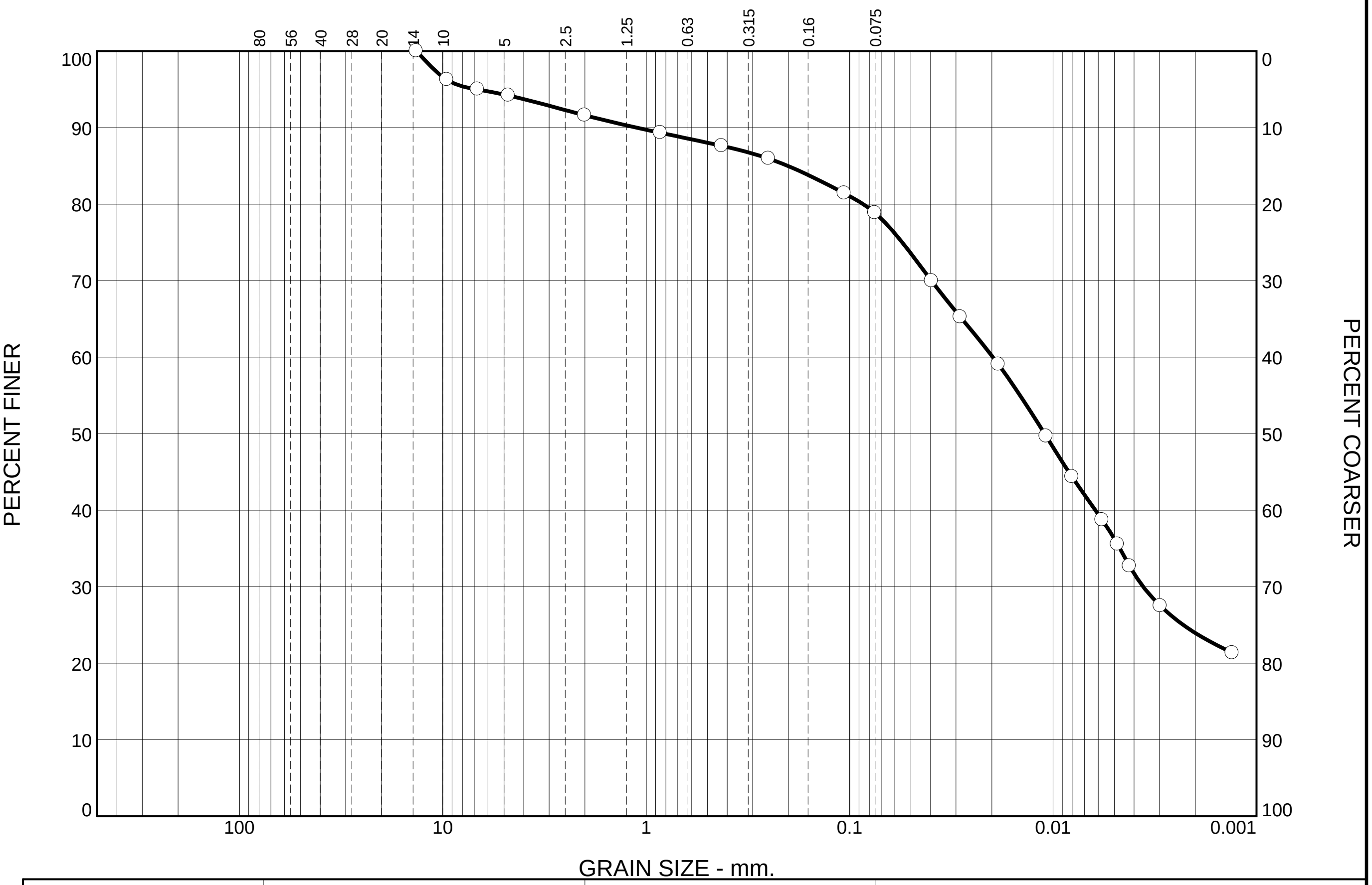
○Tested on January 15, 2021

Terrapex

Figure C-10

Tested By: AM

Particle Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	8	4	9	55	24

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.2016	0.0198	0.0110	0.0036				

Material Description	USCS	AASHTO
○ CLAYEY SILT some sand trace gravel		

Project No. CT3003.40 **Client:** Orlando Corporation

Project: 8872 & 8880 Boston Church Road and 8350 Esquesing Line Milton

○ **Sample Number:** BH514, Sample 2

Remarks:

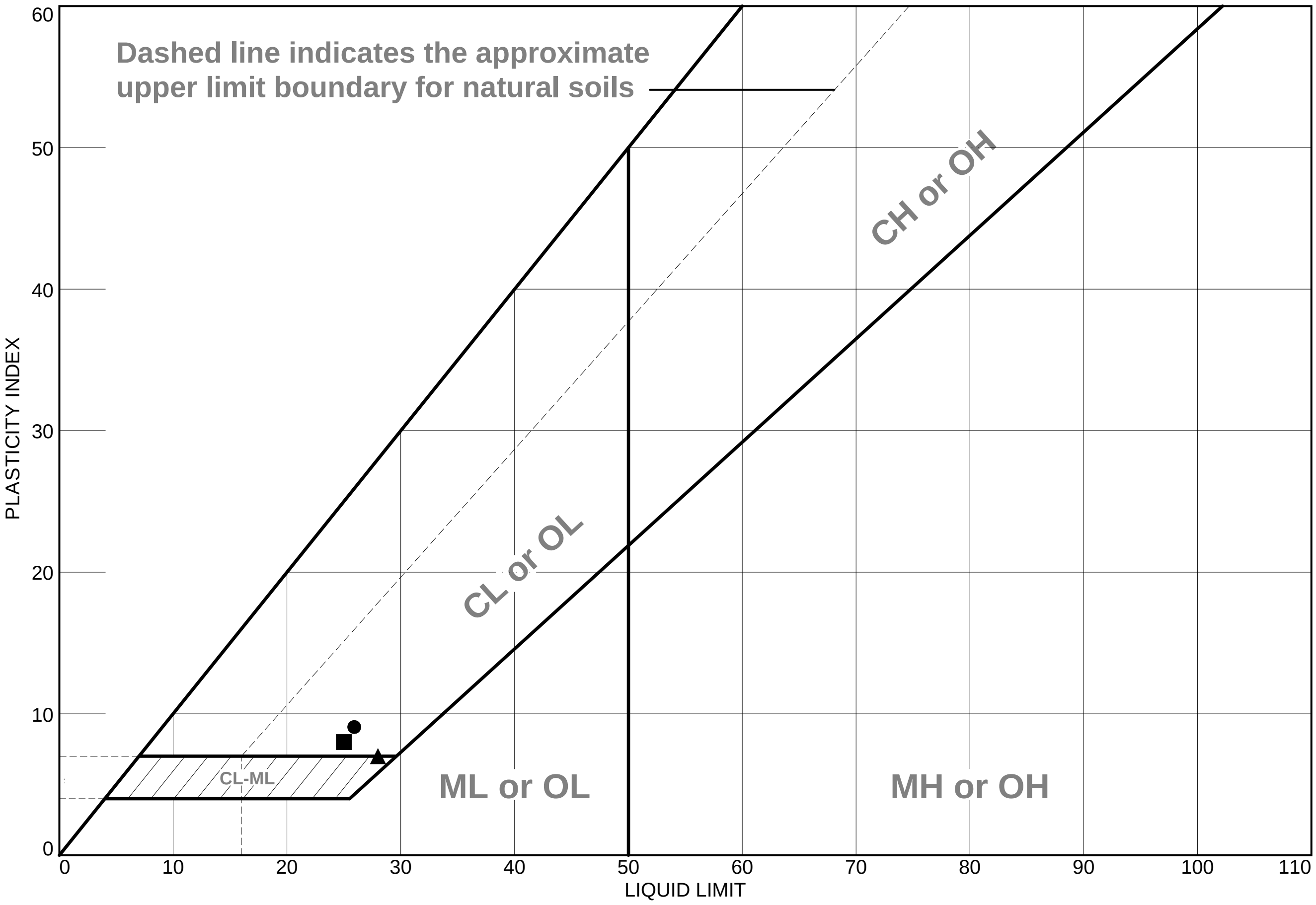
○Tested on January 15, 2021

Terrapex

Figure C-11

Tested By: AM

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	CLAYEY SILT, some sand, some gravel	26	17	9	80	70	CL
■	CLAYEY SILT, some sand, some gravel	25	17	8	82	72	CL
▲	SILT, some clay, trace sand	28	21	7	99	98	CL-ML

Project No. CT3003.40 **Client:** Orlando Corporation

Project: 8872 & 8880 Boston Church Road and 8350 Esquesing Line Milton

●**Sample Number:** BH510, SS3
■**Sample Number:** BH502, SS3
▲**Sample Number:** BH508, SS2

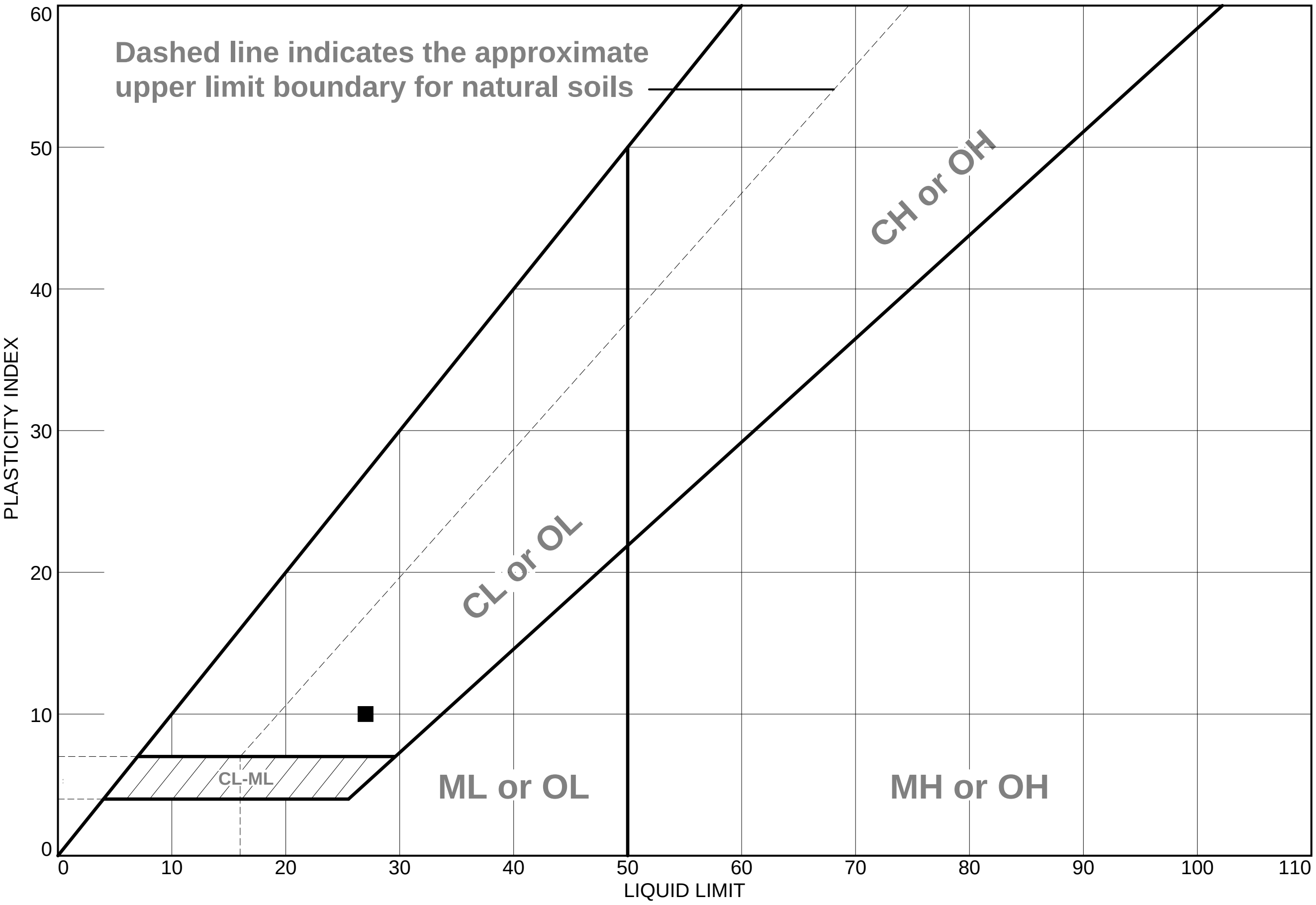
Remarks:

Terrapex

Figure C-12

Tested By: AM **Checked By:** DM

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	SILT some clay some sand trace gravel	23			88.9	82.2	
■	CLAYEY SILT some sand trace gravel	27	17	10	88	79	CL

Project No. CT3003.40 **Client:** Orlando Corporation

Project: 8872 & 8880 Boston Church Road and 8350 Esquesing Line Milton

● **Sample Number:** BH509, Sample 5
■ **Sample Number:** BH511, Sample 3

Remarks:

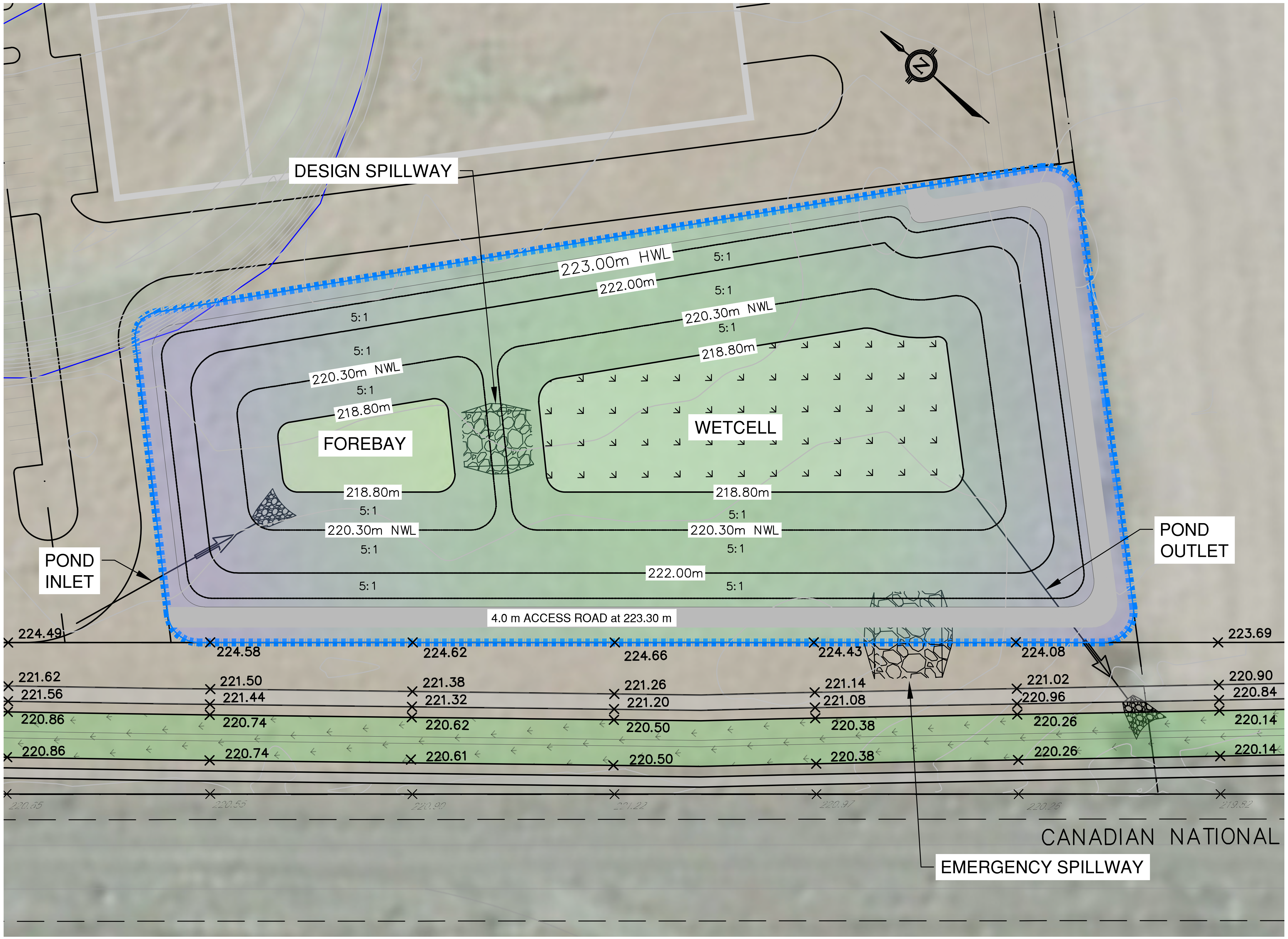
Terrapex

Figure C-13

Tested By: AM

Appendix D

Pond and Drainage Channel Drawings



DESCRIPTION	REQUIRED STORAGE	AVAILABLE STORAGE
PERMANENT POOL EL. 218.80 - EL. 220.30	5.027 m^3	6.366 m^3
EXTENDED DETENTION EL. 220.30 - EL. 220.85	4,349 m^3	4,772 m^3
25-YEAR FLOOD EL. 220.30 - EL. 221.40	8,843 m^3	9,110 m^3
100-YEAR FLOOD EL. 220.30 - EL. 221.65	10,795 m^3	10,845 m^3
ACTUAL REGIONAL FLOOD EL. 220.30 - EL. 223.00	22,459 m^3	23,067 m^3

POND DATA	
DRAINAGE AREA	29.57 HA
POND BLOCK AREA	1.52 HA
ROAD ELEV. (AT INLET MH)	223.35 m
PERMANENT POOL ELEV.	220.30 m
BOTTOM OF POND ELEV.	218.80
HWL (Regional)	223.00 m
FREE BOARD ELEV	223.30 m
POND SLOPES	5:1
POND INLET INV.	220.30 m
POND OUTLET INV.	219.80 m
APPROX. LENGTH/WIDTH RATIO	<3:1

File : G:\Projects\2017\17197 - Orlando - North Porta\3. Drawings\6. SWM\FSR FIGURES\FIG 3-2~3-5 - Pond X Concept Plan.dwg, Layout : 3-2~3-5 Date :Jul 27, 2020 - 12:39pm, Edit By : mmoryakina

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L4K 0C5
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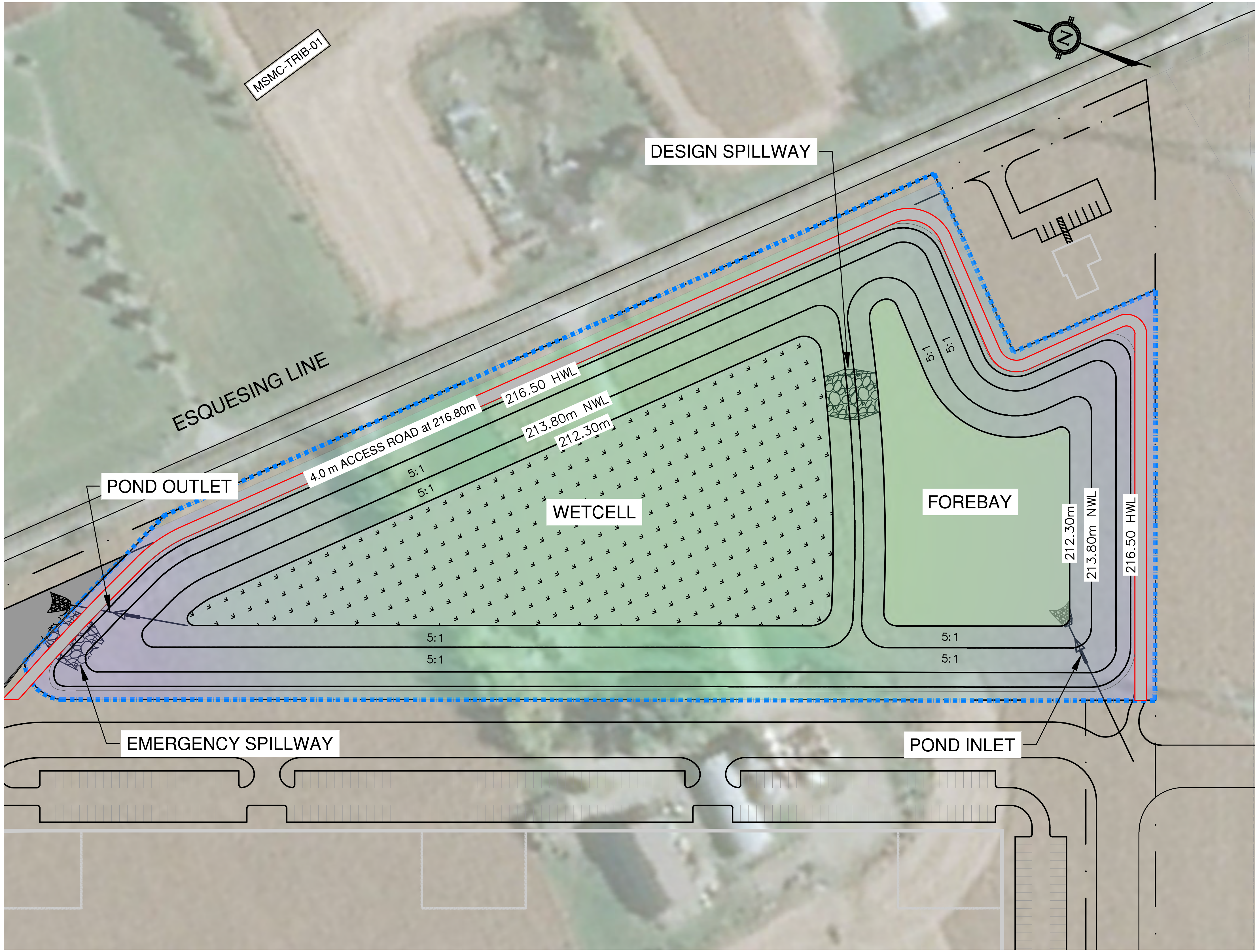
f: 905.738.0065

ORLANDO - NORTH PORTA

SWMF1 CONCEPT PLAN

SCALE: N.T.S
DATE: JUNE 2020
DESIGNED BY: T.D.
DRAWN BY: J.P./M.M.
CHECKED BY: E.T.
CHECKED BY: E.T.
PROJECT No. 17197
FIGURE No. 3-2



DESCRIPTION	REQUIRED STORAGE	AVAILABLE STORAGE
PERMANENT POOL EL. 212.30 - EL. 213.80	13,474 m^3	31,203 m^3
EXTENDED DETENTION EL. 213.80 - EL. 214.20	13,428 m^3	14,172 m^3
25-YEAR FLOOD EL. 213.80 - EL. 214.80	30,253 m^3	31,492 m^3
100-YEAR FLOOD EL. 213.80 - EL. 215.00	37,051 m^3	37,161 m^3
ACTUAL REGIONAL FLOOD EL. 213.80 - EL. 216.50	81,241 m^3	82,704 m^3

POND DATA	
DRAINAGE AREA	79.26 HA
POND BLOCK AREA	4.47 HA
ROAD ELEV. (AT INLET MH)	216.80m
PERMANENT POOL ELEV.	213.80 m
BOTTOM OF POND ELEV.	212.30 m
HWL (Regional)	216.50 m
FREE BOARD ELEV	216.80m
POND SLOPES	5:1
POND INLET INV.	213.80 m
POND OUTLET INV.	213.50 m
APPROX. LENGTH/WIDTH RATIO	3:1

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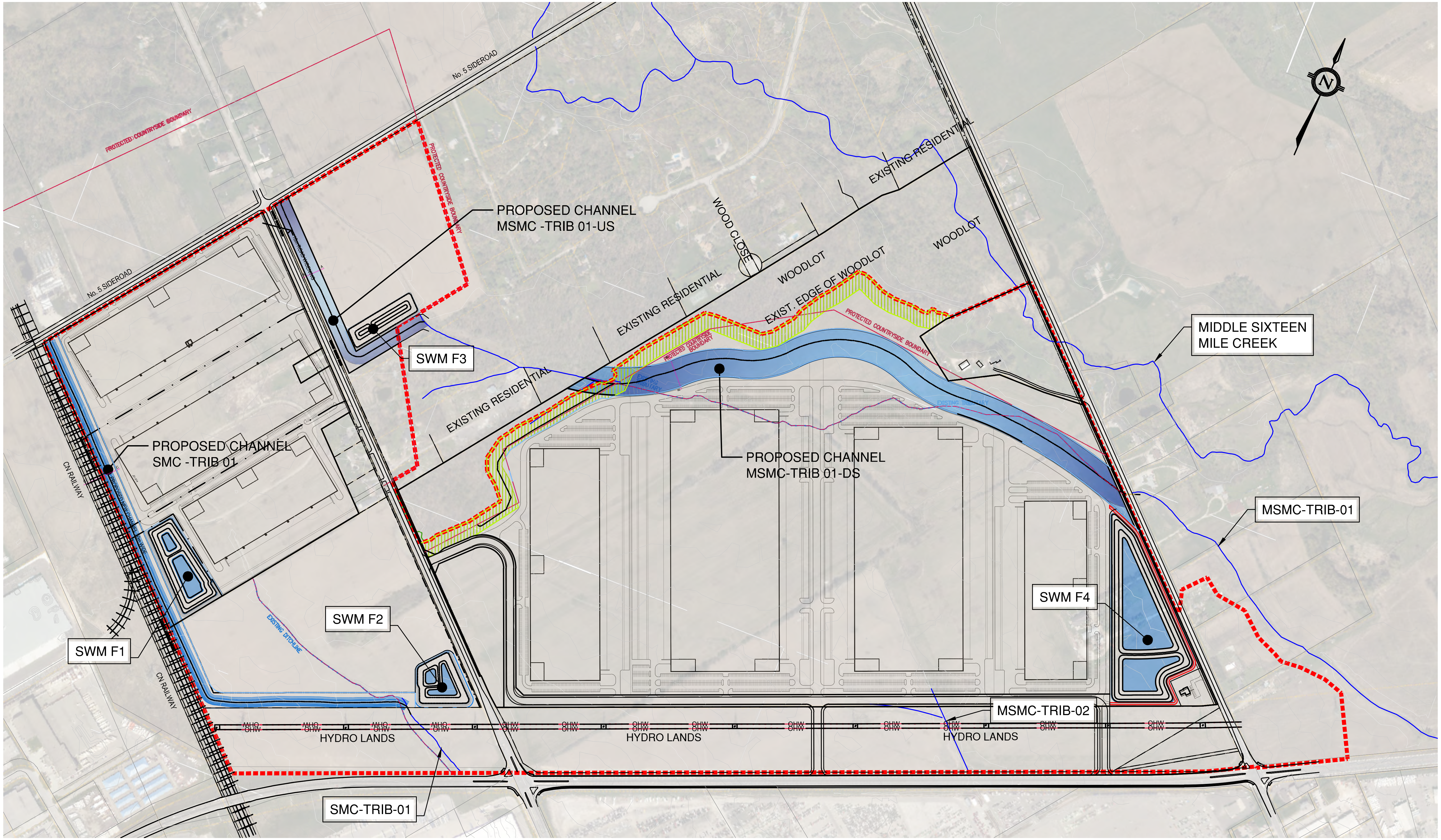
ORLANDO - NORTH PORTA

SWMF4 CONCEPT PLAN

SCALE: N.T.S.
DATE: JUNE 2020
DESIGNED BY: T.D.
DRAWN BY: J.P./M.M.
CHECKED BY: E.T.
CHECKED BY: E.T.
PROJECT No. 17197
FIGURE No. 3-5

File : G:\Projects\2017\17197 - Orlando - North Porta\3. Drawings\6. SWM\FSR FIGURES\FIG 3-2~3-5 - Pond X Concept Plan.dwg, Layout : 3-2~3-5 Date :Jul 23, 2020 - 2:31pm, Edit By : mmoryakina



File : G:\Projects\2017\17197 - Orlando - North Porta\3. Drawings\6. SWM\FSR FIGURES\FIG 4-1 - Overall Channel Design Plan.dwg, Layout : 4-1 Date :Jul 23, 2020 - 3:38pm, Edit By : mmoryakina

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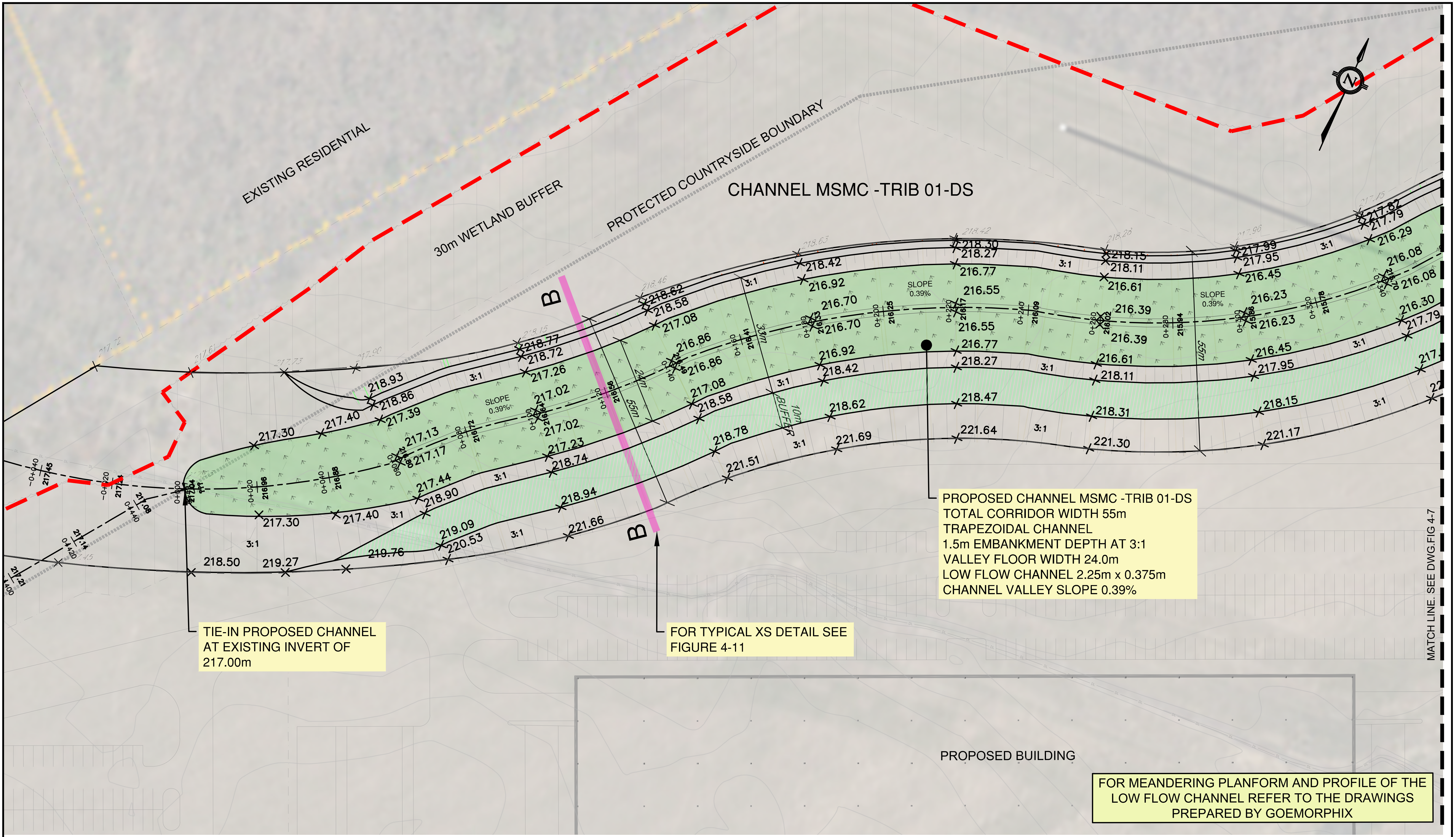
ORLANDO - NORTH PORTA
WATERCOURSE AND CHANNEL DESIGN
OVERALL PLAN

SCALE: N.T.S.
DATE: JUNE 2020
DESIGNED BY: T.D.
DRAWN BY: J.P./M.M.
CHECKED BY: E.T.
CHECKED BY: E.T.
PROJECT No. 17197
FIGURE No. 4-1



PROPOSED CHANNEL MSMC -TRIB 01-DS
TOTAL CORRIDOR WIDTH 55m
TRAPEZOIDAL CHANNEL
1.5m EMBANKMENT DEPTH AT 3:1
VALLEY FLOOR WIDTH 24.0m
LOW FLOW CHANNEL 2.25m x 0.375m
CHANNEL VALLEY SLOPE 0.39%

TIE-IN PROPOSED CHANNEL
AT EXISTING INVERT OF
217.00m

FOR TYPICAL XS DETAIL SEE
FIGURE 4-11

FOR MEANDERING PLANFORM AND PROFILE OF THE
LOW FLOW CHANNEL REFER TO THE DRAWINGS
PREPARED BY GEOMORPHIX

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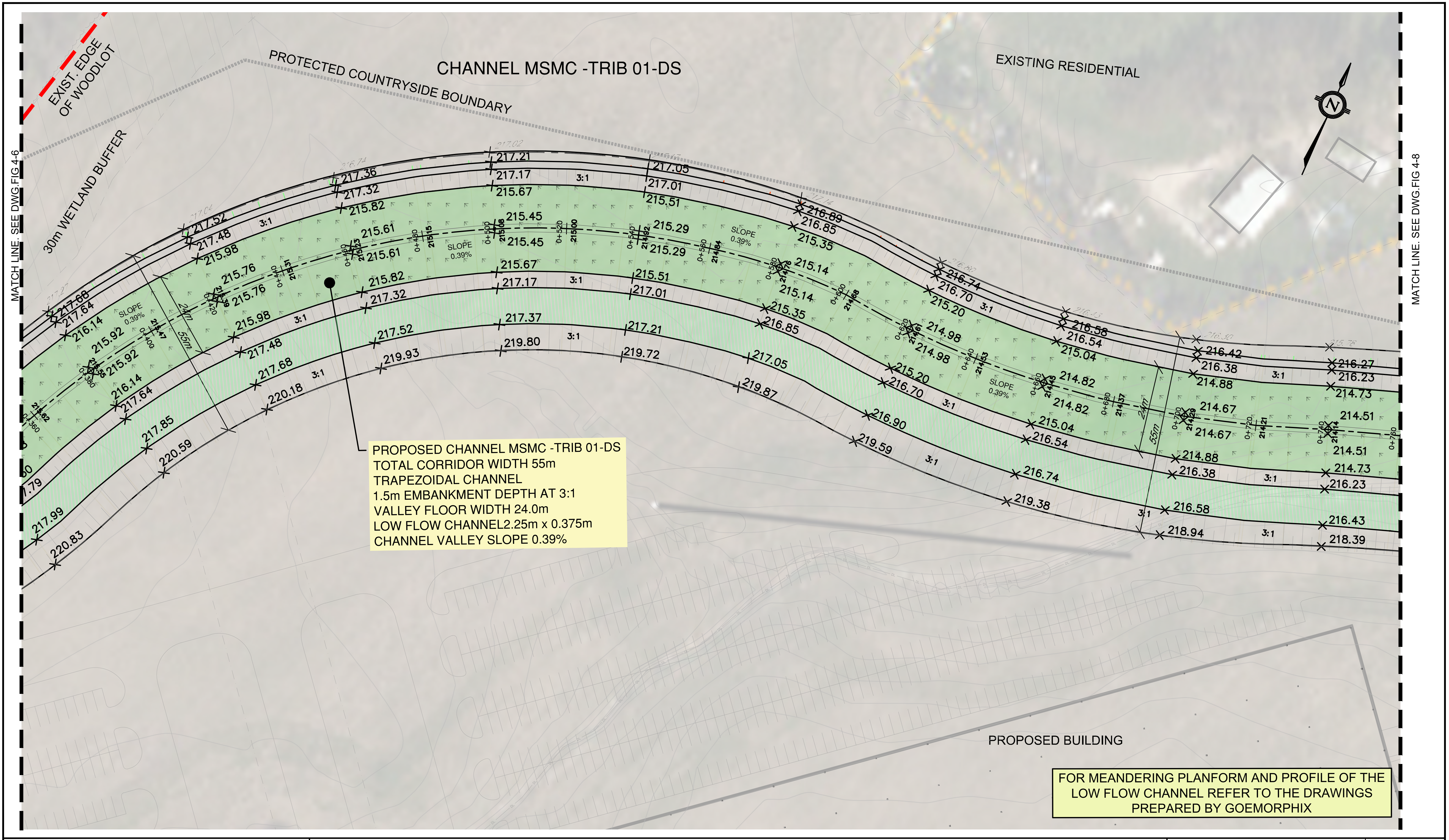
ORLANDO - NORTH PORTA
PRELIMINARY DESIGN OF CHANNEL MSMC-TRIB 01 DS
PLAN VIEW 1 OF 3

SCALE: 1:1000		PROJECT No. 17197
DATE: JUNE 2020		
DESIGNED BY: T.D.	DRAWN BY: J.P./M.M.	FIGURE No. 4-3
CHECKED BY: E.T.	CHECKED BY: E.T.	



PROPOSED CHANNEL MSMC -TRIB 01-DS
TOTAL CORRIDOR WIDTH 55m
TRAPEZOIDAL CHANNEL
1.5m EMBANKMENT DEPTH AT 3:1
VALLEY FLOOR WIDTH 24.0m
LOW FLOW CHANNEL2.25m x 0.375m
CHANNEL VALLEY SLOPE 0.39%

FOR MEANDERING PLANFORM AND PROFILE OF THE LOW FLOW CHANNEL REFER TO THE DRAWINGS PREPARED BY GOEMORPHIX

File : G:\Projects\2017\17197 - Orlando - North Porta\3. Drawings\6. SWM\FSR FIGURES\FIG 4-2 to 4-5 AND 4-9 to 4-10- Channel Plans.dwg.   Layout : 4-2~4-5 and 4.9 to 4.10   Date :Jun 11, 2020 - 4:28pm, Edit By : mmoryakina

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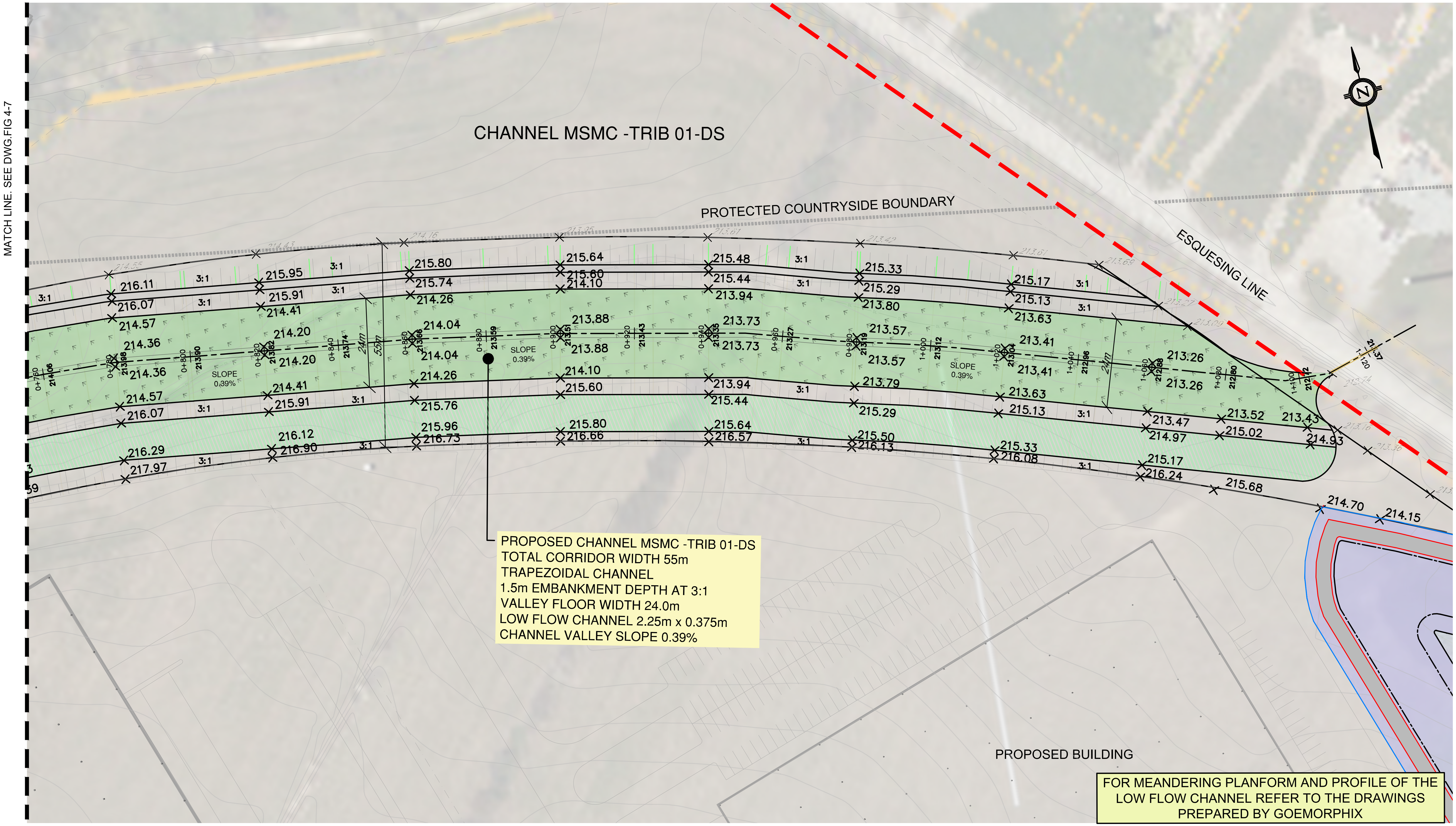
ORLANDO - NORTH PORTA
PRELIMINARY DESIGN OF CHANNEL MSMC-TRIB 01 DS
PLAN VIEW 2 OF 3

SCALE: 1:1000
DATE: JUNE 2020
DESIGNED BY: T.D.
DRAWN BY: J.P./M.M.
CHECKED BY: E.T.
CHECKED BY: E.T.
PROJECT No. 17197
FIGURE No. 4-4

File : G:\Projects\2017\17197 - Orlando - North Porta\3. Drawings\6. SWM\FSR FIGURES\FIG 4-2 to 4-5 AND 4-9 to 4-10- Channel Plans.dwg,   Layout : 4-2~4-5 and 4.9 to 4.10   Date :Jun 11, 2020 - 4:30pm, Edit By : mmoryakina



PROPOSED CHANNEL MSMC -TRIB 01-DS
TOTAL CORRIDOR WIDTH 55m
TRAPEZOIDAL CHANNEL
1.5m EMBANKMENT DEPTH AT 3:1
VALLEY FLOOR WIDTH 24.0m
LOW FLOW CHANNEL 2.25m x 0.375m
CHANNEL VALLEY SLOPE 0.39%

FOR MEANDERING PLANFORM AND PROFILE OF THE LOW FLOW CHANNEL REFER TO THE DRAWINGS PREPARED BY GOEMORPHIX

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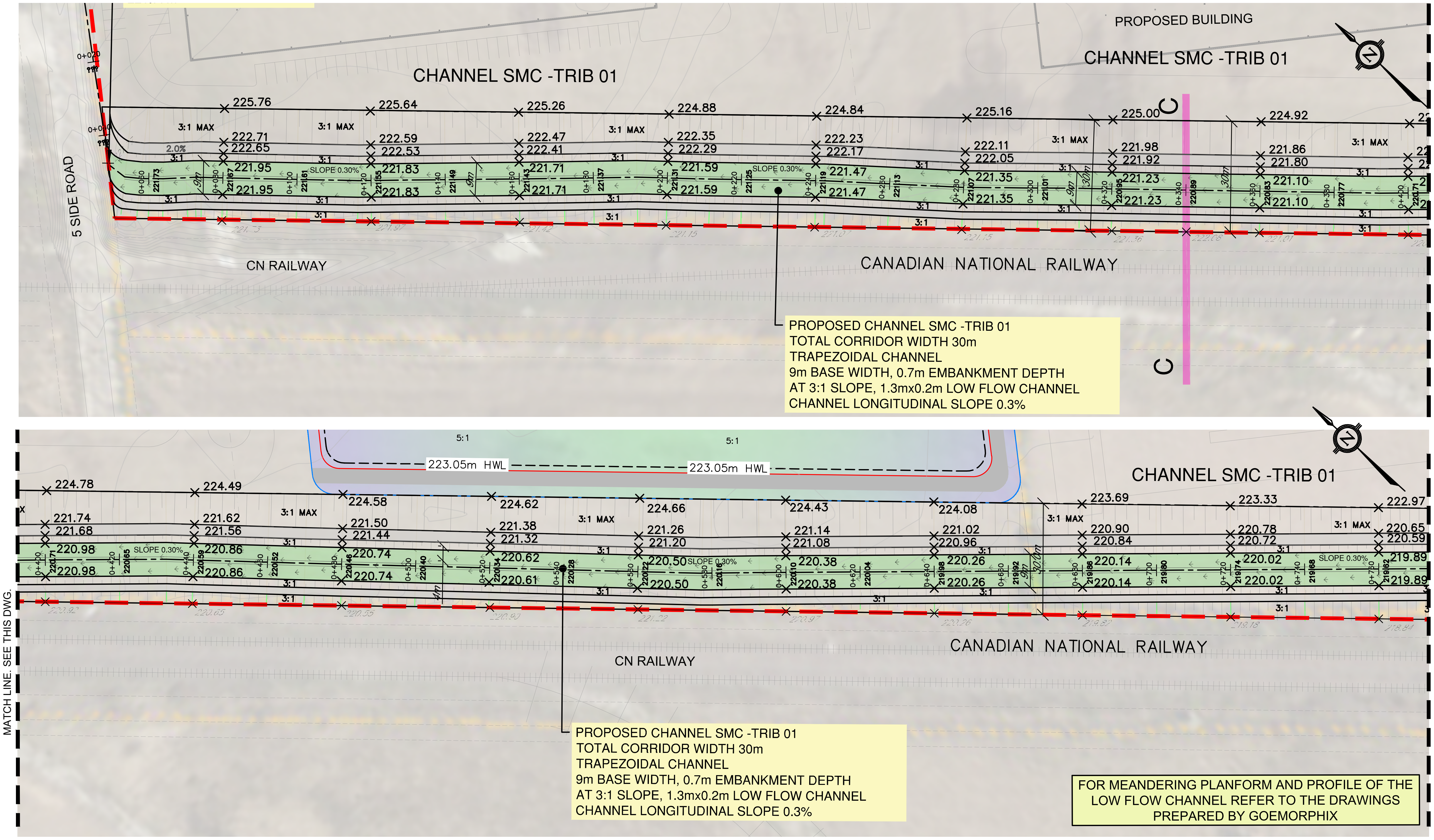
ORLANDO - NORTH PORTA
PRELIMINARY DESIGN OF CHANNEL MSMC-TRIB 01 DS
PLAN VIEW 3 OF 3

SCALE: 1:1000		PROJECT No. 17197
DATE: JUNE 2020		
DESIGNED BY: T.D.	DRAWN BY: J.P./M.M.	FIGURE No. 4-5
CHECKED BY: E.T.	CHECKED BY: E.T.	

File : G:\Projects\2017\17197 - Orlando - North Porta\3. Drawings\6. SWM\FSR FIGURES\FIG 4-2 to 4-5 AND 4-9 to 4-10- Channel Plans.dwg, Layout : 4-2~4-5 and 4-9 to 4.10 Date :Jun 11, 2020 - 4:32pm, Edit By : mmoryakina



PROPOSED CHANNEL SMC -TRIB 01
TOTAL CORRIDOR WIDTH 30m
TRAPEZOIDAL CHANNEL
9m BASE WIDTH, 0.7m EMBANKMENT DEPTH
AT 3:1 SLOPE, 1.3mx0.2m LOW FLOW CHANNEL
CHANNEL LONGITUDINAL SLOPE 0.3%

PROPOSED CHANNEL SMC -TRIB 01
TOTAL CORRIDOR WIDTH 30m
TRAPEZOIDAL CHANNEL
9m BASE WIDTH, 0.7m EMBANKMENT DEPTH
AT 3:1 SLOPE, 1.3mx0.2m LOW FLOW CHANNEL
CHANNEL LONGITUDINAL SLOPE 0.3%

FOR MEANDERING PLANFORM AND PROFILE OF THE LOW FLOW CHANNEL REFER TO THE DRAWINGS PREPARED BY GEOMORPHIX

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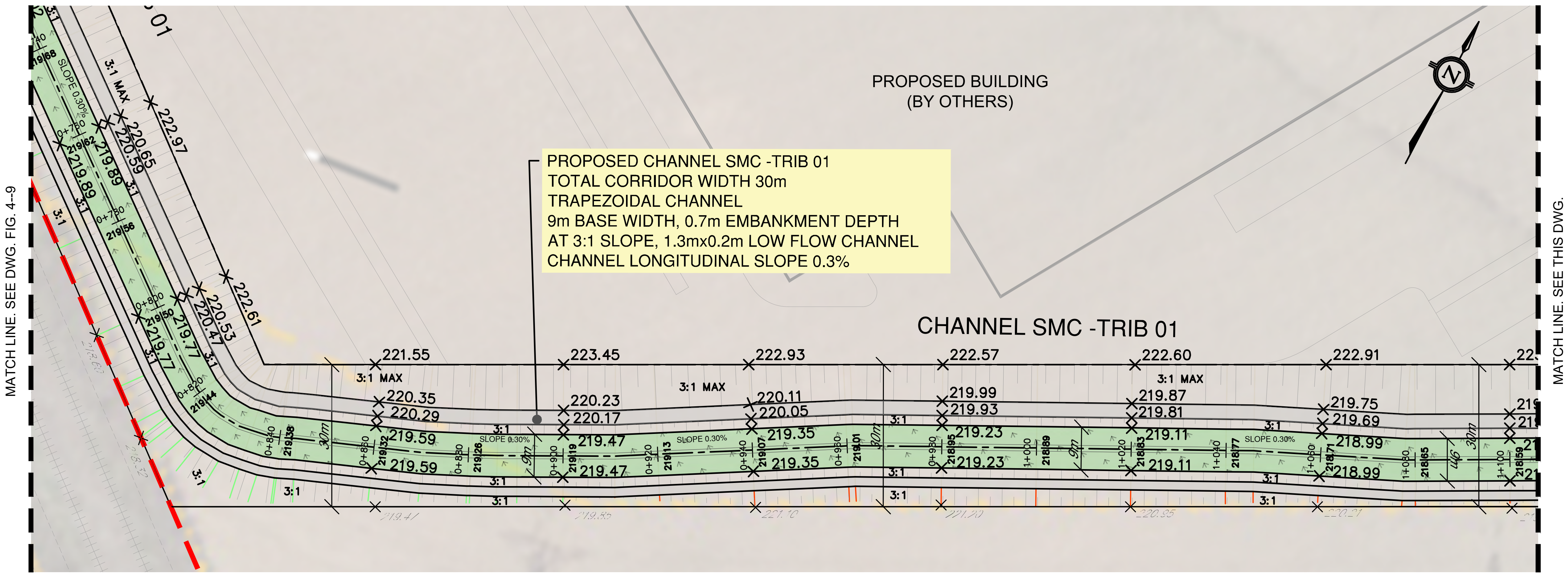
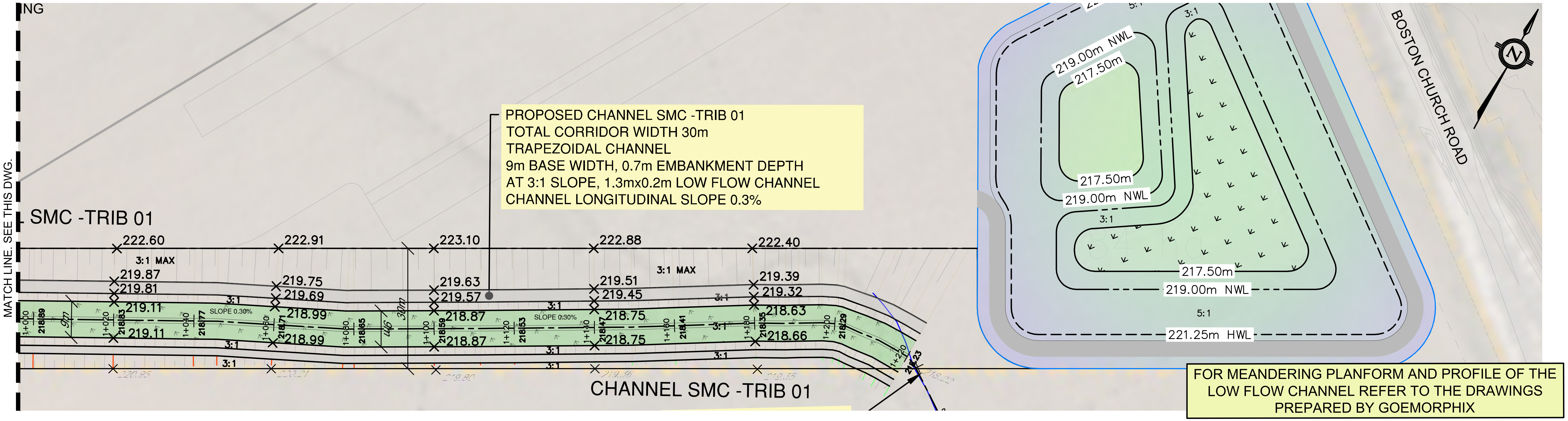
ORLANDO - NORTH PORTA
PRELIMINARY DESIGN OF CHANNEL SMC-TRIB 01
PLAN VIEW 1 OF 2

SCALE: 1:1000	PROJECT No. 17197
DATE: JUNE 2020	
DESIGNED BY: T.D.	DRAWN BY: J.P./M.M.
CHECKED BY: E.T.	CHECKED BY: E.T.
FIGURE No. 4-9	



PROPOSED CHANNEL SMC -TRIB 01
TOTAL CORRIDOR WIDTH 30m
TRAPEZOIDAL CHANNEL
9m BASE WIDTH, 0.7m EMBANKMENT DEPTH
AT 3:1 SLOPE, 1.3mx0.2m LOW FLOW CHANNEL
CHANNEL LONGITUDINAL SLOPE 0.3%



PROPOSED CHANNEL SMC -TRIB 01
TOTAL CORRIDOR WIDTH 30m
TRAPEZOIDAL CHANNEL
9m BASE WIDTH, 0.7m EMBANKMENT DEPTH
AT 3:1 SLOPE, 1.3mx0.2m LOW FLOW CHANNEL
CHANNEL LONGITUDINAL SLOPE 0.3%

FOR MEANDERING PLANFORM AND PROFILE OF THE LOW FLOW CHANNEL REFER TO THE DRAWINGS PREPARED BY GEOMORPHIX

TMIG
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L4K 0C5

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f: 905.738.0065

ORLANDO - NORTH PORTA
PRELIMINARY DESIGN OF CHANNEL SMC-TRIB 01
PLAN VIEW 2 OF 2

SCALE: 1:1000
DATE: JUNE 2020
DESIGNED BY: T.D.
DRAWN BY: J.P./M.M.
CHECKED BY: E.T.
CHECKED BY: E.T.
PROJECT No. 17197
FIGURE No. 4-10

File : G:\Projects\2017\17197 - Orlando - North Porta\3. Drawings\6. SWM\FSR FIGURES\FIG 4-2 to 4-5 AND 4-9 to 4-10- Channel Plans.dwg, Layout : 4-2~4-5 and 4.9 to 4.10 Date :Jun 11, 2020 - 4:33pm, Edit By : mmoryakina

Appendix A2.i

Correspondence

1st Submission Comments

wood.

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited
3450 Harvester Road, Suite 100
Burlington, ON L7N 3W5, Canada
T: 905-335-2353
www.woodplc.com

December 6, 2021
TP113119.2021B

Rachel Ellerman, C.E.T, E.I.T.
Stormwater Manager
Town of Milton
150 Mary Street
Milton, ON L9T 6Z5

RE: Review of Milton North Porta Comprehensive Environmental and Servicing Study,
(TMIG et. al., August 2021)
First Submission, Town of Milton

Dear Madam,

As requested, the Town's Consulting Team of Wood, Dougan & Associates, Matrix Solutions, Blackport and Associates, and C. Portt and Associates has reviewed the first submission of the Comprehensive Environmental and Servicing Study (CESS) for the North Porta Lands. The subject property lies north of the Highway 401 Industrial/Business Park, and external to any approved Secondary Plan areas within the Town for which a stormwater and environmental management strategy has been developed. Consequently, this review has been completed to determine whether the conclusions and recommendations advanced in the CESS are supported by the information and analyses presented within the document, as well as to confirm that the study complies with the requirements per the North Porta Lands, Milton, Ontario, Terms of Reference for Comprehensive Environmental and Servicing Study (ref. Hollingworth-Ellerman, November 15, 2021), and address Town criteria and industry standards of practice.

Discipline Specific Comments

A. Surface Water

This section summarizes the peer review of the CESS and the associated appendices with respect to surface water including hydrology and hydraulics, and stormwater management.

Although the main body and appendices of the CESS include most of the technical data required for the submission, the main body of the report provides limited discussion and presentation of the results, and no references are included to direct the reader toward the detailed information in the appendices. For ease of reference, it would be preferable if, as a minimum, cross-references to the report sections and/or the appendices were included to direct the reader toward where the full information is provided.

Of particular significance, however, the CESS acknowledges several tasks which remain to be completed in order to fully characterize the hydrology within the study area, and to establish the stormwater management criteria. Of note, flow monitoring remains ongoing, hence the calibration of the PCSWMM hydrologic model remains to be completed, and the stormwater management criteria advanced in the CESS are noted to be insufficient to adequately mitigate the residual increases to erosion potential identified along the Tributary of the Sixteen Mile Creek Middle Branch downstream of the subject property. Until these items are completed, the CESS is considered incomplete, and the stormwater management plan is not supportable for the proposed development. Further details are provided in the detailed comments below, regarding the report content.

i) Section 2: The Goals and Targets in this section are understood to have been copied from the November 2015 Sixteen Mile Creek Areas 2&7 Subwatershed Update Study. It is suggested that this section apply the Goals and Targets recently developed for the South Milton Subwatershed Study (Wood et. al., August 2021) which represents the most recent study for the Watershed. We note, however, that this would not significantly alter the goals and targets applied for the water resources and stormwater management components of the CESS, hence this comment is provided largely to facilitate consistency with the most current information in this regard.

ii) Section 3.4.2 provides some discussion regarding the drainage density assessment completed for the study area. While it is acknowledged that drainage density has been used historically in the Town of Milton for establishing watercourse management strategies, more recent studies in the Town (i.e., South Milton Subwatershed Study, August 2021) have applied the CVC/TRCA protocols for Headwater Drainage Feature (HDF) assessments and management requirements for low constraint drainage features, rather than requiring maintenance of drainage density post-development. This approach has been applied in combination with the more traditional practice of establishing constraint rankings (i.e., medium or high) for regulated watercourses. As such, it is suggested that the CESS Team confirm that its watercourse management approach has been completed in a manner consistent with the recent practice at the Town, and Province and that the paragraph at the end of this section be revised accordingly to clearly note this approach. Although it is acknowledged that the Terms of Reference indicate that confirmation of drainage density targets is to be completed for the CESS, the Terms of Reference also specify that management recommendations for HDFs are to be established per the CVC/TRCA protocols.

iii) Section 3.4.3 notes that no stormwater management facilities are currently located within the study area, and it references an existing stormwater management facility downstream of watercourses R1S1 and R2S2. The location of R2S2 could not be identified on Figure D3-1, hence should be added for clarity. Furthermore, we note that a stormwater management facility is located within the existing development downstream of the drainage area to reach R5S0, and should therefore be noted in this section.

In addition, reach R3S1 drains toward an open watercourse within Halton Hills. Supplemental information from the Town of Halton Hills has been obtained by the Town of Milton and provided for reference in this peer review. Based upon the information provided by Halton Hills, it is understood that the study area for the CESS does not drain toward the online dry pond facility located east of James Snow Parkway (within the Town of Halton Hills), however it is recommended that this be confirmed by the CESS Team through review of background information and supplemental field reconnaissance as appropriate, and noted accordingly in the CESS.

iv) Section 3.4.4 notes that stream flow monitoring has been conducted in 2021 at four (4) locations, and it indicates that the data collection will be ongoing in 2022. The CESS Team should confirm the proposed use of the data, specifically whether it is intended to be used for model calibration/validation. Recognizing the compressed timelines for this study, the feasibility of using this information for model development should be confirmed, and alternative approaches for model validation should also be considered/established consultatively with the Town, Conservation Halton, and Halton Region, and applied as appropriate to support the findings of the study. Additionally, this section should note the source of rainfall data to be used for the monitoring program, and the location of the rain gauge accordingly.

v) Section 3.4.4 also notes that water quality monitoring has been conducted for the surface water component of the study. The section refers to “spot sampling” for various water quality parameters, and also mentions “additional water quality sampling”. Additional information should be provided regarding the equipment and methods used for “spot sampling”, and also to clarify whether the additional water quality sampling consisted of grab sampling. Additional information should be included regarding the dates of the sampling, and the results of the sampling; in addition, the surface water quality characterization should compare the findings of the monitoring program with those reported from other studies elsewhere in the Sixteen Mile Creek Watershed (i.e. Milton Subwatershed Studies, Conservation Halton monitoring programs, Milton Long-term holistic monitoring programs etc.). Lastly, the information in this section notes that the monitoring program assessed temperature, water depth, turbidity, dissolved oxygen, hydraulic conductivity, and TSS. Additional information should be included as to why other parameters typically evaluated for water quality monitoring programs have not been evaluated (i.e. metals, anions, nutrients, oils/grease, microorganisms, organics, etc.); while the exclusion of this information is not anticipated to affect the recommended stormwater quality management criteria for the area, it is suggested that the monitoring program provide a full suite of parameters for water quality monitoring and further include requirements for pre-development monitoring and characterization to establish a baseline condition for comparison against post-development data.

vi) Section 3.4.5 provides discussion regarding the development of the hydrologic model for the area. The characterization of key aspects of the study area hydrology (i.e. description of soil types within study area and validation against other sources of information/findings from other studies, source and summary table of literature values used for model parameterization, reference to summary table of subcatchment parameters in Appendix D, validation of simulated flows from hydrologic model, etc.) is missing and considered necessary to support the hydrologic modelling completed for this site.

Furthermore, this section notes that the PCSWMM model was calibrated to reproduce the flows reported in the July 2000 FSEMS for the Highway 401 Industrial/Business Park. While comparison of model results is considered common practice for model validation, standard practice for model calibration applies observed flow and rainfall data from monitoring as the basis of comparison for parameter adjustment, rather than using previous modelling as was done for the CESS. In this regard, additional justification is required within the CESS to support the calibration approach used, and it is suggested that the CESS Team confirm whether further model calibration/validation will be completed pending the completion of the 2021/2022 surface water monitoring program.

Finally, additional information should be included in this section to demonstrate the performance of the base/uncalibrated PCSWMM model, and to document the parameter adjustments completed for the calibration (i.e., which parameters were adjusted and by what amount). This section should also include a comparison of the results of the calibrated model with the flows reported for the Highway 401 Industrial/Business Park Functional Stormwater and Environmental Management Strategy (Philips Engineering Ltd., July 2000), as well as comparisons of peak flows and runoff volumes between the PCSWMM model and the flow monitoring program, with supporting justification/rationale for any differences.

vii) Section 3.4.6 provides a brief overview of the hydraulic modelling completed for the floodplain mapping of Reach R3S1. While it is recognized that several details regarding the methodology applied for the floodplain mapping are provided in other sections of the CESS, these details should be included in this section for clarity and consistency. The following provides a partial list of some of the key details in this regard:

- Clarification as to whether the hydraulic model provided by Conservation Halton has been used for the assessment, or whether a new model has been developed based on detailed site-specific information.
- Additional details of the information used to develop/refine the hydraulic model for the study area (i.e., source data for model cross-sections, source of data for hydraulic structures, etc.).
- Cross-reference to the section/appendices providing the comparison of floodlines generated from hydraulic analyses for CESS with that generated by Conservation Halton with supporting rationale for any differences.
- Cross-reference to the section/appendices providing the comparison of flows from Conservation Halton model with those generated by the PCSWMM hydrologic model and confirmation that the flows generated by the PCSWMM model have been applied for the hydraulic analyses.
- Summary of key model parameters and source of information/rationale for values applied (i.e., expansion/contraction coefficients, roughness coefficients).
- Discussion and characterization of floodplain extent across study area based on results of hydraulic analyses.
- Cross-reference to the section/appendices providing the summary information for existing conditions riparian storage.

viii) Section 4.3 notes that feature SWM5-1 is a groundwater-supported wetland feature that is sustained by groundwater from the Orlando property. This section should provide further discussion as to whether the feature is sustained by groundwater from a regional groundwater system encompassing lands beyond the Orlando property, and the approximate extent of that system as well. In addition, further discussion should be included as to the sensitivity of the feature to adjustments in groundwater levels and surface water levels, associated tolerances and sensitivity to changes in surface water levels and soil saturation, and whether the vegetation in the feature would be more reliant on the supply of surface water and groundwater during specific months and seasons, or whether the reliance is on an annual basis. These details will assist in determining the sizing criteria for stormwater infrastructure (i.e., LID BMPs) for maintaining water budget to the feature.

ix) Section 5.4.1.1 provides an overview of lot-level controls for stormwater management, which are proposed in the CESS to be used in combination with end-of-pipe facilities. The lot controls include surface storage (i.e. rooftop storage and parking lot storage), as well as underground storage facilities. This section should clarify whether the lot-level controls have been included in the sizing of end-of-pipe facilities. We note that lot-level controls are generally under private ownership, hence it has been the Town's practice to exclude these features and systems from sizing end-of-pipe facilities for quantity and erosion control; as such, it should be clearly demonstrated and documented that the analyses completed for the CESS have been compliant with historic practices at the Town.

x) Section 5.4.1.3 notes that wet ponds have been advanced as the preferred end-of-pipe facility for the subject development. This recommendation is consistent with the Town's preference and is considered supportable.

xi) Section 5.4.2 notes that the post-development hydrologic modelling has assumed an impervious coverage of 85%. This value is considered conceptually representative of the type of development proposed for the area; however it is recommended that this be verified in the CESS based upon detailed site plan information provided in the CESS.

xii) Section 5.4.3 of the CESS provides the unitary sizing criteria for stormwater management facilities discharging toward the various receiving watercourses. The unitary sizing criteria provided in this section (ref. Table 5-2) for Parcels 1 and 4 are noted to differ from those established in other studies for similar land use conditions (i.e. the July 2000 FSEMS for the Highway 401 Industrial/Business Park and the November 2015 FSEMS for the Derry Green Secondary Plan Area). Specifically, the unitary criteria for Parcels 1 and 2 is notably lower than unitary criteria applied previously for similar land use conditions, whereas the unitary sizing criteria for Parcel 4 is notably higher than that previously established for similar land use conditions. Additional justification should be provided in this section for the difference in unitary sizing criteria. Also, the hydrologic analyses should demonstrate that the proposed development would not adversely affect the operation and performance of the downstream stormwater management facilities which receive runoff from the development area, hence the hydrologic modelling should be extended to include the downstream stormwater management facilities and corresponding drainage areas.

xiii) Section 5.4.3.2 provides an overview of the erosion thresholds along the receiving watercourses; however no supporting information is provided regarding the erosion analyses based on the hydrologic modelling and supporting rationale for the methodology applied (i.e. duration of critical flow exceedance, volume above critical flow rate, critical shear exceedance, stream power). Additional information is required in this regard.

Furthermore, the information in this section notes that an erosion threshold is to be established for the Tributary of the Sixteen Mile Creek Middle Branch downstream at Fifth Line, and that this information is to be used to establish the erosion criteria for the watercourse. This additional information will need to be reviewed once received in the next submission of the CESS, and incorporated into the hydrologic verification accordingly.

xiv) Based upon the information provided in Appendix D, it is understood that the proposed development and stormwater management plan would divert all runoff from approximately 52 ha, which currently drains toward Reach R1S1 within the study area and south toward Reach N-3-B within the Highway 401 Industrial/Business Park, and redirect it toward the Tributary of the Sixteen Mile Creek Middle Branch (i.e. Reach R3S1). The impacts of this reduced supply of runoff toward Watercourse N-3-B should be discussed within the CESS. While the information from the July 2000 FSEMS indicated no fish within this watercourse due to the presence of downstream barriers, given the vintage of this information this should be clearly confirmed by the CESS Team and documented in Section 6 of the report accordingly.

In addition, we note that the main tributaries and branches of the Sixteen Mile Creek, including the Middle Branch, have demonstrated an erosion sensitivity and a corresponding sensitivity toward increasing drainage area and storm runoff volume toward the reaches. Previous Subwatershed Studies within the Sixteen Mile Creek Watershed have concluded that extended detention requirements to mitigate erosion impacts under these diversion strategies require higher unitary storage volumes (i.e. 500 m^3/impervious ha or more) and extensive drawdown times (i.e. greater than 12 days) to effectively mitigate these impacts. It is suggested that the CESS provide further justification within Section 6 for the diversion strategy currently proposed within Parcel 4. Specifically, why is it not possible to implement a stormwater management plan which would maintain the size of pre-development drainage areas toward the current drainage outlets?

xv) Section 6.2.2 of the CESS provides a summary of the erosion assessment, and it concludes that the proposed development of the subject lands with the proposed stormwater management would increase the erosion potential along Reach R3S1 by 10% compared to existing conditions. This residual increase is considered beyond the tolerance range typically accepted for an erosion control strategy, hence revisions to the stormwater management plan are considered required in order to mitigate this residual increase. As indicated above, the proposed drainage plan would divert runoff from an additional 52 ha of land toward Reach R3S1, hence the erosion impacts noted in the CESS are considered attributable in part to the diversion of runoff proposed in the CESS. It is respectfully suggested that the CESS Team consider alternative approaches toward its stormwater management plan (i.e. incorporation of LID BMPs into the stormwater management plan, maintain discharge toward existing outlet of reach R1S1 and eliminate the diversion of runoff as currently proposed etc.).

It is also noted that the results of the erosion assessment for the reaches downstream of Parcel 1 are not included and should be provided within the CESS to demonstrate that the stormwater management facility for Parcel 1 satisfactorily addresses the requirements for erosion control. Lastly, this section should note the drawdown times for the extended detention storage component of the stormwater management facility; for reference, drawdown times between 5 and 10 days have historically been acceptable to the Town, and consideration has been given for drawdown times up to 12 days, subject to providing supporting justification and analyses using continuous simulation.

xvi) Section 6.3 provides a brief discussion of the hydrologic impacts of the proposed development and stormwater management plan, and comparison of peak flow rates under existing and proposed conditions. The results indicate that the stormwater management plan would significantly reduce peak flows for several events compared to existing conditions, hence suggesting opportunities to refine and further optimize the stormwater management facility sizing. The CESS Team should confirm whether this is to be completed in support of the next submission of the CESS. We are supportive of further refinements, particularly recognizing that the results as presented indicate a minor residual increase in Regional Storm peak flows at the outlet of Reach R3S1 under proposed conditions with stormwater management. Please note, however, that the stormwater management sizes will be subject to further review and refinement as part of the broader scale hydrologic verification to be completed upon receipt of the additional information noted above.

The information in Table 6-2 reports a 25 year peak flow rate, however we note that frequency analyses generate results for a 20 year frequency flow. The CESS Team should confirm whether the assessment for the stormwater management plan applied continuous simulation and frequency analysis, or if synthetic design storms were applied. If the former, the CESS Team should confirm whether the frequency analyses reported a 25 year frequency flow and revise the reporting as appropriate. If synthetic design storms were used, the CESS Team should confirm whether continuous simulation and frequency analyses will be used for final assessment of the stormwater management plan, and, if not, should provide supporting technical justification for applying synthetic design storms. We note that continuous simulation and frequency analysis has historically been applied to establish stormwater management criteria for developments within the Sixteen Mile Creek Watershed, and is considered more robust/supportable than synthetic design storms, hence is strongly encouraged.

xvii) Section 7.2.2.3.4 provides a brief discussion of the bioswale which is proposed to maintain hydroperiod to vegetation community SWD3-3 which lies toward the northwest limit of the Parcel 4 development area. In Section 6.1.3 of the CESS, it is noted that this bioswale (referred to as a “green swale” in Section 6.1.3) would be located within the vegetated buffer. Additional information is required within the CESS to note whether the bioswale/”green swale” would require routine maintenance, and what activities would be required. If maintenance activities are proposed, it is suggested that the bioswale/”green swale” be relocated outside of the buffer, to avoid disturbance to the vegetated community in the buffer.

xviii) Section 7.3.1 provides an overview of the proposed realignment and enhancement to the watercourse corridor for Tributary R3S1, and the conceptual designs are provided on Figures D7-3 to D7-5 of Appendix D. The information presented in this section indicates that a 15 m buffer is proposed between the realigned corridor and the proposed development to the south, however no buffer is proposed along the north limit of the realigned channel. It should be confirmed whether this approach has been accepted by Conservation Halton and Halton Region, and supporting documentation of agency approval (i.e., comments letters, meeting minutes, etc.) should be included within the CESS accordingly.

In addition, we note that the typical channel cross-section depicted on Figure D7-15 indicates some berming along the north limit of the realigned channel. Additional information is required within the CESS to justify providing a berm along the north limit, as it would be preferable for the grading along the north boundary of the realigned channel to match existing grade without berming. Further, should berming be justified and accepted by the Town and Conservation Halton, additional information should be included within the CESS regarding the engineering requirements for the design and implementation of the berm, including requirements for geotechnical engineering specifications.

xix) Table 7-3 presents the flows which were used for the hydraulic modelling, however none of the flows correspond to the hydrologic modelling results presented in Table 6-2. For clarity and consistency, the flows used for the hydraulic modelling should be reported in the hydrology section of the report.

xx) Table 7-4 provides a comparison of water surface elevations along the proposed realigned tributary under both existing and proposed conditions. Although the information in the table demonstrates that water surface elevations at the upstream and downstream limits of the watercourse would be maintained to existing levels under post-development conditions, a comparison of water surface elevations along the limits of the realigned watercourse through the site should also be included, to demonstrate no increase to flood risk to external properties to the north of Parcel 4, or else justification for excluding this information should be provided within this section of the report.

xxi) Section 7.3.1.2 and Table 7-5 provide a summary of the riparian storage along the realigned watercourse R3S1. We note that the text in this section refers to watercourse R2S1, which should be corrected for the next reporting. Additionally, we note that Table 7-5 provides the riparian storage for the 2 year, 100 year, and Regional Storm events only; although riparian storage requirements are under the purview of Conservation Halton, we note that current practice from the Authority requires that these assessments document the difference in riparian storage for the full suite of storm events (i.e. 2 year through 100 year storm events as well as Regional Storm event).

xxii) Section 7.4.1 provides an overview of the stormwater management criteria, and notes that extended detention storage is to be determined based on providing 48 hour drawdown of the 25 mm storm event. The criteria listed should be noted as a minimum criteria, with the final extended detention storage and discharge being determined based upon criteria for providing erosion control along the receiving watercourses.

xxiii) Section 8 of the CESS provides an overview of the implementation plan and requirements for future studies. This section should include additional discussion and guidance regarding the staging of works within Parcel 4, and particularly whether the realignment and enhancement of Reach R3S1 would precede development of the balance of the property and implementing the stormwater management facility (i.e. SWMF-4). Additional discussion should also be included regarding anticipated requirements for any interim works to accommodate the development, and any associated staging considerations. Finally, although it is recognized that design briefs are to be submitted as part of the next stages of planning and design, this section should provide further direction regarding the report content and methodologies/modelling to be used, and it should note that updates to the hydrologic verification should be completed to confirm whether the proposed development and stormwater management plan would satisfy the objectives and criteria advanced in the CESS.

xxiv) Section 9 provides a summary of the monitoring program for the future development. For the stormwater management facilities, this section notes that flow monitoring at the facility inlets and outlets shall be completed until 80% build-out of the development area; it is suggested that this be completed for a minimum 3 year period, similar to the duration recommended for the water quality component of the monitoring program. It is also suggested that flow monitoring be conducted within the receiving watercourses to confirm performance of the stormwater management facilities for quantity control. In addition, for the water quality component of the monitoring program, it is recommended that grab sampling be completed to obtain samples of the facility's influent and effluent, and that samples within the receiving watercourse be obtained upstream and downstream of the facility outlet to appropriately characterize the quality of the facility effluent in comparison with the background water quality within the receiving watercourse. If the wet pond facilities are ultimately to be assumed by the Town, this section of the report should also note the Town's monitoring and reporting requirements prior to assumption.

xxv) Section 10 of the report provides an overview of the conclusions from the CESS. Recognizing the additional field monitoring and analyses still to be completed for the CESS, it is respectfully suggested that it is premature for this section of the report to state "this Comprehensive Study satisfies the Terms of Reference (including agency comments on the Terms of Reference) and demonstrates that the planned development in the study area will achieve a net environmental gain to the Sixteen Mile Creek watershed." As noted, additional work is considered required before this statement can be supported.

B. Groundwater

The following section summarizes the comments for the hydrogeologic component of the CESS and the associated appendices. The technical aspects of the review focus primarily on the overall hydrogeological characterization, the potential groundwater/surface water connection with the ecological features, the supporting groundwater field program, the potential impacts from development related to the change in recharge and associated influences from subsurface infrastructure, the recommended mitigation where necessary and the proposed groundwater monitoring program.

General Comments

The report and supporting groundwater Appendix E provide an extensive presentation of the groundwater field data and interpretation. The groundwater assessment has characterized a shallow groundwater flow system that is generally restrictive to flow due to the low hydraulic conductivity nature of the fined grained silt and clay but has conductive groundwater flow pathways associated with the more extensive sand and silt lenses. The groundwater flow through these more permeable units is expected to account for the relatively larger quantities of groundwater discharge into the wetland features in the northern portion of the study area, as well as the observed groundwater discharge in Middle Sixteen Mile Creek. This groundwater discharge is consistent with, and supports, the nature of, the reported aquatic habitat (i.e., rainbow trout). The detailed groundwater characterization has been generally well integrated with the ecological function of the watercourses and wetlands.

The report addresses many issues related to Source Water Protection and confirms that the study area is not within any source water protection policy areas.

Specific Comments

i) Based on the preliminary design of rerouting channel R3S1 and the associated streambed elevations 215-213.5 masl (Appendix D, Figures D7-3, D7-4) there is a strong potential to intercept the sand and silt lenses. Given the potential increases in quantity and duration of streamflow from storm water management in the new channel, there may be an increase in the groundwater connection to the adjacent wetlands through the sand and silt lenses with a subsequent increase in discharge. Given the current recommendation (Section 7.4.4) to use the area of Parcel 4 in the vicinity of MW1, MW3, and MW8 to promote infiltration and maintain groundwater recharge/discharge to the adjacent valley land wetland communities, it would be important to recognize the overall volume of groundwater recharge and the potential impact to the wetland hydroperiod. Future studies (Section 8.2) should delineate this connection in more detail. It is expected that additional onsite drilling and monitoring in the vicinity of the proposed stream channel would need to be carried out to provide for a more fulsome impact assessment and, if warranted, recommendations for additional management strategies and long-term monitoring related to the groundwater discharge component and any change in hydroperiod.

ii) Section 6.4.6: Although it has been recommended that additional dewatering analysis will be carried out during detailed design, it should be noted within the CESS that a greater dewatering potential does exist within the more extensive sand and silt units.

iii) Section 9.3: Should the reference to Table 5 and 6 actually refer to Tables 3 and 4 in Appendix E? The specifics from Table 15 Appendix E should be noted in this section for clarity.

C. Terrestrial

This section summarizes the findings of the peer review of the terrestrial and natural heritage aspects of the CESS and the associated appendices. The peer review has focused on assessing the methodologies undertaken, findings, interpretation of findings, impact assessment, and management recommendations as they relate to the various terrestrial ecological aspects of the study, including recommendations related to implementation of a proposed Natural Heritage System.

General Comments

i) As noted within the study, many of the terrestrial ecological surveys are out of date. Additional details and supporting documentation are required to confirm whether review agencies agreed that specific surveys were not required, or if this applied to all surveys.

ii) A number of requests have been made in the detailed comments below to include unique IDs and/or to show element occurrences of species and/or areas of particular sensitivity or concern.

iii) In some cases, clarification and supporting documentation of agency concurrence should be provided to support why particular surveys were not undertaken and/or justify scoping/limiting the methods that were used (where they deviate from current standards).

iv) Evaluation of feature significance should incorporate and reflect the Region of Halton's criteria for Key Features. As well, recommendations have been provided in the detailed comments below to show the Region's current NHS on particular maps to clarify differences between the existing and proposed NHS.

v) Additional information is requested to clarify the functional relationships between the groundwater system and linked wetlands.

vi) The section assessing 'net gain' and FSEMS targets provides a qualitative assessment, but requires additional quantitative information to support the conclusions.

Specific Comments

i) Section 3.1 - Natural Heritage: The preamble indicates that some of the surveys are out of date and that discussions with review agencies agreed that a site reconnaissance would be conducted to confirm existing conditions. Specific details and documentation should be provided to confirm whether all reviewing agencies agreed that specific surveys would not be required.

ii) Section 3.1.1 - Vegetation and Botanical Inventory:

- Latest ELC visit was conducted in 2014, per Table 1 Appendix B2. Were ELC communities confirmed during site reconnaissance in 2021?

- Include ELC unique IDs in text and table references to clarify characterization summary, location of potential constraints, etc.
- Clarify the specific location of Features 1-3 on the associated ELC map.
- Presumably the reference to the S3? Species is Butternut; if so, Ontario rarity status should be revised to be S2?.
- Show locations of Butternut and distance from development on an appropriate figure to confirm they are 50 m from the proposed development footprint.
- Provide a reference for the weediness index being used.
- When characterizing vegetation communities, include reference to specific features that are being discussed using unique IDs.
- Clarify if 'invasive exotic plant species were limited to plants with a weediness index of -3.

iii) Section 3.1.2 - Amphibian Call Count:
- Clarify why a third survey was not undertaken following standard methods.
- As part of survey results, include summary of Regional/local status for the species observed.

iv) Section 3.1.3 - Breeding Bird Surveys:
- Provide a rationale for not including a point count in the north section of the study area.
- Include reference to legislation that applies to birds such as the MBCA and the FWCA.
- Regarding Barn Swallow, include occurrences and barns with confirmed nests on an appropriate figure.
- Regarding Eastern Wood-Pewee, include occurrences on an appropriate figure.

v) Section 3.1.5 - Turtle Nesting: Provide specific details regarding turtle nesting surveys.

vi) Section 3.1.6 - Salamander Surveys:
- As part of the preamble, include additional details regarding the rationale for not undertaking Ambystomid salamander trapping given the proximity of potentially suitable breeding habitat present.
- Include specific details regarding survey visits and in which years they were completed.

vii) Section 3.1.7 - Snake Cover Board, Transects, and Area Search:
- Include clarification why reptile transect/area searches were limited to the homestead west of Esquesing Line and why the edges of natural features were not surveyed.
- In the survey results section, include a summary of number of snakes observed.

viii) Section 3.1.8 - Bat Habitat and Acoustic:
- In the survey methods section, clarify that new survey methods are recommended and address how these differ from approaches that were used at the time of conducting surveys.
- In the survey methods section, clarify that specific ELC communities were surveyed and include plot locations on an appropriate figure.
- In the survey methods section, clarify which hedgerows were surveyed and update Figure 3 and Table 11 (Appendix B) accordingly, and confirm that the attributes collected were the same as for other features.
- In the survey results section, please clarify the use of polygon 1 as a unique ID, and that 'targeted surveys' implies that acoustic surveys were undertaken.
- As noted in the report, the acoustic survey methods employed are not per the current standard. Based on the methods used, the presence of Species at Risk bats cannot be ruled out. Include recognition of this in the survey results section.
- In the bat exit survey methods section, include a reference to the noted protocols, and include specific

details regarding when surveys were conducted, and identify survey locations on an appropriate figure.

- In the bat exist survey results section, include a summary of observations for the barn, as well as the residential structures.

ix) Section 3.1.9 - Winter Wildlife: In the survey methods section, include specific details regarding when surveys were undertaken.

x) Section 3.1.10 - 2021 Site Reconnaissance: In the survey results section, it should also be noted that the medium constraint watercourse was present; as well, include a figure reference to complement discussion of the HDFs.

xi) Section 4.1.1 - Key Features: Include an overlay of the Region's Natural Heritage System on Figure 12 and/or 13 to help clarify comparison and discussion of key features, key feature enhancements, linkages, RNHS removals etc.

xii) Section 4.1.1.2 - Significant Wetlands:

- Include polygon IDs and references to clarify which ELC features are identified as non-provincially significant wetland units.
- Elaborate on the existing hydrologic function of feature SWM5-1, particularly related to potential linkages to the groundwater system associated with the proposed development area. Figures presented in the hydrogeology section indicated the presence of sand lenses that may provide groundwater linkages between tableland areas and SWM5-1.
- As part of the assessment of significance using Regional criteria, note that unmapped features may be Key Features and hence part of the Regional NHS. Include additional details to support the conclusions that wetlands outside of the Greenbelt Plan and outside of the mapped NHS are not Key Features, and/or that do not make important ecological contributions to the RNHS.

xiii) Section 4.1.1.5 - Significant Valleylands: Include feature mapping for the candidate significant valleyland area on Figure 12 (Appendix B).

xiv) Section 4.1.1.6 - Significant Wildlife Habitat: It is unclear if targeted surveys for Terrestrial Crayfish habitat were undertaken. Given that incidental observations were made in areas that are typically less suitable, it is recommended that candidate Terrestrial Crayfish habitat be identified in areas where the water table is sufficient to support habitat, to ensure potential impacts are addressed and management recommendations are determined (if warranted).

xv) Section 4.1.2.6 - Wetlands Other than Those Considered Significant: Clarify if the MAS wetlands on Parcel 1 are to be included in the RNHS; the text indicates that they are, but they are not included on Figure 12 (Appendix B1).

xvi) Section 5.1 - Natural Heritage:

- Text in the set-backs subsection identifies Gray Comma and associated habitat as being considered (as an example), but this is the first time this species has been introduced as a potential species of conservation concern requiring management. It is recommended that the Significant Wildlife Habitat assessment approach be reviewed and revised accordingly to ensure Regionally and Locally important species are adequately addressed.
- Clarify if 'other wetlands', as mapped on Figure 12 (Appendix B1) are intended to be included in the RNHS.

- As part of the list of recommended buffers, include the recommendation for the candidate Significant Valleyland (+ 15 m).

xvii) Section 6.1.3 - Significant Wetlands: The hydrological function of SWM5-1 is not sufficiently characterized as part of the Natural Heritage summary; therefore it is not clear if the proposed mitigation approach of LID measures that are proposed to be implemented within the development area will be an effective approach to address impacts from reduced recharge. This is further complicated by rerouting surface drainage into the proposed realigned channel.

xviii) Section 6.1.6 - Significant Wildlife Habitat:

- As noted previously, occurrences of Terrestrial Crayfish and associated habitat were based on incidental observations, hence there may be additional areas where these species and habitat are present. It is recommended that potential impacts, mitigation, and management for this type of habitat be included.
- It is recommended that limiting construction activities be extended to April through September to avoid impacts to bat and bird species.

xix) Section 6.1.8 - Enhancements to Key Features:

- Include an overlay of the Region's Natural Heritage System on Figures 12 and/or 13 and clearly indicate the location of the Key Feature Enhancement area being discussed.
- Include a short summary of the wetland restoration targets in this section (e.g., size and composition) and reference the location on Figure 13.

xx) Section 6.1.9 – Linkages: Include an overlay of the Region's Natural Heritage System on Figures 12 and/or 13 and clearly indicate the location of areas that are assumed to be linkages, such that a clear comparison can be made to the proposed Natural Heritage System and linkages.

xxi) Section 6.1.12 - Wetlands Other than those Considered Significant:

- As noted previously, clarify the policy context of these wetlands based on the Region's criteria for unmapped wetlands that may be Key Features.
- Should the policy context allow for removal of the wetlands, clarify through what process decisions will be made regarding the appropriate/preferred mitigation strategy.

xxii) Section 6.1.15 - Locally and Regionally Rare Species**:** Discussion regarding locally and regionally rare species and associated habitat areas should be included in more detail earlier in the report as part of the characterization and analysis sections.

xxiii) Section 6.4.2 - Feature Based Water Balance: As part of the discussion of the mixed swamp associated with MP2, provide additional details regarding targets associated with infiltration and, whether or not, when combined with alterations to surface drainage (i.e., rerouting flows associated with R1S1) there is a potential to affect groundwater dynamics and associated hydroperiod of linked features (e.g., SWM5-1).

xxiv) Section 7.1 – Overview**:** Correct the reference to the constraints and high-level strategies sections.

xxv) Section 7.2.2 - Proposed Natural Heritage Systems: This section focuses on restoration strategies within the proposed Natural Heritage System. It is expected that key features of the Natural Heritage System be presented at the outset, followed by the various proposed strategies to manage potential impacts to the system.

xxvi) Section 7.2.2.1 - Background Information: The intent of this section is not clear. Is the scope supposed to be a summary of existing conditions? If so, input is required to characterize inter-related and support functions from other disciplines.

xxvii) Section 7.2.2.3 - Restoration Area Design:

- Emphasis on the use of ecologically appropriate native plants as part of the restoration plan should be included throughout this section.
- Throughout this section, where site-specific management recommendations are proposed, they should be shown on an appropriate map and referenced accordingly.

xxviii) Section 7.6 - Predicted Net Gain:

- While it is appreciated that a formal definition of net gain is provided, much of the section provides a qualitative assessment of whether or not a 'net gain' is achieved. Metrics are provided in Table 7-13, but there are no criteria outlined that allow for an objective assessment of whether or not 'net gain' will be achieved.
- For the 'net gain' targets and the FSEMS targets, there is little in the way of quantitative information of baseline and future conditions presented, therefore it is difficult to assess how 'net gain' is achieved by the plan. To improve this approach, it is recommended that evaluation criteria be included and that the various subsections include a quantitative summary of baseline and future conditions (e.g., coverage of natural areas, diversity of community types, diversity of habitat types, diversity of species, etc.). As well, there are numerous statements made throughout this section that require appropriate references to support the claims.

xxix) Section 7.6.3 - Net Gain Metric #3: Disaster risk reduced (ties with Nature-based Solutions): While it is agreed in principle that enhancing, restoring, and creating new habitat may improve the adaptive capacity of natural systems, it is not clear in this section the degree to which the restored areas will work to reduce disaster risks. It is recommended that a quantitative approach be used to assess the degree to which management of natural features on the site will result in a reduction of disaster risks. As well, reference should be made to strategies associated with the storm water management plan as they relate to reducing flooding and erosion risks.

xxx) Section 7.6.5 - FSEMS Target #2 Increasing Infiltration Capacity and Flood Control: To confirm that the target is achieved, specific reference to relevant sections of the hydrology and hydrogeological reporting should be included.

xxxi) Section 7.6.9 - FSEMS Target #6: Increase the Habitat Diversity within the Actively Managed Agricultural Fields: Specific examples should be provided to support the conclusion that a greater range of habitat conditions for flora and fauna is predicted as part of the post-development scenario.

xxxii) Section 9.4 - Ecological Post-Construction Monitoring:

- Additional monitoring locations for vegetation should be included in the proposed re-designed channel and the 30 m buffer (for planted vegetation monitoring locations).
- Details outlining a more robust monitoring program that integrates hydrology, hydrogeology, and ecology are requested to ensure mitigation strategies aimed at reducing impacts to the water balance of surface/groundwater linked wetlands are effective.

xxxiii) Section 9.4.5 - Adaptive Management Plan: Update the proposed adaptive management approaches presented in this section to be explicit and include more detail regarding triggers and respective actions to be undertaken.

D. Fluvial Geomorphology

The following section summarizes the findings from the peer review of sections relating directly to watercourses and headwater drainage features, and associated appendix material.

General Comments

i) The CESS notes that a detailed geomorphic assessment, erosion threshold analyses, and monitoring installation for reaches downstream of watercourse reach RS31 is ongoing due to recent property access agreements. This information is expected to be provided in Submission 2 of the Comprehensive Study. In addition, guidance regarding stream crossings has not been provided as no new or replacement stream crossings are proposed in the study area.

In light of the foregoing, a detailed review of the current erosion assessment in terms of confirming calculations, results, and impacts has not been completed in this current technical review, but will be when the new/updated erosion assessment is available. With regards to crossings, we support the omission of specific guidelines for stream crossings, but suggest that general recommendations for sizing and siting of potential crossings (new or upgraded) be provided as the Comprehensive Study is providing management guidance for watercourses and HDFs.

ii) In the main document, it is suggested that a section of recommendations for future study be provided, and that this include details on the requirements for natural channel design, and design briefs.

iii) We agree with the statement and approach regarding drainage density on Page 44 of the Comprehensive Study Report:

> "It should be noted that although drainage density is a requirement of the Terms of Reference, we advocate for a function-based approach to address lower order tributaries to ensure replication is achieved."

iv) The conceptual natural channel designs have been discussed as being conceptual and/or preliminary within the Comprehensive Study. However, drawings within Appendix C have the following in the revision block "first detailed design submission to agencies", and they are signed and stamped which suggests that these are not preliminary designs. Our current review has been completed with the assumption that channel designs and recommendations are conceptual and preliminary, and may be expected to change through the review and design processes.

Specific Comments

v) Comprehensive Study Report – Section 3.2.2 – Please include reference to Figure 11 and Table 14 in Appendix B to help the reader evaluate this section.

vi) Section 3.3.2 – Middle Sixteen Mile Creek (Reach SM1) is described as unconfined; however, Figure 4-1 includes the delineation of a staked top of bank and 15 m (Conservation Halton) setback. Please update the text to note that this is a confined or semi-confined system, and that the long-term stable top of bank should be used to delineate the ultimate erosion hazard. With that said, we do support the delineation of a meander belt within the broader valley to assess migration potential of the main channel.

vii) Section 3.3.2 – Please distinguish which method was applied in determining the meander belt width for each reach.

viii) Table 3-3 – please indicate the purpose of the "*" in column 2

ix) Section 4.1.2.4 – It is noted that HDF R1 does not provide a linkage given that it ultimately flows through an industrial area to a SWM facility. The Town's team has discussed the potential linkage and supports this rationale, provided the wetland (R2S1) is included within the RNHS through the proposed east-west linkage to R3S1, as described in Sections 6.1.3, 6.1.7, and 6.1.9.

x) Section 4.2.2 – Please reference Figure 11 in Appendix B that shows the watercourse and HDF management recommendations.

xi) Section 5.3.1 – Please refer to Figure 11 and Table 14 in Appendix B. Please note the approach to modify management recommendations from the outcome of the CVC/TRCA protocols. That is, there is a final management recommendation that differs based on site specific rationale.

xii) Section 5.4.3 – Erosion thresholds were not confirmed for the features draining Parcels 1 and 2. It is understood that Parcel 2 is a non-participating landowner, however, some level of confirmation should be completed to verify that proposed release rates will not have negative consequence for Parcel 2 as it exists or as developed. Similarly, the feature within the hydro corridor should not be negatively impacted. This can be a recommendation for future study, as these results are preliminary.

xiii) Section 6.1.10 – There is discussion on both a 15 m regulatory setback from the proposed floodline, and from the top of bank (on the development side of the channel). It is unclear in Figure 5-1 that there is a setback from the top of the design valley, rather it states from the floodline. If the design corridor conveys the Regional Storm flood up to the top of bank, then the limit would be the same. The text is somewhat unclear when reviewed in the context of Figure 5-1.

xiv) Section 6.2.2 - It is noted that the current stormwater strategy for Parcel 4 will result in a 35% increase in cumulative exceedance and an increase in cumulative effective work by 10% compared to the existing condition. However, additional work is anticipated based on an additional detailed geomorphic assessment and the calculation of an erosion threshold corresponding to the updated survey site. As such, we have refrained from detailed review of the current calculations and analyses until a subsequent submission.

xv) Section 7.3.1 –Bullet 1 – Reference is made to Figures D-3 to D7-5 in Appendix D as displaying preliminary design of the channel plan, profile, and sections. However, there are only plan-view drawings, and these differ greatly from the channel design concept in Appendix C.

xvi) Section 7.3.1 – Bullet 4 – Clarification is required regarding the basis for the proposed valley floor width of 24 m?

xvii) Section 7.3.2 – Please reference Table 14 in Appendix B in addition to Figure 11 in Appendix B.

xviii) Appendix B – Table 14 – HDF Assessment and Recommendations.

a. Feature R3S1H – Please confirm the value classification, and update the management recommendation if necessary. Currently "no management", but valued hydrology would lead to "mitigation".

b. Feature R6S1 – Feature has a valued hydrological characterization, but was removed from the surface following the second visit. A meeting with the Town and Conservation Halton should be held to determine the approach for finalizing the management recommendation for this feature.

c. Realigning R5S1 and R5S0 into SWM facility – net effect on realignment and conversion to bioswales. These only contribute flows to downstream offsite industrial SWM ponds south of James Snow. Need to confirm there are no impacts on HDFs within Parcel 1 and the Hydro Corridor.

xix) Appendix C – Table 3: Meander belt widths for Reach SM1 and Reach R3S1 – Please confirm if calculated meander belt widths for Reach R3S1 include the 20% factor of safety for the Williams (1986) equation. Please confirm the input parameters used to calculate the TRCA protocol to aid review of the calculations. Also, please confirm rationale for assumption of no change in hydrologic regime as per the TRCA method.

xx) Appendix C – Tables 2 and 4 – Different Manning's N values are shown for Reach R3S1 in Table 2: Detailed assessment results for reach R3S1 (N = 0.037) and for Tributary of Sixteen Mile Creek (R3S1) Orlando Lands in Table 4 (N = 0.050).

xxi) Appendix C – Section 6.1 – It is understood that the existing degraded channel will be replaced "with a naturalized shallow and deep undulating typology," which is considered appropriate for the scale and anticipated function of the design reach. The cross-sections included in the design drawings are labelled correspondingly as shallow and deep undulations. However, the planform drawings identify riffles and pools. Please clarify design intent.

xxii) Appendix C – Section 6.3 – The 1.25-year flow used to design the R3S1 bankfull channel is reported as 0.36 m^3/s, as provided by TMIG. Table 6-2 indicates that the 2-year flow within the Tributary of Middle Sixteen Mile Creek (R3S1) at downstream boundary of Subject Lands (OF-101) is 0.16 m^3/s under Proposed Conditions with SWM Controls. Please clarify which future flow is most likely to occur under future conditions.

xxiii) Main Report – Section 6.3 – (Related to preceding comment) Table 6-2 indicates that the 2-year flow within the Tributary of Middle Sixteen Mile Creek (R3S1) at downstream boundary of Subject Lands (OF-101) is 0.32 m^3/s under existing conditions and 0.16 m^3/s under Proposed Conditions with SWM Controls. Is the future 2-year flow proposed to decrease under future conditions within the proposed R3S1 channel realignment? What is the future 2-year discharge rate at flow node 101-4, near the upstream end of the proposed R3S1 channel realignment?

xxiv) Appendix C – DET-1 & DET-2 – The note on the nature of the Granular B material to be used ("GRANULAR 'B' TO BE SOURCED FROM PIT-RUN MATERIAL AND ROUNDED IN NATURE. NO CRUSHED ROCK, LIMESTONE OR POST-CONSTRUCTION MATERIALS ARE TO BE USED WITHIN THE CHANNEL.") is acknowledged and appreciated, as is the discussion regarding Granular B grain size classes and stability within Section 6.3. As there is some variability in the range of material size that that may be classified as "Granular B," it is recommended that the drawing notes include direction on the preferred or required size classes for the Granular B material and direction for onsite inspection of the material by a qualified person prior to installation. It is suggested that this be considered for any channel design drawing to ensure the desired material is installed and particularly if the Granular B material is intended to provide channel stability.

E. Fisheries

This section summarizes the peer review of the CESS and the associated appendices with respect to fish and aquatic habitat.

i) Section 1.5 Background (p. 3) appears to be a policy and legislation review and might be more appropriately titled to reflect that. The text in Section 1.5 refers to summarizing on-line databases and other resources, and previous studies pertaining to the Sixteen Mile Creek watershed, but that occurs in Section 1.6 (Secondary Source Information Review).

ii) Section 1.6.10 Sixteen Mile Creek Fisheries Review (p. 12): This section appears to misinterpret the locations of fish sampling station SXM-347 in The Sixteen Mile Creek, Grindstone Creek and Supplemental Monitoring Report (Conservation Halton, 2011) and to incorrectly identify the branch of

Sixteen Mile Creek that flows through the north-east corner of the subject lands. The Comprehensive Environmental and Servicing Study report states "Figure 2 of the Conservation Halton (2011) report depicts two stations in the vicinity of the Subject Lands: SXM-347 and SXM-349. SXM-347 is found upstream of the Subject Lands and SXM-349 is found downstream of the Subject Lands. This section of Sixteen Mile Creek is known as Middle East Branch." However, according to the Conservation Halton (2011) report, station SXM-347 is on the Middle East Branch of Sixteen Mile Creek and SXM-349 is on the Middle Branch of Sixteen Mile Creek. Given this, the relevance of Station SXM-347 to the current study should be re-evaluated and the information presented (e.g., fish species present) should be updated accordingly.

iii) Section 3.2.1 Watercourses (p. 26): Section 3.2.1 correctly identifies the watercourse located in the northeast corner of the subject lands as the Middle Branch of Sixteen Mile Creek and the relevant Conservation Halton sampling station as SXM-349. This section adequately describes the aquatic habitats present. In Section 3.2.1.2.1 reference is made to studies conducted in April 2015. Provision of information regarding the nature of those investigations (e.g., location, methods, personnel), during which Blacknose Dace were observed, would be appreciated.

iv) Section 3.2.1.1.1 Aquatic Habitat (p. 29): The verb is missing from the sentence below, after "potentially". The meaning, however, is self-evident.

"Section Rainbow Trout migrating into Sixteen Mile Creek from Lake Ontario could potentially gravel and small cobble dominated areas for spawning purposes."

v) Section 6.1.7 Fish Habitat (p. 82): This section states that the Middle Branch of Sixteen Mile Creek will be protected from development and site alteration through avoidance. Section 3.2.1.1.1 indicates that groundwater seepage from the banks of the Middle Branch of Sixteen Mile Creek. has been observed in several locations. Groundwater discharge is required to maintain water temperatures that are required to support nursery habitat for the migratory rainbow trout, which occur in the Middle Branch of Sixteen Mile Creek. A discussion of the potential effects of the development on groundwater discharge to and/or adjacent to the Middle Branch of Sixteen Mile Creek is requested.

vi) Section 9.4 Ecological Post-Construction Monitoring (p. 137): Table 9-3 indicates that fish community sampling should occur in summer (June/July), however fish use of this watercourse, which is expected to be intermittent, is most likely to occur in the spring while there is flow. It is recommended that fish community monitoring take place in the spring, when flow is present, and in the summer in the event that water is present.

vii) Section 9.4.3 RNHS Monitoring Locations - Aquatic Habitat Assessment (p. 141**):** It is recommended that the aquatic habitat assessment follow the methods outlined in the Ontario Stream Assessment Protocol.

We trust that the foregoing satisfies your current requirements in this regard. Feel free to contact our office should you have any questions or wish to discuss.

Sincerely,

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited

Per: Aaron Farrell, M.Eng., P.Eng. CPM
Associate

Per: Ron Scheckenberger, M.Eng., P.Eng.
Principal Consultant

AF/RBS/af

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c.c. Steve Hill, Dougan & Associates
Bill Blackport, Blackport and Associates
John McDonald, Matrix Solutions
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November 3, 2021

Rachel Ellerman, C.E.T., E.I.T.
Manager, Stormwater
Town of Milton
150 Mary Street
Milton, ON L9T 6Z5

BY EMAIL ONLY (Rachel.Ellerman@milton.ca)

Dear Rachel Ellerman:

Re: Orlando North Porta Development
8350 Esquesing Line & 8880 Boston Church Road, Town of Milton
Comprehensive Environmental and Servicing Study – First Submission
CH File Number: MPR 787
Orlando Corporation

Conservation Halton (CH) staff has reviewed the first submission of the "Milton North Porta, Comprehensive Environmental and Servicing Study (CESS), Version 1" prepared by TMIG et. al., dated August 2021 and received September 3, 2021. While CH is generally satisfied with this first submission, we provide the following Key Comments followed by Detailed Comments in Appendix A that will need to be addressed in a revised submission. Comments have also been provided in accordance with previous CH correspondence provided in our "Pre-consultation Meeting Follow-up Notes", addressed to the Town of Milton, and dated May 25, 2021.

Key Comments

1. Hazard mapping will need to be revised to include a 15 m allowance as well as an unencumbered 6 m access allowance outside the Regional Natural Heritage System (RNHS) and Greenbelt Natural Heritage System (GBNHS), on both sides of the proposed realigned tributary of Sixteen Mile Creek (watercourse R3S1). Further, the regulated area for the realigned watercourse must be contained on Parcel 4. All drawings and figures should be updated accordingly. *Note: When the terms "GBNHS" and "RNHS" are stated throughout the comments, they are referring to the entire system (including the associated Greenbelt NHS vegetation protection zone (VPZ) and Regional NHS buffers respectively).*

2. CH recently initiated a Flood Hazard Mapping (FHM) Study for Sixteen Mile Creek that will generate updated flood hazard mapping for this watershed. While the FHM Study does not currently affect the modeling and regulatory flood hazard mapping proposed by the CESS, the flood hazard limits may be subject to change in the future. Future regulatory decisions on development proposals in CH's regulated areas will be based on information generated by this FHM Study. The text of the CESS should make note of this.

3. All updated HEC-RAS and PCSWMM models for all scenarios should be provided for staff review.

4. CH does not credit Regulatory Storm control ponds for land use planning and regulatory flood hazard mapping unless there is either public ownership of the facility or evidence that the municipality has the legal right to ensure the proper operation and maintenance of a privately-owned facility. If the municipality is not assuming the operation and maintenance of the facility, the regulatory floodplain must be determined without the regional storage included.

5. Provide justification for the proposed SWM pond outlet location and demonstrate that it will have the least impacts to the watercourse.

6. Demonstrate the need for the replicated wetland location within the Regional Natural Heritage System (RNHS) and Greenbelt Natural Heritage System (GBNHS). All efforts should be made to move or alter the location within the "intermediary areas" to avoid encroachment.

7. Provide additional information regarding Low Impact Development (LID) measure locations and discuss potential impacts to wetland hydrological functions.

8. The report should include discussion and justify the requirement for the bioswale to be placed within the Regional Natural Heritage System (RNHS) and Greenbelt Natural Heritage System (GBNHS). The size of the swale should be reduced to the extent possible to minimize encroachment.

9. Recommend the monitoring duration for ground water should be extended to at least 10 years or 80% build out, whichever is greater to determine the effectiveness of the LID features.

10. The incorporation of an invasive species management plan is recommended to help minimize further spread of certain species within the Regional Natural Heritage System (RNHS) and Greenbelt Natural Heritage System (GBNHS) to help provide a resilient NHS post development.

11. CH recommends revising the linkage assessment to be in accordance with the Region of Halton's EIA guidelines.

12. CH recommends providing terrestrial passage for the proposed road crossings within the hydro corridor to maintain wildlife movement post development.

Summary

Staff recommend that the above Key Comments and Detailed Comments within Appendix A of this letter be addressed in an update to the CESS. To facilitate CH's review, the applicant is asked to include the following in the next submission:

- Consolidated response table (word format preferred) addressing CH's numbered comments,
- A tracked changes version of the CESS, and
- A digital copy of all submission materials (digital download preferred).

No resubmission fee is required; however, staff note that a resubmission fee will apply on third and subsequent submissions.

Please note that CH has not circulated these comments to the applicant, and we trust that you will provide them as part of your report.

We trust the above is of assistance. Please contact me with any questions.

Sincerely,

Jessica Bester, BES, MCIP, RPP
Senior Environmental Planner
905.336.1158 ext. 2317
jbester@hrca.on.ca

Att.: Appendix A: Detailed Comments on the Comprehensive Environmental and Servicing Study (CESS)
– First Submission

Cc: Christian Lupis, Town of Milton, christian.lupis@milton.ca (By Email)
Jae Hyun Park & Heather Ireland, Region of Halton, jae.park@halton.ca & heather.ireland@halton.ca (By Email)

Appendix A: Detailed Comments on the Comprehensive Environmental and Servicing Study (CESS) – First Submission

CH provides the following comments on the first submission of the Comprehensive Environmental and Servicing Study (CESS) for the Orlando North Porta Development. Staff has identified if the comments are requirements under Ontario Regulation 162/06 ("CH") or technical advisory recommendations under the Memorandum of Understanding ("MOU"), or both. Although staff has identified key sections pertaining to each comment, many comments apply to various sections and the report should be updated accordingly.

#	Topic/Section	CH Comment	CH/ MOU
General Comment			
1.	**General Comment**	CH recently initiated a Flood Hazard Mapping (FHM) Study for Sixteen Mile Creek that will generate updated flood hazard mapping for this watershed. While the FHM Study does not currently affect the modeling and regulatory flood hazard mapping proposed by the CESS, the flood hazard limits may be subject to change in the future. Future regulatory decisions on development proposals in CH's regulated areas will be based on information generated by this FHM Study. The text of the CESS should make note of this.	CH
Main Text			
2.	**Section 1.5.4 Conservation Halton (Page 6)**	The description of all the regulated features within the study area should be provided within this section of the report along with an explanation of their associated regulatory allowances/setbacks/others areas.	CH
3.	**Section 1.5.5 Provincial Policy Statement and Associated Guideline Documents**	This section should reference Section 3.1, Natural Hazards of the Provincial Policy Statement (PPS, 2020) and identify how the proposed development will meet the relevant policies of the PPS.	CH
4.	**Section 1.6.7 Ministry of Natural Resources and Forestry, (Page 10)**	The Information Gathering Form (IGF) response letter (January 15, 2016) is dated and greater than 5 years. CH recommends correspondence with MECP to determine if an update to the IGF is required to help define and target surveys within and adjacent to the study area.	MOU
5.	**Section 3.4.5 Hydrologic Analysis, (Pages 40 to 41)**	a. Based on Table 3-7, all estimated flows for R5S0 do not compare well to the FSEMS flows and R1S1/R2S2 flows do not compare well for the Regional storm event. Table 3-6 provides flows for the Tributary of Middle Sixteen Mile Creek (R3S1) at the downstream boundary of the subject lands that are significantly lower than those presented previously for MSMC-Trib-01 (69% -120%) and used in the CH hydraulic model for James Snow Parkway. Notwithstanding that previous flow rates used for MSMC-Trib-01 may be conservative as they were derived using an Index Flow Method, to support use of the PCSWMM model staff require justification for the significant differences between models or model modifications to improve the agreement between the two models.	CH

		b. In **addition to** the use of frequency flows, the 100-year design storm event should be modeled and presented in all tables as part of establishing regulatory flow rates for the receiving system (i.e., greater of the 1:100 year and Regional storm event) and confirming SWM control requirements.	
6.	**Section 4.1.2.2. Linkages, (Page 61)**	HDF R3S1A is shown in the Region of Halton Official Plan Map 1G as "Prime Agricultural Lands in NHS Enhancement/Buffer". Please update this section to correctly identify the feature and discuss the linkage potential within Parcel 4.	MOU
7.	**Section 5.1.1 Buffer Requirements, (Page 69) and Figure 5-1, Development Constraints**	The Report text and figures should be revised to address the following. a. In accordance with CH's regulation, please use the term "allowance" for offsets to natural hazard lands. b. Allowances for realigned watercourse R3S1 should read 15 m from the greatest hazard (flood line and stable top of slope), as the realignment will be creating a confined system. c. While the 15 m allowance on the north side of realigned watercourse R3S1 may partially overlap other buffers, provided that all site alterations including channel construction and grading works occur outside of the Greenbelt NHS Vegetation Protection Zone (VPZ) and Regional NHS 30 m buffer, a minimum 6 m access allowance shall be provided that does not overlap with other buffers. d. The full 15 m allowance for the realigned watercourse R3S1 must be provided and contained within Parcel 4. The regulated area for the realigned watercourse shall not extend onto other properties.	CH
8.	**Section 5.4.3.1 Stormwater Management Criteria, Table 5-2, (Page 74)**	Provide more detail on how allowable discharge rates and the unitary discharge were calculated.	CH
9.	**Section 5.4.3.2 Erosion Control, (Page 75)**	Detailed field work is required prior to Draft Plan approval to confirm the proposed erosion control rates. The location of the unitary threshold and proposed detailed field work locations should be provided on a figure.	CH
10.	**Section 5.4.3.2 Erosion Control, Table 5-3 & 5-4, (Page 76)**	A unitary rate of 0.0009 m^3/s/ha is being used for Parcels 3 and 4 when there is a more sensitive downstream reach (0.0006 m^3/s/ha). The erosion threshold number for the most sensitive reach should be used or further justification for the rate selected should be provided.	CH
11.	**Section 6.1.3 Significant Wetlands, (Page 80)**	First paragraph states that no long-term access is proposed on the northside of the channel. Please confirm that the channel is R3S1 and note that CH will require a minimum 6 m access allowance within the 15 m allowance on both sides of the watercourse channel.	CH
12.	**Section 6.1.3 Significant Wetlands, (Page 80)**	The report should justify the location and design (large footprint) of the swale within the designated NHS buffer areas. Please demonstrate that all efforts have been made to locate the swale outside of the RNHS 30 m buffer and GBNHS VPZ.	MOU

13.	**Section 6.1.7 Fish Habitat, (Page 83)**	Figure 13 shows the Proposed Natural Heritage System and not the concept plan. Review and update accordingly.	MOU
14.	**Section 6.1.8, Enhancement to Key Features (Page 85)**	Please provide an additional discussion regarding the potential hydrological impacts that the enhancement features (replicated wetland) may have on the adjacent wetland SWM5-1.	CH
15.	**Section 6.1.9 Linkages, (Page 85-86)**	The linkage assessment should reflect and be in keeping with the Region of Halton's EIA Guideline. We recommend including the recommended minimum widths for local and regional linkages and size thresholds from the EIA Guideline, to guide delineation of enhancements to key features. The linkage assessment should be provided in the context of the scale of the development and the ecological contributions to the RNHS and Greenbelt NHS. For guidance, we recommend utilizing *The Sustainable Halton Report 3.02 (Natural Heritage System Definition & Implementation; North South Environmental Inc. 2009)* for best practices. a. CH recommends incorporating terrestrial passage within the hydro corridor for the proposed crossings, with appropriately sized openness ratios to maintain the current movement opportunities for wildlife, post development. Please refer to CH's Road Ecology Best Management Practices Quick Reference Guide, 2018 for crossing guidance: Policies and Guidelines — Conservation Halton.	MOU
16.	**Section 6.1.10 Buffers, (Page 86)**	See Comment No. 7 above.	CH
17.	**Section 6.1.10 Buffers, (Page 86) and Section 6.1.13 Regulated Floodplain, (Page 87)**	As per previous meetings and discussions, 6 m of the 15 m regulatory allowance from the greatest hazard of realigned watercourse R3S1 is to be outside of the RNHS and the GBNHS. This is with the understanding that the remaining allowance may overlap the RNHS and the GBNHS, provided no channel construction and grading works are within these areas. The report does not currently state or show this requirement within the associated text and figures. Please review and update the report and associated concept designs accordingly.	CH
18.	**Section 6.1.10 Buffers, (Page 86)**	CH fish data records for watercourse R3S1 indicate that warm water sportfish are present. As per CH's "Policies and Guidelines for the Administration of Ontario Regulation 162/06 and Land Use Planning" (November 26, 2020) document (Policies 2.6 and 2.61); we recommend that the appropriate riparian and fish habitat buffer should be 30 m from bankfull. Please review and revise text and figures where appropriate.	MOU
19.	**Section 6.1.12 Wetlands Other then Those Considered Significant, (Page 87)**	In addition to the information provided, the report should also provide additional information regarding the proposed drainage and desired hydroperiod, to ensure functionality of the replicated wetland for proposed wildlife and habitat uses post development.	MOU

20.	**Section 6.1.14 Greenbelt Area, (Page 88)**	The report needs to demonstrate the need for the replicated wetland encroaching within the GBNHS VPZ and RNHS 30 m buffer and determine the feasibility of it being located outside these areas. CH recommends reviewing opportunities to move or alter the shape of the wetland within the "intermediary areas" to avoid encroachment. To help ensure there are no negative impacts on the hydrological function to the adjacent Regionally significant wetlands, we recommend indicating the development phasing approach including timing for the removal of the existing wetlands along Boston Church Road and creating the replicated wetland prior to the removal of these features.	MOU
21.	**Section 6.2.2 Downstream Erosion Assessment, (Page 86)**	CH recommends using the estimated erosion threshold rate of 0.0006 $m^3/s/ha$ for Parcel 4 until further field work can be completed.	CH
22.	**Section 6.3 Hydrology and Surface Water Quality, Table 6-2, (Page 91)**	The following should be addressed: a. Proposed Regional Storm peak flow rates for Tributary R3S1 are over pre-development peak flow rates. Proposed condition flows should meet or be lesser than the exiting conditions flows. Please revise. b. 2-, 5-, and 10-year flows for R1S1/R2S1 are over pre-development peak flow rates. Proposed condition flows should meet or be lesser than the exiting conditions flows. Please revise. c. Staff could not find the Regional Storm model for the proposed conditions without SWM. All models should be provided. d. The Regional Storm for Tributary R3S1 for the proposed conditions without SWM controls does not seem to reflect the amount and density of the proposed development. Staff would expect that the flow would increase similar to the other events, which is not reflected in the table. Please revise.	MOU
23.	**Table 7-4. Proposed Conditions Water Surface Elevations, (Page 111)**	Please provide additional discussion regarding any potential impacts on the hydrological function of wetland SWD3-3 relating to the proposed Regional water surface elevation changes for the Key Hydraulic Location – Approximately located 100 m upstream of realigned R3S1.	CH
24.	**Section 6.4.2.3 Mixed Swamp (MP2), (Page 95)**	Please state the type and location of the LID measure on a corresponding figure, to confirm there is adequate space to facilitate the infiltration target without negatively impacting the wetlands hydrological functions.	CH
25.	**Section 6.4.2.3 Mixed Swamp (MP2), and Section 7.4.4 Post-Development Water Balance and Mitigation, (Page 118)**	Please provide additional discussion regarding the feasibility of infiltration being provided to wetland SWM5-1 through infiltration test MW3 and MW8 locations. There is a concern that the locations/infiltrated water will be captured by the other features on site and not supply the required post development targets to this wetland. Please review and update accordingly.	CH

26.	**Table 7-10 Water Balance Mitigation, (Page 118)**	The proposed LID facilities require a substantial surface area to maintain the infiltration targets within Parcel 4. Recommend including additional discussion regarding space and location availability adjacent to the RNHS and GBNHS (within the "intermediary areas"). Also, discuss as part of the impact assessment for the respective adjacent RNHS and GBNHS features and their ecological functions.	MOU
27.	**Section 7.2.2.2 Restoration Goals and Objectives, (Page 100-101)**	Include Category 2 invasive species on the Urban Forest Associates Inc. (2002) Priority Invasive Plants to coincide with proposed invasive species monitoring plan.	MOU
28.	**Section 7.2.2.3.2 Replicated Tableland Wetland, (102)**	To aid in the establishment of the replicated wetland, we recommend including vegetation plugs within the proposed targeted species selection. In addition, consider vegetation salvage for some of the native species within existing wetlands, if applicable.	MOU
29.	**Section 7.2.2.4 Invasive Species Management, (Page 104)**	Since European Buckthorn was surveyed within the edge of the RNHS and GBNHS and does not protrude into the key feature, CH recommends incorporating a management plan for this species, to help minimize spread into the feature and to help build NHS resilience. Regarding the wetlands MAM2-11 and MAS2-1, we recommend incorporating a buckthorn removal plan to help minimize spread of the species using best management practices.	MOU
30.	**Section 7.3.1 Tributary of Sixteen Mile Creek (R3S1), (Page 109)**	The low flow (bank full) channel was based on the 1:25-year return period. This seems unusually high for a bank full flow, which is usually closer to the 1:2-year return period. Please explain why this storm was selected and will not result in an entrenched channel system or revise the design as necessary.	CH
31.	**Section 7.3.1 Tributary of Sixteen Mile Creek (R3S1), (Page 109)**	The corridor block is designed to contain the Regional Storm with the proposed stormwater management measures included. CH does not credit Regulatory Storm control ponds for land use planning and regulatory flood hazard mapping unless there is either public ownership of the facility or evidence that the municipality has the legal right to ensure the proper operation and maintenance of a privately-owned facility. If the municipality is not assuming the operation and maintenance of the facility, the regulatory flood plain must be determined without SWM facility storage included.	CH
32.	**Section 7.3.1 Tributary of Sixteen Mile Creek (R3S1), (Page 109)**	See Comment Nos. 7 and 17 above.	CH
33.	**Section 7.3.1.1 Proposed Conditions Hydraulic Analysis and Flood Plain, (Page 110)**	The following should be addressed: a. The channel has been designed to contain the Regional Storm with the proposed stormwater management measures included. Please be advised that CH does not credit Regulatory Storm control ponds for land use planning and regulatory flood hazard mapping unless there is either public ownership of the facility or evidence that the municipality has the legal right to ensure the proper operation and maintenance of a privately-owned facility. If the municipality is not assuming the operation and maintenance of the facility, the regulatory flood plain must be determined without the regional storage included.	CH

		b. HEC-RAS model included in submission only contains the existing riparian storage model. Most up to date modelling for existing and proposed conditions for all models should be provided.	
34.	**Section 7.4.2 Onsite Controls, (Page 115)**	The onsite controls will have a release rate of 120 L/s/ha for up to the 100-year storm event. Staff has several questions regarding the onsite controls: a. Where is this flow being discharged to? b. How was the 120 L/s/ha determined? What does this represent? c. How does the 120 L/s/ha compare to the allowable flow off site? d. If it is discharged off site has this been accounted for in the detention calculations for total parcel rate? e. Please clarify why underground storage is proposed when there is also a SWM facility. f. Please clarify how the total system operates and the cumulative flow leaving the site to all outlets.	CH
35.	**Section 7.4.3 End of Pipe Facilities, (Page 116-117)**	The following should be addressed: a. Report should better explain how these release rates were determined and should provide the pre- and post-development rates to each part of the parcels (i.e., to creek, to HDF outlet, etc.). b. The emergency overflow spillway should be designed to safely convey the greater of the uncontrolled 100-year peak or Regional Storm flow. Confirm spillway sizing.	CH
36.	**Section 8.1.2 Stormwater Management and Watercourse / HDF Management Plans, (Page 131)**	Discuss the SWM and Watercourse and HDF Management strategy for Parcel 3 to state that further studies are required.	CH
37.	**Section 8.4 Operation and Maintenance, (Page 133)**	Please clarify if there will be any expected maintenance for the bioswale proposed within the RNHS 30 m buffer and Greenbelt NHS VPZ. Please also see Comment 12 above.	MOU

38.	**Section 9.2 Fluvial Geomorphology / Erosion, (Page 136)**	A cross section on the most sensitive downstream reach should be established prior to realigning the channel. Include this location in the ongoing monitoring.	CH
39.	**Section 9.3 Groundwater, (Page 136)**	CH recommends that the post development groundwater monitoring duration be at least 10 years or until at least 80% build-out, whichever is greater. Understanding that there are proposed additional uses being proposed near the buffer, it will be important to monitor to ensure the modifications maintain the wetlands hydrological functions post development.	CH
40.	**Section 9.4.3 RNHS Monitoring Locations, (Page 142)**	This section indicates the replicated wetland unit will not be designed to support breeding amphibians due to hydroperiod limitations, however this is contradictory to Section 7.2.2.3.2, which states that potential habitat will be explored at detailed design once the hydroperiod in known. Please clarify and update to ensure report is consistent.	MOU
41.	**Section 9.4.3 RNHS Monitoring Locations, (Page 148)**	Regarding the wetland hydrology, staff recommend incorporating changes in canopy composition to the parameters.	MOU
42.	**Section 9.4.5 Adaptative Management Plan, (Page 150)**	Regarding invasive species, CH recommends including a species-specific invasive species management plan for each Category 1 species that appear as new colonies in new NHS features (stream corridors, replicated wetlands and buffers); and that can be reasonably removed, or the spread contained within the RNHS and GBNHS features. a. In addition, consider incorporating guidance from the Town of Milton Restoration Framework Table 7 (Dougan, Aug 2015) for plan preparation.	MOU
43.	**Section 9.5 Duration of Monitoring Plan, (Page 138)**	CH recommends the duration of monitoring for the Natural Heritage features, include 1, 3, and 5 years or assumption. This is to be consistent with the existing monitoring programs within the Town of Milton.	MOU
44.	**Section 9.6 Monitoring Summary, (Page 151)**	Regarding groundwater, CH recommends monitoring within MW1, MW3, and MW8 locations continuously on an annual basis up to least 10 years or until at least 80% build-out, whichever is greater.	MOU
Appendix B Natural Heritage			
45.	**Appendix B1, Figures, Figure 11. Aquatic Survey Locations and Constraint Analysis**	Regarding HDF R1S2, it is located within a regulated area (wetland), therefore the classification should be upgraded to "Protection". Update report and associated figures accordingly.	MOU
46.	**Appendix B1, Figures, Figure 12. Regional Natural Heritage Feature Components and Figure 13 Proposed Natural heritage System**	Update figures to show the Greenbelt Plan Protected Countryside limit and associated Vegetation Protection Zones (VPZs).	MOU

	(Constraints and Opportunities)		
47.	**Appendix B1, Figures, Figure 12. Regional Natural Heritage Feature Components**	Update the figure to show all CH regulated features and their associated setbacks/allowances/other areas. a. Remove the proposed floodplain from the figure to show only the existing features and their associated buffers/setbacks/allowances/other areas. b. Include the candidate Significant Valleyland limit and associated buffer on the figure.	CH
48.	**Appendix B1, Figures, Figure 13. Proposed Natural Heritage System (Constraints and Opportunities) and Figure 14. Concept Plan**	Update the figures to clearly show the details referenced in Comment No. 7 above.	CH
49.	**Appendix B2 - Tables, Table 12: Impact Assessment**	CH recommends including additional discussion within this table to justify the need to place the R2S1 swale and the replicated wetland within the RNHS 30 m buffer and Greenbelt NHS VPZ. We recommend demonstrating avoidance and looking at the feasibility for this feature to be outside of these buffer areas. Please provide appropriate mitigation measures to ensure no negative impacts on the RNHS/Greenbelt NHS, on regulated features and on ecological and hydrological form and functions.	MOU
50.	**Appendix B2 - Tables, Table 12: Impact Assessment**	Significant Woodland Avoidance/Mitigation section: To help minimize impact we recommend bird friendly window treatments.	MOU
51.	**Appendix B2 - Tables, Table 12: Impact Assessment**	Recommend including how the potential impacts to woodland water balance will be mitigated.	MOU
52.	**Appendix B2 - Tables, Table 12: Impact Assessment**	Halton Region Official Plan: Revise the linkage section to include discussion regarding the potential impacts the road crossing may have on the current wildlife function within the hydro corridor. Provide additional mitigation measures (proper sized crossing for wildlife usage) and openness ratios for culverts) to ensure wildlife movement function is maintained post development.	MOU
53.	**Appendix B2 - Tables, Table 14: Headwater Drainage Feature Classification and Management Recommendations**	Drainage feature segment R1S2: This feature is within CH's regulated area, the refined RNHS and Greenbelt NHS. Therefore, this feature should receive a final management recommendation of "Protection". Update report and associated figures accordingly.	MOU
54.	**Appendix B2 - Tables, Table 14: Headwater Drainage Feature Classification and**	Drainage feature segments R3S1D and R3S1E: As per the "Evaluation, Classification and Management of Headwater Drainage Features Guidelines" (2014), if the riparian condition from left to right differ, the classification will be according to the highest function. Therefore, HDF R3S1D and R3S1E riparian classification should be upgraded to "Valued" as they are adjacent to	MOU

	Management Recommendations	forest/wetland habitat and within the RNHS and GBNHS. This will upgrade the final management recommendation to "Conservation". Recommend updating the report, associated figures, and concept plan for post development scenario. a. In addition, HDF R3S1D flows into regionally significant and regulated wetland SWD3-3. The feature should maintain existing connections, to avoid impacts to wetland function. Within the concept design, determine the feasibility to maintain the HDF as-is on the landscape and/or integrate it into the HDF R2S1 swale design and R3S1 watercourse realignment. Please review and update accordingly.	
55.	**Appendix B2 - Tables, Table 15: Significant Wildlife Habitat Assessment (7E Ecoregion)**	Bat Maternity Colonies: We recommend confirming the total number of individuals surveyed to determine if should be Confirmed Significant Wildlife Habitat (SWH).	MOU
56.	**Appendix B2 - Tables, Table 15: Significant Wildlife Habitat Assessment (7E Ecoregion)**	There are inconsistencies within the assessment approach, as the assessment for some SWH do not consider species/habitat presence on adjacent lands. Please see detailed comments below. a. Reptile Hibernacula: Indicate if potential habitat is present within adjacent lands, if so, indicate Candidate habitat. b. Turtle Nesting Areas: Include 120 m adjacent lands within assessment to determine if Candidate habitat is present.	MOU
Appendix C Fluvial Geomorphology Report			
57.	**Drawing GEO-1**	Include the regulated wetland limit and 30 m setback on the drawing.	CH
58.	**Drawing GEO -8**	The proposed tie-in to existing channel does not line up, please adjust accordingly.	CH
Appendix D Hydrology, Hydraulics and Stormwater Management			
59.	**General Comment**	To help ensure there is adequate space, show the proposed LID location on a figure. Discuss the feasibility and type of LID measure(s) that will be utilized so that it is appropriate to maintain groundwater discharge to wetland SWM5-1 in the post development condition. Any LID measures should be located outside of the regulated area, RNHS and GBNHS.	CH
60.	**General Comment**	Further to the comment above on Section 8, Monitoring Recommendations (Page 42), we recommend extending the monitoring duration to 10 years or 80% buildout, whichever is greater to help ensure LID measures are maintaining the pre to post development wetlands hydrological functions.	CH
61.	**Appendix D1: Figures, Figure D5-1 – Proposed Conditions Hydrologic Catchment Areas**	Proposed hydrologic catchment areas do not match the PC-SWMM model. Figure or model should be updated accordingly.	CH

62.	**Appendix D1: Figures, Figure D7-2 SWMF4 Concept Plan**	Provide justification in the main text for the location of the proposed SWM pond outlet to the receiving watercourse and demonstrate that the proposed location and outlet will show the least impacts. Update the text and figures accordingly.	CH
63.	**Appendix D1: Figures, Figure D7-2 SWMF4 Concept Plan**	The proposed SWM outlet is near the existing culvert along Esquesing Line. If this location is justified as per the comment above, design revisions may be necessary to ensure erosion concerns are minimal.	CH
64.	**Appendix D2, Hydrology**	Table 6-2 shows the flows for the proposed conditions without SWM controls, but details for this model are not provided in the Appendix. Appendix should include all models used to generate flows provided in the report.	CH

Planning Services
Legislative & Planning Services
Halton Region
1151 Bronte Road
Oakville, Ontario L6M 3L1

November 4th, 2021

Rachelle Ellerman, C.E.T., E.I.T.
Manager, Stormwater
Town of Milton
150 Mary Street
Milton, ON L9T 6Z5

Dear: Rachelle

RE: Town of Milton North Porta Comprehensive Environmental & Servicing Study

Halton Region has reviewed the submitted *"Milton North Porta Comprehensive Environmental and Servicing Study Version 1"* prepared by TMIG (dated August 2021) and note that while the Region is generally satisfied with this first submission there is some additional policy analysis and justification required related to the characterization of some of the features on the landscape. Some of this information may result in adjustments or changes to the identified constraints on the lands. These comments should be addressed in a revised submission and staff would be happy to have further discussion on the comments and details contained in this letter should clarification be needed.

Background:

The Orlando North Porta Comprehensive Environmental and Servicing Study (CESS) was prepared on behalf of Orlando Corporation (Orlando) for the proposed Milton North Porta employment lands in Milton in support of land use planning approvals for the proposed industrial subdivisions.

The majority of the Subject Lands were brought into the Town of Milton's Urban Area by Halton Region Official Plan Amendment No. 38 (ROPA 38) to accommodate employment growth to 2031. Subsequently, these lands were designated "Sustainable Halton Plan (SHP) Growth Area – Employment" and "Natural Heritage System" within the Urban Area through Milton's Official Plan Amendment 31 (OPA 31). The Subject Lands are required to be part of a Secondary Plan prior to their development. Accordingly, a Town-initiated Official Plan Amendment has advanced and has been adopted by the Town of Milton to bring the majority of the subject Lands into the 'Milton 401 Industrial/Business Park Secondary Plan'.

A privately-initiated Draft Plan of Subdivision and Zoning By-Law Amendment applications will be submitted following the first submission of the CESS. These applications will seek to facilitate the development of the Subject Lands for industrial/employment uses, related stormwater management uses, natural heritage system (NHS) protection areas and related road and road widening areas.

Analysis/Discussion:

1. Conservation Halton (CH) is the ecological technical advisors for Halton Region on the CESS and subsequent planning applications for the study area. Therefore, comments provided in CH's letter dated November 3rd, 2021 on the sites biophysical characterization work, impact assessments and general comments related to conformity with the *Natural Heritage Constraints Memo for Town Initiated Official Plan Amendment Milton 401 Industrial/Business Park Secondary Plan - North Porta Lands prepared by Dougan and Associated (dated May 2021)* and relevant CH and Greenbelt policies should be addressed to CH's satisfaction prior to the acceptance of the CESS.

2. **Section 1.5.2 The Halton Region Official Plan:** Paragraph two states that the 'RNHS is a part of the Greenbelt Natural Heritage System' and that 'the RNHS corresponds with the woodland along the northern boundary of the North Porta lands'. For clarification, the Regional NHS and the Greenbelt NHS are two separate systems that create Halton's Natural Heritage System. The RNHS does not form part of the Greenbelt NHS.

   Map 1G - Key Features within the Greenbelt and Regional Natural Heritage System in the Regional Official Plan (ROP) does provide a detailed delineation of the key natural heritage features and areas, which is permitted by policy 5.4.2 of the Greenbelt Plan. As per Map 1 and Map 1G of the ROP, the woodland along the northern boundary of the North Porta lands is within the Greenbelt NHS and therefore, the policies of the Greenbelt Plan and policies under 139.3.7 of the ROP should be applied. Please revise this section accordingly.

3. **Section 1.5.3 The Greenbelt Plan:** As noted in comment 2, the woodland along the northern boundary of the North Porta lands (Parcel 3) is with the Greenbelt NHS, not the RNHS. Please revise this section accordingly and replace reference to the Regional NHS with the Greenbelt NHS.

4. **Figure 2 Landscape Setting and Designated Natural Heritage Features:** The reference to the Greenbelt Protected Countryside should be revised to show that it is the Greenbelt NHS that is being illustrated with the green hatched boundary.

5. **Section 4.1.1.2 Significant Wetlands:** This section states that MAM2-11 and MAS2-1 vegetation communities on Parcel 1 are located outside of the Greenbelt Plan Area and the Regional NHS, and are not PSWs; therefore, they do not qualify as significant wetlands per the Region's OP definition**.** A discussion must be included based on Section 3 - Baseline Inventory that provides justification on how these wetlands should not be included in the Regional NHS given the proximity to the Regional NHS and Greenbelt NHS.

6. **Section 4.1.1.2 Significant Wetlands:** If determined that MAM2-11 and MAS2-1 vegetation communities on Parcel 1 should not be included in the Regional NHS, the approach to the phasing the removal of the wetlands with the timing of the development on Parcel 1 in order to maintain drainage to the wetlands on east side of Boston Church Road must be included.

7. **Section 4.1.1.5 Significant Valleylands and Section 6.15 Candidate Significant Valleylands:** Both sections state that the Significant Valleylands will be illustrated on Figures 12 and 13 respectively. However, both figures do not illustrate the limits of this key feature. Please revise figures accordingly.

8. **Section 4.1.1.3 Buffers:** This section states that the Regional NHS mapping on Map 1G depicts buffers from key natural heritage features located immediately east of Boston Church Road as extending across the road onto the properties to the west (Parcels 1 and 2). Given the presence of Boston Church Road adjacent to the key natural heritage features, no buffer west of the road is required to protect the features. Although the presence of Boston Church Road may create a barrier to the key features, the CESS has not justified a reduction in the buffer. The CESS should be expanded to provide justification and further analysis that a reduced buffer to the NHS is warranted and does not result in impacts to the key features and functions to the NHS on the east side of Boston Church Road.

9. **Section 5.4.1 Stormwater Management Approach**: SWM components such as ancillary pipes, outlets, headwalls and other associated infrastructure required to convey flow from facilities outside of the Regional NHS to receiving water bodies may be supported in the RNHS where deemed "essential" (as defined in s.233 of the ROP) after all alternatives are explored and it is determined there are no negative impacts to the Regional NHS through an appropriate environmental study. The CESS has not demonstrated that the proposed SWM outlet within the Regional NHS on the east side of Parcel 4 is "essential" and does not result in negative impacts on the Regional NHS.

10. **Section 5.1.1 Buffer Requirements**: CH's comments 7, 16 and 17 state that hazard mapping shall include a 15 m allowance and an unencumbered 6m access allowance on both sides of the proposed realigned tributary of Sixteen Mile Creek (watercourse R3S1). As stated in CH comment 7, the 6m access allowance on the north side of R3S1 must be provided that does not overlap other buffers or vegetation protection zones.

    The Greenbelt Plan and the Regional Official Plan do not permit development or site alteration in key hydrologic features and key natural heritage features within the Greenbelt NHS including any associated vegetation protection zones. Furthermore, both plans require a 30m minimum vegetation protection zone for certain key natural heritage features (i.e. wetlands, significant woodlands) or key hydrologic features. There may be opportunity to overlap the Greenbelt Plan area with part of the CH regulatory allowance provided that the CESS provides the justification and demonstrates that all site alterations including construction of the channel (including access, temporary work zone, storage), significant grading works and long-term maintenance will be maintained within the 6m access allowance and will occur outside of the 30m vegetation protection zone for the Greenbelt NHS.

11. **Section 6.1.14 Greenbelt Area and Appendix B2 - Tables, Table 12: Impact Assessment:** The CESS needs to demonstrate that all alternatives have been considered for the location of the replicated wetland, including the feasibility of it being located outside of the vegetation protection zone of the Greenbelt NHS and Regional NHS 30m buffer. The CESS must provide a policy analysis on how the proposed location of the replicated wetland meets the ROP and Greenbelt Plan and must include an impact assessment that comprises of appropriate mitigation measures to ensure no negative impact on the NHS key features and their ecological functions. Please refer to CH comments 20, 49 and 59 for ecological technical advisory comments.

12. **Section 7.3.2.1 Bioswale for R1S2 Outlet and Appendix B2 - Tables, Table 12: Impact Assessment:** Within the 30m buffer of the Significant Woodland – Northern Woodland, a proposed bioswale will be located along the edge of the Regional NHS bordering Parcel 4,

within the wetland and woodland vegetation protection zone. The width of the swale varies from 5 m to 10 m, along the outer limit of the vegetation protection zone. As buffers are a component of the Greenbelt NHS and Regional NHS that are used to mitigate impacts to the ecological function of the key features and allow for opportunities for enhancements, site alteration should not extend into buffers that are meant to protect and enhance the NHS. The CESS must demonstrate that it has reviewed all opportunities to avoid construction of the bioswale within the vegetation protection zone. If the relocation of the proposed bioswale is not feasible, then the CESS must demonstrate that every effort should be made to limit site alterations within the vegetation protection zone and that the impacts (including long-term maintenance) to the NHS have been minimized to ensure no negative impacts to the NHS. The CESS should also assess opportunities to limit the encroachment into the vegetation protection zone as it appears based on conceptual design drawings (Figures D7-9 and D7-10 in Appendix D) that there are lands closer to the outer edge of the 30m buffer that are not being utilized. Please refer to CH comments 26, 49 and 54 for ecological technical advisory comments.

13. **Section 7.4.4 Post-Development Water Balance and Mitigation:** Based on the results of the hydrogeological investigation, the area in the vicinity of MW1, MW3 and MW8 near the proposed channel realignment has been identified for infiltration-based LIDs that can maintain groundwater recharge/ discharge to the valleyland wetland communities in this area. Appropriately designed LID measures may be considered “essential” (as defined in s.233 of the ROP) to mitigate impacts on the features and function of the NHS provided they themselves would not negatively impact features and functions of the NHS through their construction and on-going maintenance. Additionally, that the proposed locations of the LIDs maintain a 30m minimum vegetation protection zone for certain key natural heritage features (i.e. wetlands, significant woodlands) as per the Greenbelt Plan.

    The CESS must provide additional discussion regarding the location of the LIDs and include a policy conformity analysis and impact assessment on the Regional NHS and Greenbelt NHS with respect to the proposed LIDS. Please refer to CH comments 24, 25, 26, 59, and 60 for ecological technical advisory comments.

14. The linkage assessment for the study area should be completed in accordance with the Regional Official Plan and the Region of Halton’s EIA Guidelines (2020). The linkage assessment should be provided in the context of the scale of the development and the ecological contributions to the Regional NHS and Greenbelt NHS. Please refer to CH comments 6, 15, and 52 for ecological technical advisory comments.

15. **Figure 13 Proposed Natural Heritage System (Constraints and Opportunities) and Figure 14 Concept Plan:** The boundaries of proposed refined Regional NHS, not only the key features and components should be clearly illustrated on the Figure as per policy 116.1 of the ROP. The boundaries of the proposed refined Regional NHS should include the realigned tributary of Sixteen Mile Creek (watercourse R3S1) and associated buffers.

Conclusion:

Based on the above, staff recommend that the above noted comments along with technical advisory comments from CH are addressed as part of a formal revised submission of the CESS.

The revised CESS should be submitted and reviewed by the agencies prior to any Planning Act applications as the constraint limits may change based on the additional analysis requested above related to the replicated wetlands and bioswale for R1S2 Outlet. To expedite our review of any forthcoming submission, we request that a cover letter be provided to clearly identify how each of the comments in this letter has been addressed.

We trust that these comments are sufficient and request that you please keep them on file for the Region's records. Please also be advised that the Region has not circulated these comments to the applicant and we trust that the Town will share them as part of their formal communications with the applicant.

Should you have any questions or concerns, please do not hesitate to contact me.

Sincerely,

Laurielle Natywary, BES, MCIP, RPP
Manager, Community Planning North
905-825-6000 ext. 7865
laurielle.natywary@halton.ca

c: Christian Lupis, Town of Milton (via email)
Jessica Bester, Conservation Halton (via email)
Owen McCabe, Jae Hyun Park, Heather Ireland, Robert Clackett, Halton Region (via email)

Appendix A2.ii

Correspondence

Meeting Minutes

MEETING AGENDA

PROJECT	North Porta – Comprehensive Environmental and Servicing Study	
CLIENT MUNICIPALITY	Orlando Corporation Town of Milton	
DATE / TIME	January 24, 2022 / 1:30 pm – 3:30 pm	
LOCATION	Zoom Meeting	
MEETING PURPOSE	1st Submission CESS Comments	
INVITEES	Town of Milton	Rachel Ellerman, Christian Lupis
	Halton Region	Heather Ireland, Laurielle Natywary, Mark Andrews
	Conservation Halton	Jessica Bester, Jacek Strakowski
	Wood	Aaron Farrell
	TMIG	Steve Hollingworth, Tony Dang
	GEI – Savanta	Olivia Robinson, Noel Boucher
	Geo Morphix	Paul Villard, Kat Woodrow
	Palmer	Jason Cole, Nolan Boyes
PROJECT NUMBER	17197	

PROPOSED AGENDA ITEMS

1. Introduction to meeting for the CESS 1st Submission agency comments. Clarifications and discussion are requested from the CESS consultant team for select comments listed in the following agenda items.

Multi-discipline (all attendees to discuss)

2. CH Comment 7 and 17: Under Buffer Requirements, CH commented that a 15m allowance and an unencumbered 6m access allowance be included on both sides of the proposed realigned tributary of SMC (R3S1).
3. CH Comment 18: Riparian and fish habitat buffer.
4. Region Comment 12: Bioswale for R1S2 outlet.
5. Town Comment D18b: Feature R6S1 management recommendation. Town advised that the approach to finalizing the management recommendation be discussed with the Town and CH.
6. Region Comment 14 and CH Comment 15: Linkage assessment. Additional guidance requested.

Discipline Specific Discussions (Break out rooms, if required)

Surface Water/SWM

7. Hydrology (general): Discuss/confirm model verification process.

8. Town Comment D12: The erosion thresholds for Parcel 2 (non-participating landowner) and the hydro corridor. TMIG and Geo Morphix to discuss an approach to address the concern.

Ecology

Town of Milton Comments:

9. Terrestrial Comment ii) Section 3.1.1 – Vegetation and Botanical Inventory Bullets 2 and 7
10. Terrestrial Comment iv) Section 3.1.3 – Breeding Bird Surveys
11. Terrestrial Comment v) Section 3.1.5 – Turtle Nesting
12. Terrestrial Comment xvi) Section 5.1 – Natural Heritage (re: Gray Comma)
13. Aquatic Ecology Comment vii) Section 9.4.3 RHS Monitoring Locations

Halton Region Comments:

14. Comment 11 – Section 6.1.1.14 Greenbelt Areas

Conservation Halton Comments:

15. Comment 27 – Section 7.2.2.2 Restoration Goals and Objectives
16. Comment 29 – Section 7.2.2.4 Invasive Species Management
17. Comment 45 – Appendix B1 Figures: HDF R1S2 classification

Closing (all attendees)

18. Final comments and clarifications after discipline specific discussions.
19. Recap action items (if required).

MEETING MINUTES

PROJECT	North Porta – Comprehensive Environmental and Servicing Study	
CLIENT / MUNICIPALITY	Orlando Corporation Town of Milton	
DATE / TIME	January 24, 2022 / 1:30 pm – 3:30 pm	
LOCATION	Zoom Meeting	
MEETING PURPOSE	1st Submission CESS Comments	
ATTENDEES	Town of Milton	Rachel Ellerman, Christian Lupis
	Halton Region	Heather Ireland, Laurielle Natywary, Mark Andrews
	Conservation Halton	Jessica Bester, Jen Young, Lisa Jennings
	Wood	Aaron Farrell
	Dougan and Associates	Steve Hill
	Cam Portt and Associates	Cam Portt
	Matrix Solutions	John McDonald
	Blackport and Associates	Bill Blackport
	Orlando Corporation	David Moores, Lino Malito, Gary Kramer
	TMIG	Steve Hollingworth, Tony Dang
	GEI – Savanta	Olivia Robinson, Noel Boucher
	Geo Morphix	Paul Villard, John Tweedie
	Palmer	Jason Cole, Nolan Boyes
TMIG PROJECT NUMBER	17197	

ITEM	DISCUSSION	ACTION BY
1	Introductions	
2	CH Comment 7 and 17: 6m access allowance along the north side of the channel. J. Bester and J. Young noted the allowance was for future maintenance of the channel, and that maintenance cannot be within / disturb the 30m VPZ. Follow-up Note: To clarify the 6 m access allowance has multiple purposes including for future maintenance, access during emergencies (e.g. major flood event, etc.) and protection from external events that affect an erosion prone area (e.g. potential earthquakes, etc.).	TMIG CH

	Group discussion on whether maintenance is required on the north side of the channel instead of access from the south side. The channel is less than 2m deep with 3:1 side slope and there would be less disturbance to access from the south side's 6m allowance. If there was berming along north side, then maintenance access would be required. S. Hollingworth noted that berming shown on 1st submission concept design will be removed with grading refinements. TMIG to prepare and circulate plan that shows the 6m and 15m allowances for the channel on the north side, to show the limit of grading and buffer overlaps. TMIG to refine channel grading to remove berming. CH to review TMIG's updated plans and provide additional response on 6m allowance along north side of channel. Follow-up Note: As per PPS and CH policy a minimum 6 m access allowance is required from the greater of the flooding and erosion hazards (stable top of slope or meanderbelt). As such, a 6 m access allowance is required on both sides of the proposed channel, regardless if whether it is confined or unconfined.	
3	CH Comment 18: Riparian and fish habitat buffer. O. Robinson: GEI had recently received and completed a preliminary review of the fish community data from CH at R3S1 prior to the meeting. One station was identified at the downstream extent of R3S1 within the Orlando Lands that appeared to contain several warm and cool water fish species, however GEI's observed site conditions are not supportive of the fish species recorded in the CH survey data given the nature of the feature (e.g., seasonal watercourse, silty clay dominated site). Suggested it could be more consistent with Middle Branch of 16 Mile Creek. L. Jennings: 15m allowance that will be applied from the greatest hazard is sufficient for the fisheries setback given the other constraints applied to the realigned channel. The CH fish data/information should be included in the CESS. Additional discussion at end of call C. Portt: Fisheries data outlined does not seem consistent with what would be expected within R3S1. Agreed that it could be associated with 16 Mile Creek. O. Robinson: Requested clarification from CH as it could have associated post-construction monitoring implications. CH to review survey location. Potential transcription error with nearby 16 MileCreek. See response to February 2, 2022 meeting notes where this is discussed further.	CH
4	Region Comment 12: Bioswale for R1S2 outlet. S. Hollingworth requested clarification on the required justification to support the bioswale location. H. Ireland noted that the CESS did not demonstrate that options were reviewed to minimize/avoid disturbance in the 30m VPZ. L. Jennings also noted that CH also had the same comment on this matter. Group discussion on bioswale to be moved outside of the VPZ to the extent feasible. The CESS will need to demonstrate all efforts to avoid encroachment into RNHS VPZ and provide justification regarding the need to encroach within RNHS buffer and any justified encroachment should be contained within the outer 5m edge of the 30m VPZ. Swale to not require maintenance. CESS to be updated toclarify.	

5	Town Comment D18b: Feature R6S1 management recommendation. O. Robinson clarified the conditions of R6S1 of standing water on the first HDFA visit, had isolated pools with no downstream connection during second HDFA assessment and then was plowed through prior to the subsequent visits. TheCESS's recommendation is no management required. J. McDonald agrees with the rationale, the report needs to provide the justification. CH agrees. Clarification within CESS to be provided.	
6	Region Comment 14 and CH Comment 15: Linkage assessment. L. Jennings noted that CH is looking for information on local vs. regional linkages and ensure the assessments were done and there are no impacts associated with the proposed development. H. Ireland agreed and clarified that Halton Region's EIA Guidelines should be used to determine linkages. Additional clarification within the CESS is warranted since this is a component of the RNHS. O. Robinson agreed additional clarification could be provided within the CESS. O. Robinson provided an update on the wildlife passage comment within the hydro corridor from CH. O. Robinson provided update that wildlife passages would be explored, despite no aquatic features associated. CH's Road Ecology Guidelines to be followed. This will be added into the CESS.	
7	Hydrologic modelling approach to verification was discussed/clarified. The PCSWMM modelling would be carried through the CESS and used to size SWM ponds, etc. Wood will provide verification with the HSPF model. Both models are continuous simulation with frequency analysis and results between the two models are expected to largely agree. Town has precedent with this approach.	
8	Town Comment D12: The erosion thresholds for Parcel 2 (non-participating landowner) and the hydro corridor. S. Hollingworth described that instead of completing erosion assessments for Parcel 2 and hydro corridor, Orlando will approach the Parcel 2 owner for permission to have the ultimate swale built (along the west and south property boundary) to convey flows from the Parcel 1 SWM pond. Orlando to also discuss rebuilding swale across Hydro corridor to mitigate erosion. Modelling will also be completed to assess impact to downstream receiving SWM facilities at Highway 401. A. Farrell noted that erosion analysis and appropriate SWM pond erosion control to be provided if the approach with the Parcel 2 owner and Hydro is not available. S. Hollingworth acknowledged that it would be required in that case.	
9	Town Terrestrial Comment ii) Section 3.1.1 – Vegetation and Botanical Inventory Bullets 2 and 7 S. Hill noted that the CESS should have a way to differentiate between ELC polygon features for clarity when describing those features. O. Robinson noted she would explore this option internally to best identify features. Clarification on Features 1-3 will also be provided within the CESS.	
10	Town Terrestrial Comment iv) Section 3.1.3 – Breeding Bird Surveys S. Hill noted that rationale to be provided for point count along the north edge of the	

	site. Additional location between PC2 and PC3. GEI – Savanta to review andjustify survey locations in the CESS.	
11	Town Terrestrial Comment v) Section 3.1.5 – Turtle Nesting S. Hill noted that the CESS to provide more clarity on fieldwork: more information on screening vs. actual surveys, weather window, etc. Clarification within CESS to be provided.	
12	Town Terrestrial Comment xvi) Section 5.1 – Natural Heritage (re: Gray Comma) S. Hill indicated that locally and regionally rare species should be considered within the CESS. O. Robinson clarified that locally and regionally rare species should not be considered within the SWH analysis (not included within the 7E Ecoregion Criterion), however, additional commentary on Gray Comma observations should be added into the insect survey results section. GEI to confirm that local and regionally rare species are discussed within the CESS.	
13	Town Aquatic Ecology Comment vii) Section 9.4.3 RHS Monitoring Locations C. Portt: fish sampling protocol to follow OSAP, data to be compatible with CH protocols. N. Boucher requested clarity if point transect module is warranted within a seasonally constructed channel, especially given amount of effort required. C. Portt indicated that if the channel was dry then point transect was not required, however, if water was present then it should be undertaken. C. Portt to provide OSAP module references to GEI	Town – C. Portt (Received January25, 2022)
14	Region Comment 11 – Section 6.1.1.14 Greenbelt Areas Region looking for CESS to demonstrate that the replicated wetland can be constructed fully outside of the 30m VPZ. H. Ireland confirmed that similar to the bioswale discussion, various alternatives should be presented within the CESS and the best option should be identified. Clarification/rationale to be added to the CESS.	
15	Separate meeting to discuss CH ecology comments on the agenda items 15 to 17. Town to coordinate call between CH and GEI-Savanta. Follow-up Note: This subsequent meeting was scheduled for February 2, 2022. See these meeting notes as well.	Town
16	C. Lupis informed the group that the landowner northeast of Parcel 4 on Esquesing Line to raise questions at upcoming public meeting and for group to be prepared to discuss.	
17	CH and the Town to consider first stage site alteration permit for non-regulated areas and areas within current urban boundary. TMIG to resubmit site alternation permit with boundaries identified. From CH's perspective we understand that a phased site alteration process is being considered. As such, all drawings will need to be updated accordingly (e.g. remove tableland features previously identified as regulated wetlands, but since determined to be no longer regulated). The limit of site alteration should be outside the 15 m allowance from the greatest flooding and erosion hazard associated with the	

	existing watercourse (R3S1) location and outside the 30 m from the wetlands/RNHS/GBNHS. An Erosion and Sediment Control Report is also required along with the CH's "Municipal Site Alteration Applications (prior to draft plan approval)" Review Fee as per the CH Plan Review Fees 2022 Fee Schedule: Plan Review Fees — Conservation Halton.	

PLEASE NOTE: If these minutes do not agree with your records of the meeting, or if there are any omissions, please advise, otherwise we will assume the contents to be correct.

DISTRIBUTION	All Attendees
MINUTES PREPARED BY	Tony Dang, TMIG Olivia Robinson, GEI Savanta

MEETING MINUTES

PROJECT	North Porta – Comprehensive Environmental and Servicing Study	
CLIENT / MUNICIPALITY	Orlando Corporation Town of Milton	
DATE / TIME	February 2, 2022 / 2:00 pm – 3:00 pm	
LOCATION	Zoom Meeting	
MEETING PURPOSE	1st Submission CESS Comments (2nd meeting, continued from January 24, 2022)	
ATTENDEES	Town of Milton	Rachel Ellerman
	Halton Region	Mark Andrews
	Conservation Halton	Jessica Bester, Lisa Jennings
	Dougan and Associates	Steve Hill
	TMIG	Tony Dang
	GEI – Savanta	Olivia Robinson
TMIG PROJECT NUMBER	17197	

3	DISCUSSION	ACTION BY
1	Follow-up discussion on fish species data from January 24, 2022 CESS meeting. L. Jennings clarified that the observed fish species in CH's data was correct and not a transcription error. Agreed that based on the existing habitat features, the feature is not currently suitable for these species (e.g., Stonecat). O. Robinson expressed concern about whether the post-construction fish sampling would be compared to these species, since Savanta has not completed targeted fish community sampling. L. Jennings agreed that the CESS could include CH's data and then recommend what would be an appropriate target community for post-construction monitoring. The CESS to understand/recognize that some of these species (e.g., Blacknose Dace, Creek Chub) may be present in future conditions with improvements in R3S1 from the proposed realignment.	

2	CH Comment 27: Restoration goals and objectives O. Robinson requested clarification on including Category 2 invasive species Norway Maple and Moneywort. Explained that given Norway Maple's coefficient of wetness, the swamp would limit further colonization of the species naturally. No best management practices available for Moneywort (esp. in swamped areas). L. Jennings noted that the CESS to be consistent with other areas of Milton: Boyne and Derry Green. Invasive species management to pertain to potential movement in the created channel and restoration area, to be incorporated in post-construction monitoring. No pre-construction management of those species are warranted, however, should keep an eye out for post-construction monitoring in created features.	
3	CH Comment 29: Invasive species management O. Robinson requested clarification on requirements for management of European Buckthorn, given its presence on adjacent lands. L. Jennings noted concern about it moving into created features (e.g., channel, wetland). Recommended management of the species occur pre-construction to limit colonization of newly created features.	
4	CH Comment 45: HDF R1S2 management recommendation. O. Robinson agrees with CH's comment that HDF R1S2 to have management recommendation of protection. Stated that while this upgrade of R1S2 is warranted, no changes to management recommendations downstream are expected. Requested confirmation that this would not impact the management recommendation of the downstream R1S1 from mitigation. L. Jennings confirmed that R1S1's management recommendation of mitigation would not change.	
5	O. Robinson requested confirmation on restoration guidelines to follow CH or the Town's Restoration guidelines, since we are outside of the Derry Green and Boyne Subwatershed areas. S. Hill confirmed that only CH guidelines to be followed.	
6	M. Andrews followed up on the proposed bioswale connecting R1S2 to the proposed realigned R3S1. CESS to review options and provide justification for portions of the swale within the 30m VPZ, as discussed during January 24, 2022 CESS meeting.	
7	CH and the Town to consider first stage site alteration permit for non-regulated areas and areas within current urban boundary. Town and CH to provide response to January 24, 2022 meeting minute item no. 17 regarding site alteration permit submission requirements. J. Bester noted that the mapped regulated area in the middle of Parcel 4 (determined via site visit with CH in 2021 that these features are not wetlands, as discussed within CESS) can be included in the first stage site alteration. TMIG to reflect this in the revised submission.	Town / CH

8	Follow up discussion on clarifying the allowances and presenting the linework and overlapping buffers on a plan. J. Bester requested that replicated wetland north of the realigned channel to show 15m setback. Also stated that the wetland could not be located within the first 6 m of the channel for erosion hazard/channel maintenance concerns. O. Robinson referred back to discussions at Jan 24 meeting suggesting that GEO Morphix and Wood had indicated that channel maintenance would likely be accessed from the southern portion of the channel. J. Bester indicated that a 6 m access allowance on the north and south side of the realigned watercourse would be required as per CH and PPS policies (clarification added). Follow-up Note: To clarify the 6 m access allowance has multiple purposes including for future maintenance, access during emergencies (e.g. major flood event, etc.) and protection from external events that affect an erosion prone area (e.g. potential earthquakes, etc.). M. Andrews requested additional clarification on intermediary areas between realigned channel and buffer areas; suggested to be relabelled as 'naturalized area' or other appropriate label. J. Bester and M. Andrews discussed the reference to the bioswale on the north side of the channel. Wondering what its function was (e.g., LID) and if maintenance required. T. Dang confirmed no LIDs on north side of the channel. Follow-up Note: CESS discussed options for LIDs on both sides of the realigned channel including LIDs to feed the replicated wetland and to feed the existing wetland contained within Middle Sixteen Mile Creek (both on north side of channel). The locations and number of these LIDs still need to be confirmed in the second submission of the CESS. O. Robinson clarified the bioswale could be associated with the recreated wetland to convey water from the realigned channel into the wetland to support the hydroperiod (since support from roof top drainage is unavailable given location). Confirmed this bioswale would be naturalized with native seed and would not be maintained. J. Bester requested this is shown on a figure for better illustration and also requested that updated linework (show the replicated wetland with associated 15 m setback, both the 6 m access allowances and 15 m allowances on both sides of the realigned channel measured from the greatest hazard, and all RNHS/GBNHS/Greenbelt Protected Countryside limits) be provided ahead of resubmission of the CESS. TMIG to circulate revised plan next week for review/comment ahead of the CESS 2nd submission. TMIG to also circulate existing conditions hydrology modelling memo to Town next week.	TMIG

PLEASE NOTE: If these minutes do not agree with your records of the meeting, or if there are any omissions, please advise, otherwise we will assume the contents to be correct.

DISTRIBUTION	All Attendees
MINUTES PREPARED BY	Tony Dang, TMIG Olivia Robinson, GEI Savanta

Appendix A2.iii

Correspondence

Hydrologic Modelling

From: Farrell, Aaron
To: Rachel.Ellerman@milton.ca
Subject: RE: North Porta CESS - SWM Memo
Date: Wednesday, February 16, 2022 7:06:41 AM
Attachments: image001.png

Hi Rachel.

Just following-up on this item. As discussed, I’ve had a chance to review, and, from my read of the information, I don’t see that the PCSWMM model provides a good correlation to the observed flow data. Rather, the hydrograph comparisons provided on Page 4 of the memo indicate that the model consistently over-estimates peak flow and runoff volume compared to the observed data.

From my review of the information, I gather that there’s a pocket of glacial material, which hasn’t been considered in the model parameterization. I would suggest that TMIG run some tests to determine whether parameterizing those soils as clay loam or silty clay loam per the standard PCSWMM parameters would improve upon the fit between the observed and simulated condition.

It may be beneficial for us to have a brief call with TMIG to discuss, just to ensure that we’re all on the same page on this matter. Let me know if TMIG is in agreement with this approach, and we can compare availabilities accordingly.

Take care and stay well.

Aaron.

From: Rachel.Ellerman@milton.ca <Rachel.Ellerman@milton.ca>
Sent: Monday, February 7, 2022 3:36 PM
To: Farrell, Aaron <aaron.farrell@woodplc.com>
Subject: North Porta CESS - SWM Memo

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

The Town of Milton Secure Email   Expires March 9, 2022

220204_North Porta Existing Conditions H...emo.pdf   11.4 MB

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Hi Aaron,

Please see attached for a memo prepared by TMIG which discusses the SWM strategy they have applied to the North Porta lands using PCSWMM. The intent of the memo is to ensure they are responding correctly to comments on the 1st submission and using the appropriate approach prior to having their verification completed.

Once you’ve had a change to review perhaps we can have a quick call to discuss? My understanding is that they are looking for feedback and a general ‘yes you’re on the right track’ response to this memo.

Thanks,
Rachel

Milton Logo

Rachel Ellerman, C.E.T, E.I.T
Manager, Stormwater
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TECHNICAL MEMORANDUM

DATE	March 16, 2022
TO	Rachel Ellerman, Town of Milton
CC	Aaron Farrell, Wood PLC
SUBJECT	Orlando North Porta Existing Conditions Hydrology Model
FROM	Tony Dang, P.Eng. Julia Wansbrough, M.Sc., P.Eng.
PROJECT NUMBER	17197

1 INTRODUCTION

A Comprehensive Environmental and Servicing Study (Comprehensive Study) was prepared on behalf of Orlando Corporation (Orlando) for the proposed Milton North Porta employment lands in Milton, Ontario. The lands covered by the Comprehensive Study (also referred to herein as 'the Subject Lands' and 'North Porta') are generally located north of James Snow Parkway, west of Esquesing Line, south of No. 5 Side Road and east of the Canadian National Rail (CNR).

Existing conditions hydrologic analysis was previously completed by the Town for the Sixteen Mile Creek Watershed, which included the subwatersheds downstream of the North Porta Lands. The model is understood to be a continuous hydrologic model in HSP-F (Hydrological Simulation Program – FORTRAN). In consultation with the Town, the Comprehensive Study developed a continuous hydrologic model using PCSWMM specifically for analysis and design within the Subject Lands. The results of the PCSWMM analysis in the Comprehensive Study will be verified using the Town's current HSP-F modelling as part of the Town's review of the Comprehensive Study.

The Comprehensive Study's PCSWMM model is currently undergoing revisions based on the Town's review and comments for the first submission (August 2021). The hydrologic modelling updates thus far are described in this memo, which includes the scenarios, parameters, results, and validation for existing conditions.

The Comprehensive Study's PCSWMM model includes the drainage area for the Subject Lands to James Snow Parkway. Downstream areas to the SWM facilities along Highway 401 will modelled to verify the performance and operation of existing downstream facilities in proposed conditions, using information recently received from the Town. The downstream areas are not included in this modelling summary memo.

2 WATERSHED CHARACTERIZATION

The topography of the site is generally flat, with gently sloping terrain in some areas. The study area's only identified watercourse is a tributary of Middle Sixteen Mile Creek, referred to in the Comprehensive Study as R3S1. The remaining drainage features are characterized as headwater drainage features (HDFs). R3S1 and most HDFs have evidence of historic channelization and are highly altered from agricultural practices. The existing conditions drainage areas associated with Tributary of Sixteen Mile Creek (R3S1) and the headwater drainage features are shown on **Figure D3-1** appended to this memo.

From a hydrologic perspective, the predominant land use within the Subject Lands is agricultural, with the exception of wooded areas between Boston Church Road and Esquesing Line and some scattered rural residential land. A hydro corridor is located along the southern portion of the Subject Lands (parallel to James Snow Parkway). In the areas surrounding the Subject Lands, the predominant land use is also agricultural for lands to the north and east, as well as estate lot residential land uses to the north. The areas west and south of the Subject Lands area are industrial.

According to the Ontario Geologic Survey (OGS, 2010), the study area is located on the Peel Plain physiographic region and contains surficial deposits of fine-textured till derived from glaciolacustrine deposits, containing predominately clay and silt. Site specific surficial geological conditions were determined through a borehole drilling program completed by Palmer (2021) as part of the Comprehensive Study. The results of the borehole investigations were generally consistent with the regional OGS surficial geology mapping with the majority of the site being made up of clay and silt.

3 EXISTING CONDITIONS MODEL

3.1 Modelling Methodology

To facilitate a review of the drainage conditions as it currently exists, a hydrologic model of the study area was developed using PCSWMM software (supplemented by ArcGIS analysis). In general, the steps to develop the existing conditions model included:

- GIS analysis of the Digital Elevation Model (DEM) from LiDAR data to identify streamlines (i.e. flow paths) through the study area, and to delineate sub-catchment areas appropriately (including external upstream areas) contributing to flow in each part of the system.
- Developing suitable modelling parameters for sub-catchments; based on imperviousness, slope, soil type, etc.
- Determining/obtaining suitable precipitation records for continuous simulation.
- Validation of the model using preliminary flow monitoring data and existing reference models.

A base model was developed for existing conditions, from which refinements were considered through the validation/verification process described in Section 3.3. Development of the base model required the selection of parameters based on best practice approaches and suitable engineering judgement to ensure that the numerical model is sensible, robust and representative of the physical realities it is simulating. These model parameters include:

- Manning’s n for subcatchment pervious areas set to be 0.25, per typical values for naturally vegetated areas.
- Manning’s n for subcatchment impervious areas set to be 0.013, per typical values for asphalt pavement.
- Subcatchment imperviousness was estimated using an imperviousness shapefile created from satellite imagery.
  - Subcatchment mean slope was extracted from the DEM using GIS spatial analyst zonal statistics tool.
  - Drying time of seven (7) days was assumed.
  - Catchment length was manually measured for each catchment.
  - Roughness values of 0.035 for main channel flow areas (assuming vegetated channel) and 0.05 for the floodplain were applied to all natural channel routing elements.
  - Depression storage used to calculate volume of rainfall intercepted (or “lost”) to surface depression storage. Defined using standard values of 2 mm and 5 mm for impervious and pervious surfaces, respectively.
- Subcatchment infiltration losses were simulated using Modified Green Ampt equations. The input parameters required are the initial moisture deficit the soil, the soil's hydraulic conductivity, and the suction head at the wetting front. Green Ampt is a physically based infiltration model, which is slightly different from simpler conceptual infiltration models such as the SCS-CN and considered more suitable for continuous simulation modelling.

  As shown on the surficial geology figure (Appendix C), there are two predominant soil types in the study area. Following a sensitivity analysis, the following parameters were assigned to the soil parameters and spatially weighted within each subcatchment. Refer to Section 3.3 for the infiltration parameter sensitivity analysis.

Table 1: Infiltration Parameters

SURFICIAL GEOLOGY	WETTING FRONT SOIL SUCTION HEAD (mm)	SATURATED HYDRAULIC CONDUCTIVITY (mm/hr)	INITIAL DEFICIT (FRACTION)
Glaciolacustrine Deposits	250	5	0.26
Halton Till	290	0.51	0.23

Green Ampt parameters have been taken from PCSWMM lookup tables and Conservation Halton Table B.6 (please refer to Attachment C for reference values).

3.2 Rainfall Data

Continuous simulation and frequency analysis was completed to determine the 2-year to the 100-year return period peak flow rates, similar to the Town's continuous hydrologic model. The 42-year (1962 to 2003) rainfall and temperature record used in the simulation was provided by the Town and is consistent with the current modelling for the Sixteen Mile Creek Watershed. The rainfall record was based on hourly precipitation data from Burlington RBG Station from 1962 to 1995 and from Pearson Airport Station from 1996 to 2003, according to the Sixteen Mile Creek, Areas 2 and 7 Subwatershed Update Study (AMEC, 2015).

Event based simulation was completed to assess the Regulatory flow for watercourses and stormwater management facilities.

3.3 Model Validation

It was recognized that a validation exercise for the peak flows generated from the base existing conditions PCSWMM model would provide additional certainty. Thus, the base existing conditions model results were compared to field flow monitoring data (collected thus far) and other sources of modelled peak flow data.

Flow monitoring at four locations was completed by Geo Morphix from June 3rd 2021 to December 9th 2021 for the Comprehensive Study, three of which are located within the hydrology model area. Flow monitoring stations were equipped with continuous water level sensors. Discharge at each of the stations was measured on four occasions during the above monitoring period and preliminary stage-discharge relationships were calculated, recognizing that the results are preliminary due to the limited monitoring data to date.

Rainfall records at two nearby Conservation Halton rain gauge stations (Scotch Block Dam and Kelso Dam) were reviewed and compared. Both rain gauges are approximately equal in distance (about 6 km) from the centre of the study area. It was determined that the Scotch Block Dam station rainfall data would be used for analyzing and comparing flow monitoring data due to greater consistency between recorded rainfall and response in water levels at the monitoring stations.

Within the monitoring period, there were a variety of rain event intensities and durations. The following three events were selected for the model validation analysis (Table 2). The first two events were short duration events with higher intensity storms and the third event had a longer duration with a larger total amount of rainfall. Storms with longer duration and steady rainfall allow for significant infiltration, thus the model parameters related to pervious areas and infiltration influence the results, which is of interest for the existing conditions.

Table 2: Model Validation Rainfall Events

EVENT	START DATE	END DATE	RAINFALL TOTAL (mm)	RAINFALL DURATION (HOURS)
1	24/07/2021	24/07/2021	41	2
2	14/09/2021	14/09/2021	27	2
3	21/09/2021	23/09/2021	70	47

Based on discussions with Town staff and Wood (peer review engineer) (March 10, 2022), a sensitivity analysis and refinements of subcatchment parameters were required to achieve reasonable agreement between modelled and observed data. As such, different infiltration parameters were tested, and results compared against observed data. Table 3 below outlines the different subcatchment parameters tested as part of the sensitivity analysis and observations from the comparison against observed data. Based on the results of the analysis it was determined that the spatially weighted infiltration parameters with the values outlined below had the best agreement with observed data. Additional graphs showing comparisons of the different scenarios and the subcatchment parameters are provided in Attachment C.

Table 3: Infiltration Parameter Refinement

SCENARIO TESTED	INFILTRATION PARAMETERS			OBSERVATIONS
	WETTING FRONT SOIL SUCTION HEAD	SATURATED HYDRAULIC CONDUCTIVITY	INITIAL DEFICIT	
Silty Clay	290	0.51	0.23	Overestimates flows
Clay Loam	210	1.02	0.28	Overestimates flows
Conservation Halton-Group C Soils	250	5	0.26	Underestimates flows
Spatially Weighted (see note below)				Slightly overestimates flows. Appears to have best agreement with observed data
Glaciolacustrine Deposits	250	5	0.26	
Halton Till	290	0.51	0.23	

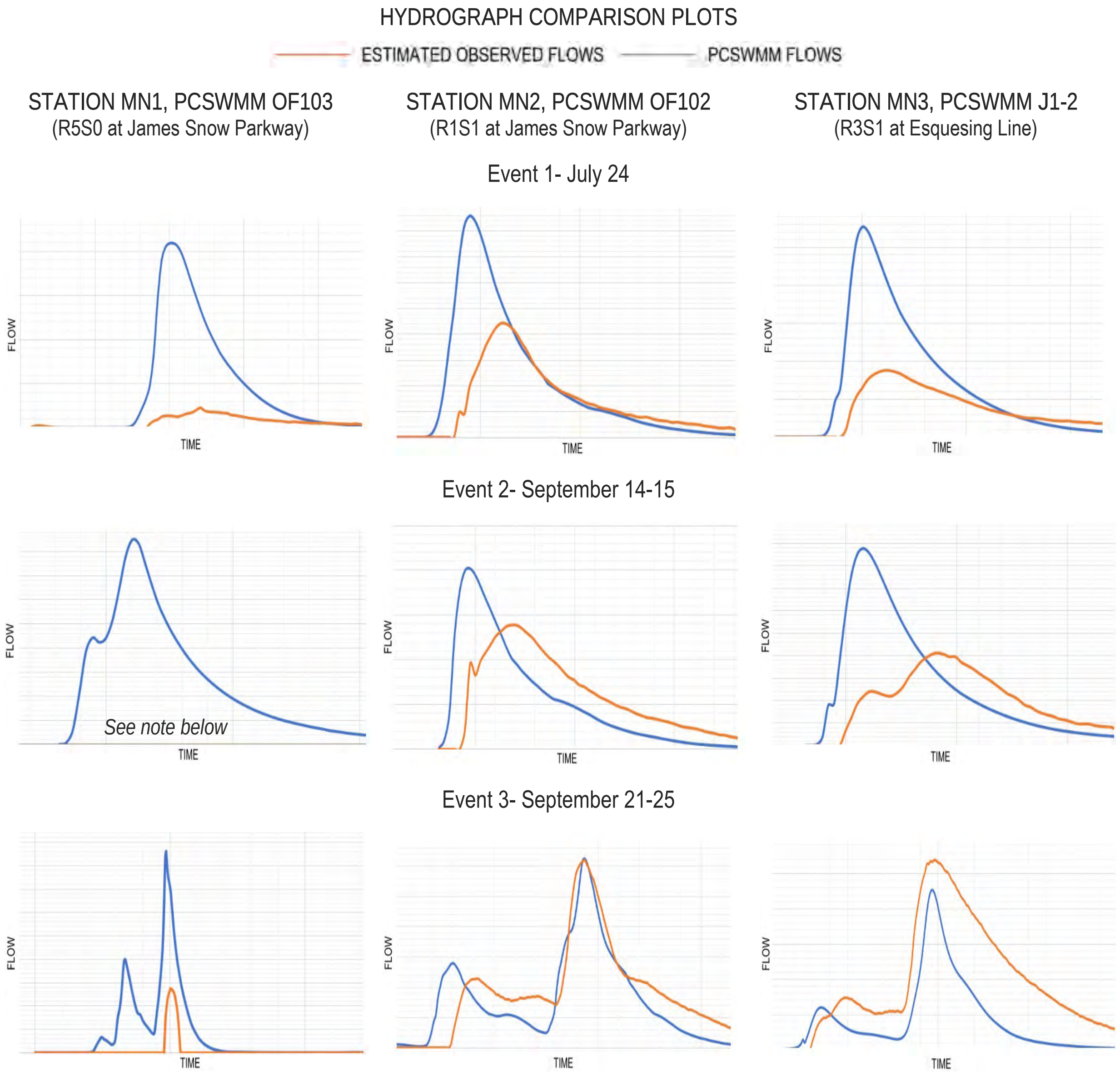
Note: The spatial distribution of the infiltration parameters is based on soil mapping shown in Attachment C (Palmer Figure 2).

Flows generated from the PCSWMM model at the stream monitoring locations were compared with the calculated flows from the stage-discharge relationships and recorded water level hydrographs for the three selected events. Results are summarized in Table 4 and Figure 1 below, with additional information appended to this memo for further clarification.

Table 4: Observed versus Modelled Discharge Rates

MONITORING STATION	PCSWMM NODE	LOCATION	COMMENTS
MN1	OF103	R5S0 at James Snow Parkway (west of Boston Church Road)	Flows from the model are higher than observed values. Note that the field data logger did not record a water level response for Event 2 (September 14-15, 2021)
MN2	OF102	R1S1 at James Snow Parkway (between Esquesing Line and Boston Church Road)	Model slightly overestimates peak flows compared to observed value for Events 1 and 2. Model slightly underestimates peak flows for longer duration Event 3.
MN3	J1-2	R3S1 at Esquesing Line	Model slightly overestimates peak flows compared to observed value for Events 1 and 2. Very good correlation for longer duration Event 3.

Figure 1: Graphs of Observed versus Modelled Discharge Rates (Refer to Attachment D for detailed graphs)



Note that the field data logger at Station MN1 did not record a water level response for Event 2 (September 14-15, 2021).

To further validate the findings, comparison of the continuous hydrographs was analyzed in PCSWMM for monitoring stations MN1 (OF103), MN2 (OF102) and MN3 (J1-2). The software uses a variety of objective functions and statistical measures to measure the goodness-of-fit between a long term continuous measured and modelled hydrograph. For the purposes of this exercise, integral square error (ISE) has been selected.

Per the CHI Journal of Water Management Modelling published paper on model calibration (Shamsi et al., 2017), ISE was found to be a useful measure of goodness-of-fit between observed and modelled hydrographs and offers ratings for different ISE ranges (Table 5).

Table 5: ISE Goodness-Of-Fit Ratings for Model Calibration

ISE RANGE	CALIBRATION RATING	MODEL APPLICATION
0 to 3	Excellent	Planning, Preliminary Design, Final Design
3.1-6	Very Good	Planning, Preliminary Design, Final Design
6.1-10	Good	Planning, Preliminary Design
10.1-25	Fair	Planning
>25	Poor	Screening

(Source: Continuous Calibration, CHI Journal of Water Management Modelling, Shamsi et al. 2017)

As can be seen in Figures 2 and 3 below, the ISE rating for both OF-102 (MN2 observed estimated values) and J1-2 (MN3 observed estimated values) is 'very good' indicating that this model can be used for design purposes. It should be noted that if the ISE is looked at on a per-event basis, there is slightly less certainty (i.e. lower ratings) between modelled and observed values suggesting that collecting additional flow data would be beneficial. Additionally, the ISE rating for OF-103 (MN1) is 19.1, which is 'fair' (Figure 4). This is likely attributed to the low flows observed during the monitoring period and continued flow monitoring is recommended.

Figure 2: OF-102, MN2 Hydrograph Comparisons

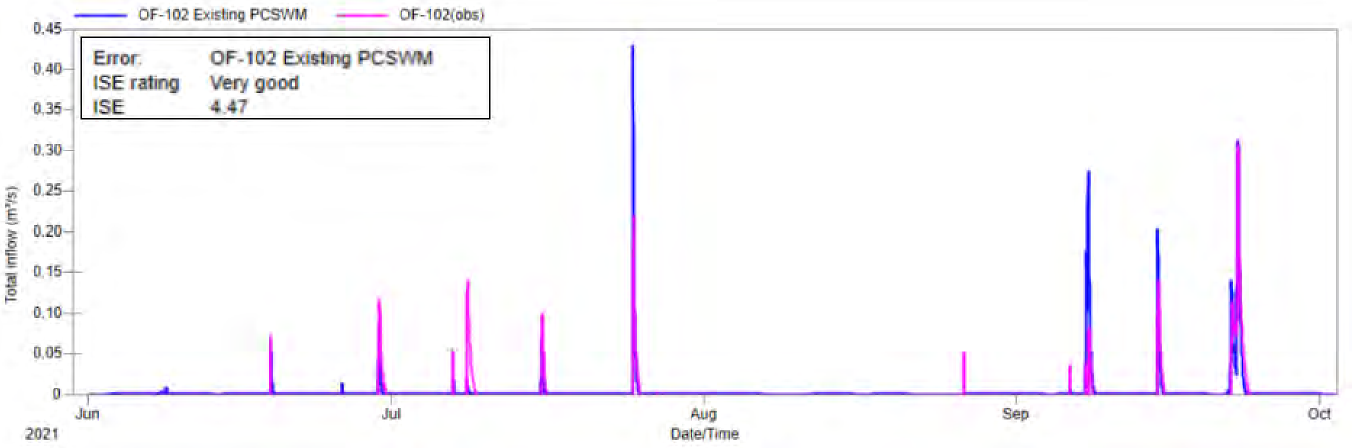


Figure 3: J1-2, MN3 Hydrograph Comparisons

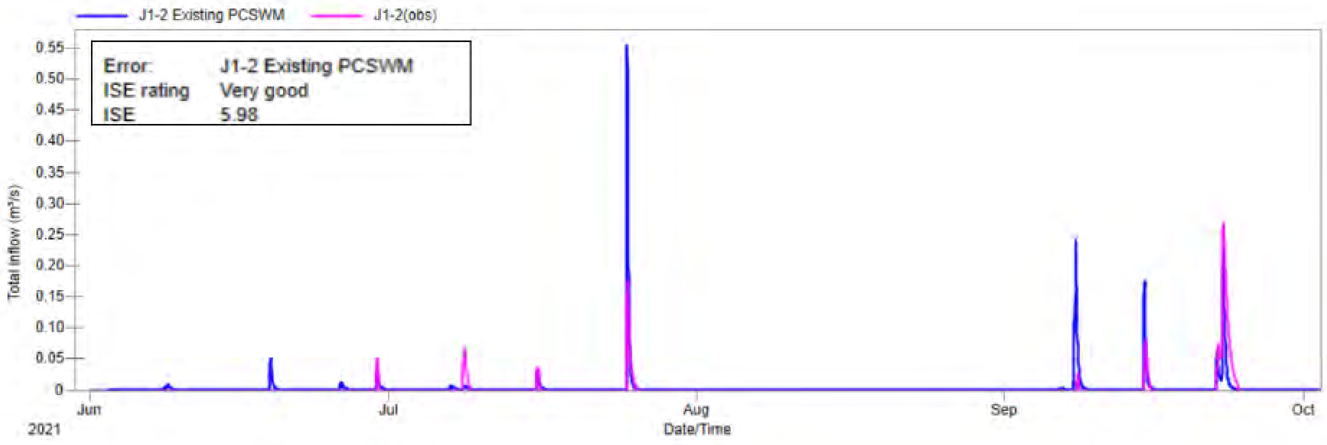
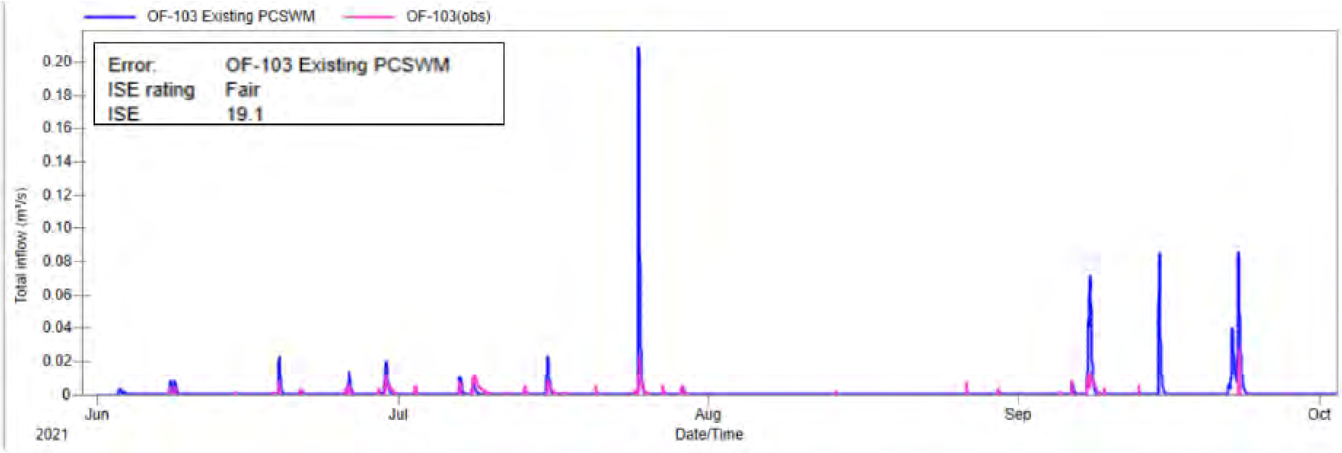


Figure 4: OF-103, MN1 Hydrograph Comparison



In addition to validation against observed data, the PCSWMM model results were also compared against flows from both the Derry Green (Amec, 2015) and Highway 401 (Philips, 2000) Functional Stormwater and Environmental Management Studies (FSMES).

Flow rates for 2- to 100-year events for similar sized catchments with similar land-use characteristics were extracted from the Derry Green and Highway 401 FSEMSs and weighted on a per hectare basis. A frequency analysis on the PCSWMM model with the Milton continuous dataset was done to determine the discharge rates for each return period at each outfall. The results of the comparison between the PCSWMM model and the Derry Green and 401 Studies can be found appended to this memo and summarized in Table 6 below.

Table 6: Comparison of Peak Flow Rates Per Hectare

MODEL	PEAK FLOW RATES (m³/s/ha)					
	2-YEAR	5-YEAR	10-YEAR	25-YEAR	50-YEAR	100-YEAR
Derry Green	0.009	0.013	0.019	0.023	0.028	0.035
Highway 401	0.004	0.007	0.009	0.012	0.016	0.019
PCSWMM	0.002	0.005	0.006	0.011	0.012	0.015

The PCSWMM model peak flow rates were slightly lower compared to the Derry Green FSEMS and the Highway 401 FSEMS.

Given that the PCSWMM model, in some cases, overestimated flows compared to observed values and underestimated flows compared to both existing studies, a calibration exercise is not recommended on the basis that there is inherent uncertainty in both validation methods.

In particular, the field monitoring data would benefit from additional discharge measurements in 2022 to provide greater certainty to the stage-discharge relationships at the monitoring stations. Calibration of the base model with field monitoring data at this point will not result in additional certainty for the model results.

That said, the base model had reasonable agreement with the rainfall events selected for the model validation analysis and the continuous dataset (i.e. ISE rating of *Very Good for Nodes 102 and J1-2*). With that, the subcatchment parameters used for the base model are considered sufficient to set stormwater management targets for the subject lands at this stage.

3.4 Peak Flows

As mentioned previously, the purpose of this model is to determine peak flow rates leaving the site under existing conditions to inform future development SWM targets.

A schematic of the PCSWMM has been provided in Attachment B. Peak flows for 2- to 100- year return periods, as well as Hurricane Hazel are summarized in Table 7 below:

Table 7: Existing Conditions Peak Flow Summary

OUTFALL	PEAK FLOW (m³/s)						
	2-YEAR	5-YEAR	10-YEAR	25-YEAR	50-YEAR	100-YEAR	HAZEL
101A- Tributary of Middle Sixteen Mile Creek (R3S1) at downstream boundary of Subject Lands	0.14	0.34	0.53	1.01	1.17	1.71	6.15
102- R1S1/ R2S1 at James Snow Parkway	0.22	0.39	0.52	0.81	0.92	1.12	4.14
103- R5S0 at James Snow Parkway	0.07	0.17	0.25	0.48	0.53	0.66	2.86
104- Southwest corner of subject lands	0.02	0.05	0.12	0.16	0.17	0.18	0.52

4 ATTACHMENTS

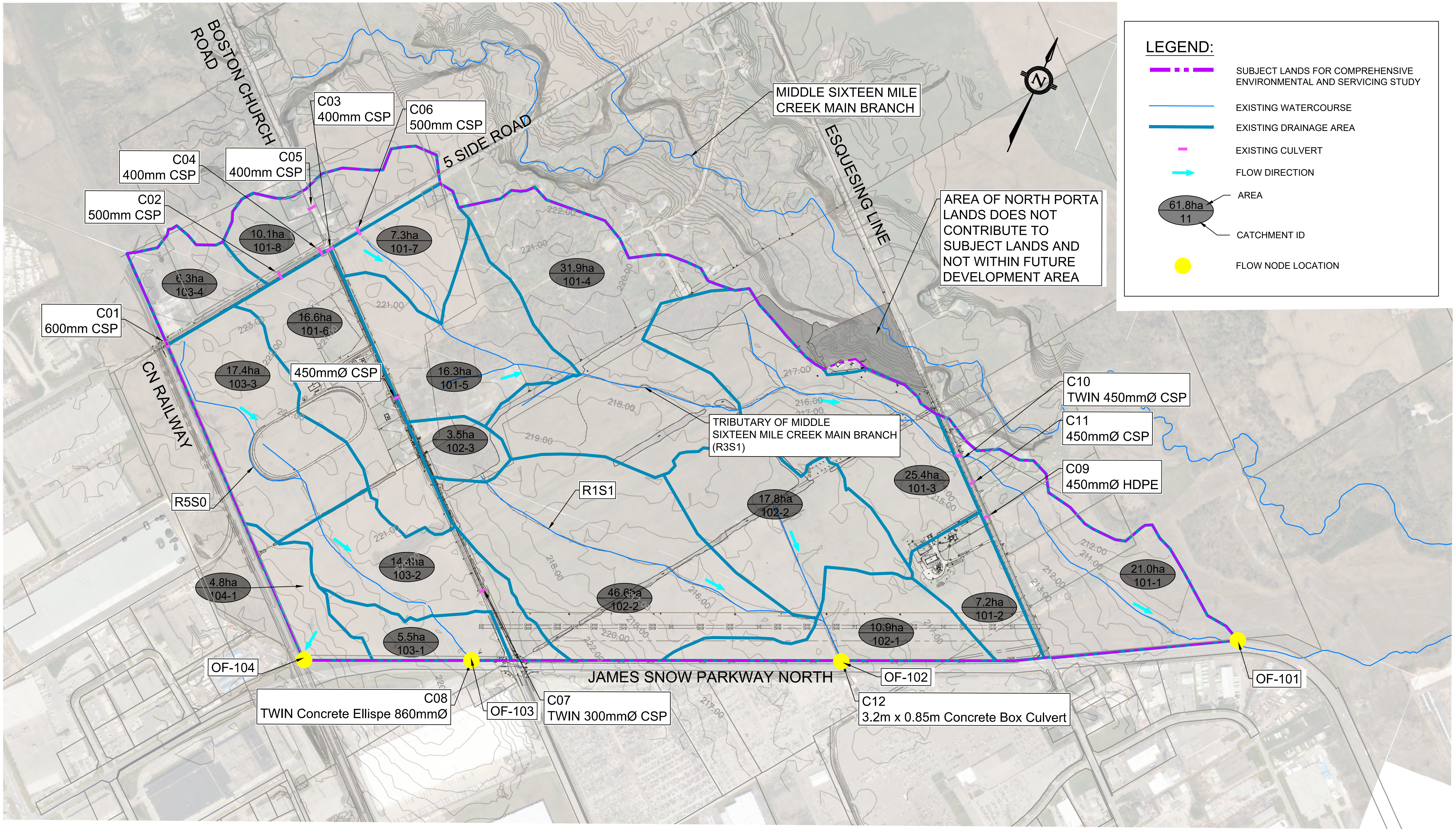
A- Figures D3-1 – Existing Conditions Hydrologic Catchment Areas (Updated from Comprehensive Study Appendix D)

B- Schematic of PCSWMM Existing Conditions Model

C- Subcatchment Parameters Supporting Documents

D- Model Validation

ATTACHMENT A



TMIG
A T.Y.LIN INTERNATIONAL COMPANY

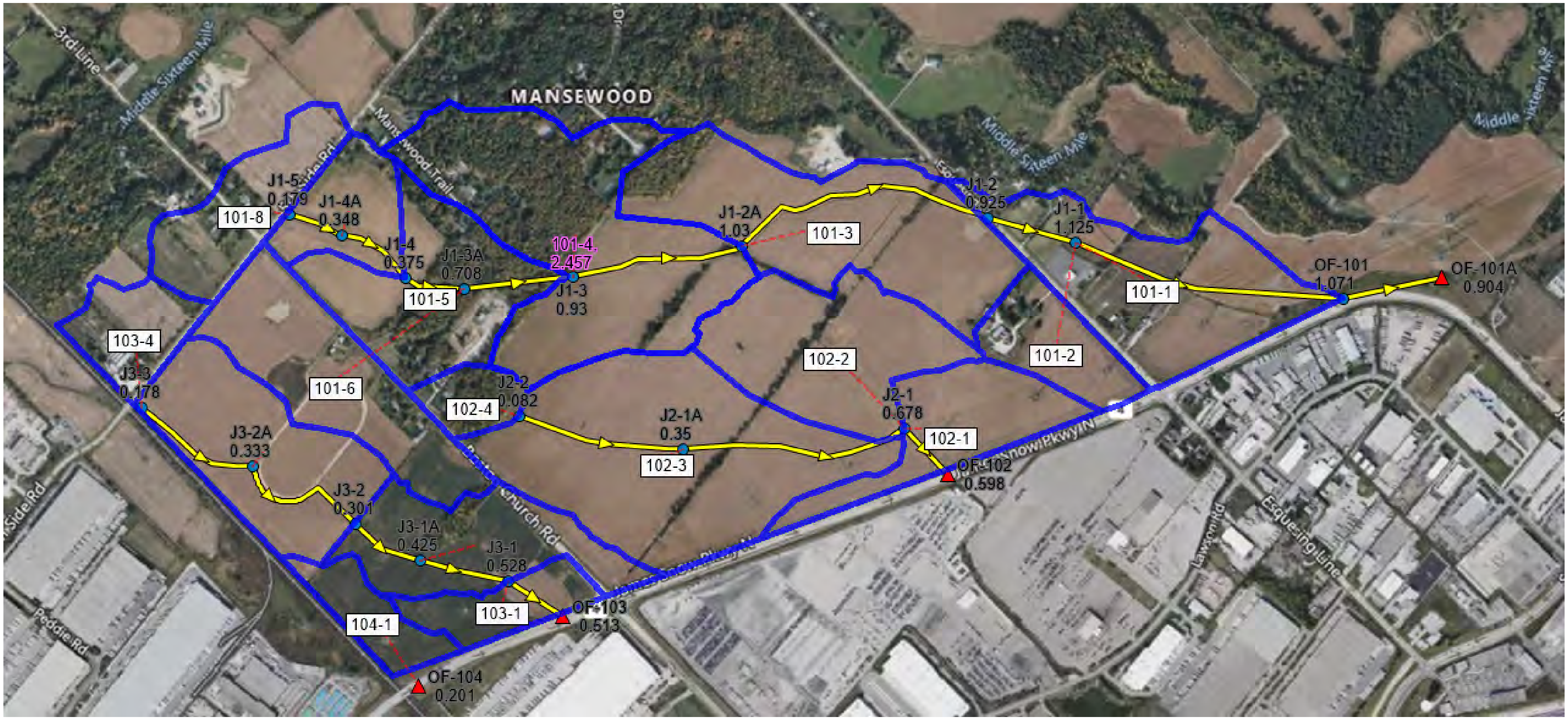
ORLANDO - NORTH PORTA
COMPREHENSIVE ENVIRONMENTAL AND SERVICING STUDY
EXISTING CONDITIONS HYDROLOGIC CATCHMENT AREAS

SCALE: 1:10,000		PROJECT No. 17197
DATE: FEBRUARY 2022		
DESIGNED BY: T.D/E.T	DRAWN BY: S.B.	FIGURE No. D3-1
CHECKED BY: S.H.	CHECKED BY: E.T.	

File : C:\Users\julia.wansbrough\Desktop\FIG D3-1 Existing Conditions Hydrologic Catchment Areas - Standard\FIG D3-1 Existing Conditions Hydrologic Catchment Areas.dwg, Layout : D3-1 Date :Feb 03, 2022 - 5:22pm, Edit By : julia.wansbrough

ATTACHMENT B

PCSWMM MODEL SCHEMATICOrlando North
Porta Existing Conditions Model



ATTACHMENT C

Name	Area (ha)	Flow Length (m)	Slope (%)	Imperv (%)	NImperv	NPerv	DStore Imperv (mm)	DStore Perv (mm)	Suction Head (mm)	Conductivity (mm/hr)	Initial Deficit (fract.)
101-1	21.05	1123	0.56	6.9	0.013	0.25	2	5	256	4.28	0.26
101-2	7.20	289	1.83	4.9	0.013	0.25	2	5	287	0.82	0.23
101-3	25.42	917	0.50	0.1	0.013	0.25	2	5	285	1.04	0.23
101-4	31.96	1090	0.50	2.5	0.013	0.25	2	5	273	2.37	0.24
101-5	16.30	744	0.60	3.6	0.013	0.25	2	5	251	4.94	0.26
101-6	16.58	1083	0.38	4.0	0.013	0.25	2	5	259	4.04	0.25
101-7	7.36	476	1.33	0.5	0.013	0.25	2	5	262	3.65	0.25
101-8	10.09	384	0.15	10.3	0.013	0.25	2	5	289	0.59	0.23
102-1	10.92	412	0.76	0.0	0.013	0.25	2	5	290	0.51	0.23
102-2	17.76	640	0.47	0.0	0.013	0.25	2	5	290	0.51	0.23
102-3	32.98	979	0.47	0.2	0.013	0.25	2	5	258	4.06	0.25
102-4	3.55	349	0.52	4.6	0.013	0.25	2	5	250	5.00	0.26
103-1	5.51	377	0.75	3.5	0.013	0.25	2	5	250	5.00	0.26
103-2	13.62	418	0.44	4.1	0.013	0.25	2	5	250	5.00	0.26
103-3	17.40	680	0.32	0.0	0.013	0.25	2	5	272	2.54	0.24
103-4	6.30	360	0.47	15.9	0.013	0.25	2	5	290	0.51	0.23
104-1	4.84	226	2.26	0.0	0.013	0.25	2	5	265	3.36	0.25

GREEN-AMPT PARAMETERS

Source: PCSWMM Lookup Tables

Soil Type	Conductivity mm/hr	Suction Head mm	Initial Deficit Fraction
Sand	120.4	49.02	0.41
Loamy Sand	29.97	60.96	0.39
Sandy Loam	10.92	109.98	0.37
Loam	3.30	88.90	0.35
Silt Loam	6.60	169.93	0.37
Sandy Clay Loam	1.52	219.96	0.26
Clay Loam	1.02	210.06	0.28
Silty Clay Loam	1.02	270.00	0.26
Sandy Clay	0.51	240.03	0.21
Silty Clay	0.51	290.07	0.23
Clay	0.25	320.04	0.21

Source: Conservation Halton Guidelines for Stormwater Management Engineering Submissions (2021), From MTO Drainage Design Standards

Soil Type	Conductivity mm/hr	Suction Head mm	Initial Deficit Fraction
Soil Group C*	5	250	0.23

**Parameter used for Glaciolacustine Deposits in Model*

INITIAL ABSTRACTION PARAMETERS

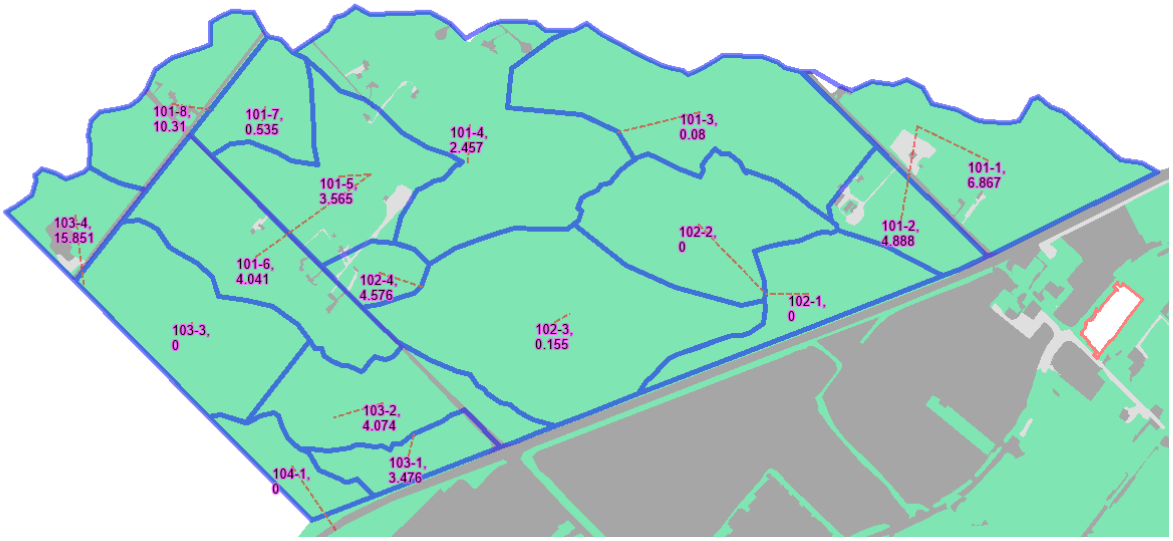
Source: SWMHYMO User's Manual (J.F. Sabourin & Associates Inc., 2000), Conveyance Modelling and Design (Haestad Methods Inc., 2003), City of Toronto Infoworks CS Modelling Guidelines (City of Toronto, 2014)

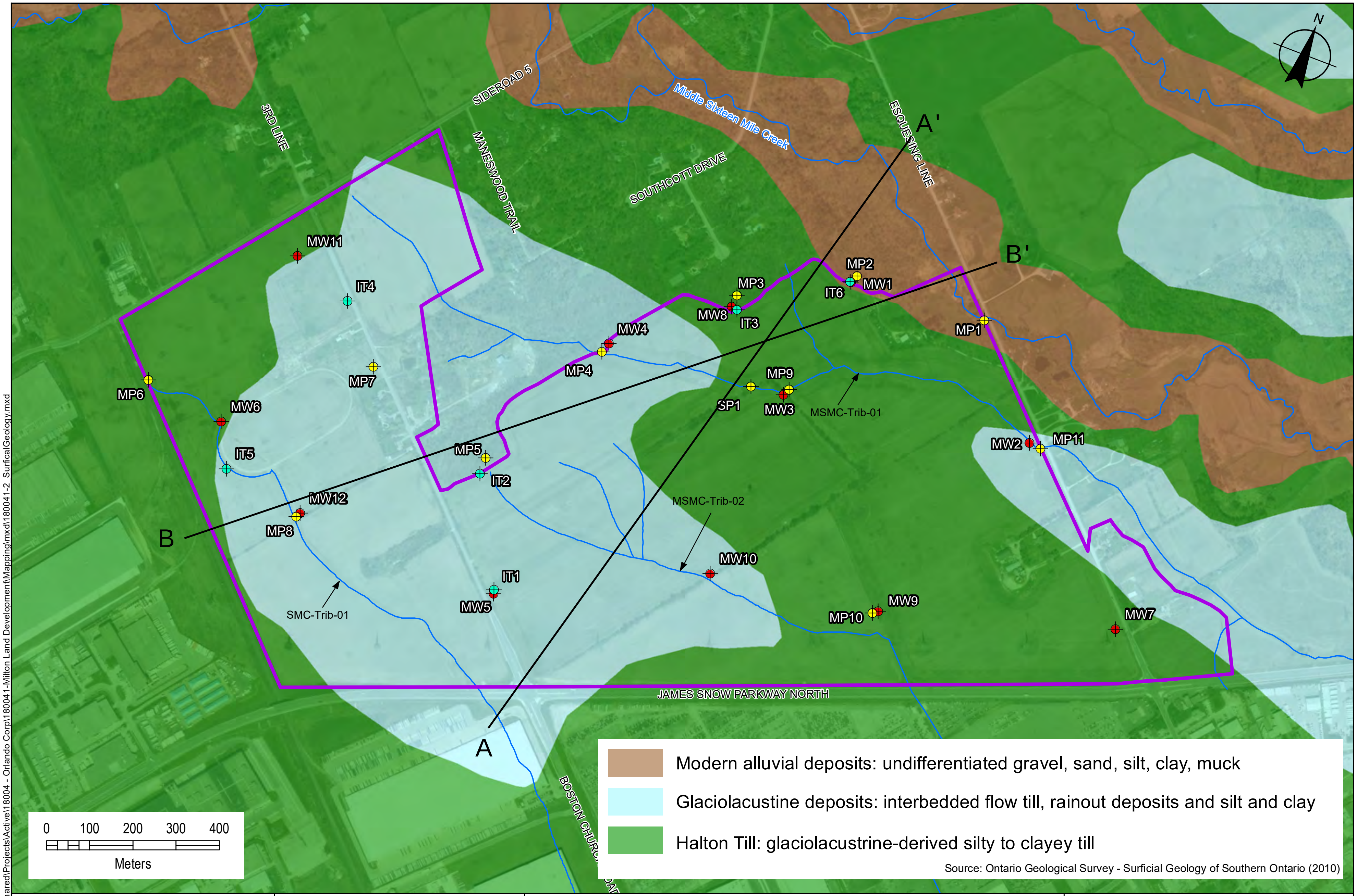
Surface	Initial Abstraction	
	Published Values	Previous City Studies (Toronto)
Impervious	0.2-2.5 mm	2 mm
Pervious	2.5-7.6 mm	5 mm

CATCHMENT IMPERVIOUSNESS

Impervious shapefile generated from satellite imagery and spatially weighted for each catchment.

Surface Type	Percent Imperviousness
Asphalt	100%
Gravel	70%
Grass	0%





Source: Ontario Geological Survey - Surficial Geology of Southern Ontario (2010)

Document Path: C:\Egnyte\Shared\Projects\Active\18004 - Orlando Corp\18004 1-Milton Land Development\Mapping\mxd\180041-2_SurficalGeology.mxd

CLIENT:
Orlando Corp

PREPARED BY:
Palmer™

PROJECT:
Milton Land Development

PROJECT NO.	180041	REVISION:	0
DATE:	Jan 14, 2019	SCALE:	1:12000
DRAWN:	BE	DATUM:	NAD 1983
CHECKED:	CH	PROJECTION:	UTM zone 17

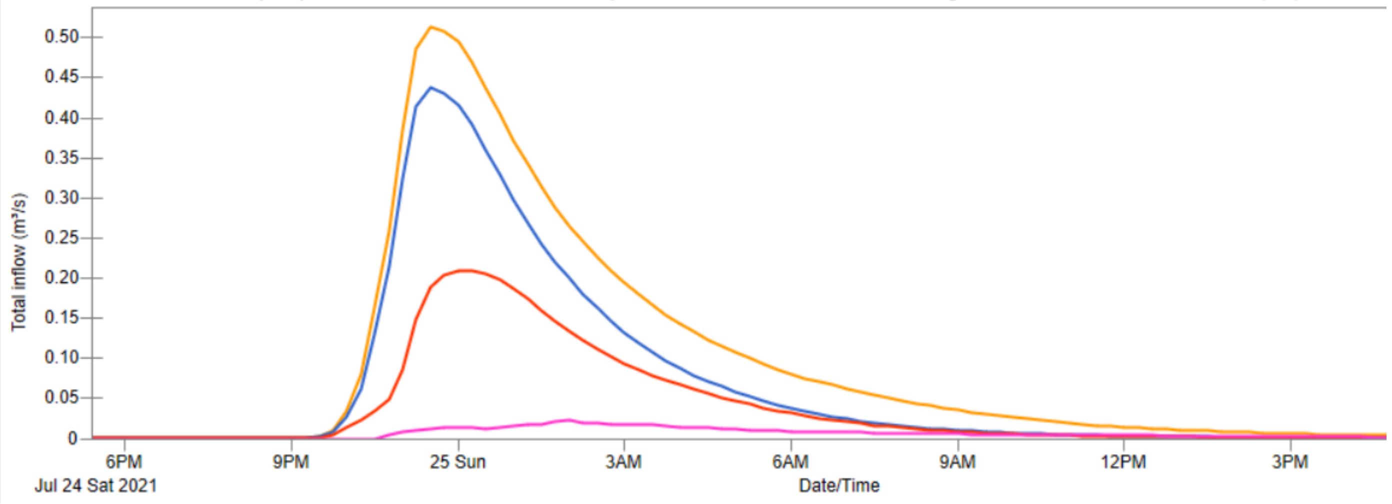
LEGEND:
- Infiltration Test
- Mini Piezometer
- Monitoring Well
- Watercourse
- Subject Site

Surficial Geology

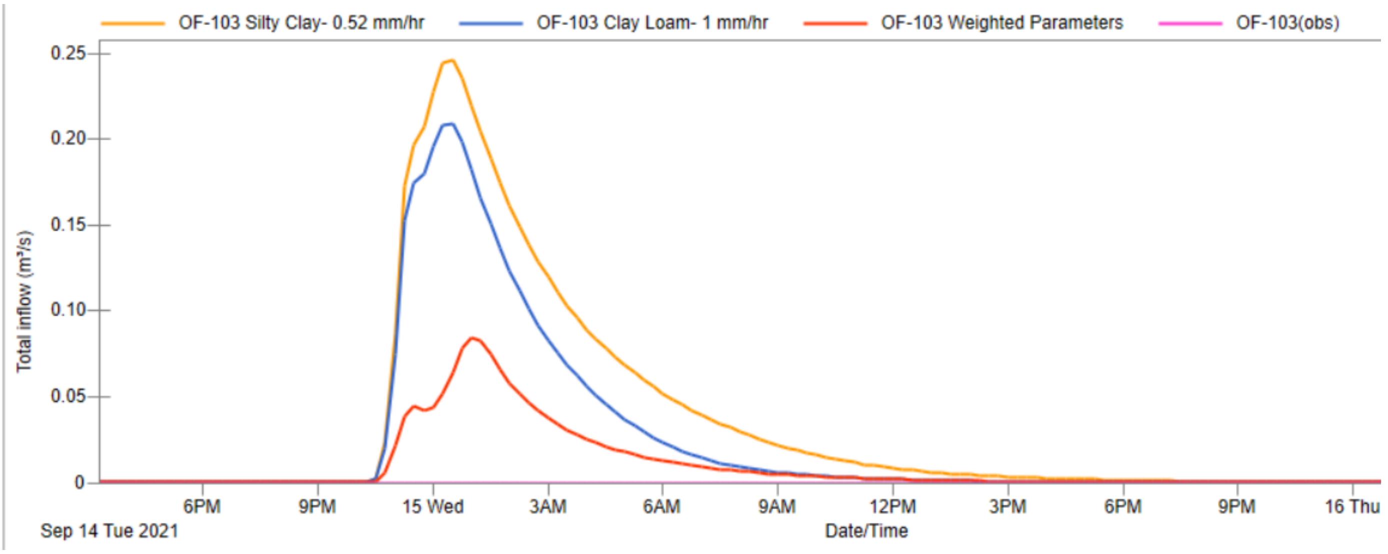
Figure 2

Imagery (2018 - DigitalGlobe) provided by Esri basemap service

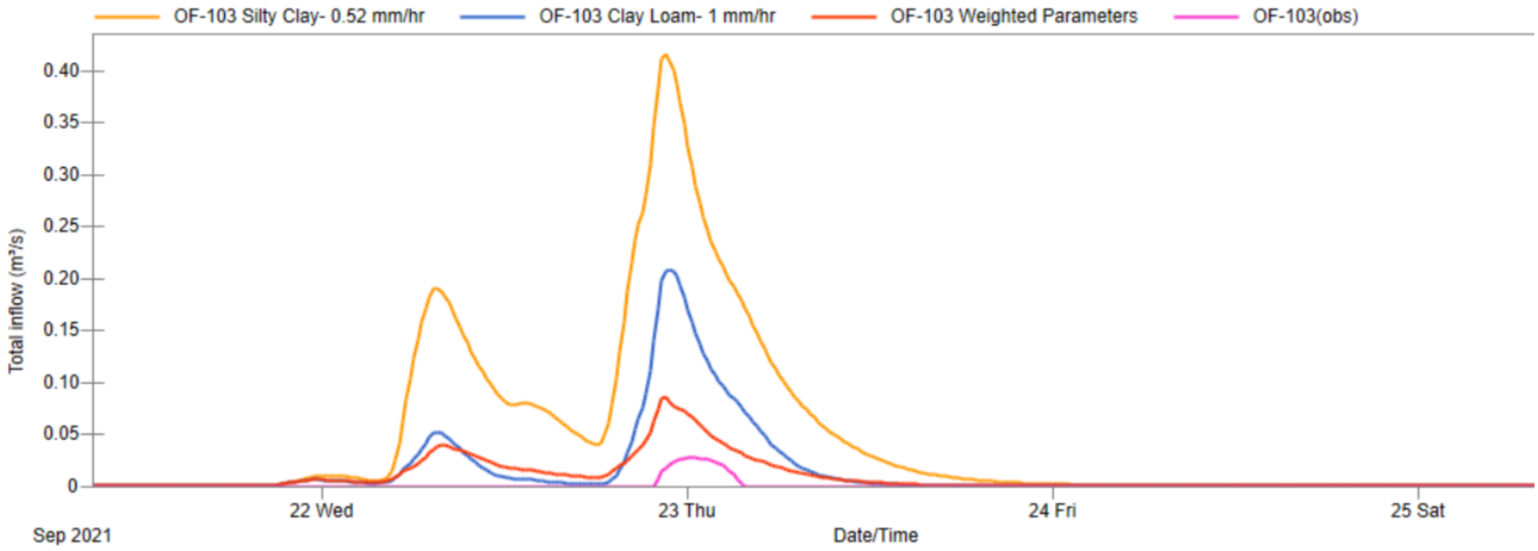
OF-103 July 24



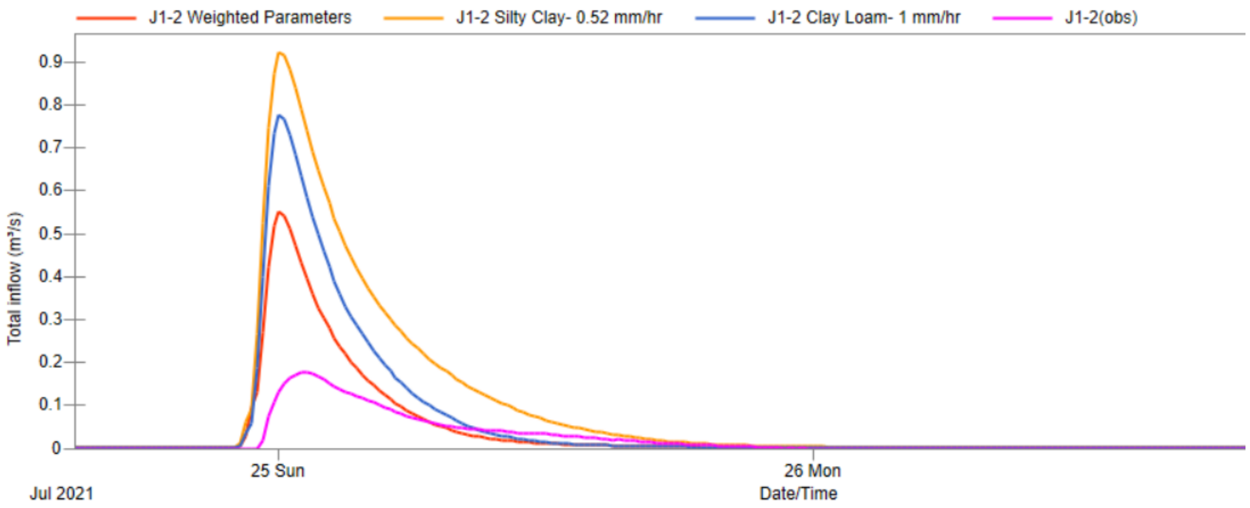
OF-103 September 14-15 Response to rainfall event was not recorded in field measured water level



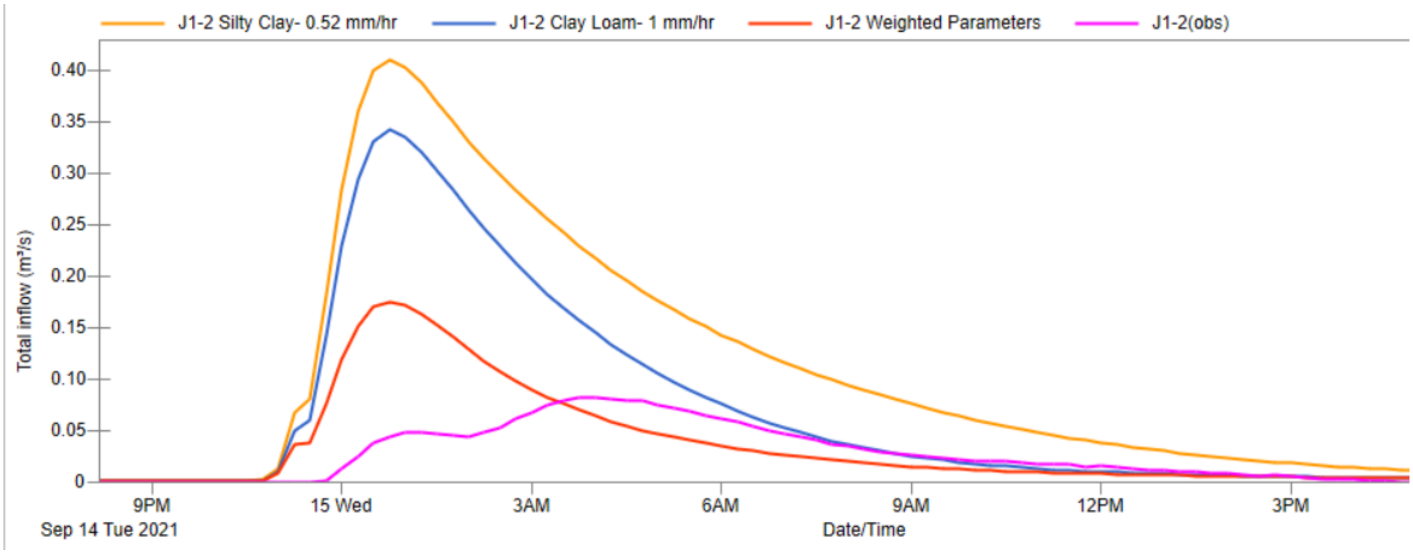
OF-103 September 21-23



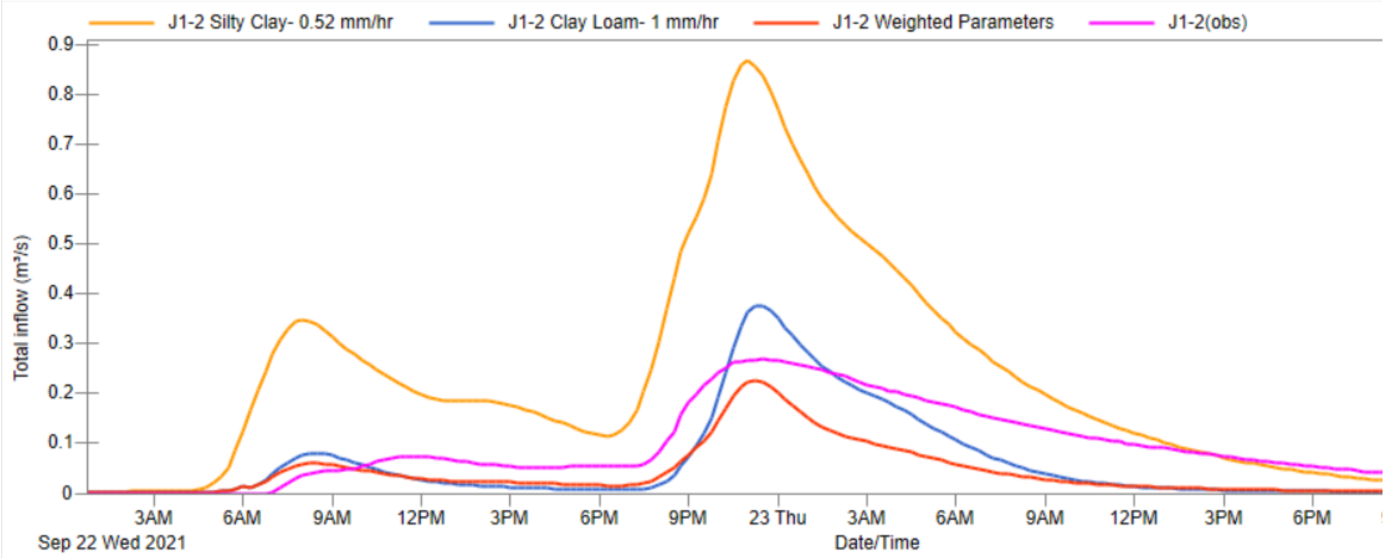
J1-2 July 24



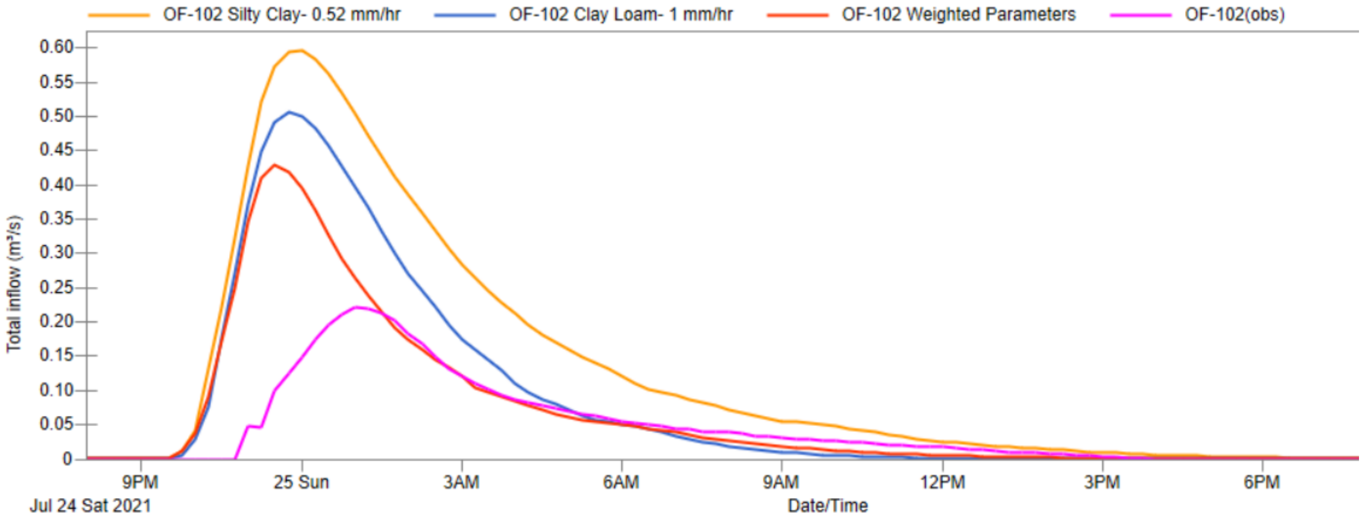
J1-2 September 14-15



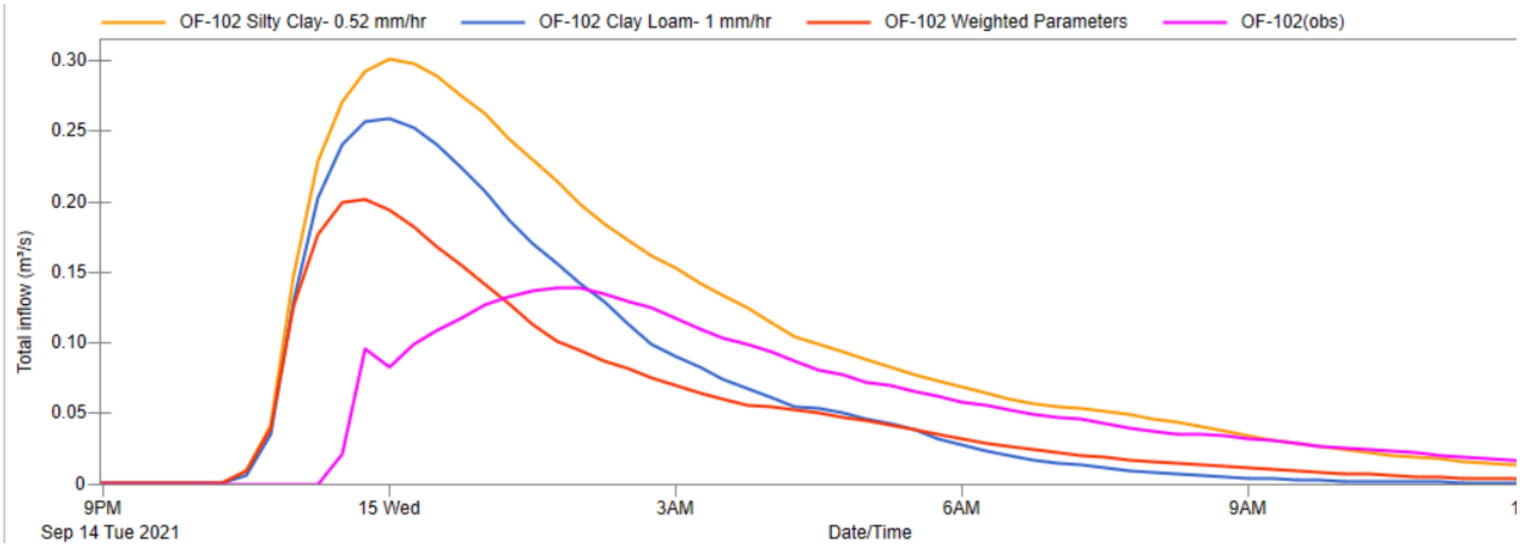
J1-2 September 21-23



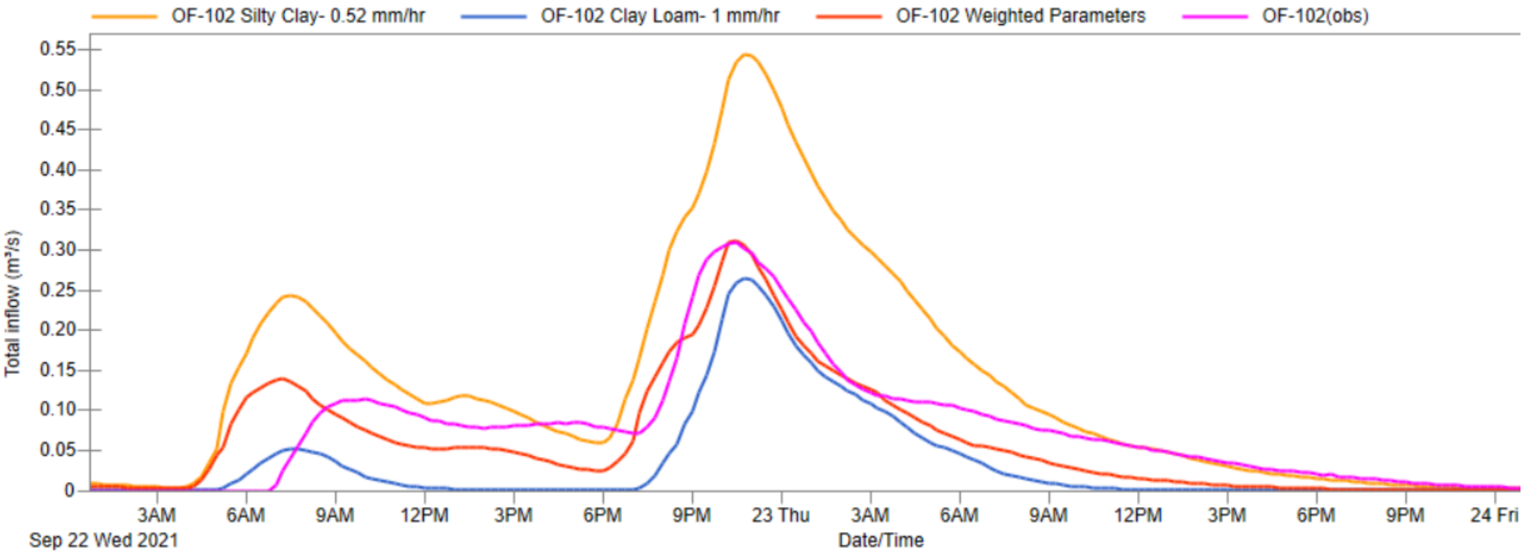
OF-102 July 24



OF-102 September 14-15



OF-102 September 21-23



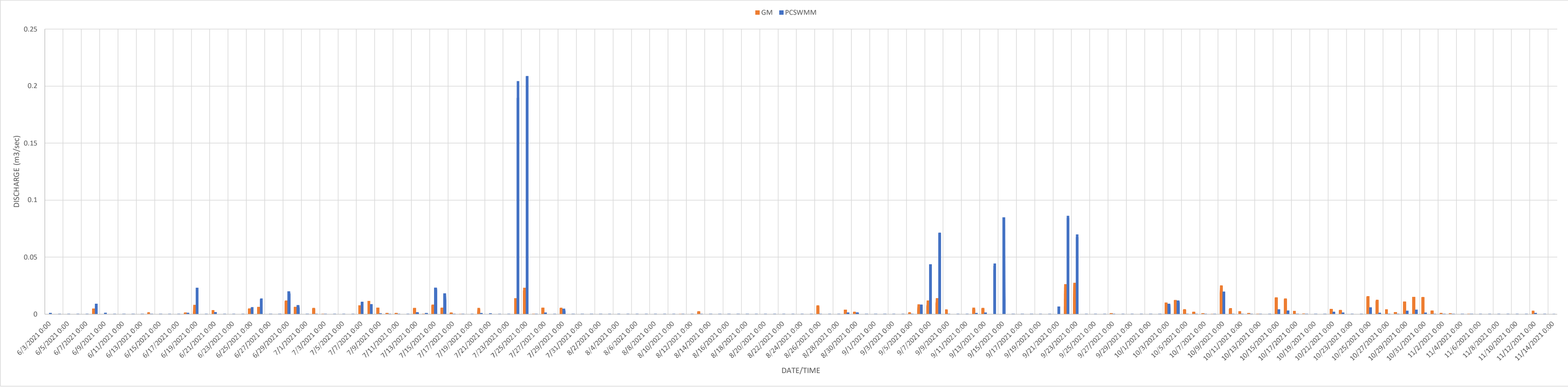
ATTACHMENT D

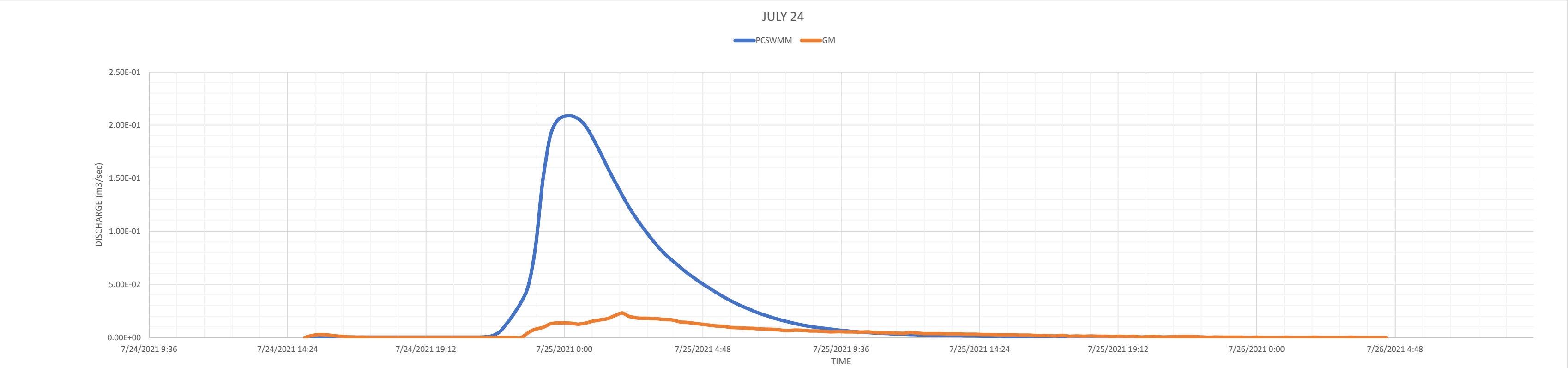
PEAK FLOW COMPARISON- NORTH PORTA PCSWMM (UNCALIBRATED) VS GEOMORPHIX ESTIMATED DISCHARG

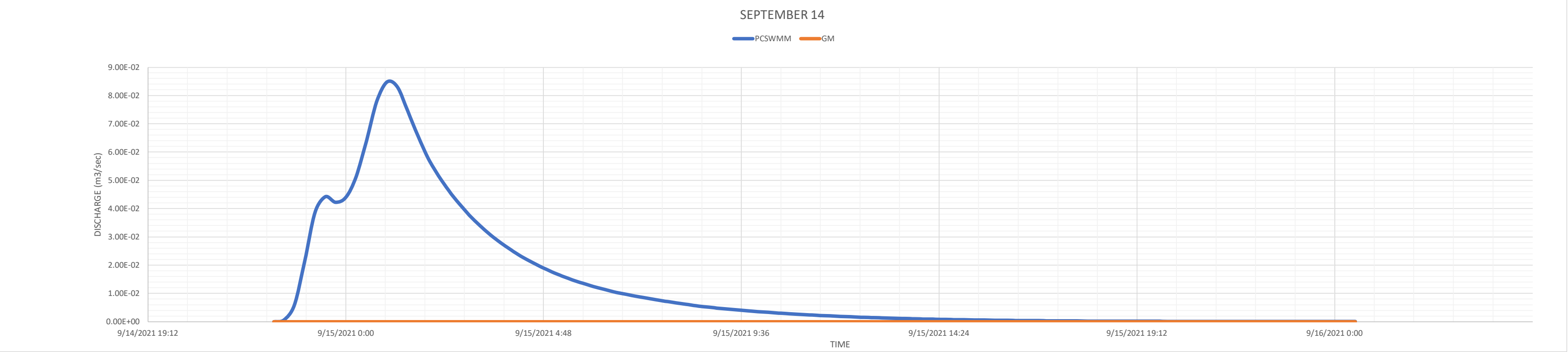
GM estimated continuous discharge records based on existing stage-discharge curves for four (4) measured flow events. GM notes that these should be considered preliminary due to limited flows observed. Scotch Block rain gauge has been used for PCSWMM modelling (consistent with GM). Three rainfall events have been selected for analysis. The September 21-24 is likely the best event to use for calibration purposes as it is longer duration with steady rainfall so the infiltration parameters will influence the model results.

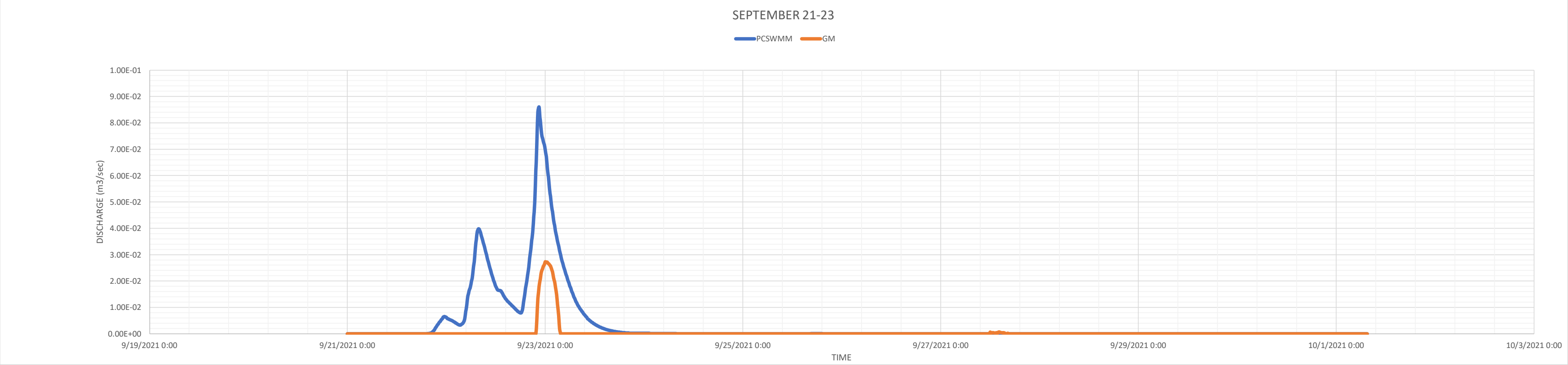
Location: R5S0 at James Snow Parkway (west of Boston Church Road

PCSWMM- OF-3, GM Station-MN1







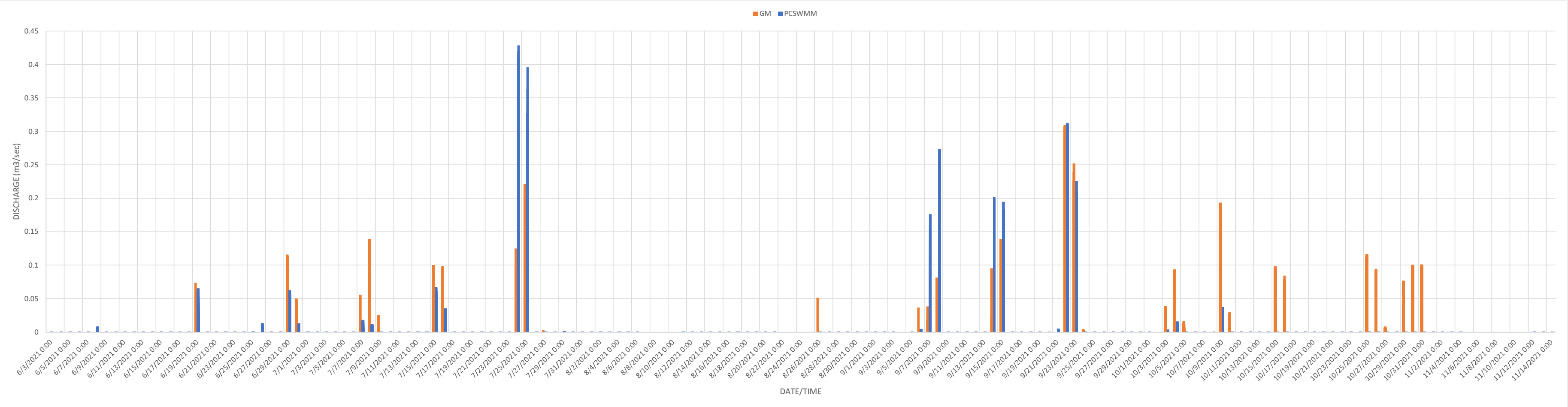


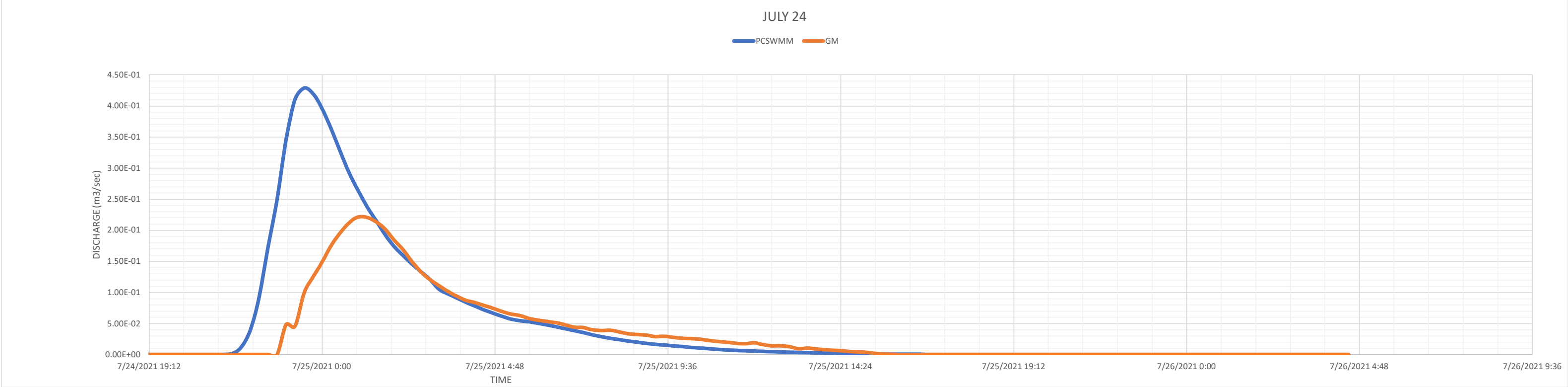
PEAK FLOW COMPARISON- NORTH PORTA PCSWMM (UNCALIBRATED) VS GEOMORPHIX ESTIMATED DISCHARGE

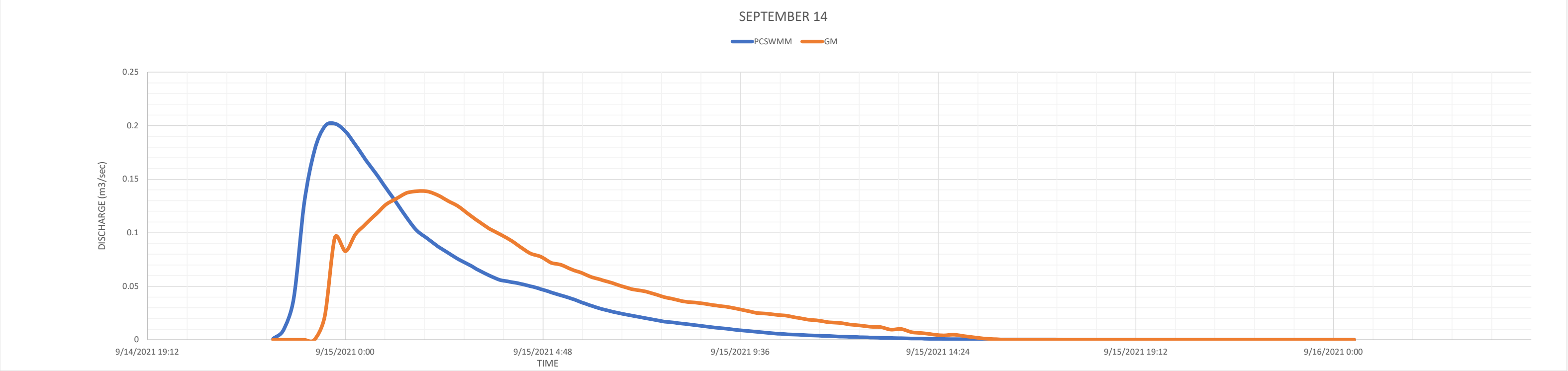
GM estimated continuous discharge records based on existing stage-discharge curves for four (4) measured flow events. GM notes that these should be considered preliminary due to limited flows observed. Scotch Block rain gauge has been used for PCSWMM modelling (consistent with GM). Three rainfall events have been selected for analysis. The September 21-24 is likely the best event to use for calibration purposes as it is longer duration with steady rainfall so the infiltration parameters will influence the model results.

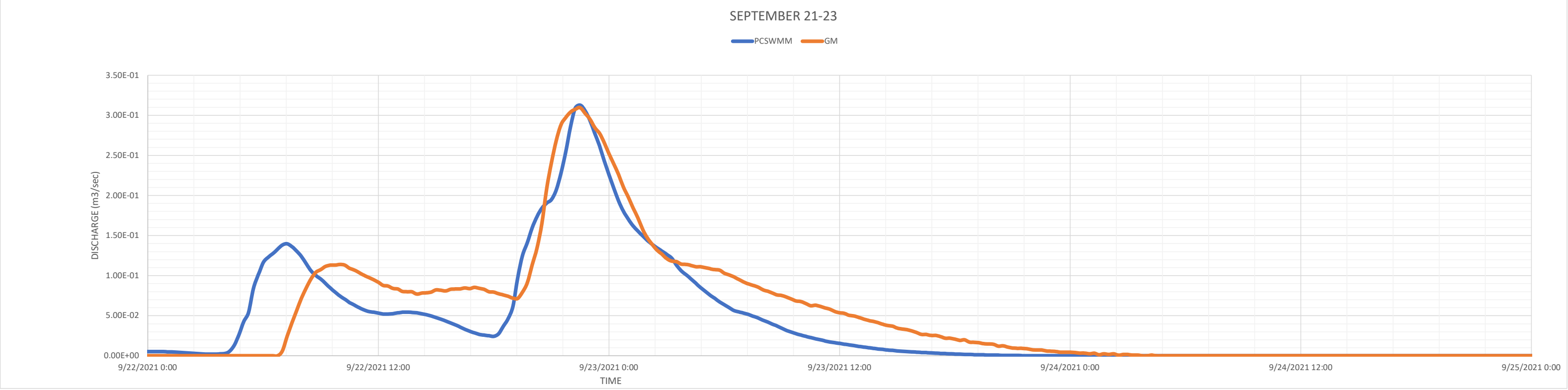
Location: R1S1 at James Snow Parkway (between Esquesing Line and Boston Church Road)

PCSWMM- OF-2, GM Station-MN2





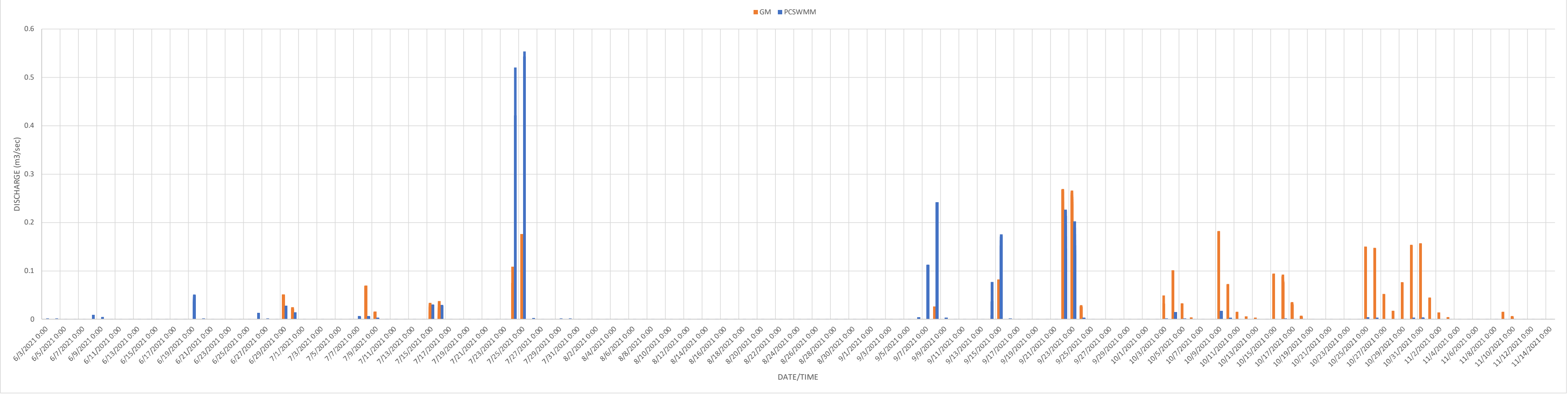


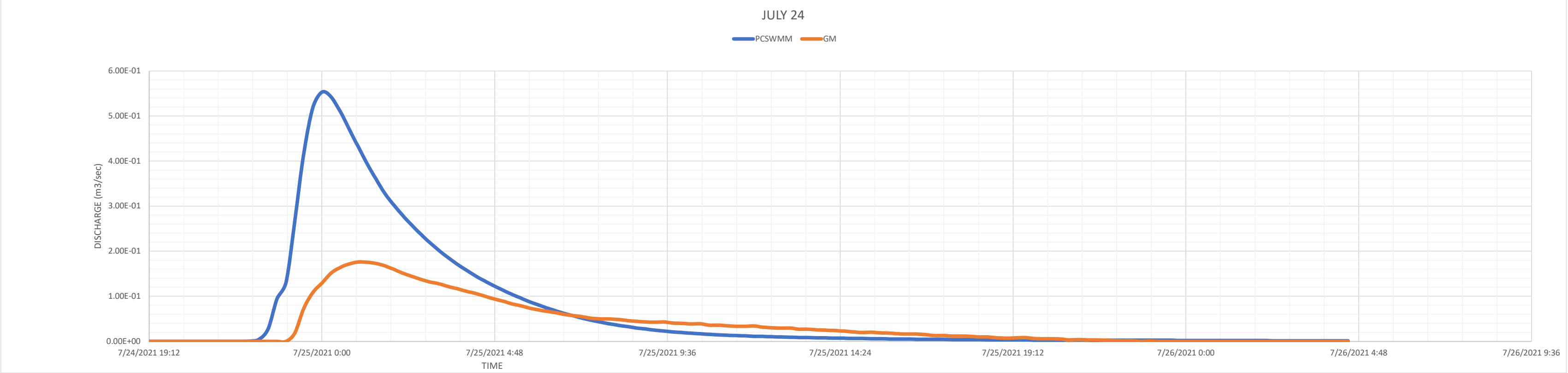


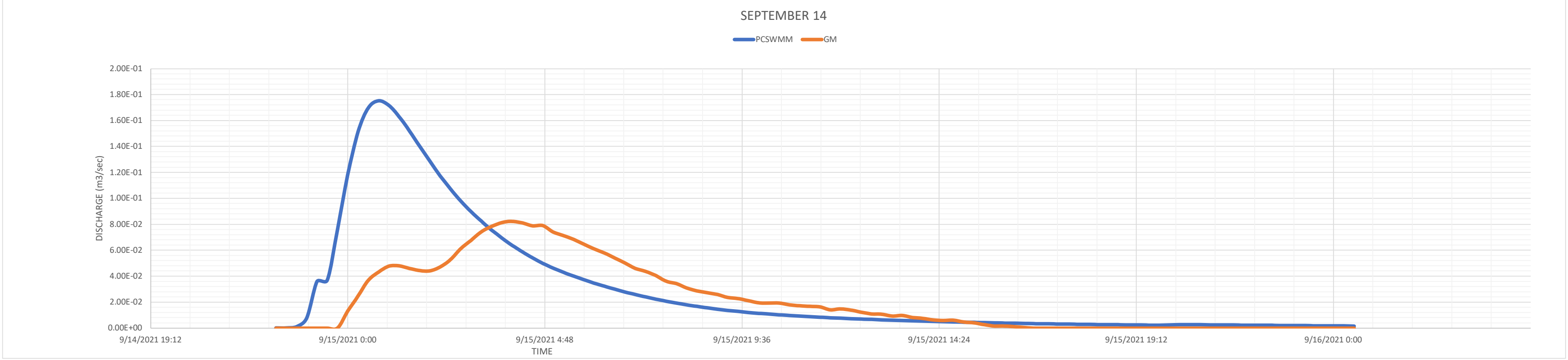
GM estimated continuous discharge records based on existing stage-discharge curves for four (4) measured flow events. GM notes that these should be considered preliminary due to limited flows observed. Scotch Block rain gauge has been used for PCSWMM modelling (consistent with GM). Three rainfall events have been selected for analysis. The September 21-24 is likely the best event to use for calibration purposes as it is longer duration with steady rainfall so the infiltration parameters will influence the model results.

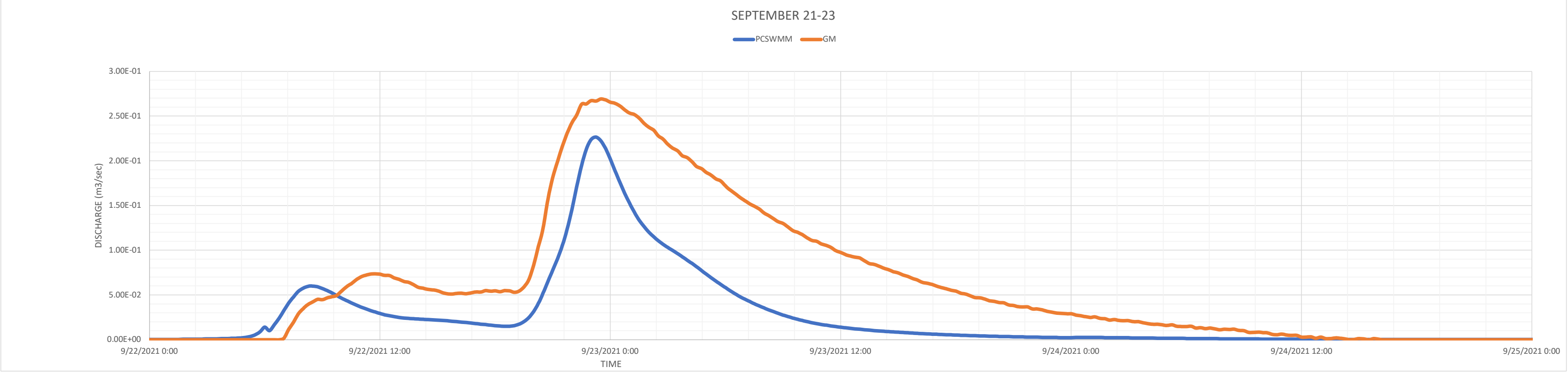
Location: R3S1 at Esquesing Line

PCSWMM- J1-2, GM Station-MN3





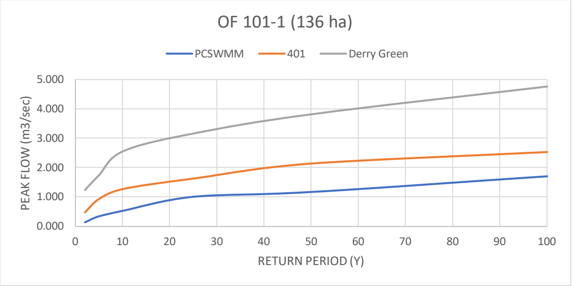


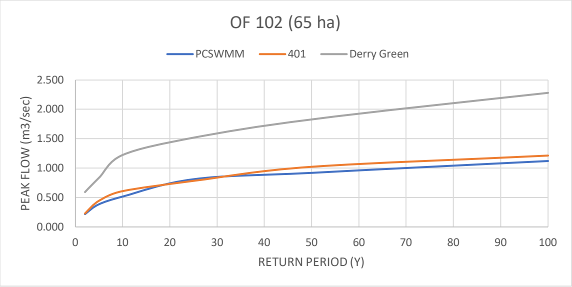


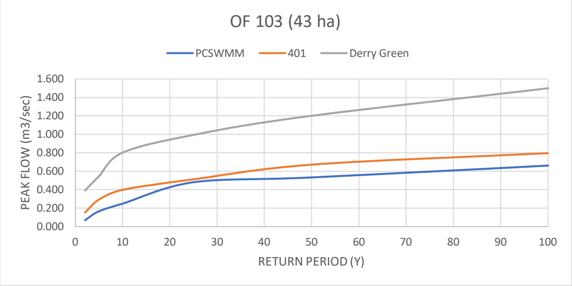
PEAK FLOW COMPARISON- NORTH PORTA PCSWMM (UNCALIBRATED) VS DERRY GREEN AND 401 MODELS

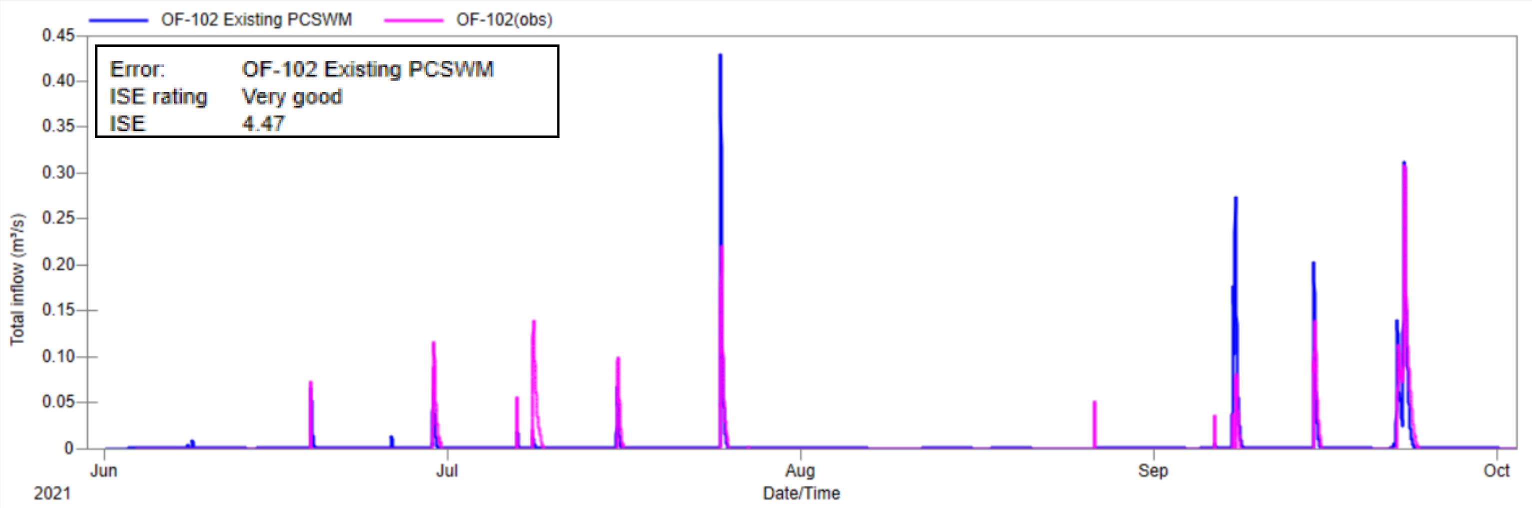
Frequency flows for Derry Green and 401 per previous sheets. Calculated using similar catchment paramaters (size, soil type, etc.) and averaged on a per hectare basis. PCSWMM frequency flows are calculated from Milton continuous data set. Peak runoff for each return period calculated using Cunanne formula (automatic PCSWMM process).

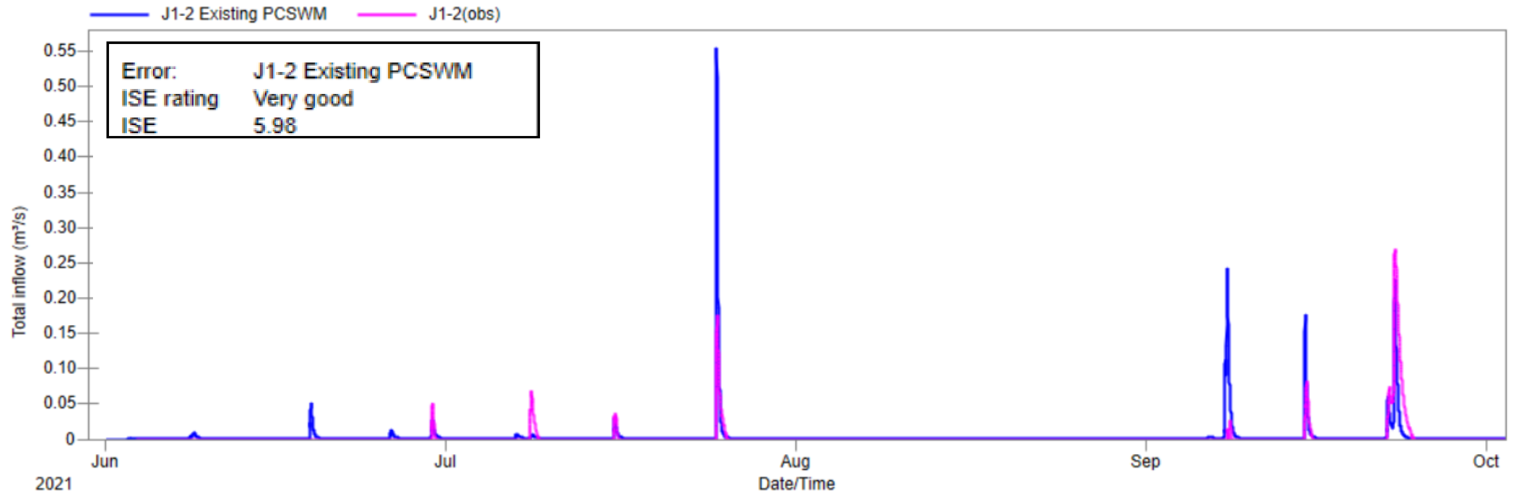
OUTFALL	AREA (HA)	2-YEAR					5-YEAR					10-YEAR					20-YEAR					50-YEAR					100-YEAR				
		PCSWMM	401 m3/s/ha	DG m3/s/ha	%Diff (401)	%Diff (DG)	PCSWMM	401 m3/s/ha	DG m3/s/ha	%Diff (401)	%Diff (DG)	PCSWMM	401 m3/s/ha	DG m3/s/ha	%Diff (401)	%Diff (DG)	PCSWMM	401 m3/s/ha	DG m3/s/ha	%Diff (401)	%Diff (DG)	PCSWMM	401 m3/s/ha	DG m3/s/ha	%Diff (401)	%Diff (DG)	PCSWMM	401 m3/s/ha	DG m3/s/ha	%Diff (401)	%Diff (DG)
			0.004	0.009				0.007	0.013				0.009	0.019				0.012	0.023				0.016	0.028				0.019	0.035		
101	135.97	0.142	0.482	1.240	108.977	158.900	0.343	0.932	1.743	92.407	134.242	0.530	1.270	2.551	82.253	131.197	1.005	1.631	3.163	47.505	103.550	1.169	2.136	3.818	58.498	106.236	1.708	2.531	4.761	38.847	94.382
102	65.21	0.219	0.231	0.595	5.408	92.342	0.388	0.447	0.836	14.146	73.217	0.517	0.609	1.224	16.391	81.187	0.812	0.782	1.517	-3.728	60.537	0.922	1.024	1.831	10.501	66.041	1.122	1.214	2.283	7.882	68.199
103	42.83	0.069	0.152	0.391	75.020	139.947	0.168	0.294	0.549	54.429	106.299	0.251	0.400	0.804	45.822	104.801	0.481	0.514	0.996	6.595	69.765	0.534	0.673	1.203	22.986	77.005	0.661	0.797	1.500	18.705	77.625
AVERAGE % DIFFERENCE					63.1	130.4				53.7	104.6				48.2	105.7				16.8	78.0				30.7	83.1				21.81	80.07

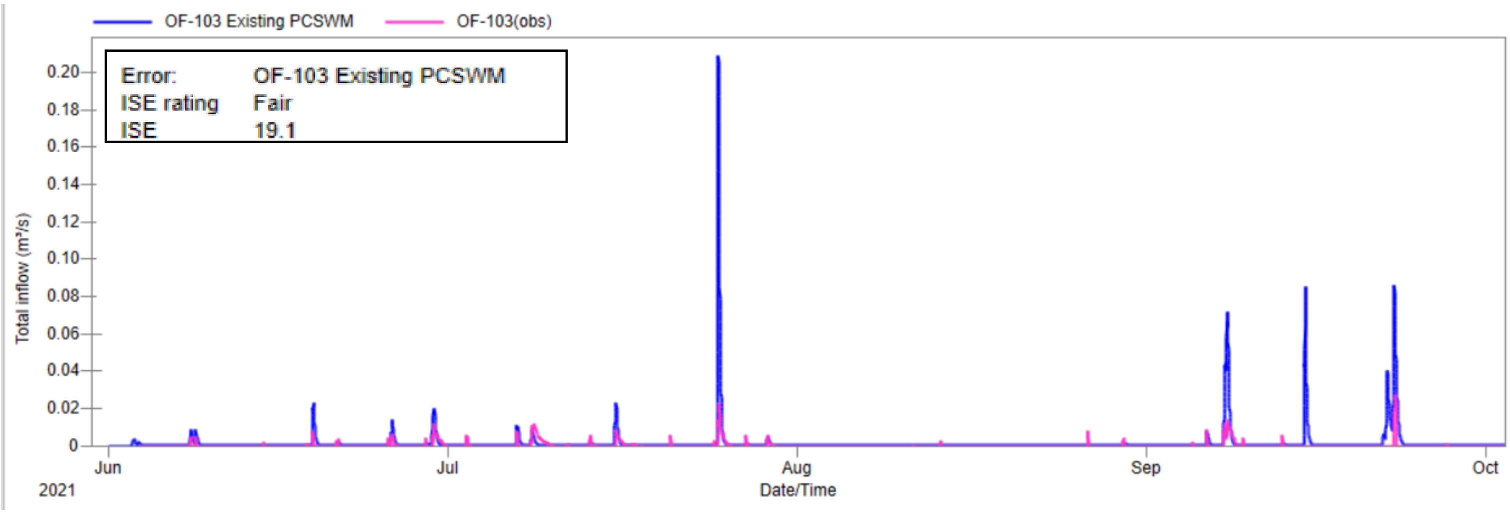







OF-102 Existing PCSWM
OF-102(obs)
Error: OF-102 Existing PCSWM
ISE rating Very good
ISE 4.47
Total inflow (m³/s)
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0
Jun
2021
Jul
Aug
Sep
Oct
Date/Time


J1-2 Existing PCSWM
J1-2(obs)
Error: J1-2 Existing PCSWM
ISE rating Very good
ISE 5.98
Total inflow (m³/s)
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0
Jun
2021
Jul
Aug
Sep
Oct
Date/Time


OF-103 Existing PCSWM
OF-103(obs)
Error: OF-103 Existing PCSWM
ISE rating Fair
ISE 19.1
Total inflow (m³/s)
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0
Jun
2021
Jul
Aug
Sep
Oct
Date/Time

Appendix A2.iv

Correspondence

Buffers and Allowances

February 10, 2022 TMIG PROJECT NUMBER 17197

Rachel Ellerman
Manager, Stormwater
Town of Milton
150 Mary Street
Milton, ON L9T 6Z5

[via email: Rachel.Ellerman@milton.ca]

Dear Ms. Ellerman,

Re: North Porta (Orlando Corporation)
Revised Figures for CESS Buffers and Allowances

The Municipal Infrastructure Group, a T.Y. Lin International Company (TMIG), on behalf of Orlando Corporation, is pleased to submit the following plans in relation to the North Porta Comprehensive Environmental and Servicing Study (CESS).

Discussion item no. 2 at the January 24, 2022 meeting with the Town, Conservation Halton and Halton Region noted that a 6m maintenance access allowance is to be added along the north side of the proposed realigned channel R3S1. In addition, Figure 5-1 of the CESS required revisions to clearly illustrate all buffers/allowances, including overlapping areas, for review agencies to understand how these buffers/allowances were applied. Attached is a revised Figure 5-1 for review and comment, noting the following:

- The 15m floodplain and 6m access allowances are shown on both sides of the channel. Figures 5-1A to 5-1D were added to show the various allowances at a more legible scale.
- Two 6m access allowance limits are shown along the north side of the channel: (1) 6m offset from the edge of the valley floor and (2) 6m offset from the top of the valley slope. The valley slope along the north side of the channel is less than 2m high with slopes between 4H:1V and 6H:1V, with a horizontal distance of generally close to 6 m from the bottom of the slope to the top of the slope. The flatter slope will allow equipment to use the valley wall for access, hence access is feasible for sections of the channel edge abutting areas that cannot be disturbed.

  It is therefore our opinion that the 6 m maintenance allowance should be applied from the edge of the valley floor. Taking this approach, the attached Figure 5-1 demonstrates that the 6 m maintenance allowance is contained fully outside of the 30 m VPZ. Regardless, we have also shown the more conservative approach with the maintenance allowance measured from the top of the valley slope, which would encroach slightly into the 30 m VPZ at a single location (see Figure 5-1A).

  Finally, we note that while the fluvial geomorphology investigation recommended a minimum 16 m meander belt width for the realigned watercourse, we have provided a 24 m wide valley base to maximize the net gain to the natural heritage system and provide further resiliency to future climate impacts on flooding and erosion.

- The configuration of the replicated wetland north of the realigned R3S1 is currently under review. Given the proposed area for the replicated wetland (0.61 ha) is less than the available area north of the channel, the replicated wetland is expected to be feasible while respecting any required allowances from the channel.

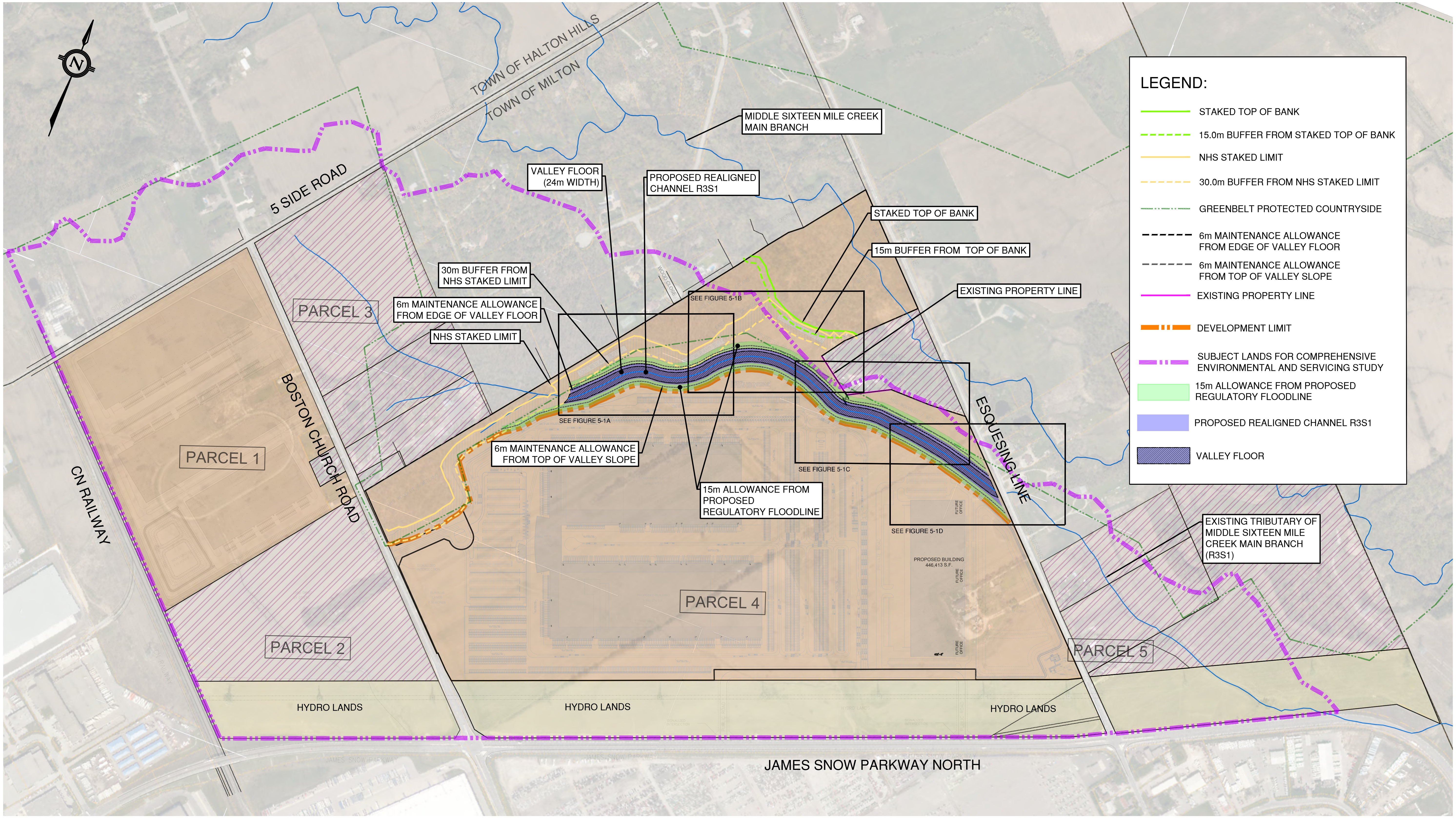
We trust that the above documentation and plans are sufficient for the Town, CH and the Region to review and provide feedback ahead of the CESS 2nd submission. Should you have any questions, please contact me at 416-300-0415.

Sincerely,
THE MUNICIPAL INFRASTRUCTURE GROUP LTD.
A T.Y. LIN INTERNATIONAL COMPANY

Steve Hollingworth
Director of Stormwater Management
SHollingworth@tmig.ca

Cc Jessica Bester, Conservation Halton
Heather Ireland, Halton Region
Olivia Robinson, GEI
Paul Villard, Geo Morphix
David Moores, Orlando Corporation

Encl. Figures 5-1, 5-1A to 5-1D



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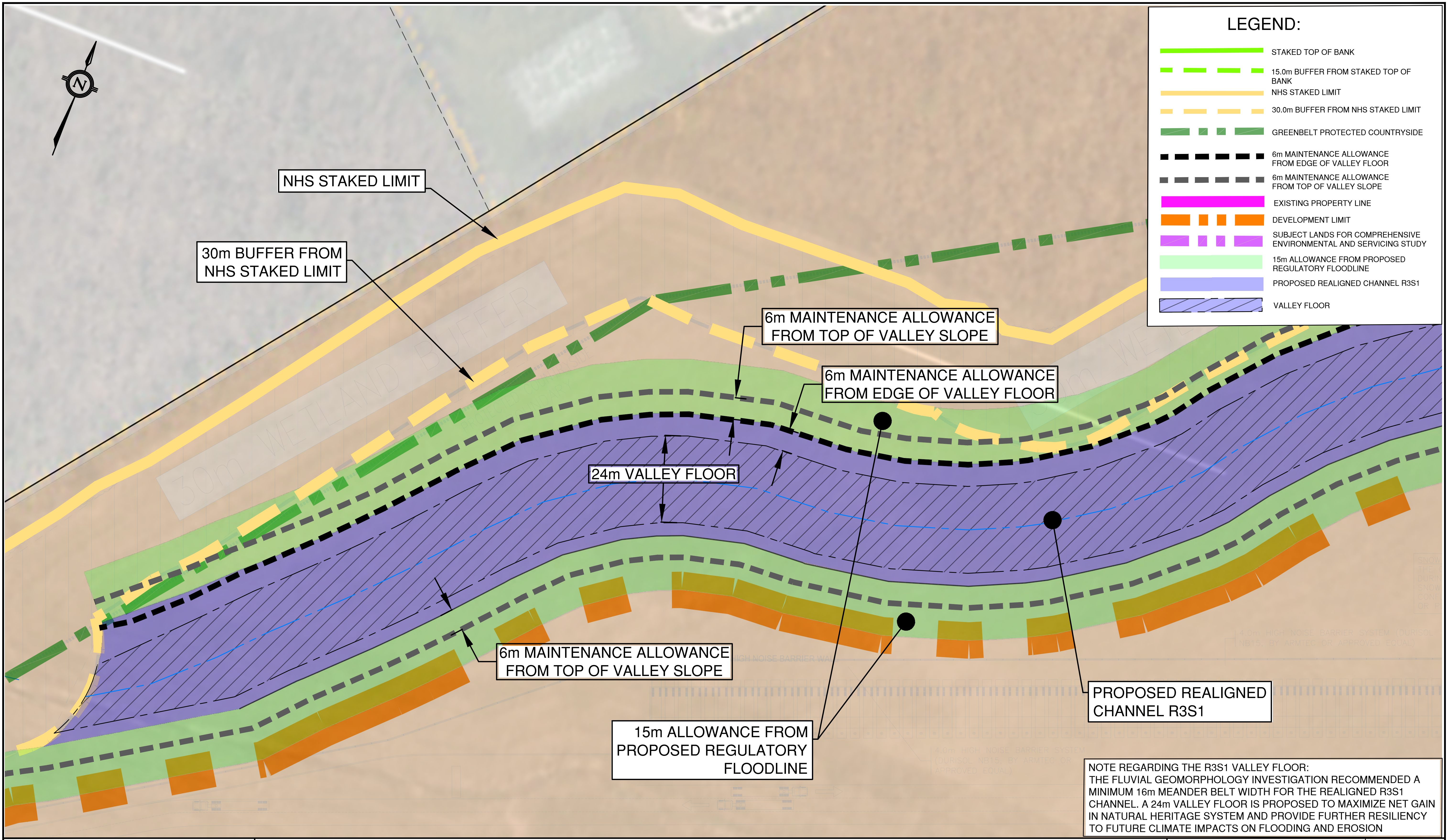
ORLANDO - NORTH PORTA
COMPREHENSIVE ENVIRONMENTAL AND SERVICING STUDY
DEVELOPMENT CONSTRAINTS MAPPING

SCALE: N.T.S
DATE: FEBRUARY 2022
DESIGNED BY: T.D/E.T
DRAWN BY: S.B.
CHECKED BY: S.H.
CHECKED BY: E.T.
PROJECT No. 17197
FIGURE No. 5-1

File : G:\Projects\2017\17197 - Orlando - North Porta\3. Drawings\6. SWM\FSR FIGURES\FIG 5-1 - Development Constraints Map.dwg, Layout : 5-1 Date :Feb 10, 2022 - 4:42pm, Edit By : tony.dang

File : G:\Projects\2017\17197 - Orlando - North Porta\3. Drawings\6. SWM\FSR FIGURES\FIG 5-1 - Development Constraints Map.dwg, Layout : 5-1a Date :Feb 10, 2022 - 4:42pm, Edit By : tony.dang



NOTE REGARDING THE R3S1 VALLEY FLOOR:
THE FLUVIAL GEOMORPHOLOGY INVESTIGATION RECOMMENDED A MINIMUM 16m MEANDER BELT WIDTH FOR THE REALIGNED R3S1 CHANNEL. A 24m VALLEY FLOOR IS PROPOSED TO MAXIMIZE NET GAIN IN NATURAL HERITAGE SYSTEM AND PROVIDE FURTHER RESILIENCY TO FUTURE CLIMATE IMPACTS ON FLOODING AND EROSION

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ORLANDO - NORTH PORTA
COMPREHENSIVE ENVIRONMENTAL AND SERVICING STUDY
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DESIGNED BY: T.D/E.T
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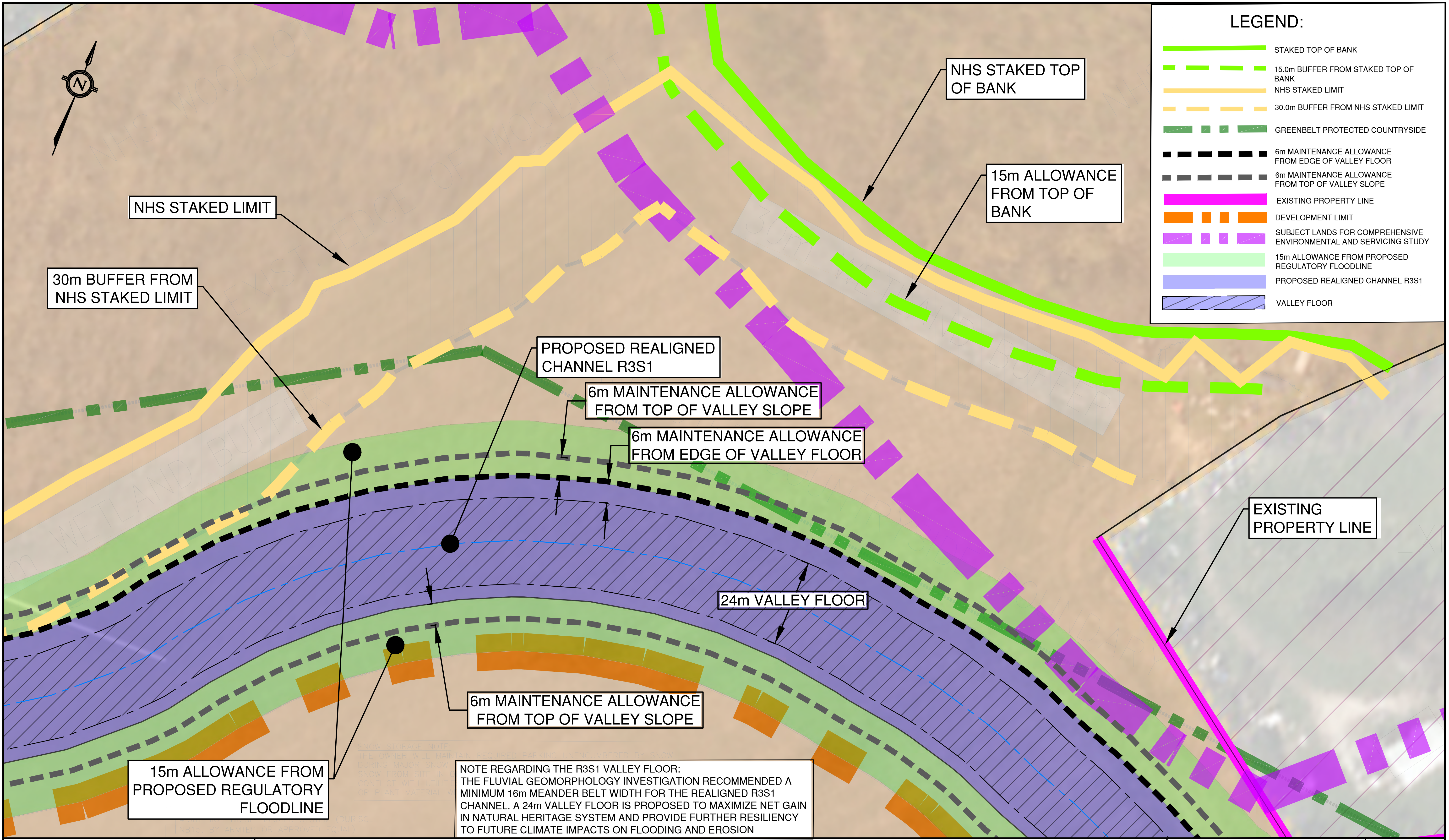
CHECKED BY: S.H.
CHECKED BY: E.T.
PROJECT No. 17197
FIGURE No. 5-1A



NOTE REGARDING THE R3S1 VALLEY FLOOR:
THE FLUVIAL GEOMORPHOLOGY INVESTIGATION RECOMMENDED A MINIMUM 16m MEANDER BELT WIDTH FOR THE REALIGNED R3S1 CHANNEL. A 24m VALLEY FLOOR IS PROPOSED TO MAXIMIZE NET GAIN IN NATURAL HERITAGE SYSTEM AND PROVIDE FURTHER RESILIENCY TO FUTURE CLIMATE IMPACTS ON FLOODING AND EROSION

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DEVELOPMENT CONSTRAINTS MAPPING

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DATE: FEBRUARY 2022
DESIGNED BY: T.D/E.T
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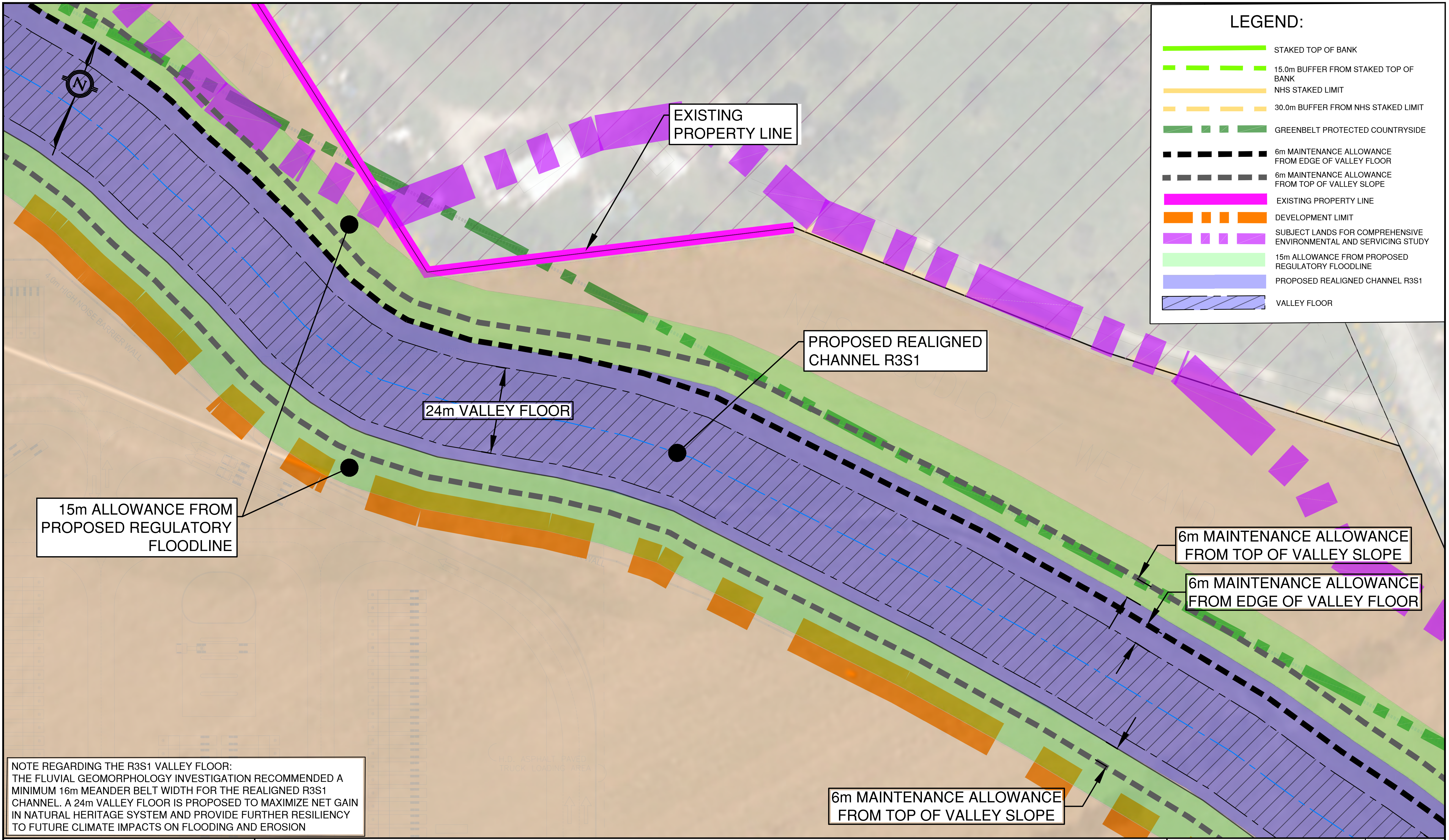
CHECKED BY: S.H.
CHECKED BY: E.T.
PROJECT No. 17197
FIGURE No. 5-1B

File : G:\Projects\2017\17197 - Orlando - North Porta\3. Drawings\6. SWM\FSR FIGURES\FIG 5-1 - Development Constraints Map.dwg, Layout : 5-1b Date :Feb 10, 2022 - 4:43pm, Edit By : tony.dang



LEGEND:

━━	STAKED TOP OF BANK
╍╍	15.0m BUFFER FROM STAKED TOP OF BANK
━━	NHS STAKED LIMIT
╍╍	30.0m BUFFER FROM NHS STAKED LIMIT
╍╍	GREENBELT PROTECTED COUNTRYSIDE
╍╍	6m MAINTENANCE ALLOWANCE FROM EDGE OF VALLEY FLOOR
╍╍	6m MAINTENANCE ALLOWANCE FROM TOP OF VALLEY SLOPE
━━	EXISTING PROPERTY LINE
╍╍	DEVELOPMENT LIMIT
╍╍	SUBJECT LANDS FOR COMPREHENSIVE ENVIRONMENTAL AND SERVICING STUDY
■	15m ALLOWANCE FROM PROPOSED REGULATORY FLOODLINE
■	PROPOSED REALIGNED CHANNEL R3S1
▨	VALLEY FLOOR

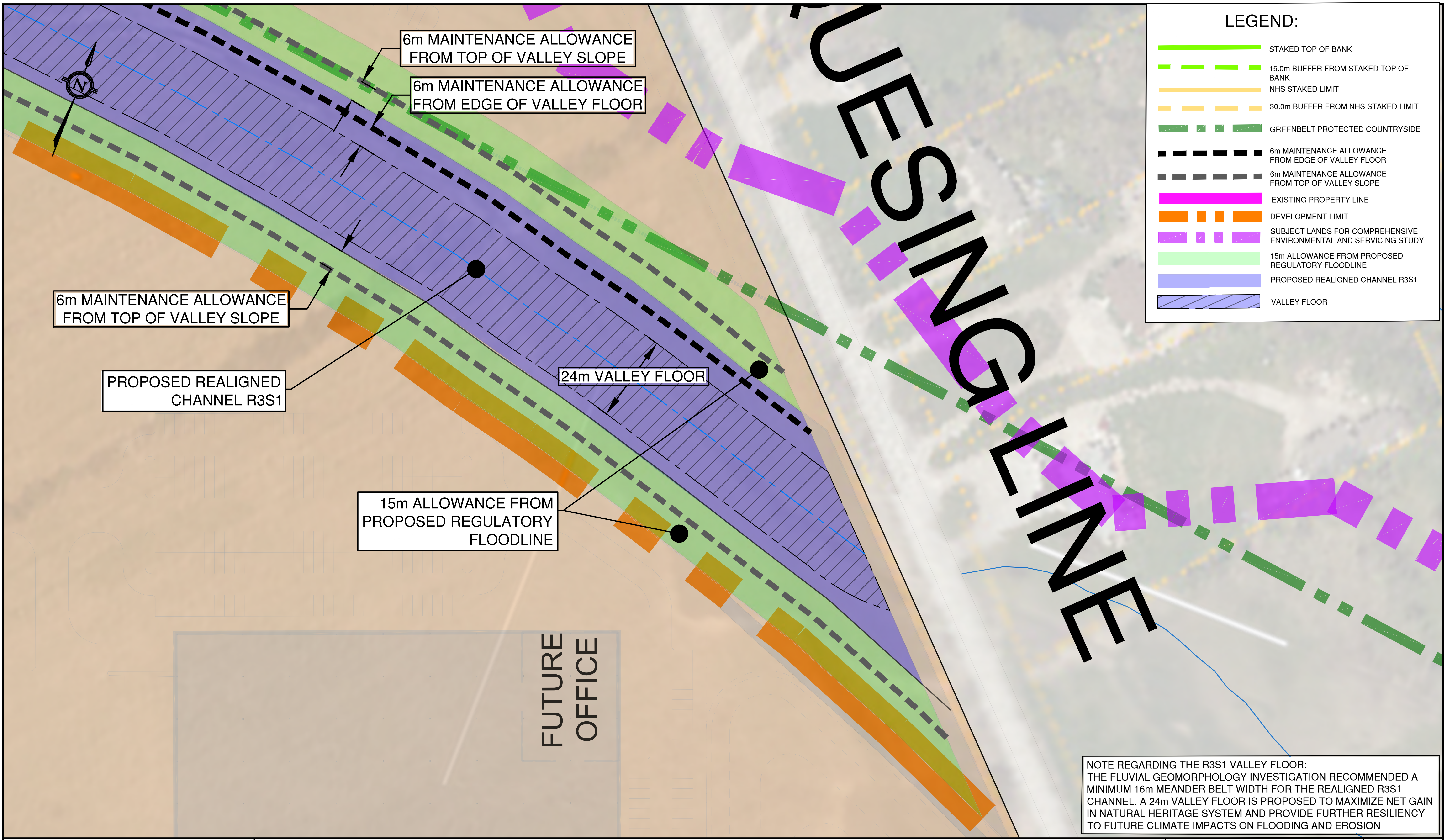
NOTE REGARDING THE R3S1 VALLEY FLOOR:
THE FLUVIAL GEOMORPHOLOGY INVESTIGATION RECOMMENDED A MINIMUM 16m MEANDER BELT WIDTH FOR THE REALIGNED R3S1 CHANNEL. A 24m VALLEY FLOOR IS PROPOSED TO MAXIMIZE NET GAIN IN NATURAL HERITAGE SYSTEM AND PROVIDE FURTHER RESILIENCY TO FUTURE CLIMATE IMPACTS ON FLOODING AND EROSION

TMIG
A T·Y·LIN INTERNATIONAL COMPANY

ORLANDO - NORTH PORTA
COMPREHENSIVE ENVIRONMENTAL AND SERVICING STUDY
DEVELOPMENT CONSTRAINTS MAPPING

SCALE: N.T.S
DATE: FEBRUARY 2022
DESIGNED BY: T.D/E.T
DRAWN BY: S.B.
CHECKED BY: S.H.
CHECKED BY: E.T.
PROJECT No. 17197
FIGURE No. 5-1C

File : G:\Projects\2017\17197 - Orlando - North Porta\3. Drawings\6. SWM\FSR FIGURES\FIG 5-1 - Development Constraints Map.dwg, Layout : 5-1c Date : Feb 10, 2022 - 4:43pm, Edit By : tony.dang



NOTE REGARDING THE R3S1 VALLEY FLOOR:
THE FLUVIAL GEOMORPHOLOGY INVESTIGATION RECOMMENDED A MINIMUM 16m MEANDER BELT WIDTH FOR THE REALIGNED R3S1 CHANNEL. A 24m VALLEY FLOOR IS PROPOSED TO MAXIMIZE NET GAIN IN NATURAL HERITAGE SYSTEM AND PROVIDE FURTHER RESILIENCY TO FUTURE CLIMATE IMPACTS ON FLOODING AND EROSION

File : G:\Projects\2017\17197 - Orlando - North Porta\3. Drawings\6. SWM\FSR FIGURES\FIG 5-1 - Development Constraints Map.dwg, Layout : 5-1d Date :Feb 10, 2022 - 4:44pm, Edit By : tony.dang

TMIG
A T·Y·LIN INTERNATIONAL COMPANY

ORLANDO - NORTH PORTA
COMPREHENSIVE ENVIRONMENTAL AND SERVICING STUDY
DEVELOPMENT CONSTRAINTS MAPPING

SCALE: N.T.S
DATE: FEBRUARY 2022
DESIGNED BY: T.D/E.T
DRAWN BY: S.B.
CHECKED BY: S.H.
CHECKED BY: E.T.
PROJECT No. 17197
FIGURE No. 5-1D

From: Jessica Bester
To: Rachel.Ellerman@milton.ca
Cc: Andrews, Mark; Ireland, Heather; Farrell, Aaron
Subject: RE: North Porta CESS - Figures for buffers and allowances
Date: Thursday, March 3, 2022 5:51:19 PM
Attachments: image001.png
image002.png

Hi Rachel,

We have reviewed the "North Porta (Orlando Corporation) Revised Figures for CESS Buffers and Allowances" submission, prepared by TMIG and dated February 10, 2022 and provide the following comments that should be addressed as part of the update to the CESS and in accordance with comments already provided in our letter dated November 3, 2021. Please note these comments are not meant to be comprehensive and all comments on the CESS will need to be addressed as part of the updates to the study.

- The 15 m allowances and 6 m access allowances on either side of the realigned watercourse need to be revised so they are offsetting from the greater of the flooding (regulatory floodplain) and erosion hazards (stable top of slope, or meander belt). Update all drawings accordingly.
- We do not need to see two options for the location of the 6 m access allowances. They should not be offset from the edge of the valley floor (see comment above). Please remove this line from all drawings.
- Regarding *"the valley slope along the north side of the channel is less than 2m high with slopes between 4H: 1V and 6H: 1V, with a horizontal distance of generally close to 6 m from the bottom of the slope to the top of the slope. The flatter slope will allow equipment to use the valley wall for access, hence access is feasible for sections of the channel edge"* if the channel is flooded during a significant storm event, access will not be available from the south side of the channel, through the channel to the north side. A separate access allowance is required outside the greater of the hazards on the north side (and the south side) of the channel. The 6 m access allowance is required from the greatest hazard regardless of whether the watercourse is a confined or an unconfined system.
- As the top of valley slope may not be the greatest hazard, the allowances should be revised so they are offset from the greatest flooding and erosion hazard. The Regulatory floodplain associated with the realigned watercourse may be subject to change based on the outcome of updates to the CESS. All figures/drawings will need to be updated accordingly within the CESS.
- The 6 m access allowance on the north side of the realigned watercourse should be revised as outlined in the comments above and so that it does not overlap with other buffers (see previous CH comments provided on the CESS).
- Update the plan to accurately show the replicated wetland with associated 15 m setback, bioswale and LIDs as mentioned as being proposed in the CESS on the north side of the channel. Their locations shall consider previous comments provided on the CESS by CH and the Region of Halton. The replicated wetland should not be located within the 6m access allowance of the realigned channel to ensure any future channel access required would not impact the wetland. We note the 15 m setback could overlap the realigned channel, and the 30 m VPZ and Greenbelt Protected Countryside Boundary (refer to previous Region of Halton comments on the CESS). Further comments will be provided on these features as part of the next review of the study.

Thanks,
Jessica

Jessica Bester, BES, MCIP, RPP
Senior Environmental Planner
Conservation Halton
2596 Britannia Road West, Burlington, ON L7P 0G3
905.336.1158 ext. 2317 | Fax 905.336.6684 | jbester@hrca.on.ca
conservationhalton.ca

Click here to learn about Conservation Halton's new strategic plan.

From: Rachel.Ellerman@milton.ca <Rachel.Ellerman@milton.ca>
Sent: February 17, 2022 4:39 PM
To: 'Ireland, Heather' <Heather.Ireland@halton.ca>; Jessica Bester <jbester@hrca.on.ca>
Cc: 'Farrell, Aaron' <aaron.farrell@woodplc.com>
Subject: FW: North Porta CESS - Figures for buffers and allowances

The Town of Milton Secure Email Expires March 19, 2022

2022-02-10 - 17197 - North Porta CESS Allo...ces.pdf 5.1 MB

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Hi everyone,

Following up on Tony's email below regarding the North Porta buffers figure, would you be able to provide comments by March 3 please?

Thank you,

Rachel

Milton Logo

Rachel Ellerman, C.E.T, E.I.T
Manager, Stormwater
150 Mary Street, Milton ON, L9T 6Z5
905-878-7252 ext. 2572
www.milton.ca

From: Tony Dang <TDang@tmig.ca>
Sent: Thursday, February 10, 2022 5:05 PM
To: Rachel Ellerman <Rachel.Ellerman@milton.ca>
Cc: Ireland, Heather <Heather.Ireland@halton.ca>; jbester@hrca.on.ca; Robinson, Olivia <orobinson@savanta.ca>; paulv <paulv@geomorphix.com>; mooresd <mooresd@orlandocorp.com>; Steve Hollingworth <SHollingworth@tmig.ca>
Subject: North Porta CESS - Figures for buffers and allowances

Hi Rachel

Please see the attached letter and figures for the North Porta CESS buffers and allowances, as discussed on the recent conferences calls.

Questions and comments can be forwarded to Steve and me.

Regards,

Tony Dang, P.Eng.
TMIG | TYLI

From: Natywary, Laurielle
To: Rachel.Ellerman@milton.ca
Cc: Andrews, Mark; "Jessica Bester" (jbester@hrca.on.ca); Clackett, Robert; McCabe, Owen; Tsai, David
Subject: North Porta CESS - Revised Figures for CESS Buffers and Allowances
Date: Monday, March 14, 2022 4:22:04 PM
Attachments: 2022-02-10 - 17197 - North Porta CESS Allowances.pdf

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Good Afternoon Rachel,

Regional staff have reviewed the “North Porta (Orlando Corporation) Revised Figures for CESS Buffers and Allowances, prepared by TMIG and dated February 10, 2022 and offer the following comments:

1. Regional Planning staff comments on the Comprehensive Environmental Servicing Study (CESS) (dated October 29, 2021) and on the Local Official Plan Amendment and Regional Official Plan Amendment (dated January 31, 2022) should be addressed as the technical work needs to be finalized prior to final development limits being confirmed.

2. It has been noted that the configuration and location of the replicated wetland north of the realigned channel (RS31) still needs to be confirmed in the CESS. The location of the replicated wetland should consider the previous comments provided by the Region. All plans and figures will need to be revised once the location of the replicated wetland, including appropriate buffers has been confirmed. Please refer to comment # 11 of the Region’s comments on the CESS dated October 29, 2021.

3. The boundaries of proposed refined Regional Natural Heritage System (NHS), not only the key features and components should be clearly illustrated on the Figure as per policy 116.1 of the Regional Official Plan (ROP). The boundaries of the proposed refined Regional NHS should include the realigned tributary of Sixteen Mile Creek (watercourse R3S1) and associated buffers. Please refer to comment # 15 of the Region’s comments on the CESS dated October 29, 2021.

4. As noted in previous comments (refer to comment # 12 of the Region’s Comments on the CESS dated October 29, 2021), any encroachments into the 30 metre Vegetation Protection Zone (VPZ) of the Greenbelt NHS for components of stormwater infrastructure and green infrastructure (i.e., bioswales) requires justification that it will not result in negative impacts to the NHS, and it must be demonstrated that it is considered essential infrastructure (as defined in policy 233 of the ROP), after all viable options have been explored. In addition, the proposed 6 m erosion access allowance for the realigned channel (RS31) is not to be located in the 30 m VPZ. This is not considered green infrastructure as per policies within the Greenbelt Plan. Accordingly, please ensure there are no encroachments and that all portions of the erosion access allowances are contained wholly outside of the 30 m VPZ. Please refer to CH’s comments dated March 3, 2022 for additional technical details on the erosion access allowance.

5. Conservation Halton is the ecological technical advisors for Halton Region on the CESS and subsequent planning applications for the study area. Therefore, Conservation Halton’s e-mail on the Revised Figures for CESS Buffers and Allowances dated March 3, 2022 should be addressed to their satisfaction.

Please feel free to be in touch if you have any questions or concerns,

Sincerely,

Laurielle

Laurielle Natywary
Manager, Community Planning North
Planning Services
Legislative & Planning Services
Halton Region
905-825-6000, ext. 7865 | 1-866-442-5866

+1.416.899.5488