APPENDIX A-11

Correspondence

NOARM Meeting, March 18, 2019

NOARM MEETING AGENDA

March 18, 2019

Mattamy Joshua's Creek
Phase 3 EIR/FSS Addendum

Purpose: To discuss EIR/FSS content specific to the next Mattamy Draft Plan of Subdivision

---

1.0 Introductions

2.0 Draft Plan of Subdivision, Phase 3

3.0 EIR/FSS Addendum Content

- Joshua's Ck EIR/FSS addressed overall SWM / environmental matters and identified items to be addressed through future Addendums (Section 13.1 and 13.2). Agency comments on Joshua's Ck EIR/FSS also noted some matters to be addressed in future addendums; these were documented in Joshua's Ck Response Document (May 2018)

- Addendum to focus on next phase Draft Plan lands and adjacent areas and include:

    a. JC-6 channel characterization and restoration – aquatic habitat mapping; restoration requirements
    b. JC-6 and JC-7 fish sampling as per NOCSS TOR – spring work
    c. JC-6 road crossing design – alignment location generally accepted; additional review/data gathering/assessment related to:
        1. Terrestrial habitat including SAR
        2. Aquatic habitat and fluvial geomorphology
        3. Geotechnical
        4. Crossing Design – grading impacts, opening size, etc.
    d. LID measures – consistent approach as per Josh Ck EIR/FSS
    e. Grading – grading along NHS will be addressed in Addendum and included in Final EIR/FSS
    f. NHS and Core 10 boundary – coordination of NHS and core boundaries on adjacent lands
    g. Runoff to PSW 31 – adjacent owner issue; Mattamy lands do not contribute flows to wetland; not included in this Addendum
    h. Trails – site visit needed?
    i. Demonstrate conformance with Final Joshua's Ck EIR/FSS report
    j. Although outside of Draft Plan, address:
        - PSW 45 water balance – address conceptually
        - Update Pond 50 limit – clarify pond block boundary adjacent to core

4.0 Addendum Format

5.0 Coordination with Adjacent Landowner

NOARM MEETING NOTES
MARCH 18, 2019
Joshua's Creek EIR/FSS Addendum, Mattamy Phase 3 lands
Notes prepared by EIR/FSS Study Team

Attendees: R. Juliao, Town of Oakville (RJ)
J. Bester, Conservation Halton (JB)
Janette Brenner, Conservation Halton (JBr)
S. Mason, Conservation Halton (SM)
M. Dickie, Mattamy Homes (MD)
J. Mosdell, Mattamy Homes (JM)
L. Hellas, Bird and Hale (LH)
P. Villard, GEO Morphix (PV)
R. Kerr, DSEL (RK)
B. Betts, DSEL (BB)
M. O'Halloran, LGL (MO)
A. Huycke, Region of Halton

Purpose: To discuss the content and format of the Mattamy Phase 3 EIR/FSS Addendum

---

See attached agenda. The discussion and agreements reached on the content of the Addendum relating to each of the agenda topics are outlined below.

LH noted that Joshua's Ck EIR/FSS addressed overall SWM / environmental matters and identified items to be addressed through future Addendums (Section 13.1 and 13.2). Agency comments on Joshua's Ck EIR/FSS also noted some matters to be addressed in future addendums; these were documented in Joshua's Ck Response Document (May 2018). The next EIR/FSS Addendum will focus on the next phase of Mattamy lands (Phase 3 lands) and adjacent areas. MD noted that the preliminary development plan will be modified to reflect outcome of the EIR/FSS Addendum work.

The content of the Phase 3 EIR/FSS Addendum was discussed including the following topics:

Joshua's Creek Stream Reach JC-6

- LH noted that the EIR/FSS Addendum would include the study of JC-6 to identify restoration opportunities. It was agreed that JC-6 is a red hatch stream which means that with the exception of any infrastructure works done by Mattamy, restoration is would be done by others.
- A general restoration concept plan will be provided for the reach. This study will also identify the area disturbed by future crossing and will provide details of the restoration requirements for that length only, which is responsibility of Mattamy.

Fishing Along JC-6 and JC-7

- JC-6 and JC-7 will be assessed this spring at which time geomorphologic work will be undertaken.
- PV discussed the approach to fishing and whether earlier videoing of fish would be beneficial. It was agreed that PV and SM would further discuss specifics regarding locations and methodology for fishing.

JC-6 Road Crossing Design

- LH advised that the approximate centreline location of this road crossing was generally accepted by CH and Town as per earlier submissions; the approximate centreline was determined in field with agencies. In response to SM, LH confirmed that the approximate centreline location is to the west of the Core limit and conforms to the Town's Master Plan.
- JBr confirmed that a site walk work was completed and advised that she had notes of this site walk (SM indicated that this occurred when she was on maternity leave).
- It was agreed that the location and design will be finalized in this Addendum, as its alignment is required as part of the subdivision layout south of the stream corridor
- RJ noted the Town's support to addressing this in the Addendum.
- SM stated that CH has indicated in the past that a span crossing would be preferred; discussion included noting that what constituted a span still needs clarification as a valley span would not be feasible; also, crossing design would be one of the evaluation criteria in finalizing location and design.
- LH explained that crossing location may shift a few (±10m) metres east or west as part of determining preferred location and further that a a number of considerations to be used in assessing crossing location and design options will be developed by the EIR/FSS team.
- LGL will be responsible for and will undertake most of the natural heritage work; B&H will provide history and review/input to road crossing options.
- Regarding SAR, MO confirmed that bat work has been completed and submitted to MNRF; bird and vegetation (butternut) work for crossing area (including potential area shift east or west) will be done this spring.
- GEO Morphix will be responsible for aquatic habitat and geomorphological evaluation and assessment.
- Re: geotechnical considerations, RK explained that he would like to do some drilling to determine whether there were any soils or seepage issues that may influence crossing design or location. The Town and CH agreed that if a map was provided showing drilling locations and access routes, that permission could be granted. RK indicated that he would forward this information to the Town and CH so this work could be done as soon as possible.

LID measures

- DSEL confirmed that the approach to LID measures outlined in the Joshua's Creek EIR/FSS would be followed and that swales in vicinity of trails, etc., would not be 'bioswales'. This was agreed to by all.

Grading

- Outstanding grading comments from the Joshua's Creek EIR/FSS relate to locations adjacent to the NHS where there are small gullies that extend outside of the main NHS areas. Filling, grading implications to the NHS limit and setback will be examined for all locations. Most locations are along JC-6 and JC-7 but some are along JC-12 outside of development area of this phase. Since it is the same issue at each location, it was agreed that it would be preferable to address all of them at this time, even though some locations are outside of this phase's limits.

NHS and Core 10 Boundary

- LH confirmed that coordination of the NHS interface is underway with the adjacent landowner (Coscorp). The Mattamy development plan will be adjusted if required to ensure appropriate NHS connectivity between developments. Based on discussions to date, modifications the development plan are required near Core 10.

- SM asked whether the alternative alignment for JC-7 was being pursued. LH confirmed that the alternative alignment is not being pursued; the existing alignment would stay.
- JBr requested that the road adjacent to the northern limit of Core 10 does not create any grading problems for the adjacent owner. RK noted that since as DSEL is the engineer for both projects, it will be easy to coordinate.

Runoff to PSW 31

- LH noted that the management of runoff to PSW 31 is an adjacent owner issue as the Mattamy lands do not contribute flows to this wetland. Therefore, it will not be included in this Addendum
- SM asked that this issue be noted in the consolidated report in Section 13 re: study requirements for adjacent EIR/FSS's. This will be done.

Trails

- LH explained that a Major Trail is located along the southern edge of the JC-6 and JC-7 corridor. As woody vegetation does not define the feature limit and therefore the corridor limit in this location, there are some areas where thicket is located in the buffer area. LGL will undertake a tree inventory through this area to determine if there are any specimen trees that have the potential to be retained.
- It was agreed that a site visit for the trail would occur subsequent to the submission of the Addendum. At that time, the proposed trail alignment could be viewed. RJ requested that the Town's Parks staff be present for that site walk.

Pond 50 limit and PSW 45

- LH noted that although these features are outside the Phase 3 development area, they would be addressed in this report, to complete all NHS-related issues.
- The SWM pond block limits adjacent to the NHS would be confirmed (i.e., wetland buffer limit).
- PV noted that the geomorphological and aquatic habitat assessment work would inform the location for the SWM outfall. Direction on locating the outfall would be identified.
- LH advised that the PSW 45 water balance assessment also would be undertaken and conceptual requirements for the future management of flows to it with development and SWMF would be outlined. SM asked about groundwater contributions to the wetland and LH advised that that would be examined as part of the assessment.
- RJ and JBr concurred that it would be good that these items would be addressed in the Addendum.

Addendum Format

- LH noted that the Addendum report format will be similar to other North Oakville Addenda already submitted. Ryan Kerr referenced EM1 as the format that will be followed. Consistent with other addenda, Joshua's Creek EIR/FSS report topics/sections that are not affected/modified by this phase will not be re-written in the addendum report; reference will be made to the main document.
- The Town and CH agreed with the proposed format for this EIR/FSS Addendum.

APPENDIX K-8

Geotechnical Reports

Geotechnical Investigation Report, Proposed Culvert Crossing, Joshua's Creek Properties South of Burnhamthorpe Road East & West of 9th Line

October 7, 2019
Ref. No.: T19773

Mattamy (Joshua Creek) Limited
c/o David Schaeffer Engineering Limited
600 Alden Road, Suite 500
Markham, Ontario
L3R 0E7

Attention: Mr. Brian Betts

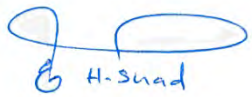
Dear Sir:

RE: GEOTECHNICAL INVESTIGATION REPORT
PROPOSED CULVERT CROSSING
JOSHUA CREEK PROPERTIES
SOUTH OF BURHAMTHORPE ROAD EAST & WEST OF 9TH LINE
OAKVILLE, ONTARIO

Please find enclosed our Geotechnical Investigation Report prepared for the above-mentioned project. We will be glad to discuss any questions arising from this work.

We thank you for giving us this opportunity to be of service to you.

Sincerely,
Shad & Associates Inc.



Houshang Shad, Ph.D., P. Eng.
Principal

Shad & Associates Inc. **GEOTECHNICAL, ENVIRONMENTAL AND MATERIALS CONSULTING ENGINEERS**
83 Citation Drive, Unit 9
Vaughan, Ontario L4K 2Z6
Tel: (905) 760-5566
Fax: (905) 760-5567
www.shadinc.ca

GEOTECHNICAL INVESTIGATION REPORT
PROPOSED CULVERT CROSSING
JOSHUA CREEK PROPERTIES
SOUTH OF BURHAMTHORPE ROAD EAST & WEST OF 9TH LINE
OAKVILLE, ONTARIO

Submitted to:

Mattamy (Joshua Creek) Limited
c/o David Schaeffer Engineering Limited
600 Alden Road, Suite 500
Markham, Ontario
L3R 0E7

Attention:

Mr. Brian Betts

Submitted by:

Shad & Associates Inc.
83 Citation Drive, Unit 9
Vaughan, Ontario, L4K 2Z6
Canada

Tel: (905) 760-5566
Fax: (905) 760-5567

October 7, 2019

T19773

TABLE OF CONTENTS

FIGURES

RECORD OF BOREHOLES

ENCLOSURES

1.0 INTRODUCTION

Shad & Associates Inc. was retained by Mattamy (Joshua Creek) Limited to carry out a geotechnical investigation for the proposed road culvert crossing over Joshua Creek, located south of Burhamthorpe Road East, West of 9th Line, in Oakville, Ontario, as shown in Figure 1. At this location, we understand that a wastewater trunk sewer line may also be constructed at a lower elevation below the proposed culvert.

The purpose of this geotechnical investigation was to obtain some information about the existing subsurface conditions at the site by means of a number of boreholes. Based on our interpretation of the data obtained, some recommendations are provided on the geotechnical aspects of design at the site.

This report contains the findings of our geotechnical investigation together with our recommendations and comments. These recommendations and comments are based on factual information and are intended only for use by the design engineers.

We recommend on-going liaison with Shad & Associates Inc. during the design and construction phases of the project to ensure that the recommendations in this report are applicable and/or correctly interpreted and implemented. Also, any queries concerning the geotechnical aspects of the proposed project should be directed to Shad & Associates Inc. for further elaboration and/or clarification.

2.0 INVESTIGATION PROCEDURES

The fieldwork was performed on September 16 and 17, 2019 and consisted of augering and sampling altogether three boreholes down to a depth of about 13.9 m below existing ground surface at Borehole 4000 drilled on the north tableland and down to a depth of approximately 1.6 m at Boreholes 4001 and 4002 that were drilled close to the creek within the valley floor. Furthermore, considering the proposed construction invert elevations, the boreholes were then extended down into the weathered shale by rock coring to 17.2, 10.5 and 10.1 m below existing grade at Boreholes 4000, 4001 and 4002, respectively. We wish to mention that the boreholes for this project were numbered in 4000-series in order to distinguish them from the previous boreholes drilled at the site. It should also be noted that a fourth borehole was to be drilled on the south tableland, but due to access issues, it could not be drilled. The borehole locations were staked-out and surveyed by RP-E Surveying Limited (O.L.S.), who also provided us with their geodetic ground surface elevations. The approximate borehole locations are shown in Figure 2.

The boreholes were advanced using hollow stem continuous flight augers, with a track-mounted power auger drilling rig, under the full-time supervision of experienced geotechnical personnel from Shad & Associates Inc. Soil samples were taken at 0.76 to 1.5 m intervals for the full depth of the investigation and Standard Penetration Tests (SPT) were performed in accordance with ASTM D1586. This consists of freely dropping a 63.5 kg (140 lbs) hammer a vertical distance of 0.76 m (30 inches) to drive a 51 mm (2 inches) diameter o.d. split-barrel (split

spoon) sampler into the ground. The number of blows of the hammer required to drive the sampler into the relatively undisturbed ground by a vertical distance of 0.30 m (12 inches) is recorded as SPT-'N' value of the soil and this gives an indication of the consistency or the relative density of the soil deposit.

The bedrock was cored using double tube core barrel in HQ-size and the obtained cores were studied for Rock Quality Designation (RQD) and Percentage Recovery.

Upon completion of boreholes, the soil and rock samples were transported to our Soil Laboratory for further examination and laboratory testing. Soil laboratory testing consisting of moisture content determination and gradation analysis were performed on representative soil samples. The results of the in-situ and laboratory tests are presented on the corresponding Record of Borehole Sheets. The Gradation Analysis curves are shown in Enclosure A.

It should be noted that samples obtained during this investigation will be stored in our Soil Laboratory for three months and will be disposed thereafter.

3.0 SUB-SURFACE CONDITIONS

The stratigraphic units and groundwater conditions are briefly discussed in this section. For more detailed information, reference should be made to the Record of Borehole Sheets.

3.1 Topsoil and Fill

Topsoil and fill were contacted at all three boreholes, extending down to depths ranging from approximately 0.7 to 0.9 m below existing ground surface.

It should be noted that the thickness and quality of topsoil and fill may vary significantly between and the beyond the borehole locations. Considering this as well as the limited diameter of the auger hole, it is recommended that allowance be made for possible variations when making construction estimates.

3.2 Clayey Silt Till

The fill deposit at Borehole 4000 was underlain by clayey silt till with occasional sand seams/interbeddings/pockets down to a depth of about 8.5 m below existing ground surface.

Standard Penetration Tests were performed at the site and the recorded 'N'-values within the clayey silt till were found to predominantly range from 17 to more than 30 blows/0.3 m penetration, indicating a very stiff to hard consistency. Selected samples from this layer were also tested for Natural Moisture Content and the results were found to generally range from 11 to 12% with a higher value of 18% measured within a moist to wet sand interbedding. Considering these results as well as the visual and tactile examination of the recovered soil samples, the clayey silt till is generally damp with occasional moist to wet sand seams/interbeddings/pockets.

Representative sample from the clayey silt till with occasional sand seams/interbeddings/pockets were tested for Gradation Analysis (Sieve Analysis and Hydrometer) as well as for Atterberg Limits (Liquid and Plastic Limits). The results are summarized below and they are presented on the Record of Boreholes and in Enclosure A.

	BH 4000: S5	BH 4000: S9
Gravel:	3%	4%
Sand:	27%	33%
Silt:	49%	46%
Clay:	21%	17%
Liquid Limit (LL):	22%	21%
Plastic Limit (PL):	17%	14%
Plasticity Index (PI):	5%	7%

Considering the above results, the clayey deposit has low plasticity.

It should be noted that due to the nature of their formation, cobbles and boulders should be expected to occur within the glacial deposits.

3.3 Silty Fine Sand

The glacial till at Borehole 4000 was in turn underlain by a wet and dense to very dense silty fine sand deposit down to a depth about 11.6 m below existing ground surface. The measured 'N'-values were 47 and more than 50 blows/0.3 m and the measured moisture content values were 18 and 20%.

3.4 Highly Weathered Shale / Silty Clay Matrix

The fine sand deposit at Borehole 4000 and the fill layer at Borehole 4001 were underlain by highly weathered shale/silty clay matrix down to depth of about 13.9 m and 1.4 m below existing grade, respectively. The highly weathered rock-soil matrix was noted to be hard and damp to moist with recorded 'N'-values of more than 50 blows/0.3 m and measured moisture content values of 7 to 18%.

3.5 Highly Weathered to Weathered Shale

Underlying the highly weathered shale/silty clay matrix at Borehole 4000 and 4001 and the fill deposit at Borehole 4002, the site was underlain by a highly weathered to weathered shale extending down to completion of the boreholes at 17.2, 10.5 and 10.1 m below existing ground surface, respectively. The shale bedrock was investigated by rock coring and the results are summarized in Table 1.

Table 1: Rock Coring Results

Borehole No.	Ground Surface Elevation m)	Core Run Below Existing Grade (m)	Total Core Recovery, TCR (%)	Rock Quality Designation, RQD (%)	Rock Quality Classification Based on RQD
BH 4000	176.7	~13.9-14.2	90	18	Very Poor
		~14.2-15.7	83	55	Fair
		~15.7-17.2	100	43	Poor
BH 4001	170.5	~1.6-2.1	77	29	Poor
		~2.1-3.6	93	37	Poor
		~3.6-5.2	90	63	Fair
		~5.2-6.6	89	73	Fair
		~6.6-8.1	98	77	Good
		~8.1-9.5	88	78	Good
		~9.5-10.5	98	90	Good
BH 4002	169.8	~1.6-2.0	81	19	Very Poor
		~2.0-3.5	95	37	Poor
		~3.5-5.1	90	62	Fair
		~5.1-6.6	100	65	Fair
		~6.6-7.9	94	76	Good
		~7.9-9.3	100	78	Good
		~9.3-10.1	95	69	Fair

Considering the above results, within the cored sections, the quality of the shale deposit is generally very poor to poor at higher elevations, but it became fair to good with increased depth.

The shale was noted to be horizontally jointed with occasional limestone seams/interbeddings. The joints and fractures within the deposit can be water bearing. The shale bedrock in this area is known to consist of Queenston Formation from the Upper Ordovician Period of the Paleozoic Era. These deposits are susceptible to degradation with prolonged exposure to the weathering elements and would swell when unloaded.

3.6 Groundwater Conditions

Groundwater conditions were monitored during and upon the completion of drilling as well as by installing a monitoring well in two of the boreholes. The results are summarized in Table 2.

Table 2: Measured Groundwater Data

Borehole	Existing Ground Surface Elevation (m)	Measured Groundwater Depth / Elevation (m)		
		Upon Borehole Completion	Sept.24, 2019	Oct.1, 2019
4000	176.7	N/A	8.4 / 168.3	8.2 / 168.5
4001	170.5	N/A	-	-
4002	169.8	N/A	1.0 / 168.8	0.9 / 168.9

It should be pointed out that the groundwater at the site would fluctuate seasonally and can be expected to be somewhat higher during the spring months and in response to major weather events. Furthermore, perched water conditions may also exist within the fill overlying the native deposits.

4.0 DISCUSSION AND RECOMMENDATIONS

According to the preliminary information provided to us by David Schaeffer Engineering Limited (DSEL), we understand that a 9600 x 1200 mm bottomless concrete culvert will be installed within the valley floor with in and out inverts of 170.04 m and 169.16 m, respectively. Upon installation of the culvert, the area will be raised and the proposed road grade will range from about 176.7 to 177.8 m on the north and south sides, respectively.

We also understand that a wastewater trunk may also be installed across the valley at approximate inverts of about 163 to 164 m. However, the exact project details and construction methodology were not known at the time of preparation of this report.

Considering the above information, some discussions and recommendation are provided in the following sections.

4.1 Proposed Culvert Crossing

The following recommendations are provided based on the preliminary information provided to us. These will need to be reviewed and confirmed once the project details are finalised.

4.1.1 Foundation

Boreholes 4001 and 4002 were located close to the two ends of the proposed culverts. Considering the subsurface conditions encountered at these boreholes, the proposed structure could be supported on spread footings founded on the undisturbed and hard highly weathered shale/silty clay matrix or on the highly weathered to weathered shale. The recommended bearing resistances and corresponding highest founding levels are provided in Table 3.

Table 3: Recommended Bearing Resistance for Spread Footings

Borehole	Highest Founding Level (m)		Founding Material	Bearing Resistance (kPa)	
	Depth	Elevation		SLS	Factored ULS
BH 4001	± 0.9	± 169.6	Highly Weathered Shale/ Hard Silty Clay Matrix	550	825
	± 1.5	± 169.0	Highly Weathered Shale	1,000	1,500
BH 4002	± 0.9	± 168.9	Highly Weathered Shale	550	825
	± 1.5	± 168.3	"	1,000	1,500

*Higher Bearing Capacity values are available at deeper elevations, if required.

The bearing resistance values are for vertical concentric loads only. Effect of load inclination and eccentricity need to be taken into account as per the CHBDC.

An ultimate friction factor of 0.5 is recommended to evaluate sliding resistance developed between the underside of concrete footing and the highly weathered shale / hard silty clay matrix.

The footing subgrade should be inspected and evaluated by the Geotechnical Engineer prior to concreting to ensure that the footings are founded on competent subgrade capable of supporting the recommended design pressure.

Design frost penetration depth for the general area is 1.2 m. Therefore, a permanent soil cover of 1.2 m or its thermal equivalent is required for frost protection of foundations.

The founding subgrade would soften when exposed. Creek flow diversion and appropriate dewatering methods, such as pumping from sumps, should also be employed to maintain a reasonably dry subgrade. A mud slab should be placed on the prepared bearing surface to minimize the effects of weathering and construction disturbance.

4.1.2 Backfill and Lateral Earth Pressures

Backfill to the crossing structure should consist of free-draining, non-frost susceptible granular materials meeting Granular A or Granular B requirements. Reference should be made to the backfill and subdrain arrangements stipulated in the OPSD 803 series for the culvert. The excavated on-site materials are not suitable for backfilling adjacent to the structure walls.

The lateral earth pressures acting on the structures, assuming full drainage from behind the walls, may be computed using the following pressure distribution:

$$p = K(\gamma H + q)$$

where p = lateral earth pressure acting at depth H, kPa
K = earth pressure coefficient (see table 5 below)
γ = unit weight of retained soil or backfill, kN/m^3
H = depth below top of wall where pressure is computed, m
q = surcharge pressure including traffic loads, kPa

Table 5 lists the unfactored parameters recommended for design, assuming an essentially level ground surface behind and in front of the wall:

Table 5: Earth Pressure Parameters

Parameter	Retained Material	
	OPSS Granular A	**OPSS Granular B**
Unit Weight, kN/m^3	22	21
Friction Angle, degrees	35	30
Active Pressure Coefficient, K_a	0.27	0.33
At-Rest Pressure Coefficient, K_0	0.43	0.5
Passive Pressure Coefficient, K_p	3.7	3.0

It should be noted that the coefficient of lateral earth pressure for the passive condition has been reduced in order to limit the wall movement that is necessary to mobilize the passive condition.

If lateral movements are not permissible and/or the wall is restrained from lateral yielding, the at-rest pressure coefficient, K_0, should be used. If the wall design allows lateral yielding (non-rigid structure), the active earth pressure coefficient, K_a, may be used.

The earth pressure coefficients in the table above do not include potential compaction effects that must be included in the design. Compaction effects should be considered as per the CHBDC.

The backfill material should be placed in 150 mm thick lifts and compacted to 95% of SPMDD, or as per applicable Town of Milton specifications. The backfill should be placed and compacted in simultaneous equal lifts on both sides of the structure, and the top of the backfill elevation should

be the same on both sides of the structure at all times. Heavy compaction equipment should not be used adjacent to the walls or roof of the structure.

Erosion protection should be provided at the new structure inlet and outlet areas. Design of the erosion protection measures must consider hydrologic/hydraulic concerns and should be carried out by specialist experienced in those fields. Vegetation cover or other protective measures should be established on all exposed earth surfaces to protect against surficial erosion.

4.1.3 Engineered Fill

Upon installation of the culvert, the area within the valley will need to be raised with engineered fill in order to receive the road pavement structure at about 176.7 to 177.8 m on the north and south sides, respectively. Engineered fill could be placed after stripping all topsoil, any soils containing excessive organics and otherwise unsuitable soils. The following placement procedure is recommended.

(i) The area to receive the engineered fill should be stripped of any topsoil, fill and other compressible, weak and deleterious materials. After stripping, the entire area should be inspected and approved by the geotechnical engineer. Spongy, wet or soft/loose spots should be sub-excavated to stable subgrade and replaced with compactable approved soil, compatible with subgrade conditions, as directed by the geotechnical engineer.

(ii) The fill material should be placed in thin layers not exceeding approximately 200 mm when loose. Oversize particles (cobbles and boulders) larger than 120 mm should be discarded, and each fill layer should be uniformly compacted with a suitably heavy compactors, suitable for the type of fill used, to at least 98% of its Standard Proctor Maximum Dry Density.

The on-site inorganic soils are generally acceptable for use as engineered fill, provided they are not contaminated with the overlying organic rich deposits and any organic inclusions are removed. Depending on the construction season, the on-site soils may require some reconditioning, wetting or drying.

(iii) Full-time geotechnical inspection and quality control (by means of frequent field density and laboratory testing) are necessary for the construction of a certifiable engineered fill. Compaction procedures and efficiency should be controlled by a qualified geotechnical technician.

(iv) The engineered fill should not be frozen and should be placed at a moisture content within 2% of the optimum value for compaction. The engineered fill should not be performed during winter months when freezing ambient temperatures occur persistently or intermittently.

4.1.4 Excavating and Dewatering

All excavations should be carried out in accordance with the Ontario Health and Safety Regulations. The soils to be excavated can be classified as follows:

-Topsoil / Fill, Type 3
Dense to Very Dense Silty Fine Sand (after dewatering)

-Very Stiff to Hard Clayey Silt Till,
Highly Weathered Shale/Silty Clay Matrix Type 2

Accordingly, for Type 3 soils, a side slope of 1H:1V is required for temporary excavations in accordance with the Ontario Health and Safety Regulations. However, in Type 2 soils, the bottom 1.2 m of excavations could be kept near vertical. Near the surface within the topsoil and fill, flatter side slopes may also be required. Any excavations into the dense and wet silty fine sand deposit should only be attempted after advance dewatering.

Stockpiles of excavated materials should be kept at least 3.0 m from the edge of the excavation to avoid slope instability. Care should also be taken to avoid overloading of any underground services/structures by stockpiles.

Considering the recommended depths for footings provided in Table 3 and the subsurface conditions encountered at the boreholes, no major dewatering problems are anticipated, although some dewatering may have to be carried out for excavations due to surface runoff or from any perched water within the fill layer or groundwater seepage from sand seams/zones within the native deposits. We are of the opinion that these should be minor and manageable by pumping from temporary sumps protected against erosion, if required. Such sumps should be dug outside the foundation footprint to minimize disturbance to the footing grade. Creek flow diversion should also be employed to maintain a reasonably dry subgrade.

No major excavation difficulties are foreseen but allowance should be made for boulders and cobbles which occur randomly in glacial deposits.

4.2 Proposed Wastewater Trunk

Based on the information provided to us by DSEL, we also understand that a wastewater trunk may also be installed across the valley with its bottom invert generally ranging from about 163 to 164 m. However, the exact project details and construction methodology were not known at the time of preparation of this report.

Considering the subsurface conditions encountered at the boreholes, the proposed trunk should generally be installed within the weathered shale, however, part of the trunk on the north side should also encounter some highly weathered shale/hard silty clay. It should however be noted that no boreholes were placed on the south tableland due to access issues and this should be carried out prior to tunneling.

Considering the above information, the trunk may be installed by tunneling. The tunnel is expected to be advanced mainly through the Queenston formation shale with occasional to some limestone seams/interbeddings. Should the tunnel face occur under mixed conditions with the shale bedrock and highly weathered shale/hard silty clay matrix, we recommend that consideration be given to lowering the tunnel within the bedrock and maintain the rock cover to at least 2 times the tunnel diameter.

In carrying out the tunnelling, consideration should be given to high in-situ horizontal stresses existing in the rock, causing compressive stress concentrations around the floor and crown of the opening and tensile stresses at the sidewall, the expected long-term deformations causing the rock to squeeze into the tunnel, the possibility of encountering combustible gas and the tendency for the shale to deteriorate over time when exposed to the weather elements.

The selection of the tunnelling equipment, method and type of temporary support should be the contractor's choice. In the selection of these, the contractor should consider the quality of the shale rock and the limestone seams/interbeddings. We would expect the tunnel to be mined using a shielded TBM fitted with a combination of disc and pick cutters, although some contractor may elect to use a main beam type TBM or a micro TBM.

In Queenston shale bedding planes, bedding shears and other shear zones exist throughout the formation. A major effect of these planes of weakness on tunnel excavations, combined with stress redistribution around the tunnel opening, will be to promote delamination and slabbing. As the tunnel drive on the proposed gradient will often intersect these bedding or shear planes, there is a potential for rock wedges and roof slabs to develop and drop off. Immediate temporary support is required for the safety of the workers.

Considering the time-dependent deformation of the Queenston shale deposit and that it will squeeze into the tunnel opening, it is recommended that the annular void around the main pipe be grouted after at least 4 to 6 months following excavation. Between the temporary tunnel liner and the pipe segments, a compressible low strength, low modulus grout material (such as foamed or cellular grout) should be placed that will absorb these long-term deformations without transferring the high stresses to the permanent main pipe. Hardwood blocking and wedges used to hold the pipe in place during grouting must also be designed to accommodate the rock squeeze.

The Queenston shale is known to contain pockets of combustible gas and this should be monitored during tunnelling and proper ventilation should be provided.

Groundwater infiltration into the tunnel should be manageable using conventional sumps and pumps within the shafts. The presence of fractures within the shale deposit will provide seepage paths for the groundwater to enter the tunnel. Depending on the amount of seepage, grouting the cracks could be considered if excessive seepage is encountered.

Shafts constructed in shale deposits are generally circular or rectangular and within the upper overburden and highly weathered shale/silty clay matrix portions could be constructed using cast-in-place concrete ring segments inserted from the top of the excavation. Alternatively, continuous caissons could be used. These types of shafts are essentially watertight, which is generally preferred. The open face section of the shaft should be protected against weathering. All shoring

design must be in accordance with the 4th Edition of the Canadian Foundation Engineering Manual. Allowable bond stress for the rock anchors is 400 kPa (inserted at least 3 m into the sound rock). An allowable bearing capacity of 3000 kPa can be used for caissons installed at least 1 m into the sound shale. The loading from construction machinery must be considered in the design. If shoring is to be carried out during winter or if the excavation is to be left open for any period of time during subzero temperatures, shoring walls must be protected against frost penetration by means of insulation or heated hoarding. The driller should be aware of the obstructions within the soil-shale complex such as cobbles, boulders and rock slabs.

The exact tunnelling details were not available for our review at the time of preparation of this report. We would however recommend that once the tunnel details are available, we should review and provide additional comments.

We would recommend the tunnelling operation to be monitored for settlement using deep, intermediate and surface monitoring points. With good workmanship, it is possible to keep the settlements within 15 mm. If higher ground movement are experienced, the tunnelling operation must be immediately reviewed. We could provide the monitoring program once the tunnel details are finalized.

5.0 CONSTRUCTION INSPECTION AND TESTING

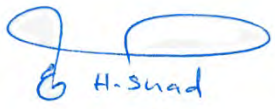
It is recommended that a programme of geotechnical/material inspection and testing be carried out during the construction phase of the project to confirm that the conditions exposed in the excavations are consistent with those encountered in the boreholes and the design assumptions, and to confirm that the various project specifications and materials requirements are being met.

6.0 CLOSURE

We recommend that once the details of the structures are finalized, our recommendations should be reviewed for their specific applicability.

The attached Report Limitations are an integral part of this report.

Sincerely,
Shad & Associates Inc.



Stephen Chong, P. Eng.
Senior Engineer

Houshang Shad, Ph.D., P. Eng.
Principal

Attention: Mr. Mike Dickie, Mattamy (Joshua Creek) Limited

STATEMENT OF LIMITATION

The conclusions and recommendations given in this report are based on information obtained at the testhole locations. Subsurface and groundwater conditions between and beyond the testholes may differ from those encountered at the testhole locations, and conditions may become apparent during construction which could not be detected or foreseen at the time of the site investigation.

The information contained herein in no way reflects on the environmental aspects of the project, unless stated otherwise.

The benchmark and elevations used in this report are primarily to establish relative elevation differences between the testhole locations and should not be used for other purposes, such as planning, grading, excavating, etc.

The design recommendations given in this report are project as well as site specific and then only if constructed substantially in accordance with the details stated in this report. 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.

The comments given in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of the testholes may not be sufficient to determine all the factors that may affect construction methods and costs. The contractors bidding on this project or undertaking 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.

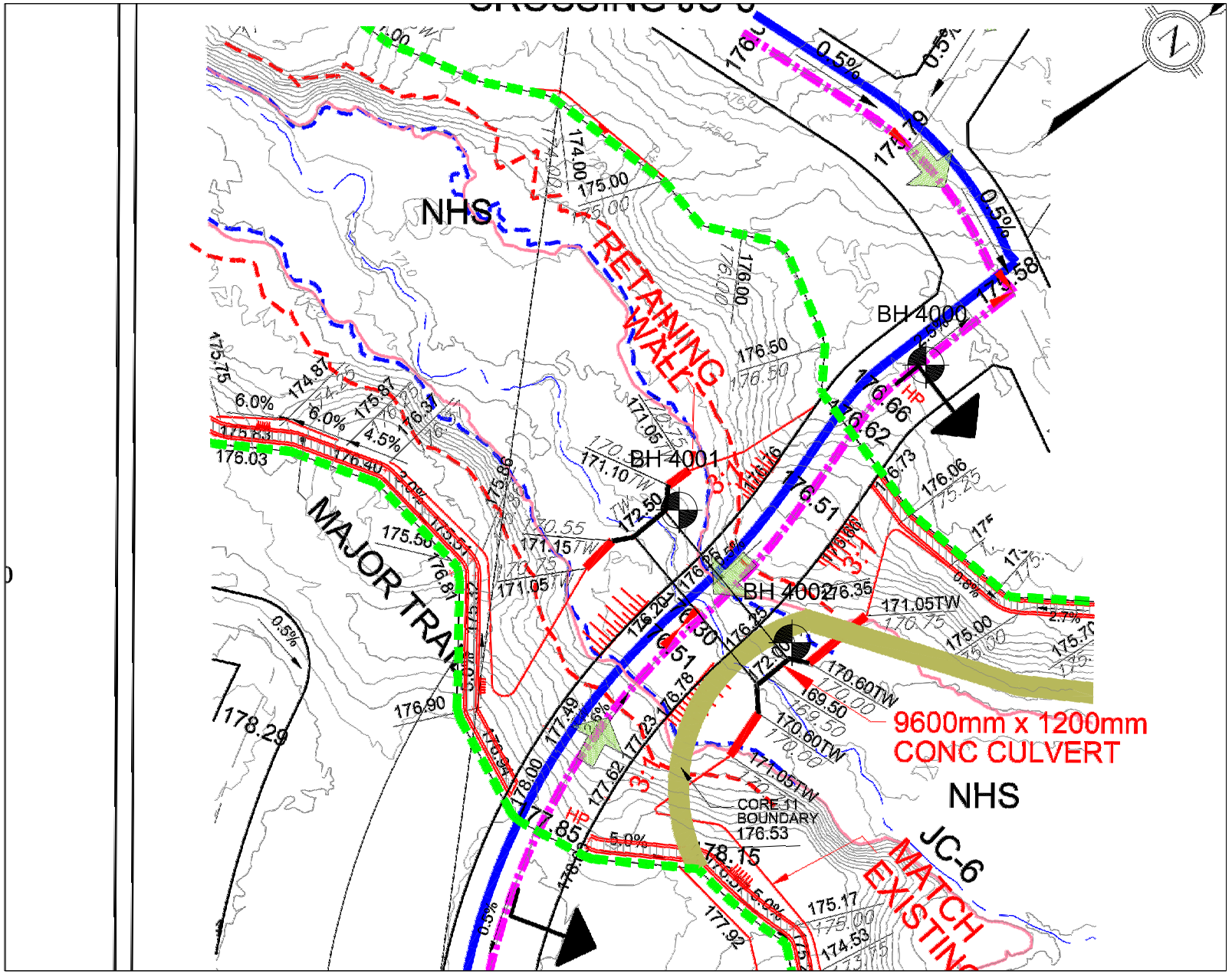
We recommend that we be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered in the testholes.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, is the responsibility of such third party. We accept no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

FIGURES

Figure 1: Site Location Plan
Figure 2: Borehole Location Plan

CLIENT: **Mattamy (Joshua Creek) Ltd.**	Drawn By: R.H.	**TITLE:** **SITE LOCATION PLAN**	Date: October 2019
	Checked By: H.S.		Project No.: **T19773**
SHAD & ASSOCIATES INC. GEOTECHNICAL, ENVIRONMENTAL AND MATERIALS CONSULTING ENGINEERS 83 Citation Drive, Unit 9 Vaughan, Ontario, L4K 2Z6 Tel: (905) 760-5566 Fax: (905) 760-5567 www.shadinc.ca	Datum: -	**PROJECT:** **Geotechnical Investigation** Proposed Road Culvert Crossing South of Burnhamthorpe East, West of 9th Line Oakville, Ontario	Figure No.: **1**
	Projection: -		
	Scale: N.T.S.		



LEGEND:

BH 4000
Approximate Borehole Locations

NOTES:

1- All borehole locations are approximate.
2- Base Plan was provided by DSEL.
3- The Drawing should be read in conjunction with the associated report by Shad & Associates Inc. T19773.

CLIENT: Mattamy (Joshua Creek) Ltd.

SHAD & ASSOCIATES INC.
GEOTECHNICAL, ENVIRONMENTAL AND MATERIALS CONSULTING ENGINEERS
83 Citation Drive, Unit 9
Vaughan, Ontario, L4K 2Z6
Tel: (905) 760-5566
Fax: (905) 760-5567
www.shadinc.com

Drawn By:	R.H.
Checked By:	H.S.
Datum:	-
Projection:	-
Scale:	N.T.S.

TITLE: Borehole Location Plan

PROJECT: Geotechnical Investigation
Proposed Road Culvert Crossing
South of Burnhamthorpe East, West of 9th Line
Oakville, Ontario

Date:	October 2019
Project No.:	T19773
Figure No.:	2

RECORD OF BOREHOLES

Record of Boreholes (4000 - 4002)
Explanation of Borehole Logs

RECORD OF BOREHOLE 4000

Project No.: T19773 **CLIENT:** Mattamy Development Corporation **ORIGINATED BY:** R.H.

DATE: September 16 & 17, 2019 **LOCATION:** Burnhamthorpe Road, Oakville **COMPILED BY:** R.H.

DATUM: Geodetic **BOREHOLE TYPE:** Hollow Stem/Rock Coring **CHECKED BY:** H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 5 15 25 35	MONITORING WELL	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
176.7		Ground Surface										
176.5	0	**Topsoil**										
		brown, occ. dark brown **Silty Clay/Clayey Silt Fill** trace topsoil, some rootlets damp		1	SS	46	12			16 12		
176.0												
	1	light brown **Clayey Silt Till** damp, very stiff		2	SS	46	30			12		
		occ. oxidized fissures occ. sand pockets		3	SS	46	28			12		
	2			4	SS	3	43			11		
		hard		5	SS	46	36			11		Gradation Analysis & Atterberg Limits, S(5): 3 27 49 21 LL: 22% PL: 17% PI: 5%
	3			6	SS	46	36			11		
	4	occ. shale fragments some oxidized fissures		7	SS	46	35			11		
	5											
	6	grey moist to wet, very stiff occ. sand interbedding		8	SS	46	17			18		
	7											

RECORD OF BOREHOLE 4000

Project No.: T19773 CLIENT: Mattamy Development Corporation ORIGINATED BY: R.H.

DATE: September 16 & 17, 2019 LOCATION: Burnhamthorpe Road, Oakville COMPILED BY: R.H.

DATUM: Geodetic BOREHOLE TYPE: Hollow Stem/Rock Coring CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS
	8	damp, hard some sand seams		9	SS	46	51	
168.1								
	9	grey **Silty Fine Sand** sand seams wet, dense		10	SS	20	47	
	10							
		very dense		11	SS	36	75/20cm	
165.1	11							
	12	reddish brown, occ. light grey **Highly Weathered Shale/ Silty Clay** damp to moist, hard		12	SS	20	50/8cm	
	13			13	SS	15	50/3cm	
162.7				14	SS	20	50/5cm	
	14	**Highly Weathered Shale**		RC-1	RC	-	-	
		reddish brown, occ. light grey **Weathered Shale**		RC-2	RC			

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH kPa
20 40 60 80 100

WATER CONTENT (%)
5 15 25 35

WATER CONTENT (%)	
12	
18	
20	
14	
18	
13	

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

Gradation Analysis & Atterberg Limits, S(9)
4 33 46 17
LL: 21%
PL: 14%
PI: 7%

possible cobbles/boulder

Approximate Invert for Proposed Wastewater Trunk @ ~ 164.0m

REC: Recovery
RQD: Rock Quality Designation

RC-1
REC: 90%
RQD: 18%

RECORD OF BOREHOLE 4000

Project No.: T19773 **CLIENT:** Mattamy Development Corporation **ORIGINATED BY:** R.H.

DATE: September 16 & 17, 2019 **LOCATION:** Burnhamthorpe Road, Oakville **COMPILED BY:** R.H.

DATUM: Geodetic **BOREHOLE TYPE:** Hollow Stem/Rock Coring **CHECKED BY:** H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	" N " VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 5 15 25 35	MONITORING WELL	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	15											RC-2 REC: 83% RQD: 55%
	16	**Weathered Shale** occ. limestone seams		RC-3	RC	-	-					RC-3 REC: 100% RQD: 43%
159.4	17											
		End of Borehole Cave-in Depth on Completion: None Groundwater Depth on Completion: N/A Measured Groundwaterl in Installed Monitoring Well on: September 24, 2019: 8.4m October 01, 2019: 8.2m										
	18											
	19											
	20											
	21											
	22											
154.3												

RECORD OF BOREHOLE 4001

Project No.: T19773 **CLIENT:** Mattamy Development Corporation **ORIGINATED BY:** R.H.

DATE: September 16 & 17, 2019 **LOCATION:** Burnhamthorpe Road, Oakville **COMPILED BY:** R.H.

DATUM: Geodetic **BOREHOLE TYPE:** Hollow Stem/Rock Coring **CHECKED BY:** H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 5 15 25 35	MONITORING WELL	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
170.5		Ground Surface										
170.3	0	**Topsoil**										
		brown **Silty Clay/Clayey Silt Fill** occ. topsoil, some rootlets damp		1	SS	46	8			11		REC: Recovery RQD: Rock Quality Designation
169.8												
	1	reddish brown **Highly Weathered Shale/Silty Clay** damp, hard		2	SS	46	70			7		
169.1												
168.9		Light grey **Highly Weathered Shale**		3	SS	5	50/8cm			4		
	2			RC-1	RC	-	-					RC-1 REC: 77% RQD: 29%
				RC-2	RC	-	-					RC-2 REC: 93% RQD: 37%
	3											
	4	reddish brown, occ. light grey **Weathered Shale** occ. limestone seams/interbeddings		RC-3	RC	-	-					RC-3 REC: 90% RQD: 63%
	5											
				RC-4	RC	-	-					RC-4 REC: 89% RQD: 73%
	6											Approximate Invert for Proposed Wastewater Trunk @ ~163.5m
	7			RC-5	RC	-	-					RC-5 REC: 98% RQD: 77%

RECORD OF BOREHOLE 4001

Project No.: T19773 **CLIENT:** Mattamy Development Corporation **ORIGINATED BY:** R.H.

DATE: September 16 & 17, 2019 **LOCATION:** Burnhamthorpe Road, Oakville **COMPILED BY:** R.H.

DATUM: Geodetic **BOREHOLE TYPE:** Hollow Stem/Rock Coring **CHECKED BY:** H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 5 15 25 35	MONITORING WELL	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	8											
	9			RC-6	RC	-	-					RC-6 REC: 88% RQD: 78%
	10			RC-7	RC	-	-					RC-7 REC: 98% RQD: 90%
159.9		**End of Borehole** Cave-in Depth on Completion: None Groundwater Depth on Completion: N/A										
	11											
	12											
	13											
	14											
155.5	15											

RECORD OF BOREHOLE 4002

Project No.: T19773 **CLIENT:** Mattamy Development Corporation **ORIGINATED BY:** R.H.

DATE: September 16 & 17, 2019 **LOCATION:** Burnhamthorpe Road, Oakville **COMPILED BY:** R.H.

DATUM: Geodetic **BOREHOLE TYPE:** Hollow Stem/Rock Coring **CHECKED BY:** H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 5 15 25 35	MONITORING WELL	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
169.8		Ground Surface										
169.6	0	**Topsoil**										
		reddish brown, occ. dark brown **Silty Clay/Clayey Silt Fill** some sand, occ. gravel some rootlets. occ. topsoil damp		1	SS	46	6			13		REC: Recovery RQD: Rock Quality Designation
168.9				2	SS	30	50/15cm			11, 5		
	1	reddish brownish grey **Highly Weathered Shale**										
		reddish brown		3	SS	5	50/8cm			4		
168.2				RC-1	RC	-	-					RC-1 REC: 81% RQD: 19%
	2											
				RC-2	RC	-	-					RC-2 REC: 95% RQD: 37%
	3											
		reddish brown, occ. light grey **Weathered Shale**										
	4			RC-3	RC	-	-					RC-3 REC: 90% RQD: 62%
	5											
				RC-4	RC	-	-					RC-4 REC: 100% RQD: 65%
	6											Approximate Invert for Proposed Wastewater Trunk @ ~ 163.5m
		occ. limestone seams/interbeddings										
	7			RC-5	RC	-	-					RC-5 REC: 94% RQD: 76%

September 24, 2019
October 01, 2019

RECORD OF BOREHOLE 4002

Project No.: T19773 **CLIENT:** Mattamy Development Corporation **ORIGINATED BY:** R.H.

DATE: September 16 & 17, 2019 **LOCATION:** Burnhamthorpe Road, Oakville **COMPILED BY:** R.H.

DATUM: Geodetic **BOREHOLE TYPE:** Hollow Stem/Rock Coring **CHECKED BY:** H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 5 15 25 35	MONITORING WELL	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	8											
	9			RC-6	RC	-	-					RC-6 REC: 100% RQD: 78%
159.7	10			RC-7	RC	-	-					RC-7 REC: 95% RQD: 69%
	11	**End of Borehole** Cave-in Depth on Completion: None Groundwater Depth on Completion: N/A Measured Groundwater in Installed Monitoring Well on: September 24, 2019: 1.0m October 01, 2019: 0.9m										
	12											
	13											
	14											
154.9												

SHAD & ASSOCIATES INC.

EXPLANATION OF BOREHOLE LOG

This form describes some of the information provided on the borehole logs, which is based primarily on examination of the recovered samples, and the results of the field and laboratory tests. It should be noted that materials, boundaries and conditions have been established only at the borehole locations at the time of investigation and are not necessarily representative of subsurface conditions elsewhere across the site. Additional description of the soil/rock encountered is given in the accompanying geotechnical report.

GENERAL INFORMATION

Project details, borehole number, location coordinates and type of drilling equipment used are given at the top of the borehole log.

SOIL LITHOLOGY

Elevation and depth

This column gives the elevation and depth of inferred geologic layers. The elevation is referred to the datum shown in the Description column.

Lithology Plot

This column presents a graphic depiction of the soil and rock stratigraphy encountered within the borehole.

Description

This column gives a description of the soil stratums, based on visual and tactile examination of the samples augmented with field and laboratory test results. Each stratum is described according to the following classification and terminology (Ref. Unified Soil Classification System):

The compactness condition of cohesionless soils (SPT) and the consistency of cohesive soils (undrained shear strength) are defined as follows (Ref. Canadian Foundation Engineering Manual):

Compactness of Cohesionless Soils	SPT N-Value
Very loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	> 50

Consistency of Cohesive Soils	SPT N-Value	Undrained Shear Strength kPa	Undrained Shear Strength psf
Very soft	0 to 2	0 to 12	0 to 250
Soft	2 to 4	12 to 25	250 to 500
Firm	4 to 8	25 to 50	500 to 1000
Stiff	8 to 15	50 to 100	1000 to 2000
Very stiff	15 to 30	100 to 200	2000 to 4000
Hard	> 30	Over 200	Over 4000

Soil Sampling

Sample types are abbreviated as follows:

SS	Split Spoon	TW	Thin Wall Open (Pushed)	RC	Rock Core
AS	Auger Sample	TP	Thin Wall Piston (Pushed)	WS	Washed Sample

Additional information provided in this section includes sample numbering, sample recovery and numerical testing results.

Field and Laboratory Testing

Results of field testing (e.g., SPT, pocket penetrometer, and vane testing) and laboratory testing (e.g., natural moisture content, and limits) executed on the recovered samples are plotted in this section.

Instrumentation Installation

Instrumentation installations (monitoring wells, piezometers, inclinometers, etc.) are plotted in this section. Water levels, if measured during fieldwork, are also plotted. These water levels may or may not be representative of the static groundwater level depending on the nature of soil stratum where the piezometer tips are located, the time elapsed from installation to reading and other applicable factors.

Comments

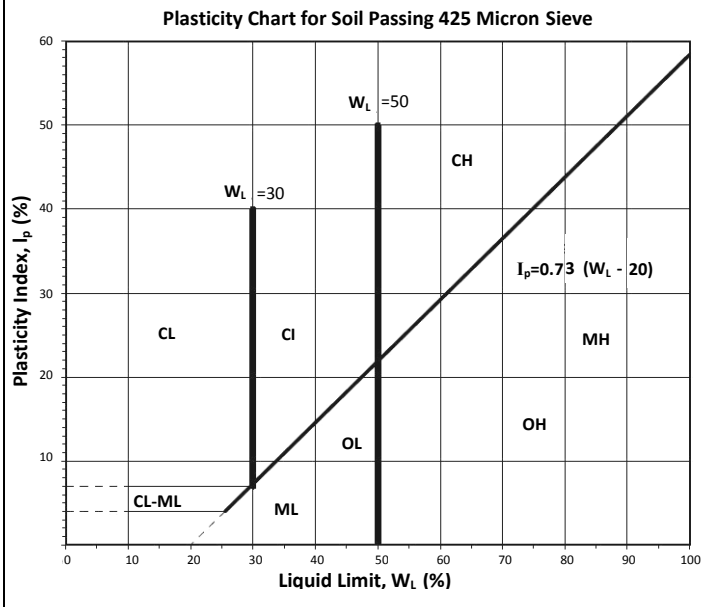
This column is used to describe non-standard situations or notes of interest.

SHAD & ASSOCIATES INC.

MODIFIED * UNIFIED CLASSIFICATION SYSTEM FOR SOILS
*The soil of each stratum is described using the Unified Soil Classification System (Technical Memorandum 36-357 prepared by Waterways Experiment Station, Vicksburg, Mississippi, Corps of Engineers, U.S Army. Vol. 1 March 1953.) modified slightly so that an inorganic clay of "medium plasticity" is recognized.

MAJOR DIVISION			GROUP SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA
COARSE GRAINED SOILS (MORE THAN HALF BY WEIGHT LARGER THAN 75µm)	GRAVELS MORE THAN HALF THE COARSE FRACTION LARGER THAN 4.75mm	CLEAN GRAVELS (TRACE OR NO FINES)	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 4;\ C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$
			GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS
		DIRTYGRAVELS (WITH SOME OR MORE FINES)	GM	SILTY GRAVELS, GRAVEL-SAND- SILT MIXTURES	ATTERBERG LIMITS BELOW "A" LINE OR P.I. MORE THAN 4
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES	ATTERBERG LIMITS BELOW "A" LINE OR P.I. MORE THAN 7
	SANDS MORE THAN HALF THE COARSE FRACTION SMALLER THAN 4.75mm	CLEAN SANDS (TRACE OR NO FINES)	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 6;\ C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$
			SP	POORLY GRADED GRAVELS, GRAVEL- SAND MIXTURES, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS
		DIRTY SANDS (WITH SOME OR MORE FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES	ATTERBERG LIMITS BELOW "A" LINE OR P.I MORE THAN 4
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES	ATTERBERG LIMITS BELOW "A" LINE OR P.I MORE THAN 7
FINE-GRAINED SOILS (MORE THAN HALF BY WEIGHT SMALLER THAN 75µm)	SILTS BELOW "A" LINE NEGLIGIBLE ORGANIC CONTENT	W_L < 50%	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY SANDS OF SLIGHT PLASTICITY	CLASSIFICATION IS BASED UPON PLASTICITY CHART (SEE BELOW)
		W_L < 50%	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS	
	CLAY ABOVE "A" LINE NEGLIGIBLE ORGANIC CONTENT	W_L < 30%	CL	INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY OR SILTY CLAYS, LEAN CLAYS	
		30% < W_L < 50%	CI	INORGANIC CLAYS OF MEDIUM PLASTICITY, SILTY CLAYS	
		W_L < 50%	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
	ORGANIC SILTS & CLAYS BELOW "A" LINE	W_L < 50%	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	WHENEVER THE NATURE OF THE FINES CONTENT HAS NOT BEEN DETERMINED, IT IS DESIGNATED BY THE LETTER "F", E.G SF IS A MIXTURE OF SAND WITH SILT OR CLAY
		W_L < 50%	OH	ORGANIC CLAYS OF HIGH PLASTICITY	
HIGH ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS	STRONG COLOUR OR ODOUR, AND OFTEN FIBROUS TEXTURE

SOIL COMPONENTS					
FRACTION	U.S STANDARD SIEVE SIZE		DEFINING RANGES OF PERCENTAGE BY WEIGHT OF MINOR COMPONENTS		
GRAVEL	COARSE	PASSING	RETAINED	PERCENT	DESCRIPTOR
		76 mm	19 mm	35-50	AND
				20-35	Y/EY
	FINE	19 mm	4.75 mm	10-20	SOME
				1-10	TRACE
SAND	COARSE	4.75 mm	2.00 mm		
	MEDIUM	2.00 mm	425 µm		
	FINE	425 µm	75 µm		
FINES (SILT OR CLAY BASED ON PLASTICITY)		75 µm			
OVERSIZED MATERIAL					
ROUNDED OR SUBROUNDED: COBBLES 76 mm TO 200 mm BOULDERS > 200 mm				NOT ROUNDED: ROCK FRAGMENTS > 76 mm ROCKS> 0.76 CUBIC METRE IN VOLUME	



Note 1: Soils are classified and described according to their engineering properties and behavior.
Note 2: The modifying adjectives used to define the actual or estimated percentage range by weight of minor components are consistent with the Canadian Foundation Engineering Manual (3rd Edition, Canadian Geotechnical Society, 1992)

TERMS OF ROCK CLASSIFICATION

Rocks are described by their composition and structural features and/or strength.

Recovery
Sum of all recovered rock core pieces from a coring run expressed as a percentage of the total length of the coring run.

Modified Recovery
Sum of those intact core pieces 100 mm+ in length expressed as a percentage of the length of the coring run.
The Rock Quality Designation (R.Q.D.) for modified recovery is:

R.Q.D. (%)	0-25	25-50	50-75	75-90	90-100
	Very poor	Poor	Fair	Good	Excellent

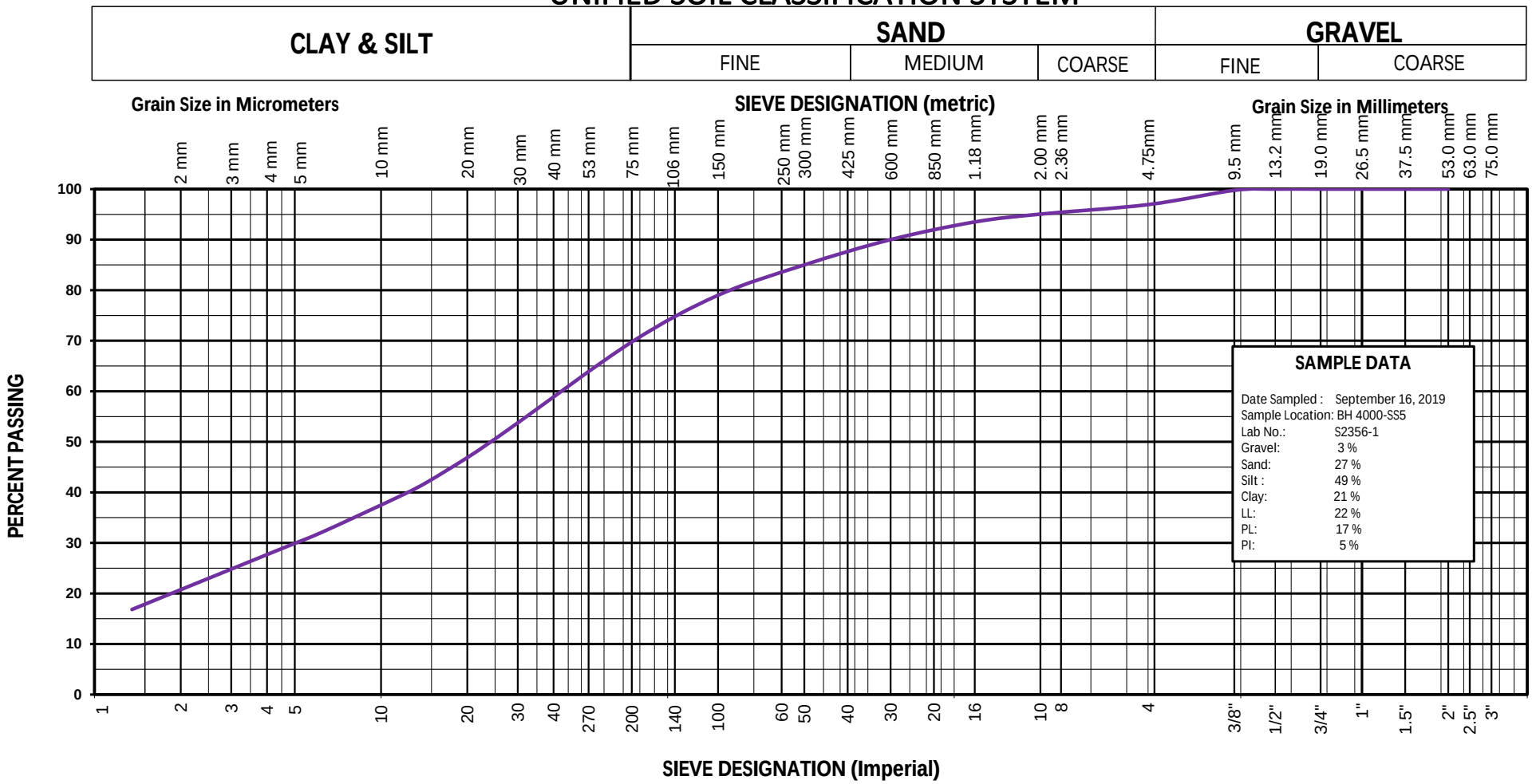
Jointing and Bedding

Spacing	50 mm	50-300 mm	0.3 m -1 m	1 m - 3 m	> 3 m
Jointing	Very close	Close	Mod. close	Wide	Very wide
Bedding	Very thin	Thin	Medium	Thick	Very thick

ENCLOSURES

Enclosure A: Laboratory Test Results

UNIFIED SOIL CLASSIFICATION SYSTEM



SHAD & ASSOCIATES INC.

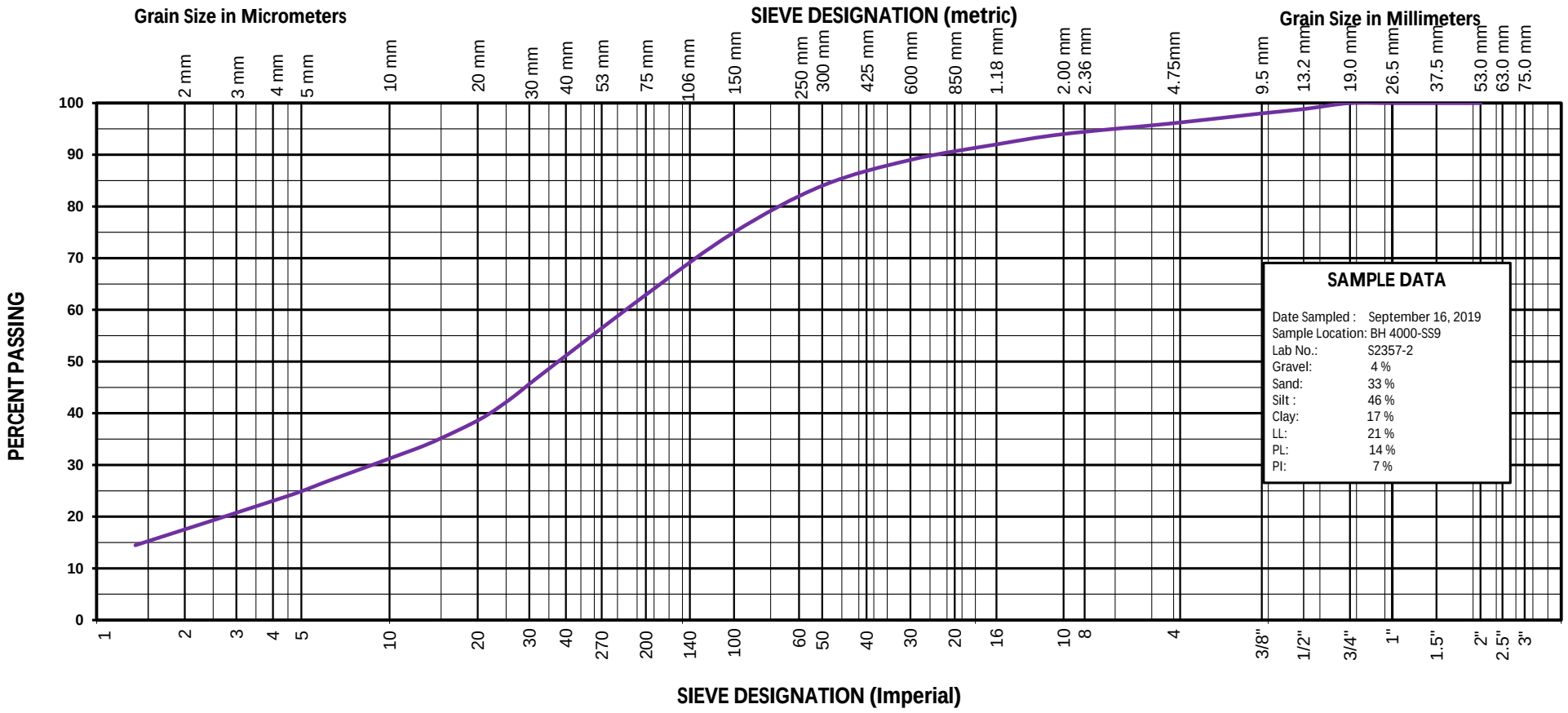
83 Citation Drive, Unit 9
Vaughan, Ontario
L4K 2Z6
Tel: (905) 760-5566
Fax: (905) 760-5567
www.shadinc.ca

SHAD & ASSOCIATES INC.

GRAIN SIZE ANALYSIS	**Project :** Joshua Creek Crossing	**Project No.:** T19773
	Client: Mattamy Development Corporation	

UNIFIED SOIL CLASSIFICATION SYSTEM

CLAY & SILT	SAND			GRAVEL	
	FINE	MEDIUM	COARSE	FINE	COARSE



SHAD & ASSOCIATES INC.

83 Citation Drive, Unit 9
Vaughan, Ontario
L4K 2Z6
Tel: (905) 760-5566
Fax: (905) 760-5567
www.shadinc.ca

SHAD & ASSOCIATES INC.

GRAIN SIZE ANALYSIS

Project : Joshua Creek Crossing

Project No.: T19773

Client: Mattamy Development Corporation

APPENDIX R

Terrestrial Inventories and SAR Consultation

APPENDIX R-5

Terrestrial Inventories and SAR Consultation

Wildlife Species Documented in Mattamy Phase 3 Lands by LGL Limited (2019)

Wildlife Species Documented in the Study Area (2019)						
Wildlife	**Scientific Name**	**Common Name**	**SARA**	**ESA**	**Legal Status**	**Other**
Herpetofauna	*Lithobates clamitans*	Green Frog			-	
	Dendroica petechia	Yellow Warbler			MBCA	
	Branta canadensis	Canada Goose			MBCA	
	Dumetella carolinensis	Gray Catbird			MBCA	
	Larus delawarensis	Ring-billed Gull			MBCA	
	Cathartes aura	Turkey Vulture			FWCA(P)	
	Corvus brachyhrynchos	American Crow			-	
	Icterus galbula	Baltimore Oriole			MBCA	
	Dolichonyx oryzivorus	Bobolink	THR	THR	MBCA	
	Molothrus ater	Brown-headed Cowbird			-	
	Spizella passerina	Chipping Sparrow			MBCA	
	Tyrannus tyrannus	Eastern Kingbird			MBCA	
	Sayornis phoebe	Eastern Phoebe			MBCA	
	Carpodacus mexicanus	House Finch			MBCA	
	Dendroica magnolia	Magnolia Warbler			MBCA	
	Zenaida macroura	Mourning Dove			MBCA	
	Colaptes auratus	Northern Flicker			MBCA	
	Vireo olivaceus	Red-eyed Vireo			MBCA	
	Buteo jamaicensis	Red-tailed Hawk			FWCA(P)	
	Actitis macularius	Spotted Sandpiper			MBCA	
	Vireo gilvus	Warbling Vireo			MBCA	
	Maleagris gallopavo	Wild Turkey			FWCA(G)	
	Empidonax alnorum	Alder Flycatcher			MBCA	
	Carduelis tristis	American Goldfinch			MBCA	
	Turdus migratorius	American Robin			MBCA	
	Spizella arborea	American Tree Sparrow			MBCA	
	Hirundo rustica	Barn Swallow	THR	THR	MBCA	
	Poecile atricapillus	Black-capped Chickadee			MBCA	
	Cyanocitta cristata	Blue Jay			FWCA(P)	
	Toxostoma rufum	Brown Thrasher			MBCA	
	Bombycilla cedrorum	Cedar Waxwing			MBCA	
	Quiscalus quiscula	Common Grackle			-	
	Geothlypis trichas	Common Yellowthroat			MBCA	

Wildlife Species Documented in the Study Area (2019)						
Wildlife	**Scientific Name**	**Common Name**	**SARA**	**ESA**	**Legal Status**	**Other**
	Picoides pubescens	Downy Woodpecker			MBCA	
	Sturnus vulgaris	European Starling			-	
	Spizella pusilla	Field Sparrow			MBCA	
	Eremophila alpestris	Horned Lark			MBCA	
	Passer domesticus	House Sparrow			MBCA	
	Troglodytes aedon	House Wren			MBCA	
Birds	*Passerina cyanea*	Indigo Bunting			MBCA	
	Charadrius vociferus	Killdeer			MBCA	
	Anas platyrhynchos	Mallard			MBCA	
	Cardinalis cardinalis	Northern Cardinal			MBCA	
	Stelgidopteryx serripennis	Northern Rough-winged Swallow			MBCA	
	Agelaius phoeniceus	Red-winged Blackbird			-	
	Passerculus sandwichensis	Savannah Sparrow			MBCA	
	Melospiza melodia	Song Sparrow			MBCA	
	Ardea herodias	Great Blue Heron			MBCA	
Mammals	*Canis latrans*	Coyote			FWCA(F)	
	Sylvilagus floridanus	Eastern Cottontail			FWCA(G)	
	Procyon lotor	Northern Raccoon			FWCA(F)	
	Odocoileus virginianus	White-tailed Deer			FWCA(G)	

SARA – federal *Species at Risk Act*:
- END - Endangered
- THR – Threatened
- SC - Special Concern

ESA - *Ontario Endangered Species Act*, 2007
- END – Endangered
- THR – Threatened
- SC - Special Concern

Other:
- Significant Wildlife Habitat Technical Guide:
- SWH – Area Sensitive Species
- INT - Interior Species

Legal Status:
- MBCA - *Migratory Birds Convention Act*
- ESA - E*ndangered Species Act*
- SARA - *Species at Risk Act*
- FWCA - *Fish and Wildlife Conservation Act*
- (P) Protected Species (G) Game species (F) Furbearing mammals

APPENDIX R-6

Terrestrial Inventories and SAR Consultation

Breeding Bird Species Documented in Mattamy Phase 3 Lands by LGL Limited (2019)

Breeding Bird Species Documented in the Study Area (2019)							
Birds	**Scientific Name**	**Common Name**	**SARA**	**ESA**	**Legal Status**	**Other**	**BBE[1]**
	Dendroica petechia	Yellow Warbler			MBCA		P,T,CF
	Branta canadensis	Canada Goose			MBCA		X
	Dumetella carolinensis	Gray Catbird			MBCA		P,T
	Larus delawarensis	Ring-billed Gull			MBCA		X
	Cathartes aura	Turkey Vulture			FWCA(P)		X
	Corvus brachyhrynchos	American Crow					H
	Icterus galbula	Baltimore Oriole			MBCA		S
	Dolichonyx oryzivorus	Bobolink	THR	THR	MBCA		H
	Molothrus ater	Brown-headed Cowbird			-		S
	Spizella passerina	Chipping Sparrow			MBCA		S
	Haliaeetus leucocephalus	Bald Eagle		SC	MBCA		X
	Tyrannus tyrannus	Eastern Kingbird			MBCA		S
	Sayornis phoebe	Eastern Phoebe			MBCA		S
	Carpodacus mexicanus	House Finch			MBCA		S
	Dendroica magnolia	Magnolia Warbler			MBCA		S
	Zenaida macroura	Mourning Dove			MBCA		H
	Colaptes auratus	Northern Flicker			MBCA		S
	Vireo olivaceus	Red-eyed Vireo			MBCA		S
	Buteo jamaicensis	Red-tailed Hawk			FWCA(P)		S
	Actitis macularius	Spotted Sandpiper			MBCA		S
	Vireo gilvus	Warbling Vireo			MBCA		S
	Maleagris gallopavo	Wild Turkey			FWCA(G)		H
	Empidonax alnorum	Alder Flycatcher			MBCA		P, T
	Carduelis tristis	American Goldfinch			MBCA		P, T
	Turdus migratorius	American Robin			MBCA		T
	Spizella arborea	American Tree Sparrow			MBCA		P, A
	Hirundo rustica	Barn Swallow	THR	THR	MBCA		T
	Poecile atricapillus	Black-capped Chickadee			MBCA		T
	Cyanocitta cristata	Blue Jay			FWCA(P)		T
	Toxostoma rufum	Brown Thrasher			MBCA		P, T
	Bombycilla cedrorum	Cedar Waxwing			MBCA		P, T
	Quiscalus quiscula	Common Grackle			-		T
	Geothlypis trichas	Common Yellowthroat			MBCA		T

Breeding Bird Species Documented in the Study Area (2019)							
Birds	**Scientific Name**	**Common Name**	**SARA**	**ESA**	**Legal Status**	**Other**	**BBE[1]**
	Picoides pubescens	Downy Woodpecker			MBCA		T
	Sturnus vulgaris	European Starling			-		T
	Spizella pusilla	Field Sparrow			MBCA		T
	Eremophila alpestris	Horned Lark			MBCA		P, T
	Passer domesticus	House Sparrow			MBCA		T
	Troglodytes aedon	House Wren			MBCA		T
	Passerina cyanea	Indigo Bunting			MBCA		T
	Charadrius vociferus	Killdeer			MBCA		T
	Anas platyrhynchos	Mallard			MBCA		T
	Cardinalis cardinalis	Northern Cardinal			MBCA		T
	Stelgidopteryx serripennis	Northern Rough-winged Swallow			MBCA		P, T
	Agelaius phoeniceus	Red-winged Blackbird			-		T
	Passerculus sandwichensis	Savannah Sparrow			MBCA		S, T
	Melospiza melodia	Song Sparrow			MBCA		P, T
	Ardea herodias	Great Blue Heron			MBCA		X

[1]BBE - Breeding Bird Evidence (according to Bird Studies Canada):

Possible Breeding:

- H - Species observed in its breeding season in suitable nesting habitat.
- S - Singing male present in its breeding season in suitable nesting habitat.

Probable Breeding:

- T - Permanent territory presumed through registration of territorial song on at least two days, a week or so apart, at the same place.
- A - Agitated behaviour or anxiety calls of an adult.

Confirmed Breeding:

- NU - Used nest or egg shell found (occupied or laid within the period of study).
- FY - Recently fledged young or downy young, including young incapable of sustained flight.
- CF - Adult carrying food for young.
- NE - Nest containing eggs.
- NY - Nest with young seen or heard.

APPENDIX R-8

Terrestrial Inventories and SAR Consultation

MNRF Emails re: SAR

-March 22, 2019 – Proposed Road Crossing, Bat Habitat Assessment

-July 9, 2019 – Phase 3 Trail Bat Habitat Assessment

March 22, 2019 – Proposed Road Crossing, Bat Habitat Assessment

Hi Martin,

Thank you for the detailed Technical Memorandum. I have reviewed it and I can confirm that an authorization under the Endangered Species Act would not be required. I agree with the proposed window for vegetation removal (November – March).

Aurora

AURORA McALLISTER | MANAGEMENT BIOLOGIST | ONTARIO MINISTRY of NATURAL RESOURCES and FORESTRY | AURORA DISTRICT OFFICE
50 Bloomington Road, Aurora, Ontario, L4G 0L8 | Email: aurora.mcallister@ontario.ca

---

From: Martin O'Halloran <mohalloran@lglcambridge.com>
Sent: March 13, 2019 2:42 PM
To: McAllister, Aurora (MNRF) <Aurora.McAllister@ontario.ca>
Cc: Jason Mosdell <Jason.Mosdell@mattamycorp.com>
Subject: Joshua's Creek Phase 3 - Proposed Road Crossing

Hi Aurora,

As discussed a few weeks ago, a road has been proposed to cross Joshua's Creek in Oakville as part of Mattamy's Phase 3 subdivision application. Please find the attached Technical Memorandum detailing the proposed works, our approach to habitat impact assessment-specifically for maternal bat roosts, and recommendations to avoid and/or mitigate impacts to roosting bats. Please feel free to call and discuss should you have any questions. Given the upcoming changes to the ESA/MNRF/MOECP, would you be able to provide written correspondence to confirm whether a permit is/isn't required to guide this application? Please note that we wish to retain the correspondence on file in the event that the ESA process change becomes unwieldly. As always, if you have any questions please feel free to call.

Regards,
Marty

Martin O'Halloran
Senior Fish and Wildlife Technologist,
ISA Certified Arborist
LGL Limited
environmental research associates
445 Thompson Drive, Unit 2
Cambridge Ontario N1T 2K7
Tel: 519-622-3300 Fax: 519-622-3310
Visit us on the web at www.lgl.com

July 9, 2019 – Phase 3 Trail Bat Habitat Assessment

Good morning,

Given the scale and the nature of the proposal, I would not require additional studies. Removing the trees during the previously recommended window should avoid any direct impacts to SAR bats.

Cheers,

Aurora

From: Martin O'Halloran <mohalloran@lglcambridge.com>
Sent: July 9, 2019 9:05 AM
To: McAllister, Aurora (MECP) <Aurora.McAllister@ontario.ca>
Subject: RE: Joshua's Creek Phase 3 - Proposed Road Crossing

Good morning,

Further to the road crossing that we discussed earlier this year (see below), we have a trail alignment proposed along the north end of the Phase 3 lands. The trail will occupy tablelands (currently cropped) for the most part and will take a short route into cultural woodland where 12 trees will require removal (4 apple, 1 basswood, 6 pear, 1 willow). We haven't conducted a full bat habitat assessment simply because I don't believe bat habitat will be affected by the proposed trail. Do you require a full bat habitat assessment to approve or would the Tree Management Plan suffice? It has a description of ELC, tree inventory, impact assessment and recommendations for Timing Windows.

Regards,
Marty

From: McAllister, Aurora (MNRF) [mailto:Aurora.McAllister@ontario.ca]
Sent: March-22-19 9:37 AM
To: Martin O'Halloran <mohalloran@lglcambridge.com>
Cc: Jason Mosdell <Jason.Mosdell@mattamycorp.com>
Subject: RE: Joshua's Creek Phase 3 - Proposed Road Crossing

Hi Martin,

Thank you for the detailed Technical Memorandum. I have reviewed it and I can confirm that an authorization under the Endangered Species Act would not be required. I agree with the proposed window for vegetation removal (November – March).

Aurora

AURORA McALLISTER | MANAGEMENT BIOLOGIST | ONTARIO MINISTRY of NATURAL RESOURCES and FORESTRY | AURORA DISTRICT OFFICE
50 Bloomington Road, Aurora, Ontario, L4G 0L8 | Email: aurora.mcallister@ontario.ca

---

From: Martin O'Halloran <mohalloran@lglcambridge.com>
Sent: March 13, 2019 2:42 PM
To: McAllister, Aurora (MNRF) <Aurora.McAllister@ontario.ca>
Cc: Jason Mosdell <Jason.Mosdell@mattamycorp.com>
Subject: Joshua's Creek Phase 3 - Proposed Road Crossing

Hi Aurora,

As discussed a few weeks ago, a road has been proposed to cross Joshua's Creek in Oakville as part of Mattamy's Phase 3 subdivision application. Please find the attached Technical Memorandum detailing the proposed works, our approach to habitat impact assessment-specifically for maternal bat roosts, and recommendations to avoid and/or mitigate impacts to roosting bats. Please feel free to call and discuss should you have any questions. Given the upcoming changes to the ESA/MNRF/MOECP, would you be able to provide written correspondence to confirm whether a permit is/isn't required to guide this application? Please note that we wish to retain the correspondence on file in the event that the ESA process change becomes unwieldly. As always, if you have any questions please feel free to call.

Regards,
Marty

Martin O'Halloran
Senior Fish and Wildlife Technologist,
ISA Certified Arborist
LGL Limited
environmental research associates
445 Thompson Drive, Unit 2
Cambridge Ontario N1T 2K7
Tel: 519-622-3300 Fax: 519-622-3310
Visit us on the web at www.lgl.com

APPENDIX U

Terrestrial Inventories and Assessments

APPENDIX U-1

Terrestrial Inventories and Assessments

Terrestrial Inventory Along Mattamy Phase 3 Trail Alignment

Tree Inventory Along Mattamy Phase 3 Trail Alignment

Project: TA8886 Phase 3
Client: Mattamy
Collectors: M. O'Halloran, V. Garofalo
Date: April 18, 30, and July 2, 2019
Area: Oakville

Tag#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	CONDITION																	Tree Management					Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Anticipated Removals	Anticipated Impacts	TPZ(m)-Oakville	Rationale	ESA/SARA	
1,001	*Pyrus sp.*	Pear	31.0	21,18		F	G	G	3										x							3.0			
1,002	*Pyrus sp.*	Pear	27.0	23.0		F	F	F	3							x		x								2.4			
1,003	*Pyrus sp.*	Pear	23.0	14.0		G	G	G	3																	2.4			
1,004	*Quercus macrocarpa*	Bur Oak	21.0			G	G	G	3																	2.4			outside property
1,005	*Tilia americana*	Basswood	28.0			D	D	D	0																	2.4			
1,006	*Pyrus sp.*	Pear	17.0	14,8		G	G	G	3																	2.4			outside property
1,007	*Quercus macrocarpa*	Bur Oak	18.0			G	G	G	3																	2.4			
1,008	*Quercus macrocarpa*	Bur Oak	16.0			G	G	G	3																	2.4			
1,009	*Pyrus sp.*	Pear	16.0			G	G	G	2																	2.4			
1,010	*Quercus macrocarpa*	Bur Oak	25.0			D	D	D	0																	2.4			outside property
1,011	*Quercus macrocarpa*	Bur Oak	23.0			G	G	G	3																	2.4			outside property
1,012	*Quercus macrocarpa*	Bur Oak	15.0			G	G	G	3																	2.4			
1,013	*Quercus macrocarpa*	Bur Oak	15.0			G	G	G	3																	2.4			
1,014	*Quercus macrocarpa*	Bur Oak	23.0			G	G	G	3																	2.4			
1,015	*Quercus macrocarpa*	Bur Oak	23.0	14.0		F	G	G	3																	2.4			fence girdling
1,016	*Quercus macrocarpa*	Bur Oak	21.0			G	G	G	3																	2.4			outside property
1,017	*Quercus macrocarpa*	Bur Oak	23.0			G	G	G	3											x						2.4			outside property
1,018	*Pyrus sp.*	Pear	21.0			G	G	G	3																	2.4			outside property
1,019	*Quercus macrocarpa*	Bur Oak	32.0	30.0		G	G	G	5		x															3.0			outside property

Tree Inventory Along Mattamy Phase 3 Trail Alignment

Project: TA8886 Phase 3
Client: Mattamy
Collectors: M. O'Halloran, V. Garofalo
Date: April 18, 30, and July 2, 2019
Area: Oakville

Tag#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	CONDITION																	Tree Management					Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Anticipated Removals	Anticipated Impacts	TPZ(m)-Oakville	Rationale	ESA/SARA	
1,020	*Pyrus sp.*	Pear	31.0			G	G	G	4																	3.0			
1,021	*Prunus serotina*	Black Cherry	41.0			P	P	F	5	10						x	x	x	x							3.0			
1,022	*Ulmus americana*	White Elm	26.0			G	G	G	3											x						2.4			outside property
1,023	*Prunus serotina*	Black Cherry	63.0			G	G	G	5		x	x														4.2			outside property, measured below crotch, fence girdling
1,024	*Quercus rubra*	Red Oak	18.0			G	G	G	4																	2.4			
1,025	*Carya ovata var. ovata*	Shagbark Hickory	33.0			G	G	G	4																	3.0			
1,026	*Quercus rubra*	Red Oak	59.0			G	G	G	6																	3.6			
1,027	*Quercus rubra*	Red Oak	16.0			G	G	G	4																	2.4			
1,028	*Tilia americana*	Basswood	20.0	10,8		G	G	G	3																	2.4			
1,029	*Quercus rubra*	Red Oak	16.0			G	G	G	3																	2.4			
1,030	*Quercus rubra*	Red Oak	34.0			G	G	G	4																	3.0			
1,031	*Quercus macrocarpa*	Bur Oak	32.0			G	G	G	4										x							3.0			
1,032	*Quercus macrocarpa*	Bur Oak	28.0			G	G	G	4																	2.4			
1,033	*Ulmus americana*	White Elm	55.0			G	G	G	6																	3.6			
1,034	*Quercus rubra*	Red Oak	60.0	30.0		G	G	G	8																	3.6			
1,035	*Ulmus americana*	White Elm	26.0			G	G	G	4																	2.4			outside property
1,036	*Quercus macrocarpa*	Bur Oak	25.0	24.0		G	G	G	5		x	x														2.4			
1,037	*Ulmus americana*	White Elm	23.0			G	G	G	3																	2.4			
1,038	*Quercus macrocarpa*	Bur Oak	15.0			G	G	G	2																	2.4			
1,039	*Quercus macrocarpa*	Bur Oak	15.0			G	G	G	2																	2.4			

Tree Inventory Along Mattamy Phase 3 Trail Alignment

Project: TA8886 Phase 3
Client: Mattamy
Collectors: M. O'Halloran, V. Garofalo
Date: April 18, 30, and July 2, 2019
Area: Oakville

Tag#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	CONDITION																Tree Management					Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Anticipated Removals	Anticipated Impacts	TPZ(m)-Oakville	Rationale	ESA/SARA	
1,040	*Quercus macrocarpa*	Bur Oak	34.0			G	G	G	6																3.0			
1,041	*Quercus macrocarpa*	Bur Oak	61.0			G	G	G	8																4.2			
1,042	*Quercus macrocarpa*	Bur Oak	62.0			G	G	G	8										x						4.2			
1,043	*Quercus macrocarpa*	Bur Oak	31.0			F	F	F	4																3.0			
1,044	*Quercus macrocarpa*	Bur Oak	100.0			F	F	F	10	20	x	x						x		x					6.0			
284	*Quercus macrocarpa*	Bur Oak	98.0			G	G	G	10																6.0			
285	*Quercus macrocarpa*	Bur Oak	72.0			G	F	G	10																4.8			
1,045	*Quercus macrocarpa*	Bur Oak	21.0			G	G	G	3																2.4			
1,046	*Quercus macrocarpa*	Bur Oak	21.0			G	G	G	3																2.4			
1,047	*Quercus macrocarpa*	Bur Oak	15.0			G	G	G	3																2.4			
1,048	*Quercus macrocarpa*	Bur Oak	21.0			G	G	G	3																2.4			
1,049	*Pyrus sp.*	Pear	23.0			G	G	G	3																2.4			
1,050	*Pyrus sp.*	Pear	17.0	17.0		G	G	G	3																2.4			
1,051	*Ulmus americana*	White Elm	65.0			D	D	D	0																4.2			
1,052	*Pyrus sp.*	Pear	20.0	20,20,10		G	G	G	4																2.4			
1,053	*Ulmus americana*	White Elm	57.0			G	G	G	7																3.6			
1,054	*Tilia americana*	Basswood	29.0			G	F	F	4																2.4			
1,055	*Malus pumila*	Apple	22.0			G	G	G	5																2.4			
1,056	*Tilia americana*	Basswood	21.0	21.0		F	F	F	2									x							2.4			

Tree Inventory Along Mattamy Phase 3 Trail Alignment

Project: TA8886 Phase 3
Client: Mattamy
Collectors: M. O'Halloran, V. Garofalo
Date: April 18, 30, and July 2, 2019
Area: Oakville

Tag#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	CONDITION																	Tree Management					Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Anticipated Removals	Anticipated Impacts	TPZ(m)-Oakville	Rationale	ESA/SARA	
1,057	*Tilia americana*	Basswood	17.0	10,8		G	G	G	3																2.4			
1,058	*Prunus serotina*	Black Cherry	36.0	,18		G	F	F	5	20															3.0			
1,059	*Quercus macrocarpa*	Bur Oak	32.0			G	G	G	4																3.0			
1,060	*Ulmus americana*	White Elm	36.0			D	D	D	0																3.0			
1,061			21.0			D	D	D	0																2.4			
1,062	*Ulmus americana*	White Elm	22.0			D	D	D	0																2.4			
1,063	*Ulmus americana*	White Elm	30.0			D	D	D	0																2.4			
1,064	*Quercus macrocarpa*	Bur Oak	27.0			G	G	G	3																2.4			
1,065	*Prunus avium*	Sweet Cherry	15.0			G	G	G	2																2.4			
1,066	*Ulmus americana*	White Elm	22.0	20.0		G	G	G	4																2.4			
1,067	*Pyrus sp.*	Pear	40.0	21.0		P	P	G	3																3.0			
1,068	*Quercus alba*	White Oak	85.0			G	G	G	8											x					5.4			consider redesign to avoid impacts to this tree
1,069	*Pyrus sp.*	Pear	19.0			G	G	G	3																2.4			
1,070	*Quercus alba*	White Oak	73.0			G	G	G	8																4.8			
1,071	*Ulmus americana*	White Elm	23.0			G	G	G	6														x		2.4			
1,072	*Ulmus americana*	White Elm	21.0			G	G	G	6														x		2.4			
1,073	*Carya ovata var. ovata*	Shagbark Hickory	20.0			G	G	G	4																2.4			
1,074	*Ulmus americana*	White Elm	18.0			G	G	G	3																2.4			
1,075	*Malus pumila*	Apple	29.0	20,18		F	P	G	6																2.4			sprawling trunk/limbs
1,076	*Pyrus sp.*	Pear	19.0	8.0		G	G	G	3																2.4			

Tree Inventory Along Mattamy Phase 3 Trail Alignment

Project: TA8886 Phase 3
Client: Mattamy
Collectors: M. O'Halloran, V. Garofalo
Date: April 18, 30, and July 2, 2019
Area: Oakville

Tag#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	CONDITION																	Tree Management					Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Anticipated Removals	Anticipated Impacts	TPZ(m)-Oakville	Rationale	ESA/SARA	
1,077	*Pyrus sp.*	Pear	23.0	15,15,12		F	F	G	4		x	x													2.4			
1,078	*Pyrus sp.*	Pear	20.0			G	G	G	3																2.4			
1,079	*Pyrus sp.*	Pear	36.0	26,13		F	F	G	3																3.0			
1,080	*Fraxinus americana*	White Ash	21.0			P	P	G	3																2.4			
1,081	*Fraxinus americana*	White Ash	21.0			F	P	G	3																2.4			
1,082	*Fraxinus americana*	White Ash	15.0			P	P	G	3																2.4			
1,083	*Pyrus sp.*	Pear	15.0			G	G	G	3																2.4			
1,084	*Pyrus sp.*	Pear	22.0			D	D	D	0																2.4			
1,085	*Pyrus sp.*	Pear	15.0			F	F	G	2																2.4			
1,086	*Quercus macrocarpa*	Bur Oak	19.0			G	G	G	2																2.4			
1,087	*Ulmus americana*	White Elm	16.0			G	G	G	3																2.4			
1,088	*Quercus macrocarpa*	Bur Oak	17.0			G	G	G	2																2.4			
1,089	*Tilia americana*	Basswood	24.0			G	G	G	5		x	x													2.4			
1,090	*Pyrus sp.*	Pear	40.0	30,19		F	F	F	6																3.0			
1,091	*Fraxinus americana*	White Ash	16.0			D	D	D	0																2.4			
1,092	*Fraxinus americana*	White Ash	32.0	25.0		D	D	D	0																3.0			
1,093	*Quercus rubra*	Red Oak	18.0	17,15		G	G	G	4																2.4			
1,094	*Fraxinus americana*	White Ash	17.0	12.0		F	F	G	9																2.4			
1,095	*Pyrus sp.*	Pear	38.0			F	F	G	4		x	x							x						3.0			
1,096	*Fraxinus americana*	White Ash	16.0			F	F	F	3																2.4			
1,097	*Pyrus sp.*	Pear	16.0			F	G	G	3																2.4			

Tree Inventory Along Mattamy Phase 3 Trail Alignment

Project: TA8886 Phase 3
Client: Mattamy
Collectors: M. O'Halloran, V. Garofalo
Date: April 18, 30, and July 2, 2019
Area: Oakville

Tag#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	CONDITION																	Tree Management					Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Anticipated Removals	Anticipated Impacts	TPZ(m)-Oakville	Rationale	ESA/SARA	
1,098	*Ulmus americana*	White Elm	55.0			G	F	G	6											x						3.6			
1,099	*Ulmus americana*	White Elm	26.0			G	F	F	4											x						2.4			
1,100	*Acer saccharum ssp. saccharum*	Sugar Maple	44.0			F	G	G	7							x										3.0			
1,101	*Pyrus sp.*	Pear	38.0	28,22,17		G	F	G	6		x	x								x						3.0			
1,102	*Pyrus sp.*	Pear	26.0			G	G	G	6																	2.4			
1,103	*Prunus serotina*	Black Cherry	16.0			G	G	G	2																	2.4			
1,104	*Ulmus americana*	White Elm	15.0			G	G	G	2																	2.4			
1,105	*Pyrus sp.*	Pear	15.0			G	G	G	3																	2.4			
1,106	*Ulmus americana*	White Elm	17.0			D	D	D	0																	2.4			
1,107	*Fraxinus americana*	White Ash	18.0			D	D	D	0																	2.4			
1,108	*Acer negundo*	Manitoba Maple	19.0			G	G	G	4																	2.4			
1,109	*Ulmus americana*	White Elm	15.0			G	G	G	2																	2.4			vines
1,110	*Prunus avium*	Sweet Cherry	18.0			G	G	G	3																	2.4			vines
1,111	*Tilia americana*	Basswood	26.0			F	G	G	3																	2.4			
1,112	*Pyrus sp.*	Pear	17.0			G	G	G	3																	2.4			
1,113	*Quercus macrocarpa*	Bur Oak	16.0			G	G	G	3																	2.4			
1,114	*Carya ovata var. ovata*	Shagbark Hickory	38.0			G	G	G	7																	3.0			
1,115	*Pyrus sp.*	Pear	37.0			F	G	G	4							x										3.0			
1,116	*Pyrus sp.*	Pear	15.0			F	G	G	4																	2.4			
1,117	*Malus pumila*	Apple	36.0	31,24		F	F	G	6		x	x														3.0			
1,118	*Pyrus sp.*	Pear	16.0			G	G	G	3																	2.4			
1,119	*Pyrus sp.*	Pear	22.0			G	G	G	3																	2.4			
1,120	*Pyrus sp.*	Pear	23.0	10.0		G	G	G	3																	2.4			

Tree Inventory Along Mattamy Phase 3 Trail Alignment

Project: TA8886 Phase 3
Client: Mattamy
Collectors: M. O'Halloran, V. Garofalo
Date: April 18, 30, and July 2, 2019
Area: Oakville

Tag#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	CONDITION																	Tree Management					Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Anticipated Removals	Anticipated Impacts	TPZ(m)-Oakville	Rationale	ESA/SARA	
1,121	*Pyrus sp.*	Pear	30.0	20.0		P	P	G	3											x						2.4			
1,122	*Pyrus sp.*	Pear	25.0			P	F	G	5							x			x							2.4			
1,123	*Pyrus sp.*	Pear	16.0			P	F	G	3							x			x							2.4			
1,124	*Pyrus sp.*	Pear	21.0			F	G	G	3		x	x														2.4			
1,125	*Ulmus americana*	White Elm	65.0	32,18,35		G	G	G	7																	4.2			
1,126	*Ulmus americana*	White Elm	20.0	16.0		G	G	G	4		x	x											x			2.4			
1,127	*Ulmus americana*	White Elm	18.0			G	G	G	4																	2.4			
1,128	*Pyrus sp.*	Pear	16.0	15,15,11		F	F	G	4		x	x														2.4			
1,129	*Pyrus sp.*	Pear	21.0	19.0		F	F	G	4																	2.4			
1,130	*Pyrus sp.*	Pear	17.0			F	G	G	4							x										2.4			
1,131	*Pyrus sp.*	Pear	18.0			F	F	G	4		x	x														2.4			
1,132	*Pyrus sp.*	Pear	43.0			P	P	G	7							x										3.0			fallen
1,133	*Pyrus sp.*	Pear	22.0	11,20		P	P	F	3							x										2.4			
1,134	*Prunus serotina*	Black Cherry	36.0			G	G	G	7																	3.0			
1,135	*Pyrus sp.*	Pear	19.0	17.0		P	P	G	4																	2.4			
1,136	*Pyrus sp.*	Pear	15.0	11,12		F	F	G	4																	2.4			
1,137	*Amelanchier sp.*	Serviceberry	15.0	11.0		G	G	G	4																	2.4			
1,138	*Pyrus sp.*	Pear	23.0			G	G	G	4																	2.4			
1,139	*Pyrus sp.*	Pear	31.0	26,31		F	F	G	4		x	x														3.0			
1,140	*Pyrus sp.*	Pear	35.0	29.0		F	F	G	6		x	x														3.0			
1,141	*Ulmus americana*	White Elm	22.0			G	G	G	4																	2.4			
1,142	*Carya ovata var. ovata*	Shagbark Hickory	42.0			G	G	G	6																	3.0			
1,143	*Pyrus sp.*	Pear	20.0	13,10,18		F	F	G	4		x	x														2.4			
1,144	*Ulmus americana*	White Elm	17.0			G	G	G	3																	2.4			
1,145	*Pyrus sp.*	Pear	29.0			F	G	G	4								x									2.4			
1,146	*Pyrus sp.*	Pear	25.0			G	G	G	4																	2.4			

Tree Inventory Along Mattamy Phase 3 Trail Alignment

Project: TA8886 Phase 3
Client: Mattamy
Collectors: M. O'Halloran, V. Garofalo
Date: April 18, 30, and July 2, 2019
Area: Oakville

Tag#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	CONDITION																	Tree Management					Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Anticipated Removals	Anticipated Impacts	TPZ(m)-Oakville	Rationale	ESA/SARA	
1,147	*Fraxinus americana*	White Ash	27.0	25,20		D	D	D	0																2.4			
1,148	*Fraxinus americana*	White Ash	26.0			D	D	D	0																2.4			
1,149	*Ulmus americana*	White Elm	24.0			G	G	G	4																2.4			
1,150	*Fraxinus americana*	White Ash	26.0			D	D	D	4																2.4			
1,151	*Ulmus americana*	White Elm	29.0			G	G	G	4																2.4			
1,152	*Carya ovata var. ovata*	Shagbark Hickory	36.0	34,16		G	G	G	8																3.0			
1,153	*Ulmus americana*	White Elm	19.0	13.0		G	G	G	4																2.4			
1,154	*Quercus macrocarpa*	Bur Oak	77.0			G	G	G	1 2										x	x					4.8			
1,155	*Ulmus americana*	White Elm	16.0			G	G	G	4																2.4			
1,156	*Ulmus americana*	White Elm	19.0			G	G	G	4																2.4			
1,157	*Ulmus americana*	White Elm	22.0			G	G	G	3											x					2.4			
1,158	*Quercus macrocarpa*	Bur Oak	22.0			G	G	G	4																2.4			
1,159	*Quercus macrocarpa*	Bur Oak	18.0			G	G	G	2														x		2.4			
1,160	*Quercus macrocarpa*	Bur Oak	18.0			G	G	G	2		x	x													2.4			
1,161	*Pyrus sp.*	Pear	38.0	31,16,20		F	F	G	4		x	x				x	x								3.0			
1,162	*Quercus macrocarpa*	Bur Oak	28.0			G	G	G	3																2.4			
1,163	*Pyrus sp.*	Pear	16.0	15.0		P	P	G	4		x	x	e												2.4			
1,164	*Pyrus sp.*	Pear	27.0	20.0		F	F	G	4		x	x													2.4			

Tree Inventory Along Mattamy Phase 3 Trail Alignment

Project: TA8886 Phase 3
Client: Mattamy
Collectors: M. O'Halloran, V. Garofalo
Date: April 18, 30, and July 2, 2019
Area: Oakville

Tag#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	CONDITION																	Tree Management					Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Anticipated Removals	Anticipated Impacts	TPZ(m)-Oakville	Rationale	ESA/SARA	
1,165	*Quercus macrocarpa*	Bur Oak	31.0	13.0		G	G	G	5																3.0			
1,166	*Quercus macrocarpa*	Bur Oak	30.0			G	G	G	4																2.4			
1,167	*Quercus macrocarpa*	Bur Oak	16.0			G	G	G	2																2.4			
1,168	*Quercus macrocarpa*	Bur Oak	20.0			G	G	G	4																2.4			
1,169	*Quercus macrocarpa*	Bur Oak	43.0	38.0		F	F	G	7		x	x													3.0			
1,170	*Quercus macrocarpa*	Bur Oak	109.0			F	G	G	10							x									6.5			large willow at base
1,171	*Fraxinus americana*	White Ash	18.0			D	D	D	0																2.4			
1,172	*Fraxinus americana*	White Ash	25.0	16,23,24		D	D	D	0																2.4			
1,173	*Quercus macrocarpa*	Bur Oak	21.0			G	G	G	4																2.4			
1,174	*Quercus macrocarpa*	Bur Oak	25.0			G	G	G	4																2.4			
1,175	*Quercus macrocarpa*	Bur Oak	22.0			G	G	G	4																2.4			
1,176	*Quercus macrocarpa*	Bur Oak	20.0	13.0		P	P	G	4		x	x													2.4			
1,177	*Quercus macrocarpa*	Bur Oak	65.0	18.0		G	G	G	9																4.2			
1,178	*Fraxinus americana*	White Ash	21.0			D	D	D	3																2.4			
1,179	*Pyrus sp.*	Pear	18.0	14.0		F	F	G	4		x	x													2.4			
1,180	*Pyrus sp.*	Pear	18.0	18,14		G	G	G	4		x	x													2.4			
1,181	*Quercus macrocarpa*	Bur Oak	32.0			G	G	G	6																3.0			
1,182	*Pyrus sp.*	Pear	25.0			G	G	G	4																2.4			

Tree Inventory Along Mattamy Phase 3 Trail Alignment

Project: TA8886 Phase 3
Client: Mattamy
Collectors: M. O'Halloran, V. Garofalo
Date: April 18, 30, and July 2, 2019
Area: Oakville

Tag#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	CONDITION																	Tree Management					Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Anticipated Removals	Anticipated Impacts	TPZ(m)-Oakville	Rationale	ESA/SARA	
1,183	*Pyrus sp.*	Pear	17.0			G	G	G	4																2.4			
1,184	*Carya ovata var. ovata*	Shagbark Hickory	18.0	15,13		G	G	G	4																2.4			
1,185	*Quercus macrocarpa*	Bur Oak	130.0			G	F	G	13		x						x								7.8			fence girdling, bad leader, lightning strike?
1,186	*Pyrus sp.*	Pear	36.0	22,20		G	G	G	4																3.0			not tagged - hazard
1,187	*Ulmus americana*	White Elm	39.0			G	G	G	7																3.0			
1,188	*Pyrus sp.*	Pear	22.0			G	G	G	4																2.4			
1,189	*Ulmus americana*	White Elm	20.0			G	G	G	4																2.4			not tagged - hazard
1,190	*Salix sp.*	Willow	16.0			G	F	G	4																2.4			broken leader
1,191	*Salix sp.*	Willow	35.0	31,30,20		F	G	G	8																3.0			
1,192	*Salix sp.*	Willow	42.0			F	F	G	7				se												3.0			
1,193	*Pyrus sp.*	Pear	15.0			G	G	G	4																2.4			
1,194	*Pyrus sp.*	Pear	12.0			G	G	G	3																2.4			
1,195	*Pyrus sp.*	Pear	17.0			G	G	G	3																2.4			
1,196	*Fraxinus pennsylvanica*	Red Ash	15.0			G	G	F	3																2.4			
1,197	*Pyrus sp.*	Pear	16.0	13,15,15		G	G	G	3																2.4			
1,198	*Pyrus sp.*	Pear	17.0	15.0		G	G	G	3																2.4			
1,199	*Pyrus sp.*	Pear	13.0			G	G	F	2	20															2.4			
1,200	*Pyrus sp.*	Pear	19.0	11.0		G	G	G	3																2.4			
1,201	*Pyrus sp.*	Pear	17.0	16,14,9		G	G	G	4																2.4			
1,202	*Fraxinus pennsylvanica*	Red Ash	16.0	16.0		G	G	G	3		x	x													2.4			
1,203	*Fraxinus pennsylvanica*	Red Ash	13.0			G	G	G	3																2.4			
1,204	*Fraxinus pennsylvanica*	Red Ash	20.0	11.0		P	P	F	3												x				2.4			

Tree Inventory Along Mattamy Phase 3 Trail Alignment

Project: TA8886 Phase 3
Client: Mattamy
Collectors: M. O'Halloran, V. Garofalo
Date: April 18, 30, and July 2, 2019
Area: Oakville

Tag#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	CONDITION																	Tree Management					Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Anticipated Removals	Anticipated Impacts	TPZ(m)-Oakville	Rationale	ESA/SARA	
1,205	*Pyrus sp.*	Pear	22.0	20.0		G	F	F	3																2.4			
1,206	*Pyrus sp.*	Pear	22.0	10.0		G	G	G	3																2.4			
1,207	*Pyrus sp.*	Pear	15.0	12.0		G	G	G	3																2.4			
1,208	*Pyrus sp.*	Pear	12.0	10,10,8		G	F	P	3	40															2.4			
1,209	*Fraxinus pennsylvanica*	Red Ash	20.0			D	D	D	0																2.4			
1,210	*Pyrus sp.*	Pear	15.0			G	G	G	2																2.4			
1,211	*Pyrus sp.*	Pear	22.0	14,10,12		G	G	G	4																2.4			
1,212	*Pyrus sp.*	Pear	15.0	14.0		G	G	G	3																2.4			
1,213	*Fraxinus pennsylvanica*	Red Ash	22.0			G	G	F	3																2.4			
1,214	*Pyrus sp.*	Pear	16.0			F	F	F	3												x				2.4			
1,215	*Pyrus sp.*	Pear	65.0			P	P	P	4							x	x	x	x						4.2			hollow, hazard
1,216	*Pyrus sp.*	Pear	16.0	15.0		G	G	G	4																2.4			
1,217	*Pyrus sp.*	Pear	16.0	15,14		P	F	F	3							x	x	x	x						2.4			split trunk
1,218	*Fraxinus pennsylvanica*	Red Ash	15.0			P	P	P	3				x								x				2.4			
1,219	*Pyrus sp.*	Pear	11.0	11,10,9		G	G	G	3																2.4			
1,220	*Pyrus sp.*	Pear	18.0	13.0		G	G	G	3																2.4			
1,221	*Pyrus sp.*	Pear	21.0			G	G	G	3																2.4			
1,222	*Fraxinus pennsylvanica*	Red Ash	13.0			F	F	F	2												x				2.4			
1,223	*Ulmus americana*	White Elm	21.0			G	G	G	3																2.4			
1,224	*Pyrus sp.*	Pear	34.0	15.0		G	G	G	3																3.0			
1,225	*Pyrus sp.*	Pear	13.0			G	G	G	3																2.4			
1,226	*Fraxinus pennsylvanica*	Red Ash	10.0			G	G	F	2												x				2.4			
1,227	*Pyrus sp.*	Pear	14.0			G	G	G	3																2.4			
1,228	*Pyrus sp.*	Pear	11.0	10,9,9		G	G	G	3																2.4			

Tree Inventory Along Mattamy Phase 3 Trail Alignment

Project: TA8886 Phase 3
Client: Mattamy
Collectors: M. O'Halloran, V. Garofalo
Date: April 18, 30, and July 2, 2019
Area: Oakville

Tag#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	CONDITION																	Tree Management					Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Anticipated Removals	Anticipated Impacts	TPZ(m)-Oakville	Rationale	ESA/SARA	
1,229	*Ulmus americana*	White Elm	10.0			D	D	D	0																	2.4			
1,230	*Pyrus sp.*	Pear	13.0	11.0		G	G	G	3																	2.4			
1,231	*Pyrus sp.*	Pear	19.0			G	G	G	3																	2.4			
1,232	*Fraxinus pennsylvanica*	Red Ash	13.0			D	D	D	0												x					2.4			
1,233	*Pyrus sp.*	Pear	12.0			G	G	G	3																	2.4			
1,234	*Fraxinus pennsylvanica*	Red Ash	14.0			G	G	G	3												x					2.4			
1,235	*Pyrus sp.*	Pear	17.0	14.0		G	G	G	4										x							2.4			
1,236	*Pyrus sp.*	Pear	15.0	11.0		G	G	G	3																	2.4			
1,237	*Fraxinus pennsylvanica*	Red Ash	18.0			G	G	G	3																	2.4			
1,238	*Tilia americana*	Basswood	13.0			G	F	G	2																	2.4			tree leaning on it
1,239	*Tilia americana*	Basswood	14.0			G	F	G	3														x			2.4			
1,240	*Tilia americana*	Basswood	14.0			G	G	G	2																	2.4			
1,241	*Fraxinus pennsylvanica*	Red Ash	10.0			D	D	D	0																	2.4			
1,242	*Tilia americana*	Basswood	17.0			G	G	G	3																	2.4			
1,243	*Fraxinus pennsylvanica*	Red Ash	14.0			F	F	F	3																	2.4			
1,244	*Tilia americana*	Basswood	10.0			G	G	G	3																	2.4			
1,245	*Tilia americana*	Basswood	20.0			G	G	G	4																	2.4			
1,246	*Ulmus americana*	White Elm	14.0			G	G	G	3																	2.4			
1,247	*Tilia americana*	Basswood	27.0			G	G	G	5																	2.4			
1,248	*Pyrus sp.*	Pear	19.0			G	G	G	3																	2.4			
1,249	*Tilia americana*	Basswood	11.0			G	G	G	3																	2.4			
1,250	*Fraxinus pennsylvanica*	Red Ash	18.0			G	G	G	3																	2.4			
1,251	*Fraxinus pennsylvanica*	Red Ash	13.0			D	D	D	0																	2.4			

Tree Inventory Along Mattamy Phase 3 Trail Alignment

Project: TA8886 Phase 3
Client: Mattamy
Collectors: M. O'Halloran, V. Garofalo
Date: April 18, 30, and July 2, 2019
Area: Oakville

Tag#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	CONDITION																	Tree Management					Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Anticipated Removals	Anticipated Impacts	TPZ(m)-Oakville	Rationale	ESA/SARA	
1,252	*Fraxinus pennsylvanica*	Red Ash	10.0			G	G	G	2																2.4			
1,253	*Fraxinus pennsylvanica*	Red Ash	10.0			F	F	F	1																2.4			
1,254	*Tilia americana*	Basswood	16.0			G	G	G	3																2.4			
1,255	*Tilia americana*	Basswood	12.0			F	G	G	1																2.4			
1,256	*Fraxinus pennsylvanica*	Red Ash	13.0			D	D	D	0																2.4			
1,257	*Tilia americana*	Basswood	12.0			G	G	G	2																2.4			
1,258	*Tilia americana*	Basswood	13.0			G	G	G	2																2.4			
1,259	*Tilia americana*	Basswood	14.0			G	G	G	2																2.4			
1,260	*Tilia americana*	Basswood	13.0			G	G	G	2																2.4			
1,261	*Ulmus americana*	White Elm	16.0			D	D	D	0																2.4			
1,262	*Tilia americana*	Basswood	15.0			G	G	G	4																2.4			
1,263	*Tilia americana*	Basswood	15.0			G	G	G	4																2.4			
1,264	*Malus pumila*	Apple	10.0	9.0		F	F	G	4		x	x													2.4			
1,265	*Fraxinus pennsylvanica*	Red Ash	15.0	15.0		F	F	G	4		x	x													2.4			
1,266	*Fraxinus pennsylvanica*	Red Ash	12.0			D	D	D	0																2.4			
1,267	*Ulmus americana*	White Elm	17.0			G	G	G	3																2.4			
1,268	*Fraxinus pennsylvanica*	Red Ash	11.0			F	F	G	2																2.4			
1,269	*Fraxinus pennsylvanica*	Red Ash	10.0			D	D	D	0																2.4			
1,270	*Fraxinus pennsylvanica*	Red Ash	12.0			D	D	D	3																2.4			
1,271	*Fraxinus pennsylvanica*	Red Ash	12.0			D	D	D	0																2.4			
1,272	*Tilia americana*	Basswood	12.0			G	G	G	2																2.4			

Tree Inventory Along Mattamy Phase 3 Trail Alignment

Project: TA8886 Phase 3
Client: Mattamy
Collectors: M. O'Halloran, V. Garofalo
Date: April 18, 30, and July 2, 2019
Area: Oakville

Tag#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	CONDITION																	Tree Management					Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Anticipated Removals	Anticipated Impacts	TPZ(m)-Oakville	Rationale	ESA/SARA	
1,273	*Tilia americana*	Basswood	22.0			G	G	G	4																2.4			
1,274	*Tilia americana*	Basswood	11.0			G	G	G	2																2.4			
1,275	*Prunus serotina*	Black Cherry	19.0			G	G	G	4																2.4			
1,276	*Fraxinus pennsylvanica*	Red Ash	14.0	13.0		D	D	D	2																2.4			
1,277	*Tilia americana*	Basswood	10.0			G	G	G	1																2.4			
1,278	*Acer saccharum ssp. saccharum*	Sugar Maple	11.0			G	G	G	2																2.4			
1,279	*Fraxinus pennsylvanica*	Red Ash	13.0			D	D	D	0																2.4			
1,280	*Fraxinus pennsylvanica*	Red Ash	11.0			D	D	D	0																2.4			
1,281	*Fraxinus pennsylvanica*	Red Ash	10.0	8.0		D	D	D	0																2.4			
1,282	*Pyrus sp.*	Pear	19.0	9.0		P	G	G	6		x	x						x							2.4			at base
1,283	*Fraxinus pennsylvanica*	Red Ash	16.0			D	D	D	0																2.4			
1,284	*Fraxinus pennsylvanica*	Red Ash	15.0			F	F	G	2																2.4			
1,285	*Pyrus sp.*	Pear	20.0			G	G	G	2																2.4			
1,286	*Tilia americana*	Basswood	15.0			G	G	G	2																2.4			
1,287	*Tilia americana*	Basswood	19.0			G	G	G	3																2.4			
1,288	*Tilia americana*	Basswood	10.0			G	G	G	2																2.4			
1,289	*Fraxinus pennsylvanica*	Red Ash	14.0			D	D	D	0																2.4			
1,290	*Acer saccharum ssp. saccharum*	Sugar Maple	16.0			G	G	G	5																2.4			
1,291	*Fraxinus pennsylvanica*	Red Ash	35.0	12,11		D	D	D	0																3.0			
1,292	*Acer saccharum ssp. saccharum*	Sugar Maple	11.0	11.0		F	F	G	3		x	x													2.4			

Tree Inventory Along Mattamy Phase 3 Trail Alignment

Project: TA8886 Phase 3
Client: Mattamy
Collectors: M. O'Halloran, V. Garofalo
Date: April 18, 30, and July 2, 2019
Area: Oakville

Tag#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	CONDITION																	Tree Management					Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Anticipated Removals	Anticipated Impacts	TPZ(m)-Oakville	Rationale	ESA/SARA	
1,293	*Ulmus americana*	White Elm	33.0			G	G	G	6															x	3.0	<25% DL over trail		
1,294	*Fraxinus pennsylvanica*	Red Ash	28.0			F	F	G	5															x	2.4	<25% DL over trail		
1,295	*Malus pumila*	Apple	55.0			D	D	D	0																3.6			hollow
1,296	*Fraxinus pennsylvanica*	Red Ash	11.0			D	D	D	0																2.4			
1,297	*Fraxinus pennsylvanica*	Red Ash	12.0			D	D	D	0																2.4			
1,298	*Fraxinus pennsylvanica*	Red Ash	10.0	8.0		D	D	D	0																2.4			
1,299	*Pyrus sp.*	Pear	17.0			G	G	G	2																2.4			
1,300	*Fraxinus pennsylvanica*	Red Ash	13.0			D	D	D	0																2.4			
1,301	*Fraxinus pennsylvanica*	Red Ash	21.0			F	F	F	5																2.4			
1,302	*Fraxinus pennsylvanica*	Red Ash	2.0			D	D	D	0																1.8			
1,303	*Fraxinus pennsylvanica*	Red Ash	15.0			F	F	F	3															x	2.4	<25% DL over trail		
1,304	*Prunus avium*	Sweet Cherry	12.0			F	F	G	4															x	2.4	>=25% DL over trail		
1,305	*Prunus avium*	Sweet Cherry	13.0			G	G	G	3															x	2.4	>=25% DL over trail		
1,306	*Prunus avium*	Sweet Cherry	23.0			G	G	G	6															x	2.4	>=25% DL over trail		
1,307	*Prunus avium*	Sweet Cherry	24.0			G	G	G	6															x	2.4	>=25% DL over trail		
1,308	*Prunus avium*	Sweet Cherry	13.0			G	G	G	2																2.4			
1,309	*Fraxinus pennsylvanica*	Red Ash	11.0			D	D	D	2																2.4			
1,310	*Fraxinus pennsylvanica*	Red Ash	14.0			F	F	F	3																2.4			

Tree Inventory Along Mattamy Phase 3 Trail Alignment

Project: TA8886 Phase 3
Client: Mattamy
Collectors: M. O'Halloran, V. Garofalo
Date: April 18, 30, and July 2, 2019
Area: Oakville

Tag#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	CONDITION																	Tree Management					Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Anticipated Removals	Anticipated Impacts	TPZ(m)-Oakville	Rationale	ESA/SARA	
1,311	*Prunus avium*	Sweet Cherry	14.0			F	G	G	3									x							2.4			
1,312	*Fraxinus pennsylvanica*	Red Ash	14.0			F	F	F	4																2.4			
1,313	*Fraxinus pennsylvanica*	Red Ash	13.0			F	F	F	3																2.4			
1,314	*Fraxinus pennsylvanica*	Red Ash	19.0			D	D	D	0																2.4			
1,315	*Malus pumila*	Apple	20.0	18,15,13, 14		F	F	G	6		x	x													2.4			
1,316	*Fraxinus pennsylvanica*	Red Ash	14.0			D	D	D	0																2.4			
1,317	*Fraxinus pennsylvanica*	Red Ash	36.0			D	D	D	0																3.0			
1,318	*Acer saccharum ssp. saccharum*	Sugar Maple	14.0			G	G	G	3																2.4			
1,319	*Fraxinus pennsylvanica*	Red Ash	13.0			F	F	F	3																2.4			vines
1,320	*Ulmus americana*	White Elm	32.0			G	G	G	7																3.0			
1,321	*Tilia americana*	Basswood	17.0	10.0		G	G	G	4																2.4			
1,322	*Tilia americana*	Basswood	26.0	22,9		F	F	G	7		x	x											x		2.4			
1,323	*Tilia americana*	Basswood	24.0			G	G	G	4														x		2.4			
1,324	*Acer saccharum ssp. saccharum*	Sugar Maple	20.0			G	G	G	3														x		2.4			
1,325	*Tilia americana*	Basswood	11.0			G	G	G	2																2.4			
1,326	*Quercus macrocarpa*	Bur Oak	36.0			G	G	G	7																3.0			
1,327	*Malus pumila*	Apple	17.0	15,16		P	P	G	7																2.4			
1,328	*Prunus avium*	Sweet Cherry	36.0			G	G	G	6																3.0			
1,329	*Fraxinus pennsylvanica*	Red Ash	17.0			F	F	F	3																2.4			
1,330	*Malus pumila*	Apple	35.0			P	P	F	4																3.0			broken, fallen

Tree Inventory Along Mattamy Phase 3 Trail Alignment

Project: TA8886 Phase 3
Client: Mattamy
Collectors: M. O'Halloran, V. Garofalo
Date: April 18, 30, and July 2, 2019
Area: Oakville

Tag#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	CONDITION																	Tree Management					Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Anticipated Removals	Anticipated Impacts	TPZ(m)-Oakville	Rationale	ESA/SARA	
1,331	*Fraxinus pennsylvanica*	Red Ash	12.0			D	D	D	0																2.4			
1,332	*Fraxinus pennsylvanica*	Red Ash	10.0			D	D	D	0																2.4			
1,333	*Fraxinus pennsylvanica*	Red Ash	13.0			F	F	F	3																2.4			
1,334	*Fraxinus pennsylvanica*	Red Ash	17.0			F	F	F	3																2.4			
1,335	*Prunus avium*	Sweet Cherry	21.0			G	F	G	8																2.4			
1,336	*Fraxinus pennsylvanica*	Red Ash	31.0			F	F	F	6																3.0			
1,337	*Pyrus sp.*	Pear	16.0			G	F	G	4														x		2.4			
1,338	*Fraxinus pennsylvanica*	Red Ash	17.0			F	F	F	4																2.4			
1,339	*Fraxinus pennsylvanica*	Red Ash	12.0	11.0		D	D	D	0																2.4			
1,340	*Fraxinus pennsylvanica*	Red Ash	11.0			F	F	F	3																2.4			
1,341	*Fraxinus pennsylvanica*	Red Ash	20.0			P	F	F	3																2.4			
1,342	*Fraxinus pennsylvanica*	Red Ash	13.0			F	F	F	3																2.4			
1,343	*Fraxinus pennsylvanica*	Red Ash	17.0			F	F	F	3																2.4			
1,344	*Fraxinus pennsylvanica*	Red Ash	13.0			F	F	F	3																2.4			
1,345	*Fraxinus pennsylvanica*	Red Ash	18.0			F	F	F	3																2.4			
1,346	*Fraxinus pennsylvanica*	Red Ash	13.0			F	F	F	3																2.4			
1,347	*Fraxinus pennsylvanica*	Red Ash	17.0			F	F	F	3																2.4			

Tree Inventory Along Mattamy Phase 3 Trail Alignment

Project: TA8886 Phase 3
Client: Mattamy
Collectors: M. O'Halloran, V. Garofalo
Date: April 18, 30, and July 2, 2019
Area: Oakville

Tag#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	CONDITION																	Tree Management					Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Anticipated Removals	Anticipated Impacts	TPZ(m)-Oakville	Rationale	ESA/SARA	
1,348	*Fraxinus pennsylvanica*	Red Ash	13.0			F	F	F	3																2.4			
1,349	*Fraxinus pennsylvanica*	Red Ash	16.0	15.0		F	F	F	3		x	x													2.4			
1,350	*Malus pumila*	Apple	16.0	15,13,11, 10		F	F	G	6																2.4			
1,351	*Fraxinus pennsylvanica*	Red Ash	15.0	15.0		F	F	F	4																2.4			
1,352	*Fraxinus pennsylvanica*	Red Ash	11.0	11.0		F	F	F	3																2.4			
1,353	*Fraxinus pennsylvanica*	Red Ash	11.0	11.0		F	F	F	3																2.4			
1,354	*Pyrus sp.*	Pear	13.0			G	G	G	2																2.4			
1,355	*Fraxinus pennsylvanica*	Red Ash	12.0	12.0		D	D	D	0																2.4			
1,356	*Fraxinus pennsylvanica*	Red Ash	18.0			F	F	F	3																2.4			
1,357	*Fraxinus pennsylvanica*	Red Ash	15.0	11.0		F	F	F	3																2.4			
1,358	*Fraxinus pennsylvanica*	Red Ash	20.0			F	F	F	3																2.4			
1,359	*Fraxinus pennsylvanica*	Red Ash	22.0			F	F	F	3																2.4			
1,360	*Fraxinus pennsylvanica*	Red Ash	14.0			F	F	F	3																2.4			
1,361	*Fraxinus pennsylvanica*	Red Ash	18.0			F	F	F	3																2.4			
1,362	*Fraxinus pennsylvanica*	Red Ash	16.0			F	F	F	3																2.4			
1,363	*Fraxinus pennsylvanica*	Red Ash	19.0	18.0		F	F	F	3																2.4			
1,364	*Fraxinus pennsylvanica*	Red Ash	13.0			F	F	F	3																2.4			

Tree Inventory Along Mattamy Phase 3 Trail Alignment

Project: TA8886 Phase 3
Client: Mattamy
Collectors: M. O'Halloran, V. Garofalo
Date: April 18, 30, and July 2, 2019
Area: Oakville

Tag#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	CONDITION																	Tree Management					Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Anticipated Removals	Anticipated Impacts	TPZ(m)-Oakville	Rationale	ESA/SARA	
1,365	*Malus pumila*	Apple	12.0	10.0		F	F	F	3																2.4			
1,366	*Fraxinus pennsylvanica*	Red Ash	11.0			F	F	F	3																2.4			
1,367	*Fraxinus pennsylvanica*	Red Ash	15.0			F	F	F	3																2.4			
1,368	*Pyrus sp.*	Pear	17.0			F	G	G	3																2.4			
1,369	*Fraxinus pennsylvanica*	Red Ash	24.0	17.0		D	D	D	3																2.4			
1,370	*Pyrus sp.*	Pear	14.0			G	F	G	3																2.4			bent canopy
1,371	*Fraxinus pennsylvanica*	Red Ash	20.0			F	F	F	3																2.4			
1,372	*Fraxinus pennsylvanica*	Red Ash	10.0			D	D	D	0																2.4			
1,373	*Acer negundo*	Manitoba Maple	21.0	18.0		G	G	G	4																2.4			
1,374	*Malus pumila*	Apple	11.0	10,8		F	G	G	3		x	x													2.4			
1,375	*Malus pumila*	Apple	17.0	16.0		F	G	G	4				se												2.4			
1,376	*Malus pumila*	Apple	14.0			G	G	G	3																2.4			
1,377	*Malus pumila*	Apple	15.0	9.0		G	G	G	3																2.4			
1,378	*Pyrus sp.*	Pear	24.0			G	G	G	4																2.4			
1,379	*Malus pumila*	Apple	14.0	11.0		G	G	G	4																2.4			
1,380	*Pyrus sp.*	Pear	13.0			G	G	G	4																2.4			
1,381	*Malus pumila*	Apple	13.0	10.0		F	G	G	4																2.4			
1,382	*Pyrus sp.*	Pear	33.0	10.0		G	G	G	4																3.0			
1,383	*Pyrus sp.*	Pear	13.0			G	G	G	3																2.4			
1,384	*Fraxinus pennsylvanica*	Red Ash	20.0			D	D	D	0																2.4			
1,385	*Fraxinus pennsylvanica*	Red Ash	21.0			D	D	D	0																2.4			
1,386	*Fraxinus pennsylvanica*	Red Ash	15.0			D	D	D	0																2.4			

Tree Inventory Along Mattamy Phase 3 Trail Alignment

Project: TA8886 Phase 3
Client: Mattamy
Collectors: M. O'Halloran, V. Garofalo
Date: April 18, 30, and July 2, 2019
Area: Oakville

Tag#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	CONDITION																	Tree Management					Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Anticipated Removals	Anticipated Impacts	TPZ(m)-Oakville	Rationale	ESA/SARA	
1,387	*Fraxinus pennsylvanica*	Red Ash	14.0			D	D	D	0																2.4			
1,388	*Fraxinus pennsylvanica*	Red Ash	16.0	14,13		D	D	D	0																2.4			
1,389	*Fraxinus pennsylvanica*	Red Ash	17.0	13.0		D	D	D	0																2.4			
1,390	*Fraxinus pennsylvanica*	Red Ash	10.0	6.0		D	D	D	0															x		2.4	>=25% DL over trail		
1,391	*Malus pumila*	Apple	17.0	16,16,16		F	F	G	5		x	x														2.4			
1,392	*Fraxinus pennsylvanica*	Red Ash	16.0			F	F	F	3																	2.4			
1,393	*Quercus macrocarpa*	Bur Oak	18.0			G	G	G	3																	2.4			
1,394	*Fraxinus pennsylvanica*	Red Ash	40.0			F	F	F	6																	3.0			
1,395	*Fraxinus pennsylvanica*	Red Ash	26.0			F	F	F	3																	2.4			
1,396	*Prunus serotina*	Black Cherry	15.0			G	G	G	2																	2.4			
1,397	*Prunus avium*	Sweet Cherry	13.0			G	G	G	3																	2.4			
1,398	*Pyrus sp.*	Pear	26.0			P	G	G	3							x	x	x								2.4			
1,399	*Fraxinus pennsylvanica*	Red Ash	22.0			F	F	F	3																	2.4			
1,400	*Fraxinus pennsylvanica*	Red Ash	15.0			F	F	F	2																	2.4			
1,401	*Fraxinus pennsylvanica*	Red Ash	11.0			F	F	F	2																	2.4			
1,402	*Fraxinus pennsylvanica*	Red Ash	11.0			F	F	F	2																	2.4			
1,403	*Fraxinus pennsylvanica*	Red Ash	12.0			F	F	F	2																	2.4			
1,404	*Pyrus sp.*	Pear	20.0			P	F	G	3																	2.4			intertwined with 1395

Tree Inventory Along Mattamy Phase 3 Trail Alignment

Project: TA8886 Phase 3
Client: Mattamy
Collectors: M. O'Halloran, V. Garofalo
Date: April 18, 30, and July 2, 2019
Area: Oakville

Tag#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	CONDITION																	Tree Management					Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Anticipated Removals	Anticipated Impacts	TPZ(m)-Oakville	Rationale	ESA/SARA	
1,405	*Fraxinus pennsylvanica*	Red Ash	10.0			F	F	F	2																2.4			
1,406	*Pyrus sp.*	Pear	22.0			F	F	G	4																2.4			
1,407	*Pyrus sp.*	Pear	15.0	14.0		G	F	G	3																2.4			
1,408	*Pyrus sp.*	Pear	15.0			G	G	G	2																2.4			
1,409	*Fraxinus pennsylvanica*	Red Ash	19.0			G	G	G	3																2.4			
1,410	*Pyrus sp.*	Pear	13.0	10.0		G	G	G	3																2.4			
1,411	*Quercus macrocarpa*	Bur Oak	31.0			G	G	G	4																3.0			
1,412	*Pyrus sp.*	Pear	21.0	13.0		G	G	G	3																2.4			
1,413	*Pyrus sp.*	Pear	18.0			G	G	G	3																2.4			
1,414	*Pyrus sp.*	Pear	14.0	12,10,10		G	G	G	3																2.4			
1,415	*Pyrus sp.*	Pear	20.0			G	G	G	3																2.4			
1,416	*Malus pumila*	Apple	22.0	19,14		G	G	G	4																2.4			
1,417	*Malus pumila*	Apple	18.0	16,15		G	G	G	4																2.4			
1,418	*Pyrus sp.*	Pear	25.0	21,16		G	G	G	3																2.4			
1,419	*Malus pumila*	Apple	22.0	21.0		P	P	P	2								x	x							2.4			trunk broken
1,420	*Pyrus sp.*	Pear	18.0			G	G	G	3																2.4			
A1	*Fraxinus pennsylvanica*	Red Ash	23.0			D	D	D	0																2.4			
A2	*Fraxinus pennsylvanica*	Red Ash	17.0	15.0		D	D	D	0																2.4			
A3	*Fraxinus pennsylvanica*	Red Ash	16.0	15,12		D	D	D	0																2.4			
A4	*Fraxinus pennsylvanica*	Red Ash	70.0			D	D	D	0																4.2			fused trunk
A5	*Fraxinus pennsylvanica*	Red Ash	45.0	38,12		D	D	D	0																3.0			
A6	*Fraxinus pennsylvanica*	Red Ash	20.0	18,20		D	D	D	0																2.4			

Tree Inventory Along Mattamy Phase 3 Trail Alignment

Project: TA8886 Phase 3
Client: Mattamy
Collectors: M. O'Halloran, V. Garofalo
Date: April 18, 30, and July 2, 2019
Area: Oakville

Tag#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	CONDITION																	Tree Management					Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Anticipated Removals	Anticipated Impacts	TPZ(m)-Oakville	Rationale	ESA/SARA	
A7	*Fraxinus pennsylvanica*	Red Ash	25.0	14,12		D	D	D	0																2.4			
A8	*Fraxinus pennsylvanica*	Red Ash	30.0			D	D	D	0																2.4			
A9	*Fraxinus pennsylvanica*	Red Ash	25.0	25,20,18		D	D	D	0																2.4			
A10	*Fraxinus pennsylvanica*	Red Ash	32.0			D	D	D	0																3.0			
A11	*Fraxinus pennsylvanica*	Red Ash	31.0	12.0		D	D	D	0																3.0			
A12	*Fraxinus pennsylvanica*	Red Ash	29.0			D	D	D	0																2.4			
A13	*Fraxinus pennsylvanica*	Red Ash	23.0	20.0		D	D	D	0																2.4			
A14	*Fraxinus pennsylvanica*	Red Ash	28.0	24,20,14		D	D	D	0																2.4			
A15	*Fraxinus pennsylvanica*	Red Ash	38.0			D	D	D	0																3.0			
1,545	*Fraxinus pennsylvanica*	Red Ash	12.0			F	G	F	2											X					2.4			
1,546	*Fraxinus pennsylvanica*	Red Ash	17.0			D	D	D	0					X											2.4			
1,547	*Fraxinus pennsylvanica*	Red Ash	20.0			D	D	D	0					X										x	2.4	<25% DL over trail		
1,548	*Pyrus sp.*	Pear	21.0			F	G	G	3																2.4			
1,549	*Pyrus sp.*	Pear	12.0			P	P	G	3					X	X			X							2.4			
1,550	*Pyrus sp.*	Pear	14.0	12,11		F	G	G	3									X							2.4			
1,551	*Fraxinus pennsylvanica*	Red Ash	15.0			D	D	D	0														x		2.4	>=25% DL over trail		
1,552	*Malus pumila*	Apple	12.0	10,13,11		G	G	G	3																2.4			
1,553	*Malus pumila*	Apple	13.0			G	G	G	2																2.4			
1,554	*Malus pumila*	Apple	12.0	10,9		G	G	G	3																2.4			

Tree Inventory Along Mattamy Phase 3 Trail Alignment

Project: TA8886 Phase 3
Client: Mattamy
Collectors: M. O'Halloran, V. Garofalo
Date: April 18, 30, and July 2, 2019
Area: Oakville

Tag#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	CONDITION																	Tree Management					Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Anticipated Removals	Anticipated Impacts	TPZ(m)-Oakville	Rationale	ESA/SARA	
1,555	*Malus pumila*	Apple	15.0	15,12,13		G	G	G	3															x			within trail footprint		
1,556	*Pyrus sp.*	Pear	14.0	12.0		P	G	G	3					X										x		2.4	>=25% DL over trail		
1,557	*Pyrus sp.*	Pear	16.0	16,15		G	F	G	3															x		2.4	>=25% DL over trail		
1,558	*Pyrus sp.*	Pear	17.0			G	G	G	3															x		2.4	>=25% DL over trail		
1,559	*Malus pumila*	Apple	13.0	10.0		G	G	G	3															x		2.4	>=25% DL over trail		
1,560	*Pyrus sp.*	Pear	20.0			F	G	G	3								X							x		2.4	>=25% DL over trail		
1,561	*Malus pumila*	Apple	13.0			G	G	G	3															x		2.4	>=25% DL over trail		
1,562	*Fraxinus pennsylvanica*	Red Ash	15.0			P	P	P	1												X			x		2.4	>=25% DL over trail		
1,563	*Pyrus sp.*	Pear	15.0			G	G	G	3															x		2.4	>=25% DL over trail		
1,564	*Pyrus sp.*	Pear	22.0	15,9		P	F	F	4								X	X						x		2.4	>=25% DL over trail		
1,565	*Fraxinus pennsylvanica*	Red Ash	12.0			D	D	D	2												X					2.4			
1,566	*Malus pumila*	Apple	12.0	12,12,9		G	G	G	3															x		2.4	within trail footprint		
1,567	*Pyrus sp.*	Pear	28.0	22.0		G	G	G	4																	2.4			
1,568	*Pyrus sp.*	Pear	29.0			G	G	G	3																x	2.4	<25% DL over trail		
1,569	*Pyrus sp.*	Pear	13.0	10.0		G	G	G	3															x		2.4	within trail footprint		
1,570	*Malus pumila*	Apple	16.0	15,12		G	G	G	3															x		2.4	>=25% DL over trail		
1,571	*Malus pumila*	Apple	22.0	14.0		G	G	G	4																x	2.4	<25% DL over trail		

Tree Inventory Along Mattamy Phase 3 Trail Alignment

Project: TA8886 Phase 3
Client: Mattamy
Collectors: M. O'Halloran, V. Garofalo
Date: April 18, 30, and July 2, 2019
Area: Oakville

Tag#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	CONDITION																	Tree Management					Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Anticipated Removals	Anticipated Impacts	TPZ(m)-Oakville	Rationale	ESA/SARA	
1,572	*Pyrus sp.*	Pear	13.0			G	G	G	3															x	2.4	<25% DL over trail		
1,573	*Pyrus sp.*	Pear	21.0			P	F	F	3							X	X	X						x	2.4	<25% DL over trail		
1,574	*Pyrus sp.*	Pear	22.0	18.0		G	G	G	4														x		2.4	>=25% DL over trail		
1,575	*Pyrus sp.*	Pear	13.0			G	G	G	2															x	2.4	<25% DL over trail		
1,576	*Pyrus sp.*	Pear	11.0	11,10		P	P	F	3							X	X	X						x	2.4	<25% DL over trail		
1,577	*Pyrus sp.*	Pear	20.0			G	G	G	4																2.4			
1,578	*Malus pumila*	Apple	18.0			G	F	G	3											X					2.4			
1,579	*Malus pumila*	Apple	14.0			G	G	G	4															x	2.4	<25% DL over trail		
1,580	*Malus pumila*	Apple	11.0			F	F	F	3																2.4			
1,581	*Malus pumila*	Apple	16.0	15,13		G	G	G	4																2.4			
1,582	*Pyrus sp.*	Pear	18.0	15,12		G	G	G	4														x		2.4	>=25% DL over trail		
1,583	*Malus pumila*	Apple	11.0			G	G	G	3															x	2.4	<25% DL over trail		on slope
1,584	*Malus pumila*	Apple	15.0	13,12		G	G	G	4														x		2.4	>=25% DL over trail		
1,585	*Malus pumila*	Apple	20.0	17,16		G	G	G	5														x		2.4	>=25% DL over trail		
1,586	*Malus pumila*	Apple	23.0	20,15		G	G	G	5														x		2.4	>=25% DL over trail		
1,587	*Malus pumila*	Apple	15.0	15.0		G	G	G	4														x		2.4	within trail footprint		
1,588	*Pyrus sp.*	Pear	28.0	15,12		G	G	G	3														x		2.4	>=25% DL over trail		
1,589	*Malus pumila*	Apple	12.0	12,12		G	G	G	2														x		2.4	>=25% DL over trail		

Tree Inventory Along Mattamy Phase 3 Trail Alignment

Project: TA8886 Phase 3
Client: Mattamy
Collectors: M. O'Halloran, V. Garofalo
Date: April 18, 30, and July 2, 2019
Area: Oakville

Tag#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	CONDITION																	Tree Management					Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Anticipated Removals	Anticipated Impacts	TPZ(m)-Oakville	Rationale	ESA/SARA	
1,590	*Malus pumila*	Apple	17.0	15,15		G	G	G	4															x	2.4	<25% DL over trail		
1,591	*Pyrus sp.*	Pear	22.0	16,15,18		G	G	G	5															x	2.4	<25% DL over trail		
1,592	*Ulmus americana*	White Elm	17.0			G	F	G	4														x		2.4	>=25% DL over trail		vines in canopy
1,593	*Pyrus sp.*	Pear	12.0			G	G	G	3														x		2.4	>=25% DL over trail		vines in canopy
1,594	*Salix sp.*	Willow	12.0			G	G	G	2														x		2.4	within trail footprint		vines in canopy
1,595	*Prunus avium*	Sweet Cherry	12.0			G	G	G	2															x	2.4	<25% DL over trail		vines in canopy
1,596	*Prunus avium*	Sweet Cherry	12.0			G	F	F	2															x	2.4	<25% DL over trail		vines in canopy
1,597	*Prunus serotina*	Black Cherry	35.0			G	F	F	5																3.0			vines in canopy
																							TOTALS	**30**	**16**			

Legend

DBH (cm)	Diameter at breast height
TI	Trunk Integrity
CS	Crown Structure
CV	Crown Vigour
DL (m)	Drip Line
CDB	Crown Dieback
EAB	Emerald Ash Borer
ESA/SARA	Species at Risk
TPZ	Tree Protection Zone
Lean Dir.	Lean Direction

Condition

G	Good
F	Fair
P	Poor
D	Dead
L	Light
M	Moderate
H	Heavy
E	East
W	West
N	North
S	South
F	Frost
C	Compression
T	Tension
S	Shear Plane

APPENDIX U-2

Terrestrial Inventories and Assessments

Terrestrial Inventory in Gullies

Terrestrial Inventory in Gullies												
	Scientific Name	**Common Name**	**GRank**	**SRank**	**MNR**	**COSEWIC**	**Local Status HNAI 2006**	**Gully A**	**Gully B**	**Gully C**	**Gully D**	**Gully E**
	RANUNCULACEAE	**BUTTERCUP FAMILY**										
*	*Ranunculus acris*	tall buttercup	G5	SE5			I					x
	ULMACEAE	**ELM FAMILY**										
	Ulmus americana	white elm	G5?	S5			C			x		
	JUGLANDACEAE	**WALNUT FAMILY**										
	Juglans nigra	black walnut	G5	S4			C		x			x
	GUTTIFERAE	**ST. JOHN'S-WORT FAMILY**										
*	*Hypericum perforatum*	common St. John's-wort	G?	SE5			I	x				
	SALICACEAE	**WILLOW FAMILY**										
	Populus deltoides	cottonwood	G5T?	S5						x		
	BRASSICACEAE	**MUSTARD FAMILY**										
*	*Thlaspi arvense*	field penny-cress	G?	SE5			I				x	
	ROSACEAE	**ROSE FAMILY**										
	Amelanchier sp.	juneberry							x			
	Crataegus sp.	hawthorn						x	x	x		x
	Fragaria virginiana ssp. glauca	scarlet strawberry						x	x			x
	Geum aleppicum	yellow avens	G5	S5			C	x		x		
*	*Malus pumila*	common apple	G5	SE5			I	x				x
	Prunus virginiana var. virginiana	choke cherry	G5T?	S5			C					x
*	*Pyrus communis*	common pear	G5	SE4			I			x		x
*	*Rosa multiflora*	multiflora rose	G?	SE4			I			x		
	Rubus idaeus ssp.	wild red raspberry	G5T	S5			C		x	x		

Terrestrial Inventory in Gullies												
	Scientific Name	**Common Name**	**GRank**	**SRank**	**MNR**	**COSEWIC**	**Local Status HNAI 2006**	**Gully A**	**Gully B**	**Gully C**	**Gully D**	**Gully E**
	strigosus											
	Rubus occidentalis	thimble-berry	G5	S5			C	x				
	FABACEAE	**PEA FAMILY**										
*	*Glycine max*	soya bean	G?	SE2			I				x	
*	*Lotus corniculatus*	bird's-foot trefoil	G?	SE5			I		x		x	
*	*Melilotus alba*	white sweet-clover	G?	SE5			I			x		
	CORNACEAE	**DOGWOOD FAMILY**										
	Cornus racemosa	red panicled dogwood	G5?	S5			C	x	x	x		
	Cornus sericea ssp. sericea	red-osier dogwood	G5	S5			C			x		x
	RHAMNACEAE	**BUCKTHORN FAMILY**										
*	*Rhamnus cathartica*	common buckthorn	G?	SE5			I	x	x	x		x
	VITACEAE	**GRAPE FAMILY**										
	Vitis riparia	riverbank grape	G5	S5			C			x		
	APIACEAE	**PARSLEY FAMILY**										
*	*Daucus carota*	wild carrot	G?	SE5			I			x	x	
	PLANTAGINACEAE	**PLANTAIN FAMILY**										
*	*Plantago lanceolata*	ribgrass	G5	SE5			I	x	x			
	OLEACEAE	**OLIVE FAMILY**										
	Fraxinus pennsylvanica	red ash	G5	S5			C		x			
	SCROPHULARIACEAE	**FIGWORT FAMILY**										
*	*Veronica officinalis*	common speedwell	G5	SE5			I	x				

Terrestrial Inventory in Gullies												
	Scientific Name	**Common Name**	**GRank**	**SRank**	**MNR**	**COSEWIC**	**Local Status HNAI 2006**	**Gully A**	**Gully B**	**Gully C**	**Gully D**	**Gully E**
	CAPRIFOLIACEAE	**HONEYSUCKLE FAMILY**										
*	*Lonicera tatarica*	tartarian honeysuckle	G?	SE5			I		x	x		x
	DIPSACACEAE	**TEASEL FAMILY**										
*	*Dipsacus fullonum ssp. sylvestris*	wild teasel	G?T?	SE5			I				x	
	ASTERACEAE	**ASTER FAMILY**										
*	*Arctium minus*	common burdock	G?T?	SE5			I					x
	Aster lanceolatus ssp. lanceolatus	tall white aster	G5T?	S5			C					x
	Aster sp.	aster								x		
*	*Cirsium vulgare*	bull thistle	G5	SE5			I					x
	Euthamia graminifolia	flat-topped bushy goldenrod	G5	S5			C		x			
	Solidago canadensis	canada goldenrod	G5	S5			C	x	x	x		x
*	*Taraxacum officinale*	common dandelion	G5	SE5			I	x			x	x
	POACEAE	**GRASS FAMILY**										
*	*Bromus inermis ssp. inermis*	awnless brome	G4G5T?	SE5			I		x	x		x
	Phalaris arundinacea	reed canary grass	G5	S5			C					x
*	*Phleum pratense*	timothy	G?	SE5			I		x			
	Poa compressa	Canada blue grass	G?	S5			C			x		
	Setaria sp.	foxtail								x		

APPENDIX U-3

Terrestrial Inventories and Assessments

Terrestrial Inventory and Assessment Along Reach JC-6 Road Alignments

Terrestrial Inventory and Assessment Along JC-6 Road Alignments

Project: TA8886 Phase 3
Client: Mattamy
Date: April 18, 30, July 2, 2019
Collectors: M. O'Halloran, V. Garofalo
Area: Oakville

TAG#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	Condition																Tree Management								Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Removal Recommended Option 1	Removal Recommended Option 2	Impact Anticipated Option 1	Impact Anticipated Option 2	Protect	TPZ(m)-City/Privately Owned Tree	TPZ(m) Ravine/Natural Feature Tree	ESA/SARA	
1,193	*Pyrus sp.*	Pear	15.0			G	G	G	4																			2.40			
1,194	*Pyrus sp.*	Pear	12.0			G	G	G	3																			2.40	3.60		
1,195	*Pyrus sp.*	Pear	17.0			G	G	G	3																			2.40			
1,196	*Fraxinus pennsylvanica*	Red Ash	15.0			G	G	F	3																			2.40	3.60		
1,197	*Pyrus sp.*	Pear	16.0	13,15,15		G	G	G	3																			2.40			
1,198	*Pyrus sp.*	Pear	17.0	15.0		G	G	G	3															x	x				2.40	3.60		
1,199	*Pyrus sp.*	Pear	13.0			G	G	F	2	20														x	x				2.40			
1,200	*Pyrus sp.*	Pear	19.0	11.0		G	G	G	3																				2.40	3.60		
1,201	*Pyrus sp.*	Pear	17.0	16,14,9		G	G	G	4																				2.40			
1,202	*Fraxinus pennsylvanica*	Red Ash	16.0	16.0		G	G	G	3		x	x																	2.40	3.60		
1,203	*Fraxinus pennsylvanica*	Red Ash	13.0			G	G	G	3																		x		2.40			
1,204	*Fraxinus pennsylvanica*	Red Ash	20.0	11.0		P	P	F	3												x						x		2.40	3.60		
1,205	*Pyrus sp.*	Pear	22.0	20.0		G	F	F	3																x	x			2.40			
1,206	*Pyrus sp.*	Pear	22.0	10.0		G	G	G	3															x	x				2.40	3.60		
1,207	*Pyrus sp.*	Pear	15.0	12.0		G	G	G	3															x	x				2.40			
1,208	*Pyrus sp.*	Pear	12.0	10,10,8		G	F	P	3	40														x	x				2.40	3.60		
1,209	*Fraxinus pennsylvanica*	Red Ash	20.0			D	D	D	0																				2.40			
1,210	*Pyrus sp.*	Pear	15.0			G	G	G	2															x	x				2.40	3.60		

Terrestrial Inventory and Assessment Along JC-6 Road Alignments

Project: TA8886 Phase 3
Client: Mattamy
Date: April 18, 30, July 2, 2019
Collectors: M. O'Halloran, V. Garofalo
Area: Oakville

TAG#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	Condition																Tree Management								Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Removal Recommended Option 1	Removal Recommended Option 2	Impact Anticipated Option 1	Impact Anticipated Option 2	Protect	TPZ(m)-City/Privately Owned Tree	TPZ(m) Ravine/Natural Feature Tree	ESA/SARA	
1,211	*Pyrus sp.*	Pear	22.0	14,10,12		G	G	G	4															x	x				2.40			
1,212	*Pyrus sp.*	Pear	15.0	14.0		G	G	G	3															x	x				2.40	3.60		
1,213	*Fraxinus pennsylvanica*	Red Ash	22.0			G	G	F	3																				2.40			
1,214	*Pyrus sp.*	Pear	16.0			F	F	F	3												x								2.40	3.60		
1,215	*Pyrus sp.*	Pear	65.0			P	P	P	4							x	x	x	x										4.20			hollow, hazard
1,216	*Pyrus sp.*	Pear	16.0	15.0		G	G	G	4															x	x				2.40	4.00		
1,217	*Pyrus sp.*	Pear	16.0	15,14		P	F	F	3							x	x	x	x					x	x				2.40			split trunk
1,218	*Fraxinus pennsylvanica*	Red Ash	15.0			P	P	P	3				x								x								2.40	3.60		
1,219	*Pyrus sp.*	Pear	11.0	11,10,9		G	G	G	3																				2.40			
1,220	*Pyrus sp.*	Pear	18.0	13.0		G	G	G	3																	x			2.40	3.60		
1,221	*Pyrus sp.*	Pear	21.0			G	G	G	3																				2.40			
1,222	*Fraxinus pennsylvanica*	Red Ash	13.0			F	F	F	2												x								2.40	3.60		
1,223	*Ulmus americana*	White Elm	21.0			G	G	G	3																				2.40			
1,224	*Pyrus sp.*	Pear	34.0	15.0		G	G	G	3																				3.00	4.80		
1,225	*Pyrus sp.*	Pear	13.0			G	G	G	3															x					2.40			
1,226	*Fraxinus pennsylvanica*	Red Ash	10.0			G	G	F	2												x			x					2.40	3.60		
1,227	*Pyrus sp.*	Pear	14.0			G	G	G	3																	x			2.40			
1,228	*Pyrus sp.*	Pear	11.0	10,9,9		G	G	G	3															x			x		2.40	3.60		

Terrestrial Inventory and Assessment Along JC-6 Road Alignments

Project: TA8886 Phase 3
Client: Mattamy
Date: April 18, 30, July 2, 2019
Collectors: M. O'Halloran, V. Garofalo
Area: Oakville

TAG#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	Condition																Tree Management								Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Removal Recommended Option 1	Removal Recommended Option 2	Impact Anticipated Option 1	Impact Anticipated Option 2	Protect	TPZ(m)-City/Privately Owned Tree	TPZ(m) Ravine/Natural Feature Tree	ESA/SARA	
1,229	*Ulmus americana*	White Elm	10.0			D	D	D	0																			2.40			
1,230	*Pyrus sp.*	Pear	13.0	11.0		G	G	G	3															x	x				2.40	3.60		
1,231	*Pyrus sp.*	Pear	19.0			G	G	G	3															x	x				2.40			
1,232	*Fraxinus pennsylvanica*	Red Ash	13.0			D	D	D	0											x									2.40	3.60		
1,233	*Pyrus sp.*	Pear	12.0			G	G	G	3															x	x				2.40			
1,234	*Fraxinus pennsylvanica*	Red Ash	14.0			G	G	G	3											x				x	x				2.40	3.60		
1,235	*Pyrus sp.*	Pear	17.0	14.0		G	G	G	4										x					x	x				2.40			
1,236	*Pyrus sp.*	Pear	15.0	11.0		G	G	G	3															x	x				2.40	3.60		
1,237	*Fraxinus pennsylvanica*	Red Ash	18.0			G	G	G	3															x	x				2.40			
1,238	*Tilia americana*	Basswood	13.0			G	F	G	2																				2.40	3.60		tree leaning on it
1,239	*Tilia americana*	Basswood	14.0			G	F	G	3														x						2.40			
1,240	*Tilia americana*	Basswood	14.0			G	G	G	2																				2.40	3.60		
1,241	*Fraxinus pennsylvanica*	Red Ash	10.0			D	D	D	0																				2.40			
1,242	*Tilia americana*	Basswood	17.0			G	G	G	3																				2.40	3.60		
1,243	*Fraxinus pennsylvanica*	Red Ash	14.0			F	F	F	3																				2.40			
1,244	*Tilia americana*	Basswood	10.0			G	G	G	3																				2.40	3.60		
1,245	*Tilia americana*	Basswood	20.0			G	G	G	4																				2.40			
1,246	*Ulmus americana*	White Elm	14.0			G	G	G	3																				2.40	3.60		

Terrestrial Inventory and Assessment Along JC-6 Road Alignments

Project: TA8886 Phase 3
Client: Mattamy
Date: April 18, 30, July 2, 2019
Collectors: M. O'Halloran, V. Garofalo
Area: Oakville

TAG#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	Condition																Tree Management								Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Removal Recommended Option 1	Removal Recommended Option 2	Impact Anticipated Option 1	Impact Anticipated Option 2	Protect	TPZ(m)-City/Privately Owned Tree	TPZ(m) Ravine/Natural Feature Tree	ESA/SARA	
1,247	*Tilia americana*	Basswood	27.0			G	G	G	5																x			2.40			
1,248	*Pyrus sp.*	Pear	19.0			G	G	G	3																			2.40	3.60		
1,249	*Tilia americana*	Basswood	11.0			G	G	G	3																x			2.40			
1,250	*Fraxinus pennsylvanica*	Red Ash	18.0			G	G	G	3																x			2.40	3.60		
1,251	*Fraxinus pennsylvanica*	Red Ash	13.0			D	D	D	0																			2.40			
1,252	*Fraxinus pennsylvanica*	Red Ash	10.0			G	G	G	2															x					2.40	3.60		
1,253	*Fraxinus pennsylvanica*	Red Ash	10.0			F	F	F	1																			2.40			
1,254	*Tilia americana*	Basswood	16.0			G	G	G	3																			2.40	3.60		
1,255	*Tilia americana*	Basswood	12.0			F	G	G	1																			2.40			
1,256	*Fraxinus pennsylvanica*	Red Ash	13.0			D	D	D	0																			2.40	3.60		
1,257	*Tilia americana*	Basswood	12.0			G	G	G	2																			2.40			
1,258	*Tilia americana*	Basswood	13.0			G	G	G	2																			2.40	3.60		
1,259	*Tilia americana*	Basswood	14.0			G	G	G	2																			2.40			
1,260	*Tilia americana*	Basswood	13.0			G	G	G	2																			2.40	3.60		
1,261	*Ulmus americana*	White Elm	16.0			D	D	D	0																			2.40			
1,262	*Tilia americana*	Basswood	15.0			G	G	G	4															x				2.40	4.00		
1,263	*Tilia americana*	Basswood	15.0			G	G	G	4															x				2.40			
1,264	*Malus pumila*	Apple	10.0	9.0		F	F	G	4		x	x												x				2.40	4.00		
1,265	*Fraxinus pennsylvanica*	Red Ash	15.0	15.0		F	F	G	4		x	x												x				2.40			

Terrestrial Inventory and Assessment Along JC-6 Road Alignments

Project: TA8886 Phase 3
Client: Mattamy
Date: April 18, 30, July 2, 2019
Collectors: M. O'Halloran, V. Garofalo
Area: Oakville

TAG#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	Condition																Tree Management								Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Removal Recommended Option 1	Removal Recommended Option 2	Impact Anticipated Option 1	Impact Anticipated Option 2	Protect	TPZ(m)-City/Privately Owned Tree	TPZ(m) Ravine/Natural Feature Tree	ESA/SARA	
1,266	*Fraxinus pennsylvanica*	Red Ash	12.0			D	D	D	0																			2.40	3.60		
1,267	*Ulmus americana*	White Elm	17.0			G	G	G	3														x					2.40			
1,268	*Fraxinus pennsylvanica*	Red Ash	11.0			F	F	G	2														x					2.40	3.60		
1,269	*Fraxinus pennsylvanica*	Red Ash	10.0			D	D	D	0																			2.40			
1,270	*Fraxinus pennsylvanica*	Red Ash	12.0			D	D	D	3																			2.40	3.60		
1,271	*Fraxinus pennsylvanica*	Red Ash	12.0			D	D	D	0																			2.40			
1,272	*Tilia americana*	Basswood	12.0			G	G	G	2																			2.40	3.60		
1,273	*Tilia americana*	Basswood	22.0			G	G	G	4																x			2.40			
1,274	*Tilia americana*	Basswood	11.0			G	G	G	2																			2.40	3.60		
1,275	*Prunus serotina*	Black Cherry	19.0			G	G	G	4																			2.40			
1,276	*Fraxinus pennsylvanica*	Red Ash	14.0	13.0		D	D	D	2																			2.40	3.60		
1,277	*Tilia americana*	Basswood	10.0			G	G	G	1																			2.40			
1,278	*Acer saccharum ssp. saccharum*	Sugar Maple	11.0			G	G	G	2																			2.40	3.60		
1,279	*Fraxinus pennsylvanica*	Red Ash	13.0			D	D	D	0																			2.40			
1,280	*Fraxinus pennsylvanica*	Red Ash	11.0			D	D	D	0																			2.40	3.60		
1,281	*Fraxinus pennsylvanica*	Red Ash	10.0	8.0		D	D	D	0																			2.40			

Terrestrial Inventory and Assessment Along JC-6 Road Alignments

Project: TA8886 Phase 3
Client: Mattamy
Date: April 18, 30, July 2, 2019
Collectors: M. O'Halloran, V. Garofalo
Area: Oakville

TAG#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	Condition																Tree Management								Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Removal Recommended Option 1	Removal Recommended Option 2	Impact Anticipated Option 1	Impact Anticipated Option 2	Protect	TPZ(m)-City/Privately Owned Tree	TPZ(m) Ravine/Natural Feature Tree	ESA/SARA	
1,282	*Pyrus sp.*	Pear	19.0	9.0		P	G	G	6		x	x						x								x			2.40	6.00		at base
1,283	*Fraxinus pennsylvanica*	Red Ash	16.0			D	D	D	0																				2.40			
1,284	*Fraxinus pennsylvanica*	Red Ash	15.0			F	F	G	2																				2.40	3.60		
1,285	*Pyrus sp.*	Pear	20.0			G	G	G	2																				2.40			
1,286	*Tilia americana*	Basswood	15.0			G	G	G	2																				2.40	3.60		
1,287	*Tilia americana*	Basswood	19.0			G	G	G	3																				2.40			
1,288	*Tilia americana*	Basswood	10.0			G	G	G	2																				2.40	3.60		
1,289	*Fraxinus pennsylvanica*	Red Ash	14.0			D	D	D	0																				2.40			
1,290	*Acer saccharum ssp. saccharum*	Sugar Maple	16.0			G	G	G	5																	x			2.40	5.00		
1,291	*Fraxinus pennsylvanica*	Red Ash	35.0	12,11		D	D	D	0																				3.00			
1,292	*Acer saccharum ssp. saccharum*	Sugar Maple	11.0	11.0		F	F	G	3		x	x																	2.40	3.60		
1,293	*Ulmus americana*	White Elm	33.0			G	G	G	6																				3.00			
1,294	*Fraxinus pennsylvanica*	Red Ash	28.0			F	F	G	5																				2.40	5.00		
1,295	*Malus pumila*	Apple	55.0			D	D	D	0																				3.60			hollow
1,296	*Fraxinus pennsylvanica*	Red Ash	11.0			D	D	D	0																				2.40	3.60		
1,297	*Fraxinus pennsylvanica*	Red Ash	12.0			D	D	D	0																				2.40			

Terrestrial Inventory and Assessment Along JC-6 Road Alignments

Project: TA8886 Phase 3
Client: Mattamy
Date: April 18, 30, July 2, 2019
Collectors: M. O'Halloran, V. Garofalo
Area: Oakville

TAG#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	Condition																Tree Management								Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Removal Recommended Option 1	Removal Recommended Option 2	Impact Anticipated Option 1	Impact Anticipated Option 2	Protect	TPZ(m)-City/Privately Owned Tree	TPZ(m) Ravine/Natural Feature Tree	ESA/SARA	
1,298	*Fraxinus pennsylvanica*	Red Ash	10.0	8.0		D	D	D	0																			2.40	3.60		
1,299	*Pyrus sp.*	Pear	17.0			G	G	G	2														x					2.40			
1,300	*Fraxinus pennsylvanica*	Red Ash	13.0			D	D	D	0																			2.40	3.60		
1,301	*Fraxinus pennsylvanica*	Red Ash	21.0			F	F	F	5														x	x				2.40			
1,302	*Fraxinus pennsylvanica*	Red Ash	12.0			D	D	D	0																			2.40	3.60		
1,303	*Fraxinus pennsylvanica*	Red Ash	15.0			F	F	F	3																			2.40			
1,304	*Prunus avium*	Sweet Cherry	12.0			F	F	G	4																			2.40	4.00		
1,305	*Prunus avium*	Sweet Cherry	13.0			G	G	G	3																			2.40			
1,306	*Prunus avium*	Sweet Cherry	23.0			G	G	G	6																			2.40	6.00		
1,307	*Prunus avium*	Sweet Cherry	24.0			G	G	G	6																			2.40			
1,308	*Prunus avium*	Sweet Cherry	13.0			G	G	G	2															x	x			2.40	3.60		
1,309	*Fraxinus pennsylvanica*	Red Ash	11.0			D	D	D	2																			2.40			
1,310	*Fraxinus pennsylvanica*	Red Ash	14.0			F	F	F	3															x	x			2.40	3.60		
1,311	*Prunus avium*	Sweet Cherry	14.0			F	G	G	3									x						x	x			2.40			
1,312	*Fraxinus pennsylvanica*	Red Ash	14.0			F	F	F	4															x	x			2.40	4.00		
1,313	*Fraxinus pennsylvanica*	Red Ash	13.0			F	F	F	3															x	x			2.40			
1,314	*Fraxinus pennsylvanica*	Red Ash	19.0			D	D	D	0																			2.40	3.60		

Terrestrial Inventory and Assessment Along JC-6 Road Alignments

Project: TA8886 Phase 3
Client: Mattamy
Date: April 18, 30, July 2, 2019
Collectors: M. O'Halloran, V. Garofalo
Area: Oakville

TAG#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	Condition																Tree Management								Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Removal Recommended Option 1	Removal Recommended Option 2	Impact Anticipated Option 1	Impact Anticipated Option 2	Protect	TPZ(m)-City/Privately Owned Tree	TPZ(m) Ravine/Natural Feature Tree	ESA/SARA	
1,315	*Malus pumila*	Apple	20.0	18,15,13,14		F	F	G	6		x	x												x	x				2.40			
1,316	*Fraxinus pennsylvanica*	Red Ash	14.0			D	D	D	0																				2.40	3.60		
1,317	*Fraxinus pennsylvanica*	Red Ash	36.0			D	D	D	0																				3.00			
1,318	*Acer saccharum ssp. saccharum*	Sugar Maple	14.0			G	G	G	3															x	x				2.40	3.60		
1,319	*Fraxinus pennsylvanica*	Red Ash	13.0			F	F	F	3															x	x				2.40			vines
1,320	*Ulmus americana*	White Elm	32.0			G	G	G	7																				3.00	7.00		
1,321	*Tilia americana*	Basswood	17.0	10.0		G	G	G	4																				2.40			
1,322	*Tilia americana*	Basswood	26.0	22,9		F	F	G	7		x	x											x						2.40	7.00		
1,323	*Tilia americana*	Basswood	24.0			G	G	G	4														x						2.40			
1,324	*Acer saccharum ssp. saccharum*	Sugar Maple	20.0			G	G	G	3														x						2.40	3.60		
1,325	*Tilia americana*	Basswood	11.0			G	G	G	2																				2.40			
1,326	*Quercus macrocarpa*	Bur Oak	36.0			G	G	G	7															x	x				3.00	7.00		
1,327	*Malus pumila*	Apple	17.0	15,16		P	P	G	7															x	x				2.40			
1,328	*Prunus avium*	Sweet Cherry	36.0			G	G	G	6															x	x				3.00	6.00		
1,329	*Fraxinus pennsylvanica*	Red Ash	17.0			F	F	F	3															x	x				2.40			
1,330	*Malus pumila*	Apple	35.0			P	P	F	4															x	x				3.00	4.80		broken, fallen

Terrestrial Inventory and Assessment Along JC-6 Road Alignments

Project: TA8886 Phase 3
Client: Mattamy
Date: April 18, 30, July 2, 2019
Collectors: M. O'Halloran, V. Garofalo
Area: Oakville

TAG#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	Condition																Tree Management								Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Removal Recommended Option 1	Removal Recommended Option 2	Impact Anticipated Option 1	Impact Anticipated Option 2	Protect	TPZ(m)-City/Privately Owned Tree	TPZ(m) Ravine/Natural Feature Tree	ESA/SARA	
1,331	*Fraxinus pennsylvanica*	Red Ash	12.0			D	D	D	0																			2.40			
1,332	*Fraxinus pennsylvanica*	Red Ash	10.0			D	D	D	0																			2.40	3.60		
1,333	*Fraxinus pennsylvanica*	Red Ash	13.0			F	F	F	3														x	x				2.40			
1,334	*Fraxinus pennsylvanica*	Red Ash	17.0			F	F	F	3														x	x				2.40	3.60		
1,335	*Prunus avium*	Sweet Cherry	21.0			G	F	G	8														x	x				2.40			
1,336	*Fraxinus pennsylvanica*	Red Ash	31.0			F	F	F	6														x	x				3.00	6.00		
1,337	*Pyrus sp.*	Pear	16.0			G	F	G	4													x	x	x				2.40			
1,338	*Fraxinus pennsylvanica*	Red Ash	17.0			F	F	F	4														x	x				2.40	4.00		
1,339	*Fraxinus pennsylvanica*	Red Ash	12.0	11.0		D	D	D	0																			2.40			
1,340	*Fraxinus pennsylvanica*	Red Ash	11.0			F	F	F	3														x	x				2.40	3.60		
1,341	*Fraxinus pennsylvanica*	Red Ash	20.0			P	F	F	3														x	x				2.40			
1,342	*Fraxinus pennsylvanica*	Red Ash	13.0			F	F	F	3														x	x				2.40	3.60		
1,343	*Fraxinus pennsylvanica*	Red Ash	17.0			F	F	F	3														x	x				2.40			
1,344	*Fraxinus pennsylvanica*	Red Ash	13.0			F	F	F	3														x	x				2.40	3.60		

Terrestrial Inventory and Assessment Along JC-6 Road Alignments

Project: TA8886 Phase 3
Client: Mattamy
Date: April 18, 30, July 2, 2019
Collectors: M. O'Halloran, V. Garofalo
Area: Oakville

TAG#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	Condition																Tree Management								Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Removal Recommended Option 1	Removal Recommended Option 2	Impact Anticipated Option 1	Impact Anticipated Option 2	Protect	TPZ(m)-City/Privately Owned Tree	TPZ(m) Ravine/Natural Feature Tree	ESA/SARA	
1,345	*Fraxinus pennsylvanica*	Red Ash	18.0			F	F	F	3														x	x				2.40			
1,346	*Fraxinus pennsylvanica*	Red Ash	13.0			F	F	F	3														x	x				2.40	3.60		
1,347	*Fraxinus pennsylvanica*	Red Ash	17.0			F	F	F	3														x	x				2.40			
1,348	*Fraxinus pennsylvanica*	Red Ash	13.0			F	F	F	3														x	x				2.40	3.60		
1,349	*Fraxinus pennsylvanica*	Red Ash	16.0	15.0		F	F	F	3		x	x											x	x				2.40			
1,350	*Malus pumila*	Apple	16.0	15,13,11,10		F	F	G	6														x	x				2.40	6.00		
1,351	*Fraxinus pennsylvanica*	Red Ash	15.0	15.0		F	F	F	4														x	x				2.40			
1,352	*Fraxinus pennsylvanica*	Red Ash	11.0	11.0		F	F	F	3														x	x				2.40	3.60		
1,353	*Fraxinus pennsylvanica*	Red Ash	11.0	11.0		F	F	F	3														x	x				2.40			
1,354	*Pyrus sp.*	Pear	13.0			G	G	G	2														x	x				2.40	3.60		
1,355	*Fraxinus pennsylvanica*	Red Ash	12.0	12.0		D	D	D	0																			2.40			
1,356	*Fraxinus pennsylvanica*	Red Ash	18.0			F	F	F	3														x	x				2.40	3.60		
1,357	*Fraxinus pennsylvanica*	Red Ash	15.0	11.0		F	F	F	3														x	x				2.40			
1,358	*Fraxinus pennsylvanica*	Red Ash	20.0			F	F	F	3														x	x				2.40	3.60		

Terrestrial Inventory and Assessment Along JC-6 Road Alignments

Project: TA8886 Phase 3
Client: Mattamy
Date: April 18, 30, July 2, 2019
Collectors: M. O'Halloran, V. Garofalo
Area: Oakville

TAG#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	Condition																Tree Management								Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Removal Recommended Option 1	Removal Recommended Option 2	Impact Anticipated Option 1	Impact Anticipated Option 2	Protect	TPZ(m)-City/Privately Owned Tree	TPZ(m) Ravine/Natural Feature Tree	ESA/SARA	
1,359	*Fraxinus pennsylvanica*	Red Ash	22.0			F	F	F	3														x	x				2.40			
1,360	*Fraxinus pennsylvanica*	Red Ash	14.0			F	F	F	3														x	x				2.40	3.60		
1,361	*Fraxinus pennsylvanica*	Red Ash	18.0			F	F	F	3														x	x				2.40			
1,362	*Fraxinus pennsylvanica*	Red Ash	16.0			F	F	F	3														x	x				2.40	3.60		
1,363	*Fraxinus pennsylvanica*	Red Ash	19.0	18.0		F	F	F	3														x	x				2.40			
1,364	*Fraxinus pennsylvanica*	Red Ash	13.0			F	F	F	3														x	x				2.40	3.60		
1,365	*Malus pumila*	Apple	12.0	10.0		F	F	F	3														x	x				2.40			
1,366	*Fraxinus pennsylvanica*	Red Ash	11.0			F	F	F	3														x	x				2.40	3.60		
1,367	*Fraxinus pennsylvanica*	Red Ash	15.0			F	F	F	3														x	x				2.40			
1,368	*Pyrus sp.*	Pear	17.0			F	G	G	3														x	x				2.40	3.60		
1,369	*Fraxinus pennsylvanica*	Red Ash	24.0	17.0		D	D	D	3																			2.40			
1,370	*Pyrus sp.*	Pear	14.0			G	F	G	3														x	x				2.40	3.60		bent canopy
1,371	*Fraxinus pennsylvanica*	Red Ash	20.0			F	F	F	3														x	x				2.40			
1,372	*Fraxinus pennsylvanica*	Red Ash	10.0			D	D	D	0																			2.40	3.60		
1,373	*Acer negundo*	Manitoba Maple	21.0	18.0		G	G	G	4														x	x				2.40			

Terrestrial Inventory and Assessment Along JC-6 Road Alignments

Project: TA8886 Phase 3
Client: Mattamy
Date: April 18, 30, July 2, 2019
Collectors: M. O'Halloran, V. Garofalo
Area: Oakville

TAG#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	Condition																Tree Management								Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Removal Recommended Option 1	Removal Recommended Option 2	Impact Anticipated Option 1	Impact Anticipated Option 2	Protect	TPZ(m)-City/Privately Owned Tree	TPZ(m) Ravine/Natural Feature Tree	ESA/SARA	
1,374	*Malus pumila*	Apple	11.0	10,8		F	G	G	3		x	x												x	x				2.40	3.60		
1,375	*Malus pumila*	Apple	17.0	16.0		F	G	G	4				se											x	x				2.40			
1,376	*Malus pumila*	Apple	14.0			G	G	G	3															x	x				2.40	3.60		
1,377	*Malus pumila*	Apple	15.0	9.0		G	G	G	3																		x		2.40			
1,378	*Pyrus sp.*	Pear	24.0			G	G	G	4																				2.40	4.00		
1,379	*Malus pumila*	Apple	14.0	11.0		G	G	G	4																				2.40			
1,380	*Pyrus sp.*	Pear	13.0			G	G	G	4																				2.40	4.00		
1,381	*Malus pumila*	Apple	13.0	10.0		F	G	G	4																				2.40			
1,382	*Pyrus sp.*	Pear	33.0	10.0		G	G	G	4																				3.00	4.80		
1,383	*Pyrus sp.*	Pear	13.0			G	G	G	3																				2.40			
1,384	*Fraxinus pennsylvanica*	Red Ash	20.0			D	D	D	0																				2.40	3.60		
1,385	*Fraxinus pennsylvanica*	Red Ash	21.0			D	D	D	0																				2.40			
1,386	*Fraxinus pennsylvanica*	Red Ash	15.0			D	D	D	0																				2.40	3.60		
1,387	*Fraxinus pennsylvanica*	Red Ash	14.0			D	D	D	0																				2.40			
1,388	*Fraxinus pennsylvanica*	Red Ash	16.0	14,13		D	D	D	0																				2.40	3.60		
1,389	*Fraxinus pennsylvanica*	Red Ash	17.0	13.0		D	D	D	0																				2.40			
1,390	*Fraxinus pennsylvanica*	Red Ash	10.0	6.0		D	D	D	0																				2.40	3.60		
1,391	*Malus pumila*	Apple	17.0	16,16,16		F	F	G	5		x	x												x	x				2.40			

Terrestrial Inventory and Assessment Along JC-6 Road Alignments

Project: TA8886 Phase 3
Client: Mattamy
Date: April 18, 30, July 2, 2019
Collectors: M. O'Halloran, V. Garofalo
Area: Oakville

TAG#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	Condition																Tree Management								Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Removal Recommended Option 1	Removal Recommended Option 2	Impact Anticipated Option 1	Impact Anticipated Option 2	Protect	TPZ(m)-City/Privately Owned Tree	TPZ(m) Ravine/Natural Feature Tree	ESA/SARA	
1,392	*Fraxinus pennsylvanica*	Red Ash	16.0			F	F	F	3															x	x				2.40	3.60		
1,393	*Quercus macrocarpa*	Bur Oak	18.0			G	G	G	3																	x	x		2.40			
1,394	*Fraxinus pennsylvanica*	Red Ash	40.0			F	F	F	6															x	x				3.00	6.00		
1,395	*Fraxinus pennsylvanica*	Red Ash	26.0			F	F	F	3															x	x				2.40			
1,396	*Prunus serotina*	Black Cherry	15.0			G	G	G	2															x	x				2.40	3.60		
1,397	*Prunus avium*	Sweet Cherry	13.0			G	G	G	3																x	x			2.40			
1,398	*Pyrus sp.*	Pear	26.0			P	G	G	3							x	x	x							x	x			2.40	3.60		
1,399	*Fraxinus pennsylvanica*	Red Ash	22.0			F	F	F	3																x	x			2.40			
1,400	*Fraxinus pennsylvanica*	Red Ash	15.0			F	F	F	2																x	x			2.40	3.60		
1,401	*Fraxinus pennsylvanica*	Red Ash	11.0			F	F	F	2																x	x			2.40			
1,402	*Fraxinus pennsylvanica*	Red Ash	11.0			F	F	F	2																x	x			2.40	3.60		
1,403	*Fraxinus pennsylvanica*	Red Ash	12.0			F	F	F	2																x	x			2.40			
1,404	*Pyrus sp.*	Pear	20.0			P	F	G	3															x	x				2.40	3.60		intertwined with 1395
1,405	*Fraxinus pennsylvanica*	Red Ash	10.0			F	F	F	2															x	x				2.40			
1,406	*Pyrus sp.*	Pear	22.0			F	F	G	4															x	x				2.40	4.00		
1,407	*Pyrus sp.*	Pear	15.0	14.0		G	F	G	3																				2.40			

Terrestrial Inventory and Assessment Along JC-6 Road Alignments

Project: TA8886 Phase 3
Client: Mattamy
Date: April 18, 30, July 2, 2019
Collectors: M. O'Halloran, V. Garofalo
Area: Oakville

TAG#	Species Scientific Name	Species Common Name	DBH (cm)	Additional Stems	Estimation of DBH (x)	Condition																Tree Management								Comments
						TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Suppressed	Removal Recommended Option 1	Removal Recommended Option 2	Impact Anticipated Option 1	Impact Anticipated Option 2	Protect	TPZ(m)-City/Privately Owned Tree	TPZ(m) Ravine/Natural Feature Tree	ESA/SARA	
1,408	*Pyrus sp.*	Pear	15.0			G	G	G	2																			2.40	3.60		
1,409	*Fraxinus pennsylvanica*	Red Ash	19.0			G	G	G	3																			2.40			
1,410	*Pyrus sp.*	Pear	13.0	10.0		G	G	G	3																			2.40	3.60		
1,411	*Quercus macrocarpa*	Bur Oak	31.0			G	G	G	4																			3.00			
1,412	*Pyrus sp.*	Pear	21.0	13.0		G	G	G	3																			2.40	3.60		
1,413	*Pyrus sp.*	Pear	18.0			G	G	G	3																			2.40			
1,414	*Pyrus sp.*	Pear	14.0	12,10,10		G	G	G	3																			2.40	3.60		
1,415	*Pyrus sp.*	Pear	20.0			G	G	G	3																			2.40			
1,416	*Malus pumila*	Apple	22.0	19,14		G	G	G	4																			2.40	4.00		
1,417	*Malus pumila*	Apple	18.0	16,15		G	G	G	4																			2.40			
1,418	*Pyrus sp.*	Pear	25.0	21,16		G	G	G	3																			2.40	3.60		
1,419	*Malus pumila*	Apple	22.0	21.0		P	P	P	2								x	x										2.40			trunk broken
1,420	*Pyrus sp.*	Pear	18.0			G	G	G	3																			2.40	3.60		
																							TOTALS	**90**	**87**	**17**	**5**				

Legend

DBH (cm)	Diameter at breast height
TI	Trunk Integrity
CS	Crown Structure
CV	Crown Vigour
DL (m)	Drip Line
CDB	Crown Dieback
EAB	Emerald Ash Borer
ESA/SARA	Species at Risk
TPZ	Tree Protection Zone
Lean Dir.	Lean Direction

Condition

G	Good
F	Fair
P	Poor
D	Dead
L	Light
M	Moderate
H	Heavy
E	East
W	West
N	North
S	South
F	Frost
C	Compression
T	Tension
S	Shear Plane

STONYBROOK

May 28, 2020
File 60226

Ms. L. Musson
Town of Oakville
1225 Trafalgar Road
Oakville, Ontario
L6H 0H3

Ms. L. Schreiner
Conservation Halton
2596 Britannia Road West
Burlington, Ontario
L7P 0G3

Re: Mattamy (Joshua Creek) Phase 3 EIR/FSS Addendum to the Final Joshua's Creek Tributaries EIR/FSS North Oakville East, Town of Oakville

We are pleased to submit the Mattamy Phase 3 EIR/FSS Addendum in support of the proposed Mattamy (Joshua Creek) Phase 3 Draft Plan of Subdivision. This report is an Addendum to the *Final Joshua's Creek Tributaries EIR/FSS* (January 2020). This Addendum updates the *Final Joshua's Creek Tributaries EIR/FSS* on environmental and engineering matters associated with the Mattamy Phase 3 lands. It is provided in an Addendum format as per discussions with the Town of Oakville and Conservation Halton.

If you have any questions regarding the content of this document, please contact the undersigned.

Sincerely,

STONYBROOK CONSULTING INC.

Nancy Mather, P. Eng.

Attachments: Mattamy Phase 3 EIR/FSS Addendum
(email digital version only)

c. + attach. Mr. M. Dickie, Mattamy Homes'
Mr. J. Mosdell, Mattamy Homes
Mr. R. Kerr/B. Betts, DSEL

Joshua's Phase 3 EIR Proposed Road Crossing

Tree Species

- Option 1 Grading Limit
- Option 2 (Preferred Alignment) Grading Limit
- Option 1 Limit of Disturbance
- Option 2 Limit of Disturbance
- Trail
- Core 11 Boundary
- NHS Corridor Boundary
- Creek Centreline

LGL LIMITED
environmental research associates

Project	TA8886	**Figure**	U
Date	May 2020	**Prepared By**	KC
Scale	1:600	**Verified By**	MJO

MATTAMY PHASE 3
ENVIRONMENTAL IMPLEMENTATION REPORT AND FUNCTIONAL SERVICING STUDY

ADDENDUM #3 to the
Final Joshua's Creek Tributaries EIR/FSS

May 2020

Prepared by

Stonybrook Consulting Inc.
David Schaeffer Engineering
LGL Limited
Bird and Hale Limited
GEO Morphix Limited
R. J. Burnside & Associates Limited
.

TABLE OF CONTENTS

LIST OF FIGURES AND DRAWINGS (at end of report text)

LIST OF TABLES

LIST OF APPENDICES

1.0 INTRODUCTION

1.1 Study Purpose and Addendum Content

The *Final Environmental Implementation Report/Functional Servicing Study, Joshua's Creek Tributaries and the Mattamy Lands* dated January 2020 ("*Final Joshua's Creek EIR/FSS*") was recently approved by the Town of Oakville (the "Town") and Conservation Halton ("CH"). The *Final Joshua's Creek EIR/FSS* was completed for several EIR Subcatchment Areas that lie within the Joshua's Creek subwatershed, between Dundas Street and Burnhamthorpe Road in North Oakville East, in support of two Draft Plans of Subdivision for the Bressa Development Limited and Dunoak Development Inc. lands. Conceptual EIR/FSS analyses were completed on other Mattamy lands and on non-participating lands within the EIR Subcatchment Area, including lands owned by Redoak G. & A. Inc., Capoak Inc., A. Capobianco & Sons Ltd, Coscorp (Rampen) and Argo (Joshua Creek) Development Limited.

The *Final Joshua's Creek EIR/FSS* notes that,

> *"This EIR/FSS supports the draft plan applications submitted for the Bressa and Dunoak lands, and addresses EIR/FSS requirements for other lands in the FSS Study Area that do not currently have Draft Plans of Subdivision applications. Further study, including potential Addendums to this EIR/FSS, will be required to support draft plan approval of other lands within the Study Areas. Based on the extent of environmental and servicing work completed as part of this EIR/FSS specific to the Subject Lands, this further study may only be confirmation that information contained in this EIR/FSS remains current and is consistent with the future draft plan application for the 1564984 Ontario Limited (1564984 Ontario Ltd) lands. Where this future draft plan may deviate from the development plans shown in this EIR/FSS, an update to the servicing plans may be required. For other lands within the EIR Subcatchment Area (i.e., non-participating lands) where the same degree of EIR/FSS analyses has not been included in this EIR/FSS, depending upon location in the EIR Subcatchment Area, additional study may include environmental analyses addressing field verification of NHS boundaries, trail location and design, confirmation of servicing, grading, SWM pond design, Species at Risk analyses and consistency with this EIR/FSS. Prior to the preparation of further studies, the specific scope of study should be addressed with the Town and CH."* [underlining added].

As recommended in the *Final Joshua's Creek EIR/FSS*, this EIR/FSS Addendum #3 to the *Final Joshua's Creek EIR/FSS* has been prepared in support of Mattamy's next phase of development. This EIR/FSS Addendum supports the Draft Plan of Subdivision application for 60.5ha of the Mattamy (Joshua Creek) Limited Phase 3 lands. These lands, referred to as the Mattamy Phase 3 lands in this EIR/FSS Addendum, are located in the central portion of the EIR Subcatchment Area. See **Figures 1.1R** and **1.4R** for the location and ownership of these lands respectively. The Mattamy Phase 3 lands include portions of their lands previously referred to as the 1564984 Ontario Limited, Dunoak Development Inc. and Bressa Development Limited lands. For continuity with the *Final Joshua's Creek EIR/FSS*, references to the previous property names are used in the EIR/FSS Addendum where appropriate.

This *Addendum #3* updates the *Final Joshua's Creek EIR/FSS* and should be read in conjunction with that report. Substantial portions of that EIR/FSS remain unchanged; some sections require only minor revisions; and others require more substantive changes to reflect/support the Mattamy Phase 3 Draft Plan of Subdivision. As such, the format of this Addendum includes only those components of the *Final Joshua's Creek EIR/FSS* that have been updated to address/reflect the Draft Plan of Subdivision and to review/address specific topics outlined in Section 13.1.2 of the *Final Joshua's Creek EIR/FSS* related to the Mattamy Phase 3 lands. Section 13.1.2 study requirements affecting Phase 3 lands include:

a) Further discussions may be required with Coscorp (former Rampen lands), the owners of the lands to the west of the northwest portion of the Subject Lands to ensure that the location of 100m Linkage width along Reach JC-7 is coordinated between the two landowners.

b) Additional fisheries and aquatic information may be required for Reaches JC-6 and JC-7 as per the NOCSS EIR-FSS Terms of Reference, and in consultation with CH.

f) Data acquisition and assessments in addition to the fisheries and aquatic requirements (bullet b) above)) will be necessary in support of the road crossing of JC-6, related to:

    i. The crossing alignment and design, including crossing size and span width, taking into account the requirement for it to be three times the bankfull width, will have to be confirmed. In addition, an open-footed culvert is recommended to maintain fisheries potential. The road design requirements would be finalized at detailed design for these lands.

    ii. Conformity with NOCSS management strategy and recommendations for this reach will have to be confirmed, reviewing and addressing all items outlined in Section 10.2.

g) Associated with the crossing of Reach JC-6, DFO should be contacted to determine their level of interest related to these activities and the need for any approvals from them.

h) Further SAR investigations related to bats will be required, including associated with the road alignment across Reach JC-6 and trail locations. Additional SAR investigations, and mitigation as necessary, and tree assessment related to trail locations will be required.

i) Finalization of the trail locations and associated grading and drainage designs will be required, along the NHS limit along Reaches JC-6, JC-7, and JC-13, as well as across Reach JC-6, following the recommendations in Section 6.3 and Appendix N-1, and in consultation with the Town and CH. (Note that the trail along Reach JC-13 will be addressed in a future EIR/FSS Addendum for those lands).

j) There are several areas where grading has the potential to alter the regulation limit and/or affect future draft plans lotting/limits. Grading should be reviewed and revised in the following areas:

    <u>Grading related to Trails</u>

    - Surrounding Cross Section 17-17 (Drawing 7A)
    - Adjacent to and east of Cross Section 16-16 (Drawings 7A & 7B) extending to the crossing of JC-6

- Surrounding Cross Section 20-20 (Drawing 7B)
- Surrounding Cross Section 30-30 (Drawing 7B)
- Adjacent to and extending southeast of cross section 13-13 (Drawing 7B)

Grading related to NHS Crossing

- Grading associated with the trail, which may result in an adjustment to the top of bank downstream of the new JC-6 crossing

k) The need for restoration/plantings and monitoring requirements associated with trails as outlined in Sections 6.3 and 12.3.4 must be incorporated into the EIR/FSS.

l) The habitat and SAR protection and mitigation requirements as outlined in Section 5.1.2 and Appendix N-2, for all trails and any other construction activities within the NHS will need to be determined.

m) Watermain and wastewater crossings are required under Joshua's Creek Reaches JC-6. In order to minimize the impact on the creeks, the services crossings will be located in the proposed road allowances with details provided at the detailed design stage.

o) As part of the EIR/FSS Addenda for Mattamy lands, revisit 100yr and Regional Storm peak flow rates on River 1 Reaches 1 &2 (Main Joshua's Creek) from Section 11.024 to upstream of Burnhamthorpe Road and compare to NOCSS unit area flow rates times drainage area. If required, update hydraulic modeling with consistent and appropriate flow data to ensure that the extent of the existing and proposed condition floodplain (including impacts from the proposed JC-6 crossing) and the associated regulated setback will be maintained within the proposed NHS.

The Addendum also includes data and analyses of two EIR/FSS matters associated with Mattamy lands located north of their Phase 3 lands. This includes addressing the following two specific recommendations for further study set out in the *Final Joshua's Creek EIR/FSS, Section 13.1.2:*

c) - The water balance requirements for PSW 45 will need to be determined; and,

j) - There are several areas where grading has the potential to alter the regulation limit and/or affect future draft plans lotting/limits. Grading should be reviewed and revised in the following areas:

Grading related to Ponds and Valley

- Adjacent to the northwest corner of Pond P50 (Drawing 7B)
- Additional grading detail around P50 (western edge and south eastern corner near the outfall) is required to confirm that the proposed pond grades can be achieved without adjustment to the regulation limit (Drawing 7B)"

Section 13.1.2 items d), e), n) and part of i) will be addressed in future EIR/FSS Addendums associated with the lands containing Ponds 48 and 50, the JC-13 trail and proposed retaining walls.

The following sections of the *Final Joshua's Creek EIR/FSS* are updated in this Addendum:

- Section 1.6, EIR/FSS Consultation
- Section 2.1, NHS Components

- Section 3.0, NHS Delineation
- Sections 4.0, Geology and Hydrogeology
- Section 5.1.1, Species At Risk
- Section 5.4, Characteristics of Stream Reaches
- Section 5.5, Stream Corridor Boundaries
- Section 6.1, Description of Development Plans
- Section 6.3, Location of Trails in NHS
- Sections 7.8, 7.10, 7.11 and 7.12, Stormwater Management
- Section 8.0, Groundwater Assessment
- Section 9.0, Water and Wastewater Servicing
- Section 10.0, Roads
- Section 11.0, Construction Practices
- Section 12.0, Monitoring
- Section 13.0 and 13.1, Study Recommendations

Addendum #3 requires no amendments to the definition of Subject Lands, EIR Subcatchment Area or FSS Study Area in the *Final Joshua's Creek EIR/FSS*. Numerous figures from the *Final Joshua's Creek EIR/FSS* have been updated to reflect the Mattamy Phase 3 Draft Plan of Subdivision or revise findings of various EIR/FSS analyses where needed. These figures have been identified with the letter 'R' following the figure number (e.g., Figure 1.1R modifies Figure 1.1 from the *Final Joshua's Creek EIR/FSS*). Some figures from the *Final Joshua's Creek EIR/FSS* are provided in Appendix Q for ease of reference; no changes were made to them. Other new figures required to illustrate Mattamy Phase 3 matters are also included with new figure numbers not used in the *Final Joshua's Creek EIR/FSS*.

A number of new Appendices that form part of this EIR/FSS Addendum provide supporting data and analyses on the Mattamy Phase 3 lands.

1.4 EIR/FSS Study Team

A multi-disciplinary study team has analyzed the environment and servicing of the Mattamy Phase 3 lands. Their responsibilities include:

- Stonybrook Consulting Inc. – Lead consultant addressing limits of development, study integration and management;
- David Schaeffer Engineering Limited – Lead FSS consultant addressing municipal servicing, stormwater management (SWM) and site grading;
- J. F. Sabourin & Associates Inc. – SWM and floodplain analyses;
- LGL – Aquatic and terrestrial ecology;
- Bird and Hale Limited - Advisor on aquatic and terrestrial ecology and NOCSS requirements;
- R. J. Burnside & Associates Limited – Geology and hydrogeology;
- GEO Morphix Ltd. – Fluvial geomorphology/erosion assessment and aquatic ecology; and,
- DS Consultants Ltd. - Geotechnical

1.6 EIR/FSS Consultation and Previous Submissions

Meetings held to discuss various Mattamy Phase EIR/FSS matters include:

- March 18, 2019 – NOARM meeting to discuss the scope of the Mattamy Phase 3 EIR/FSS Addendum. The meeting agenda and meeting notes are provided in Appendix A-11; and,

- November 27, 2019 – Pre-consultation meeting with the Town to discuss the draft plan of subdivision

Through the preparation of this EIR/FSS Addendum, consultation was held with adjacent landowners, Coscorp (Rampen) and Argo (Joshua Creek) Developments, regarding coordination of NHS boundaries and development plans. Reference was also made to EIR/FSS analyses presented in the following other EIR/FSS Addendums to the *Final Joshua's Creek EIR/FSS* where appropriate*:*

- *Redoak/Capoak Environmental Implementation Report/Functional Servicing Study Addendum #1 to the Final Joshua's Creek Tributaries EIR/FSS,* October 2019, *(Redoak/Capoak EIR/FSS Addendum);* and,

- *Argo (Joshua Creek) Environmental Implementation Report/Functional Servicing Study Addendum #2 to the Final Joshua's Creek Tributaries EIR/FSS,* December 2019*, (Argo EIR/FSS Addendum)*

2.0 NATURAL HERITAGE SYSTEM FRAMEWORK

2.1 Natural Heritage System Components

Section 2.1 of the *Final Joshua's Creek EIR/FS*S describes various Natural Heritage System (NHS) components present in the EIR Subcatchment Area and the FSS Study Area. This includes discussion of Core Preserve Areas, Linkage and Optional Linkage Preserve Areas, High Constraint Stream Corridors, Medium Constraint Stream Corridors and Other Hydrological Features. **Figure 2.1R** illustrates the location of various NHS components.

The only NHS components on the Mattamy Phase 3 lands are a portion of Core 10, a small portion of Stream Reach JC-31A (Low Constraint Stream) and an Optional Linkage Preserve Area (OPLA). However, there are other components of the NHS in immediate adjacent areas that must be addressed in this EIR/FSS Addendum. The northern boundary of the Mattamy Phase 3 lands follows the southern NHS boundary along Stream Reaches JC-5 and JC-6 (that includes portions of Core 11) and Stream Reach JC-7. As described in the *Final Joshua's Creek EIR/FSS,* Stream Reaches JC-5 and JC-6 are High Constraint Streams; Stream Reach JC-7 is a Medium Constraint Stream. A Linkage Preserve Area exists along Stream Reaches JC-5, JC-6 and JC-7. There are no Hydrologic Features A or B, or topographical depressions on the Mattamy Phase 3 lands. **Figure 2.1** has been revised to highlight the location of the Mattamy Phase 3 lands relative to the NHS framework and components.

The descriptions of Cores 10 and 11 in the *Final Joshua's Creek EIR/FSS* remain unchanged. Also, as described in the *Final Joshua's Creek EIR/FSS*, the OPLA will not be implemented. The Linkage Preserve Area along Reaches JC-6 and JC-7 is 100m wide. Its location was established as part of the *Final Joshua's Creek EIR/FSS* and has been reviewed and confirmed as part of this EIR/FSS Addendum based on discussions with the adjacent landowner (Coscorp).

As recommended in the *Final Joshua's Creek EIR/FSS,* this EIR/FSS Addendum addresses the following matters associated with various NHS components:

- Core 10 and 11 boundaries and NHS boundaries along Stream Reaches JC-5/6/7 are reviewed and confirmed in Sections 3.0 and 5.5;
- Descriptions of aquatic conditions along Stream Reaches JC-5/6/7 are provided in Section 5.4;
- Trail design in the outer portions of Core 10, Core 11 and Stream Reaches JC-5/6/7 are addressed in Sections 6.3 and 7.11; and,
- Options and recommendations for road crossing design of Stream Reach JC-6 are outlined in Section 10.

Also, although not part of the Mattamy Phase 3 lands, based on discussions with the Town of Oakville and Conservation Halton, the following EIR matters affecting the NHS are included in this Addendum:

- Drainage to PSW 45 located north of the Mattamy Phase 3 lands within the NHS along Stream Reach JC-13 are addressed in Section 7.10; and,

- Updated Pond 50 grading is presented in Section 7.11.

2.2 Permitted Uses in the Natural Heritage System

Section 2.2 of the *Final Joshua's Creek EIR/FSS* remains unchanged. **Table 2.2** summarizes policy direction on permitted uses and refers to specific report sections in this EIR/FSS Addendum where these permitted uses on the Mattamy Phase 3 lands are addressed.

Sections 6.3.5.2 of NOCSS, OMB Minutes of Settlement and some mediation agreements also address permitted uses in the NHS. With respect to this EIR/FSS Addendum, reference was also made to direction provided on road crossings of the NHS and trails in the NHS in Section 6.3.5.2 of the NOCSS. Direction presented in NOCSS Section 6.3.5.3 on permissible grading in the NHS was also referenced and provided guidance to update the preliminary grading plan for the Mattamy Phase 3 lands.

Table 2.2: NHS Policy Direction

OPA 272 Policy Number	Potential Permitted Use	Policy Direction	Addressed in EIR/FSS Addendum
7.4.7.3 c) i)	Development or land disturbance	Permitted in accordance with the directions of the North Oakville Creeks Subwatershed Study and any related Environmental Implementation Report, and Federal, Provincial and Conservation Authority regulations for required flood and stream bank erosion control; for fish, wildlife and conservation management; to accommodate a stormwater outfall; or in Medium Constraint Stream Corridor Areas.	Section 10.0
7.4.7.3 c) ii)	Roads and related utilities	Permitted only to cross the designation in the general area of the road designations shown on Figures NOE2 and NOE4 or as defined through an Environmental Assessment; road design criteria are identified in policies.	Section 10.0
7.4.7.3 c) iii)	Expansion to existing Water and Wastewater services	Expansion permitted to existing Water and Wastewater services which are located on sites with existing facilities subject to any required Environmental Assessment.	Not applicable to this EIR/FSS Addendum
7.4.7.3 c) iv)	Trails, interpretative displays or signage or other similar passive recreation uses	Permitted if consistent with the purpose of the applicable designation and criteria listed in policy.	Sections 6.2 and 6.3
7.4.7.3 c) v)	Stormwater management facilities	Permitted subject to directions of the North Oakville Creeks Subwatershed Study, conformance with technical performance specifications listed in policy and as shown conceptually on Figure NOE3.	Section 7.0
7.4.7.3 c) vi)	Grading in the Natural Heritage component of the Natural Heritage and Open Space System	Permitted in accordance with the directions established in the North Oakville Creeks Subwatershed Study or appropriate Environmental Assessment.	Sections 6.3 and 7.11
7.4.7.3 c) vii)	Private Driveways	Permitted across the Linkage Preserve Area joining the north area and south area of the Core Preserve Area located north of Burnhamthorpe Road and west of Trafalgar Road	Not applicable to this EIR/FSS Addendum
7.4.7.3 c) viii)	Adaptive re-use of heritage buildings for institutional uses	Art gallery and art school permitted in the Linkage Preserve Area associated with Reach JC-7	Not applicable to this EIR/FSS Addendum

3.0 NHS DELINEATION

Section 3.0 of the *Final Joshua's Creek EIR/FSS* addresses the delineation of the NHS in the EIR Subcatchment Areas, including Core 10, Core 11 and numerous stream corridors on participating and non-participating lands. The report included discussion on fieldwork and detailed boundary delineation on the 1564984 Ontario Ltd., Bressa and Dunoak lands, including the resulting NHS boundaries. The *Final Joshua's Creek EIR/FSS* also identified preliminary NHS boundaries on non-participants lands with the recommendation that these boundaries need to be confirmed through field staking of natural features in support of future development applications.

Portions of the NHS lie within or adjacent to the Mattamy Phase 3 lands including:

- The north boundary of the Mattamy Phase 3 lands is consistent with the NHS boundary along Stream Reaches JC-5, JC-6 and JC-7. This includes a portion of the western end of Core 11; and,
- The east limits of Core 10 lie within the southwest portion of the Mattamy Phase 3 lands.

The NHS boundary on the Mattamy Phase 3 lands was determined and approved through the *Final Joshua's Creek EIR/FSS* and was presented on **Drawing Joshua's Creek NHS-4** along Stream Reaches JC-5, JC-6 and JC-7, **Drawing Joshua's Creek Core 11-NHS-3** and **Core 10-NHS-6**.

The *Final Joshua's Creek EIR/FSS* identified that, "*Further discussions may be required with Coscorp (former Rampen lands), the owners of the lands to the west of the northwest portion of the Subject Lands to ensure that the location of 100m Linkage width along Reach JC-7 is coordinated between the two landowners*." (Section 13.1.2a)). Further, through the completion of the *Argo (Joshua Creek) EIR/FSS Addendum #2* to the *Final Joshua's Creek EIR/FSS,* the NHS boundary was reviewed and coordinated along the common property line between the Argo and Mattamy Phase 3 lands. The *Argo EIR/FSS Addendum* (December 2019) included discussion and a recommended amendment to the NHS boundary on the Mattamy Phase 3 lands.

This EIR/FSS Addendum has addressed the above two NHS matters along Mattamy Phase 3 property boundaries. As discussed below, a revision has been made on **Drawing Core 11-NHS-3**; the approved NHS boundaries shown on **Drawings NHS-4** and **Core-NHS-6** on the Mattamy Phase 3 lands remain unchanged.

<u>Mattamy Phase 3/Coscorp NHS Boundary</u>

Prior to the preparation of the *Final Joshua's Creek EIR/FSS* reporting, discussions were held between Mattamy and Coscorp. to coordinate and finalize the NHS along Stream Reach JC-7 and Core 10 at their common property boundary. In 2019, the Core 10 and Stream Reach features on the Coscorp lands were staked and surveyed, and the NHS boundaries were established. They were connected to the approved Mattamy Phase 3 NHS boundaries shown on **Drawings NHS-4** and **Core 10-NHS-6** in the *Final Joshua's Creek EIR/FSS*. As a result, no changes were required to the Mattamy Phase 3 NHS boundary.

Mattamy Phase 3/Argo NHS Boundary

The *Final Joshua's Creek EIR/FSS* defined the NHS boundary along Stream Reach JC-5 with a straight line between:

- Thicket stake TH-51 on the Mattamy Phase 3 lands; and
- An estimated dripline stake based on air photo interpretation on the then Diam Construction lands.

As part of the *Argo EIR/FSS Addendum*, the Argo NHS was defined based on fieldwork and application of the NOCSS NHS recommendations. As noted in the *Argo EIR/FSS Addendum*, the Argo NHS near the Mattamy Phase 3 lands boundary (location LOD 1) is based on the surveyed dripline plus 10m. The Mattamy Phase 3 NHS was based on the surveyed dripline plus 10m, however, the last Mattamy Phase 3 stake (TH-51) was inadvertently placed on the Argo lands within the hedgerow that extends southerly from the Core. When the Mattamy Phase 3 staking was done, access to the then Diam lands was not available and therefore the appropriate location for the turning point was not accurately located. Figure 6.3.12 from NOCSS shows that the Core boundary in this location follows a relatively straight line and does not include any portion of the hedgerow south of the Core boundary.

To appropriately knit together the NHS line in this location, the *Argo EIR/FSS Addendum* recommended that Mattamy Phase 3 stake TH-51 be removed and the Argo dripline boundary be extended westerly using a straight line between Argo stake D-10 and Mattamy Phase 3 stake TH-52. The resulting NHS is shown on **Figure 3.1** and revised **Drawing Core 11-NHS-3R**. This small change on the Mattamy Phase 3 lands is reflected in the proposed Draft Plan of Subdivision.

Mattamy Phase 3/Redoak NHS Boundary

The *Redoak/Capoak EIR/FSS Addendum* #1 to the *Final Joshua's Creek EIR/FSS* (October 2019) included the delineation of the Core 10 boundary on the Redoak lands located west of the Mattamy Phase 3 lands. The Redoak NHS tied into the approved Core 10 boundary on the Mattamy Phase 3 lands shown in the *Final Joshua's Creek EIR/FSS*. As a result, the NHS at the common property boundary between these two properties is consistent with the NHS location shown on the approved **Drawing Core 10-NHS-6**.

4.0 GEOLOGY AND HYDROGEOLOGY

The geology and hydrogeology of the lands included in Phase 3 were described in Section 4 of the *Final Joshua's Creek EIR/FSS* and this Addendum requires no revisions to the findings. The scope of work completed addressed the technical requirements as set out in the EIR Hydrogeological Terms of Reference for North Oakville (TOR, 2007), and the report described the physiography, topography, drainage conditions, climate, stratigraphy, surficial and bedrock geology, and hydrogeology (local groundwater use, groundwater levels, hydraulic conductivity, and groundwater flow conditions) as well as the local groundwater and surface water quality.

The only additional groundwater investigations completed for the Mattamy Phase 3 area related to PSW 45 and the proposed creek crossing of Reach JC-6. To assist in the evaluation of existing conditions the following additional instrumentation illustrated on **Figure 4.1R** was implemented:

- One piezometer nest (shallow and deep pipes) was installed in PSW 45 to assess the surface water / groundwater interactions in the wetland. Findings are described in Section 7.10 of this report;

- One piezometer nest (shallow and deep pipes) was installed in the Reach JC-6 valley in the vicinity of the future road crossing to assess the surface water / groundwater interactions in this area and the findings are described in Section 10.2 of this report; and,

- Two monitoring wells were installed in the Reach JC-6 valley in the general location of the future road crossing to assess groundwater levels and potential implications for construction. Findings are described in Section 10.2 of this report.

For ease of reference, a brief summary of the key geology and hydrogeology findings from the *Final Joshua's Creek EIR/FSS* is provided below:

- The EIR Subcatchment Areas are located on the south slope of the Trafalgar Moraine and are characterized by an undulating till surface with a maximum relief of about 25m. The land is sloping to the southeast and the lowest elevations are found along the Joshua's Creek's Main Tributary near Dundas Street.

- The Subject Lands generally lie within five tributary subcatchment areas within the FSS Study Area: Joshua's Creek West Tributary (JC17), Joshua's Creek Main Tributary (JC12W), JC9A, JC6 and JC16).

- Long-term surface water monitoring has shown that the streamflow conditions are dependent not only on seasonal climatic conditions, but on the overall long term climate conditions. The early part of the decade was dry and all of the Joshua's Creek Tributaries north of Dundas Street had been reported as dry with no groundwater inputs and only intermittent flow. Over more recent years, the climatic conditions have been relatively wet and the water table has risen. There are areas now where minor groundwater seepage can be observed along the Joshua's Creek Tributaries, and although at times the water is stagnant or the flows are too low

to measure, water usually has been observed in the Main Tributary of Joshua's Creek near Dundas Street. The seepage volumes are generally insufficient to contribute to baseflow and as such, the Joshua's Creek Tributaries in the FSS Study Area continue to be described as intermittent watercourses.

- The geology is characterized by clayey silt to silt glacial till deposits, generally overlying weathered shale bedrock. The till thickness varies from more than 10m thick in the upland areas to less than 1m thick in watercourse valleys. Outcrops occur along sections of the watercourses within the southern parts of the JC17 and JC12W Subcatchment Areas.

- A 5m thick sand and gravel layer underlying the till was encountered in several locations in the northern part of the Subject Lands and it is interpreted that this is a narrow bedrock valley infill deposit. It is interpreted that the bedrock valley trends in an easterly direction, roughly underlying the JC6 Subcatchment Tributary and lower portions of the JC9A Subcatchment Tributary valleys. It is postulated that the sand and gravel either pinches out to the south or the granular filled valley trends off-site to the east. This bedrock valley does not appear to have any significant influence on the shallow groundwater flow conditions across the Subcatchment Areas.

- Well testing has shown that the hydraulic conductivity of the till is generally quite low (values ranging from 3×10^{-5} cm/sec to less than 10^{-7} cm/sec). The hydraulic conductivity of shale tends to be controlled by fracturing and bedding planes, and test results suggest that the hydraulic conductivity of the upper part of the shale is in the order of 1×10^{-5} cm/sec. The sand layer infilling the bedrock valley also showed moderately low hydraulic conductivity (about 5×10^{-5} cm/sec).

- There are no high-yielding or regionally extensive water supply aquifers in the Study Area reflecting the general lack of coarse-grained sand and gravels and the relatively low hydraulic conductivity glacial till overburden and shale bedrock materials. No use of groundwater is proposed and the development will be serviced by municipal water supplies obtained from Lake Ontario.

- Extensive and long term groundwater monitoring has been completed. The groundwater levels tend to vary seasonally by about 2m. The observed groundwater levels are generally highest in the spring and lower throughout the fall months. The depth to groundwater also varies from more than 5m below grade in the upland areas to grade along some of the watercourses.

- The interpreted groundwater elevation contours show that the groundwater flow is generally moving southeast and is consistent with the regional groundwater flow mapping that shows groundwater flows from the topographic high of the Trafalgar Moraine southeast towards Lake Ontario (NOCSS, 2006). Groundwater flow is interpreted to converge along the topographically lower areas of the Joshua's Creek Main Tributary and the Joshua's Creek West Tributary watercourses.

- The EIR Subcatchment Areas have both groundwater recharge and discharge conditions. It is interpreted that recharge through the surficial tills occurs vertically down to the bedrock and then seeps laterally along the top of the shale. The actual amount of water that recharges and

moves through the subsurface system is limited by the relatively low hydraulic conductivity of the till sediments and the shale bedrock. It is likely that infiltration to the water table and groundwater movement throughout the area is predominantly controlled by fracturing within the till and upper weathered shale.

- Groundwater seepage (discharge conditions) has been noted at monitoring stations along Joshua's Creek West Tributary and at the confluence of the streams within Subcatchments JC9A and JC6. Discharge conditions are also expected along the valley of the Joshua's Creek Main Tributary. These watercourses have incised channels that have eroded to the surface of the weathered shale bedrock, and the bottom of the till/top of shale contact is considered to be a zone of preferential groundwater movement.

- The lateral flow gradient across the Study Area is low (about 0.01). The low gradients and the relatively low hydraulic conductivity of the till and underlying shale materials restrict recharge and as such, the groundwater flux (quantity or volume of water flow) that occurs is limited. This is consistent with the surface water monitoring information that has found only minor seepage volumes and no perennial baseflow in the Joshua's Creek Tributaries.

- Overall, the surface water and groundwater quality data suggest that the water quality in the EIR Subcatchment Areas is only minimally affected by anthropogenic influences such as agricultural land uses and road salt.

5.0 STREAM, AQUATIC AND TERRESTRIAL SYSTEMS INCLUDING SPECIES AT RISK

Section 5 of the *Final Joshua's Creek EIR/FS*S describes the Joshua's Creek streams, wetlands, woodlands. It also discusses Species at Risk (SAR) on the Mattamy lands for which draft plans were prepared. Drainage areas and stream breaks were confirmed, stream corridor boundaries were established and various stream reaches were discussed in detail.

This EIR/FSS Addendum provides greater detail concerning Stream Reaches JC-5, JC-6 and JC-7, including corridor boundaries, riparian conditions, geomorphological functions, habitat characteristics and SAR.

As referenced in Section 1.6, a NOARM meeting was held March 18, 2019 to discuss the scope of this Phase 3 Addendum (see Appendix A-11). It was agreed that the Addendum would address the requirements set out in Section 13 of the *Final Joshua's Creek EIR/FSS* and, specifically with respect to the NHS, the following stream, aquatic and terrestrial recommendations were identified:

- 13.1.2 b) Additional fisheries and aquatic information may be required for Reaches JC-6 and JC-7 as per the NOCSS EIR-FSS Terms of Reference, and in consultation with CH.

- 13.1.2 f) Data acquisition and assessments in addition to the fisheries and aquatic requirements (bullet b) above) will be necessary in support of the road crossing of JC-6, related to:

    i. The crossing alignment and design, including crossing size and span width, taking into account the requirement for it to be three times the bankfull width, will have to be confirmed. In addition, an open-footed culvert is recommended to maintain fisheries potential. The road design requirements would be finalized at detailed design for these lands.

    ii. Conformity with NOCSS management strategy and recommendations for this reach will have to be confirmed, reviewing and addressing all items outlined in Section 10.2.

- 13.1.2 g) Associated with the crossing of Reach JC-6, DFO should be contacted to determine their level of interest related to these activities and the need for any approvals from them.

- 13.1.2 h) Further SAR investigations related to bats will be required, including associated with the road alignment across Reach JC-6 and trail locations. Additional SAR investigations, and mitigation as necessary, and tree assessment related to trail locations will be required.

- 13.1.2 l) The habitat and SAR protection and mitigation requirements as outlined in Section 5.1.2 and Appendix N-2, for all trails and any other construction activities within the NHS will need to be determined.

To address these natural heritage related items, supplemental terrestrial and aquatic investigations were completed, as referenced in the applicable subsections below.

This EIR/FSS Addendum amends Section 5 of the *Final Joshua's Creek EIR/FSS* to include discussions below on SAR, stream characterization, and terrestrial investigations.

5.1.1 Species at Risk (SAR)

Additional SAR investigations were undertaken for the Stream Reach JC-6 corridor and the western portion of Core 11, with respect to trail and road crossing location requirements.

In this regard, a SAR information request was submitted to the Ministry of Environment Conservation, and Parks (MECP) and a response was provided on August 2, 2019. The entire municipality list (Oakville) of SAR occurrences was provided in order to screen for habitats and species known to occur in the municipality and which may utilize the Mattamy Phase 3 Lands. The MECP list is provided in Appendix R-4. The potential for occurrence on the Mattamy Phase 3 Lands has been considered based on direct wildlife observations and with comparison of habitat requirements of the listed species with habitat conditions found on-site. The resulting screening identified species with confirmed occurrence or the potential to occur on Mattamy Phase 3 Lands. This information was used to determine the importance of the Mattamy Phase 3 Lands to a particular species, and to identify species-specific mitigation measures where/if appropriate. SAR confirmed and those considered of reasonable likelihood to occur on the Mattamy Phase 3 Lands are discussed below.

The developable lands within the Mattamy Phase 3 Lands and the portions of the NHS that support trail sections and road crossings (see Section 6 and Section 10, respectively) were investigated to determine the presence of Species at Risk (SAR). Incidental observations of wildlife SAR were recorded during non-specific surveys (Appendix R-5), such as botanical and detailed tree surveys (April 18, 30, and July 2, 2019). Breeding bird surveys were conducted on June 3 and 17, 2019, to document breeding bird evidence (BBE) and to characterize the nature, extent and significance of breeding bird usage of the Mattamy Phase 3 Lands (Appendix R-6). Surveys were conducted between dawn and 4 hours after dawn. Survey methodology and breeding bird behaviours used as evidence of breeding success were categorized according to the Breeding Bird Atlas five-year surveys organized by Bird Studies Canada (Cadman et al., 2007). In order to make an accurate determination, the following definitions have been applied in this case:

- Possible breeding: observed in breeding season, observed in breeding season in suitable nesting habitat, singing male present or breeding calls heard in breeding season;

- Probable breeding: permanent territory presumed through registration of territorial song or occurrence of an adult on at least 2 days, a week or more apart, at the same place; agitated behavior or anxiety calls of an adult; and,

- Confirmed breeding: used nest or egg shell found (occupied or laid within the period of study), recently fledged young or downy young, including young incapable of flight, adult carrying food for young, nest containing eggs, nest with young seen or heard.

The Mattamy Phase 3 Lands revealed 53 species of wildlife to include 1 amphibian, 47 species of birds, 1 notable invertebrate, and 4 species of mammals. Thirty-seven species of birds are protected by the Migratory Bird Convention Act (MBCA) and the Fish and Wildlife Conservation Act, four are protected by the Fish and Wildlife Conservation Act, and notably, two are listed as threatened on the Endangered Species Act*,* 2007 (ESA); Barn Swallow (*Hirundo rustica*) and Bobolink (*Dolichonyx oryzivorus*). In addition, Monarch Butterfly (*Danaus plexippus*) and Bald Eagle (*Haliaeetus leucocephalus*) were

incidentally observed and are listed as Special Concern under the ESA. There were no mammals observed with relation to the ESA.

Barn Swallow (*Hirundo rustica)* was observed foraging for aerial insect prey during both breeding bird surveys. Anthropogenic structures (e.g. buildings, bridges, culverts) represent nesting opportunities for this species but there are no appropriate structures present on the Mattamy Phase 3 Lands for which to affix a nest. No evidence was found to confirm breeding on the Mattamy Phase 3 Lands; birds were not observed to be defending territory, nor nest building or carrying food to a nest. Of note, Barn Swallows have been documented foraging throughout the North Oakville lands. The *General Habitat Description for Barn Swallow* (an MNRF technical document which provides greater clarity on the area of habitat protected for a species) describes three levels of habitat characterization ranging in sensitivity from Category 1 (most sensitive) to Category 3 (least sensitive) as follows:

- Category 1 - the nest;
- Category 2 - within 5 metres of a nest; and,
- Category 3 - between 5 and 200 metres of the nest.

One remnant Barn Swallow (Threatened) nest, was observed on an abandoned farmhouse fronting Burnhamthorpe Road, and approximately 450m north of the Mattamy Phase 3 Lands. Demolition of the farmhouse resulted the creation of a replacement nesting structure, in compliance with the Endangered Species Act, within the Reach JC-6 valley (part of this Addendum's site investigations area) prior to the 2019 nesting season, though, the structure was not used by Barn Swallows during the nesting season. The nest structure is approximately 200m (straight distance) upstream of the proposed Stream Reach JC-6 road crossing.

One male **Bobolink**, listed as Threatened, was observed within the agricultural field south of Stream Reach JC-6, on June 17, 2019. As a result, a third survey to target grassland bird SAR was conducted on July 2, 2019 (in addition to June 3 and 17, 2019), to adhere to Bobolink survey protocol requirements. However, both the initial June 3 and final July 2 surveys did not reveal the presence of Bobolink. Moreover, Bobolink prefers large tracts of tallgrass prairie, open meadow habitat, and hay fields, none of which are found within the Mattamy Phase 3 Lands. Since the lone Bobolink was heard vocalizing on only one occasion, it satisfies the definition of *possible breeding*, which does not meet breeding evidence requirements to trigger permitting under the Endangered Species Act.

A **Bald Eagle**, listed as Special Concern, was observed during the July 2, 2019 surveys, passing over with no distinct relation to the Mattamy Phase 3 Lands. Bald Eagle prefer to nest in habitats close to large water bodies, and the Mattamy Phase 3 Lands are not within proximity to large water bodies and thus nesting habitat does not exist within the Mattamy Phase 3 Lands.

Monarch Butterfly (Special Concern) adults were observed on the Mattamy Phase 3 Lands, presumably to lay eggs on milkweed plants or to feed on nectar produced by flowering herbaceous plants. Threats to Monarchs include habitat loss and fragmentation at overwintering sites in the Oyamel Fir forests of central Mexico and perhaps the widespread use of herbicides employed in agricultural practices. In Ontario, sensitive habitats include open water shorelines on large lakes which provide natural migratory routes and staging areas for migrating/congregating butterflies. Since the Mattamy Phase 3 Lands are not in proximity to sensitive habitats, impacts to Monarch populations are not anticipated. Further, species listed as Special Concern are not afforded special protections under the ESA.

Butternut (Endangered) are not found within the developable lands, proposed trail, or Stream Reach JC-6 crossing. In addition, a 50m band extending into the NHS, alongside the proposed trail and road crossing was inventoried for Butternut trees, though, none were found. This search included the areas within Core 11 and Stream Reach JC-6 cultural woodlands and thickets, floodplains and slopes.

Four bat species (**Little Brown Myotis, Northern Myotis, Eastern Small-footed Myotis, and Tri-colored Bat**) are identified provincially as 'endangered' and protected under the ESA. Three of the four bat SAR use trees with openings, cavities or peeling/sloughing bark in various stages of decay for maternal roosts. The Tri-coloured Bat relies on tree foliage to establish roosts and in particular, clusters of dead or dying leaves mainly in mature oak trees (MNRF 2017). A Technical Memorandum (Appendix R-7) for the potential effects of the proposed Stream Reach JC-6 crossing on potential bat habitat was submitted to MNRF for review to ensure compliance with the ESA. A response was provided March 22, 2019, confirming that an ESA permit would not be necessary provided the recommended mitigation is employed comprising exclusion of vegetation removal between April 1st to Sept 30th, as described in Appendix R-8.

In summary, a screening for species at risk in context of the Mattamy Phase 3 lands included detailed surveys, incidental observations, and habitat suitability. The EIR/FSS process revealed the presence of several species at risk; Barn Swallow, Bobolink, Bald Eagle, and Monarch; analyses concluded that none of these require ESA permitting. In addition, the process revealed the potential for occurrence of Butternut and Bat roost habitat, though, detailed surveys confirmed that Butternut is absent from the Mattamy Phase 3 Lands, and a Bat Habitat Assessment provided to the MNRF confirmed that an ESA permit is not required provided that specific mitigation is employed as describe above.

Phase 3 Portion of Core 11 Trail Alignment

Much of the proposed trail alignment (see Section 6) is situated in agricultural fields, and where the trail enters the NHS only small pear and apple (Cultural Woodland -CUW1) are the dominant tree species with scattered small white elm and white ash and a hawthorn/buckthorn dominant understorey. Butternut, SAR birds, and candidate bat roost trees were not observed within the proposed trail area of the cultural woodland. Therefore, there are no foreseen SAR issues related to the proposed trail alignment.

Treed Habitat (Hedgerows) Outside the NHS

Several hedgerows are present within the Mattamy Phase 3 Lands with species potentially suitable for roost habitat of some bat species. During the Joshua's Creek EIR/FSS submission, MNRF provided direction (email from B. Kowalyk, MNRF, May 14, 2018) that "it is the unprotected isolated treed habitats at least 0.5 ha in area and averaging at least 30 metres in width that need to be assessed for tree species, size and cavity composition to help determine whether acoustic bat surveys for 10 days in June at four stations per hectare should be undertaken. Where the treed habitat is adjacent/contiguous to protected woodland, the relative proportion of unprotected woodland to the overall woodland of similar character needs to be determined." MNRF confirmed that the adjacent Bressa hedgerows extending south from Core 11 did not require acoustic monitoring, as timing mitigation was sufficient to avoid significant impacts to SAR bats. The Mattamy Phase 3 Lands southernmost hedgerows had not been assessed for bat roost potential as of the May 11, 2018 site meeting, but, additional assessments were conducted in June, 2018, to determine whether there is potential for occupied bat habitat in such areas outside the NHS. MNRF indicated (email from B. Kowalyk, MNRF, June 25, 2018) that, "it appears that

there is no 0.5ha with an average width of at least thirty metres, so there does not seem to be a bat habitat needing land use protection" outside of the NHS.

Given that the MNRF confirmed hedgerows are not considered within the context of bat habitat and the ESA, impacts to species at risk bats will be avoided and/or minimized with implementation of the recommended timing windows for vegetation removal.

5.4 Characterization of Stream Reaches on Mattamy Lands

The nineteen stream reaches within the EIR Subcatchment Areas, comprising six Low Constraint (Green) Streams, four Medium Constraint (Blue) Streams, and nine High Constraint (Red) Streams, one of which is designated 'High Constraint – Needing Rehabilitation' were discussed in the *Final Joshua's Creek EIR/FSS*. Only those stream reaches located immediately adjacent to the Mattamy Phase 3 Lands are addressed in this EIR/FSS Addendum. This includes Stream Reaches JC-5 (High Constraint, red stream), JC-6 (High Constraint, red-hatch stream) and JC-7 (Medium Constraint, blue stream) that have been examined in further detail to reflect additional findings based on more detailed site specific investigations. These reaches are illustrated on **Figure 2.1R** and **Figure 5.1** (Appendix Q), with their classifications indicated.

Under the *Final Joshua's Creek EIR/FSS*, there was a requirement to obtain additional aquatic habitat information for Stream Reaches JC-6 and JC-7. This included fish sampling and detailed habitat mapping. Rapid geomorphological field assessments were also completed for Stream Reaches JC-5, JC-6, and JC-7. Results of this work are outlined below.

Aquatic Habitat Characterization and Mapping

Fish sampling and detailed habitat mapping were requested to identify habitat features and specifically confirm locations of important habitat structures including instream vegetation, boulders, undercut banks, riffles, pools, runs, and woody debris. The study requirements for aquatic mapping and fish sampling were determined through consultation with Conservation Halton. GEO Morphix staff members met on site with CH staff (Samantha Mason and Alex Lenarduzzi) on May 22, 2019 to confirm the reaches, and data collection methods for fish sampling along Stream Reaches JC-6 and JC-7, and geomorphological requirements for Stream Reaches JC-5, JC-6 and JC-7.

As part of the reach-by-reach geomorphological assessments, habitat sketch maps were completed, and the Rapid Stream Assessment Technique was applied. These tools provide a detailed approach to habitat mapping and characterization. The RSAT is typically employed to provide a broader view of the system and considers the ecological function of the watercourse (Galli, 1996). Observations of channel stability, channel scouring or sediment deposition, instream and riparian habitats, and water quality are recorded as part of the assessment to provide an overall score that ranks the channel as maintaining a poor (<13), fair (13-24), good (25-34), or excellent (35-42) degree of stream health. Both Stream Reaches JC-6 and JC-7 were classified as having *Good* stream health. The main limiting factor of the RSAT assessment was poor riparian cover conditions, with limited morphology being a secondary factor.

Detailed habitat sketch maps based on Newson and Newson (2000) were completed for the two reaches. Reach JC-7 was heavily vegetated but with poor morphological variability. Woody debris and coarse substrate were not observed. Although no fish were documented in the reach through the NOCSS investigations, it was classified as marginal fish habitat based on its flow pattern and

connectivity to a large, vegetated floodplain. Channel morphology (i.e., riffles and pools) was more developed along the downstream extent of Reach JC-6. Several refuge pools were observed throughout the lower reach and riparian cover was also more developed. Overall, there was limited pool development. Only in areas with woody debris were pools fully developed. Under the NOCSS investigations, Reach JC-6 was classified as important fish habitat, however the lack of well-developed pool features reduces fish refugia during low flow conditions. Detailed habitat sketch maps are included in Appendix E-4.

As stated in the *Final Joshua's Creek EIR/FSS*, according to NOCSS, Reach JC-6 is categorized as a 'red-hatched' or 'high constraint stream with rehabilitation opportunities. Red-hatched streams are to be protected in their existing locations for hydrological and ecological reasons. However, due to past impacts, there are opportunities for enhancement to protect and improve their functional roles. Through the OPA 272 Ontario Municipal Board hearing, it was confirmed that any enhancement measures would be the responsibility of the CH and/or the Town and not the Landowners, with the exception of any areas disturbed as part of the development activities (i.e., trails, servicing, road crossing of JC-6).

Reach JC-7 is categorized as a 'blue stream' or 'medium constraint stream'. These watercourses may be deepened and/or re-located, but must be left open for hydrological and ecological reasons. As per the *Final Joshua's Creek EIR/FSS*, Reach JC-7 is to be retained as-is. No modifications are proposed as part of this EIR/FSS Addendum.

According to the RSAT completed on June 21, 2019, the riparian habitat conditions of both Reaches JC-6 and JC-7 are classified as poor-fair. The canopy coverage is less than 50% shaded, with only 30% shade for large mainstem areas. Additionally, the riparian area is predominantly wooded, but with major localized gaps. To enhance the habitat characteristics of Reach JC-6 in the area of the disturbance for the proposed road crossing, recommendations for enhanced habitat features are provided in Section 10. These recommendations will fulfill the targets, objectives, and goals as outlined in the *Final Joshua's Creek EIR/FSS*, and meet the criteria for allowable works within the red-hatched stream system.

Fish Sampling

The NOCSS reported eight fish species present in the Joshua's Creek subcatchment. These species include blacknose dace (*Rhinichthys atratulus*), bluntnose minnow (*Pimephales notatus*), brook stickleback (*Culaea inconstans*), chinook salmon (*Oncorhynchus tshawytscha*), common shiner (*Luxilus cornutus*), creek chub (*Semotilus atromaculatus*), fathead minnow (*Pimephales promelas*), johnny darter (*Etheostoma microperca* [sic]), and white sucker (*Catostomus commersonii*). Supplemental fish sampling was completed in August 2018 by LGL Ltd. on Reaches JC-1, JC-2, and JC-3 downstream of the Phase 3 lands. The survey confirmed the presence of creek chub, blacknose dace, brook stickleback, fathead minnow, white sucker, and a goldfish. Notwithstanding goldfish, these generalist fish species are typical for intermittent streams in the upper branches of warmwater systems such as Joshua's Creek. They are tolerant of low flows and oxygen levels, as well as turbidity and temperature fluctuations that are characteristic of small streams in altered landscapes, such as the predominantly agricultural catchments within which these creeks are found.

To address study requirements for the EIR/FSS Addendum for the Mattamy Phase 3 lands, and characterize the aquatic species present along Reaches JC-6 and JC-7, fish sampling was completed. GEO Morphix and Conservation Halton staff conducted a site walk on May 22, 2019 to determine the most appropriate sampling methodology and to select suitable locations. Two methods were selected to sample and document fish species in both reaches, which included capturing continuous underwater

camera footage and backpack electrofishing. Several pools were selected by Conservation Halton staff as the most suitable locations for installing the underwater cameras, and suitable sections of the channel were selected for the electrofishing survey. All locations are indicated in **Figure 5.1C**.

The presence of local fish species was identified by completing a backpack electrofishing survey on July 12, 2019 under MNRF permit. The purpose of this sampling method was to gather baseline fish community data prior to the restoration and enhancement work that has been proposed for Reach JC-6. Five sampling reaches were identified, four within Reach JC-6 and one within JC-7, as indicated in **Figure 5.1C**. It was determined that these reaches were to be sampled in adherence to the Ontario Stream Assessment Protocol (OSAP) electrofishing protocol for single pass electrofishing (Stanfield, 2017). For each of the five reaches assessed (Electrofishing Sampling Sites 1 – 5), sampling was completed at stagnant pools. At the time of the assessment, the system was experiencing low water level conditions, and dry channel conditions between pool features. As such, it was not necessary to isolate the electrofishing locations at the upstream and downstream extent of the sites, as dry riffle crests provided a boundary. The total sampling effort was calculated as 3.17 shocking seconds/m^2; however, it is noted that the majority of the channel was dry and therefore the electrofisher could not be used. Based on the estimated wetted area assessed only, the sampling effort would be 11.6 shocking seconds/m^2, which is consistent with the OSAP protocol. Fish sampling results are provided in **Table 5.7** and discussed below.

- **Electrofishing Site 1** was approximately 40m of channel located near the downstream limit of Reach JC-7. Here, electrofishing was completed within two stagnant pools which had an average wetted width of 1.5m. No instream vegetation was observed within the pools, which were flanked by grasses within the adjacent riparian area. Overall, little shading was provided at this location and instream cover was lacking. No fish were sampled from within this section of channel.

- **Electrofishing Site 2** was a 50m section of channel located approximately 100m from the downstream extent of Reach JC-6. Riparian conditions were comparable to observations downstream, and similarly there was a lack of instream structure or significant shading. Two pools were sampled within this section of the reach, which had an average wetted width of approximately 1.0m. No fish were retrieved from the first pool, however fish species sampled from the second pool included creek chub, blacknose dace, and brook stickleback.

- **Electrofishing Site 3** was a 45m section of channel located approximately 200m from the downstream extent of Reach JC-6. The extent of instream cover within this section of channel was slightly greater than at Sites 1 and 2 due to a higher amount of woody debris within the channel, and being in closer proximity to the adjacent woody riparian vegetation. Two stagnant pools were assessed which had an average wetted width of 1.8m. Creek chub, blacknose dace, and brook stickleback were sampled at this location.

- **Electrofishing Site 4** was a 90m section of channel located immediately upstream from the reach break between Reaches JC-6 and JC-7, nearby a farm crossing. Instream cover and shading at this location was provided by undercut banks and woody debris. Again, two stagnant pools were assessed, where creek chub, blacknose dace, and brook stickleback were sampled. The average wetted width of these features was 1.8m.

- **Electrofishing Site 5** was a 60m section of channel located near the upstream limit of Reach JC-7. Here, undercut banks, woody debris, and large rootwads within stagnant pools provided cover for local fish. Similar to the downstream extent, creek chub, blacknose dace, and brook stickleback were sampled within the one pool on site, which had an average wetted width of 1.5m.

To supplement the electrofishing effort, underwater camera footage was collected on June 12 and June 17, 2019 at five pools within Reaches JC-6 and JC-7 (**Figure 5.1C**). At each site, two cameras were placed within the deepest pool. One camera was positioned in an upstream direction, and one camera was positioned to collect footage across the width of the channel. The cameras were fitted with flat lens casings to avoid visual distortion and blurriness caused by using convex lens casings underwater. Cameras were mounted to either weighted metal plates or flexible tripods, which secured the cameras to the channel bed. Each sampling location was established and remained undisturbed for a minimum of 30 minutes to allow fish to acclimatize to the presence of the camera. Video review occurred the following day to ensure proper functioning of each camera, lens fitting, resolution/frame rate settings, and mounts.

Based on the camera footage collected over a period of two days, three species of fish were identified: creek chub, blacknose dace, and brook stickleback. Footage along Reach JC-7 mostly showed evidence of only brook stickleback, but all three species were common along Reach JC-6.

Table 5.7: Reach JC-6 and JC-7 Fish Species

Species Common Name	Number of Fish Sampled	Minimum Length (mm)	Maximum Length (mm)
Blacknose Dace	95	100	350
Brook Stickleback	190	120	800
Creek Chub	25	200	500

Rapid Geomorphic Assessments

In addition to the fisheries assessment, rapid geomorphological field assessments were completed for Stream Reaches JC-5, JC-6, and JC-7 on June 17, 2019. The assessment included the following reach-by-reach observations:

- Characterization of stream form, process, and evolution using the Rapid Geomorphological Assessment (RGA) (MOE, 2003; VANR, 2007);
- Stream habitat classification following the Rapid Stream Assessment Technique (RSAT) (Galli, 1995);
- Habitat sketch mapping based on Newson and Newson (2000);
- Stream stability classification following a modified Downs (1995) approach;
- Instream estimates of bankfull channel geometry, pool depths, and riffle lengths;
- Observations of bed and bank material composition and structure;
- Observations of groundwater inputs or areas of upwelling; and
- Evidence of erosion, scour, deposition, or any valley wall contact.

A summary of the stream reaches adjacent to the Mattamy Phase 3 lands is provided below and presented by constraint category (green, blue, red-dashed, and red). A photographic record of reach observations is included in Appendix D-3.

5.4.1 Green Stream JC-31A

Reach JC-31A, a Low Constraint Stream, is located along the eastern boundary of the Mattamy Phase 3 lands. It was addressed in the *Final Joshua's Creek EIR/FSS*. Consistent with that report, OPA 272 policies and NOCSS recommendations, Reach JC-31A will be incorporated into the development plan. No further site visits or analyses are required for this Reach.

5.4.2 Blue Stream JC-7

Approximately 250m of Stream Reach JC-7, a Medium Constraint Stream Corridor (blue stream reach), is located along the western portion of the northern boundary of the Mattamy Phase 3 lands. Observations outlined in NOCSS and the *Final Joshua's Creek EIR/FSS* note that this stream channel is a well-defined, low-gradient valley system with a mix of fragmented riparian communities.

More recently, additional review of Reach JC-7 was completed by GEO Morphix as part of this EIR/FSS Addendum. The GEO Morphix assessment (June 2019) revealed a single-threaded, straight channel with a low gradient. The channel was densely vegetated primarily with reed species. The average width and depth of the bankfull channel was measured as 0.98m and 0.39m, respectively. The channel was vegetation controlled with limited evidence of erosion. The reach also lacked morphological variability. Riffles and pools were limited. Channel substrate contained mostly clay, silt, and sand; however, small sections of gravel and cobbles were observed along the reach. Channel characteristics are summarized in **Table 5.8**.

Under NOCSS, the Rapid Geomorphological Assessment (RGA) technique was applied on Reach JC-7 to understand current stream form and potential evolution. Following the RGA, the channel was classified as *In Regime/Stable* (RGA score of 0.11). To confirm previous observations, the RGA protocol was also completed in June 2019 as part of this EIR/FSS Addendum. Observations were generally in conformance with NOCSS. Reach JC-7 was classified as *In Regime/Stable* (RGA score of 0.14).

Based on the fisheries, aquatic habitat and fluvial geomorphological assessments completed as part of this EIR/FSS Addendum, the NOCSS aquatic and fisheries assessment as reported in the *Final Joshua's Creek EIR/FSS* is confirmed, although the description is modified. As NOCSS stated, the habitat is very common within the Study Area, but it now can be categorized as occupied fish habitat.

No modifications are proposed to this stream reach.

Table 5.8: Characteristics of Blue Stream Reach JC-7

Reach	Average Bankfull Width (m)	Average Bankfull Depth (m)	Substrate	Riparian Vegetation	Notes
JC-7	0.98	0.39	Clay, sand, localized section of small gravel	Continuous grasses and herbaceous vegetation; sparse trees	▪ Flows to east and drains to JC-6 ▪ Riparian vegetation encroachment within channel ▪ Limited evidence of erosion ▪ Limited instream morphology

5.4.3 Red-Hatched Stream JC-6

Reach JC-6, a High Constraint Stream Corridor with Rehabilitation Opportunities (red-hatched stream reach) comprises the majority of the eastern portion of the northern boundary of the Mattamy Phase 3 lands. SAR investigations within this corridor were confined to the area in the vicinity of the road crossing, as discussed above in Section 5.1.1, and subsequently in Section 10.2. The terrestrial habitat conditions of the corridor are as described in the *Final Joshua's Creek EIR/FSS*, with more detail provided concerning tree species discussed in Section 10.2.

With regard to aquatic habitat conditions, observations outlined in NOCSS and the *Final Joshua's Creek EIR/FSS* note that the channel is a well-defined, moderate-gradient valley system with fragmented canopy cover and thicket-to-wooded riparian communities. Due to past impacts of the channel as a result of agricultural land use, there are opportunities for enhancement to protect and improve aquatic habitat and overall channel form and function, providing the reason why the reach is categorized as 'red-hatched'

More recently, additional review of Reach JC-6 was completed by GEO Morphix as part of this EIR/FSS Addendum. The GEO Morphix assessment (June 2019) revealed a predominantly single-threaded, irregularly meandering channel with a moderate gradient. However, several sections of the reach showed evidence of offshoot channels. Riparian vegetation consisted primarily of continuous grasses, herbaceous species, and fragmented wooded communities predominantly south of the creek. The average width and depth of the bankfull channel was 1.33m and 0.38m, respectively. Minor erosion was observed in the form of undercut banks. Channel substrate contained mostly clay, silt, and sand. Riffles and pools were observed along the reach and channel substrate ranged from clay, sand, and silt, to larger gravels in the riffle areas. Channel characteristics are summarized in **Table 5.9**.

Under NOCSS, the Rapid Geomorphological Assessment (RGA) technique was applied on Reach JC-6 to understand current stream form and potential evolution. Following the RGA, the channel was classified as *In Regime/Stable* (RGA score of 0.15). To confirm previous observations, the RGA protocol was also completed in June 2019 as part of the additional assessments as part of this EIR/FSS Addendum. In June 2019, Reach JC-6 was classified as *In Transition/Stress* (RGA score of 0.30). The increase in the RGA score was attributed to planimetric form adjustment supported by observations of multiple channel flow paths, formation of chutes, and a misaligned channel thalweg.

Based on these assessments, the NOCSS aquatic and fisheries assessment as reported in the *Final Joshua's Creek EIR/FSS* is confirmed. As NOCSS stated and reiterated in the *Final Joshua's Creek EIR/FSS,* the habitat is "common; moderately sensitivity to activities, plays important role in sustaining fisheries" and thus is "important habitat" for fisheries.

Table 5.9: Characteristics of Red Dashed Stream Reach JC-6

Reach	Average Bankfull Width (m)	Average Bankfull Depth (m)	Substrate	Riparian Vegetation	Notes
JC-6	1.33	0.38	Clay, sand, localized sections of gravel and cobbles	Continuous grasses and herbaceous vegetation; dense tree sections on south side	▪ Flows to east and drains to JC-5 ▪ Riparian vegetation encroachment within channel ▪ Evidence of woody debris ▪ Active bank erosion (undercutting) ▪ Riffle/pool morphology present

In response to the EIR/FSS requirement to identify potential restoration opportunities along Reach JC-6, this reach is described in more detail in **Table 5.10** and **Figure 5.1D** highlighting areas where past agricultural practices have affected stream conditions.

Table 5.10: Stream Reach JC-6 Existing Conditions Associated with Red-Hatch Categorization

ID*	Name	Feature Length (m)	Feature Area (m^2)**	Existing Conditions Description
P1	Pool 1	4.5	5.9	▪ Pool feature with limited depth due to siltation and encroachment of terrestrial vegetation ▪ Creek chub, brook stickleback and blacknose dace observed with underwater camera
VWC1	Valley Wall Contact 1	2.4	N/A	▪ Low flow channel contacting valley wall causing erosion at the toe of slope ▪ No observed risk to adjacent property or infrastructure
R1	Riffle 1	2.0	2.7	▪ Well-developed riffle composed of cobble and sparse gravel bed materials
R2	Riffle 2	2.3	3.1	▪ Well-developed riffle composed of cobble and sparse gravel bed materials
B1	Bank 1	2.3	N/A	▪ Poorly defined right channel bank looking downstream
CH1	Channel 1	33.0	31.7	▪ Section of limited channel morphology, as shown by multiple flow paths and the encroachment of terrestrial vegetation into the channel (sapling and grass), which may act as a barrier to fish passage during low flow periods ▪ Well-developed riffle composed of gravel and cobble present at mid-point of CH1 section
CH2	Channel 2	6.7	8.9	▪ Section of limited channel morphology and poor bank definition along right channel bank looking downstream ▪ Heavy encroachment of terrestrial vegetation in channel (saplings and grasses) ▪ Channel wider in this section compared to average bankfull channel width

ID*	Name	Feature Length (m)	Feature Area (m^2)**	Existing Conditions Description
R3	Riffle 3	5.1	6.8	▪ Riffle feature with bed substrate composed of a dense clay
P2	Pool 2	5.7	7.6	▪ Shallow pool feature at apex of meander bend with siltation on channel bed ▪ Fish sampling with electrofisher and camera trap showed presence of brook stickleback, creek chub and blacknose dace
R4	Riffle 4	3.4	4.5	▪ Riffle feature composed of a clay dominant substrate ▪ Encroachment of terrestrial vegetation in channel
R5	Riffle 5	4.3	5.7	▪ Riffle feature composed of clay dominant substrate
B2	Bank 2	3.2	N/A	▪ More bank erosion observed in this location than elsewhere along reach ▪ Significant undercutting observed along both channel banks
CH3	Channel 3	76.0	101.1	▪ Section of poorly defined channel as shown by encroachment of terrestrial vegetation, no morphological variability, the presence of multiple flow paths and minimal variation between channel and floodplain substrates
P3	Pool 3	3.7	4.9	▪ Limited pool development at apex of meander bend ▪ Bed material consists of gravel and cobble overlaying till ▪ Feature dry during fish sampling with electrofisher ▪ Brook stickleback, creek chub and blacknose dace observed using instream camera system
P4	Pool 4	6.7	8.9	▪ Limited pool development at apex of meander bend ▪ Siltation observed along channel bed, which was predominantly composed of a cohesive clay ▪ Brook stickleback, creek chub and blacknose dace sampled using electrofisher
CH4	Channel 4	55	73.2	▪ Section of poorly defined channel as shown by encroachment of terrestrial vegetation, no morphological variability, the presence of multiple flow paths and minimal variation between channel and floodplain substrates ▪ Brook stickleback, creek chub and blacknose dace sampled using electrofisher

*****ID and colour correspond to Newson and Newson (2000) habitat sketch maps and Figure 5.1D: Stream Reach JC-6 Existing Conditions

**Feature length X average bankfull channel width for entire Reach JC-6; average bankfull width = 1.33 m

Consistent with NOCSS recommendations and EIR/FSS Terms of Reference, as part of this EIR/FSS Addendum, opportunities for restoration along Reach JC-6 were identified.

Section 10.2 discusses restoration along Reach JC-6 associated with the future road/services crossing of the NHS and Section 6.3 discusses trail works in the NHS, both of which are Mattamy's responsibility to implement. Other potential rehabilitation/restoration opportunities noted in **Table 5.11** are provided as input to others who may wish to complete specific restoration works along Reach JC-6 in the future. **Figure 5.1D** illustrates the general locations of the areas listed in **Table 5.11**.

Ontario Municipal Board Minutes of Settlement (June 2006) are clear that NHS restoration will be completed by landowners only in areas associated with proposed NHS works, such as SWM ponds/outfalls, trails, and road/services crossings of the NHS. The listing of potential restoration opportunities in **Table 5.11** does not infer that all of these works must be implemented, nor does it address who might implement these works, or some of them, in the future. Priorities for such works would be determined in the future by others.

Table 5.11: Stream Reach JC-6 Potential Restoration Opportunities

ID*	Name	Existing Conditions Descriptions	Potential Restoration Opportunities
P1	Pool 1	▪ Pool feature with limited depth due to siltation and encroachment of terrestrial vegetation ▪ Creek chub, brook stickleback and blacknose dace observed with underwater camera	▪ Addition of large woody debris or woody vegetation would enhance pool form and function providing low flow refugia and potential for overwintering habitat
VWC1	Valley Wall Contact 1	▪ Low flow channel contacting valley wall causing erosion at the toe of slope	▪ Bank stabilization and enhancement would reduce fine sediment release ▪ Improved microhabitat could be achieved through installation of live-staking and wattles
R1	Riffle 1	▪ Well-developed riffle composed of cobble and sparse gravel bed materials	▪ Diversity of substrate and spawning opportunities for existing fish communities could be improved through installation of gravels
R2	Riffle 2	▪ Well-developed riffle composed of cobble and sparse gravel bed materials	▪ Diversity of substrate and spawning opportunities for existing fish communities could be improved through installation of gravels
B1	Bank 1	▪ Poorly defined right channel bank looking downstream	▪ Bank stabilization and enhancement would reduce fine sediment release ▪ Improved microhabitat could be achieved through installation of live-staking and wattles
CH1	Channel 1	▪ Section of limited channel morphology as shown by multiple flow paths and the encroachment of terrestrial vegetation into the channel (sapling and grass), which act as a barrier to fish passage during low flow periods ▪ Well-developed riffle composed of gravel and cobble present at mid-point of CH1 section	▪ In vicinity of future JC-6 road crossing, proposed natural channel design will restore channel morphology and fish passage will be re-instated (Section 10.2.2 discusses proposed restoration) ▪ To be completed by landowner
CH2	Channel 2	▪ Section of limited channel morphology and poor bank definition along right channel bank looking downstream ▪ Heavy encroachment of terrestrial vegetation in channel (saplings and grasses) ▪ Channel wider in this section compared to average bankfull channel width	▪ Bank stabilization would reduce fine sediment release ▪ Improved microhabitat could be achieved through installation of live-staking and wattles
R3	Riffle 3	▪ Riffle feature with bed substrate composed of a dense clay	▪ Diversity of substrate and spawning opportunities for existing fish communities could be improved through installation of gravels and cobbles
P2	Pool 2	▪ Shallow pool feature at apex of meander bend with siltation on channel bed ▪ Fish sampling with electrofisher and camera trap showed presence of brook stickleback, creek chub and blacknose dace	▪ Addition of large woody debris or woody vegetation would enhance pool form and function providing low flow refugia and potential for overwintering habitat

ID*	Name	Existing Conditions Descriptions	Potential Restoration Opportunities
R4	Riffle 4	▪ Riffle feature composed of a clay dominant substrate ▪ Encroachment of terrestrial vegetation in channel	▪ Diversity of substrate and spawning opportunities for existing fish communities could be improved through installation of gravels and cobbles
R5	Riffle 5	▪ Riffle feature composed of clay dominant substrate	▪ Diversity of substrate and spawning opportunities for existing fish communities could be improved through installation of gravels and cobbles
B2	Bank 2	▪ More bank erosion observed in this location than elsewhere along reach ▪ Area of active bank erosion with undercutting observed along both channel banks	▪ Bank stabilization and enhancement would reduce fine sediment release ▪ Improved microhabitat could be achieved through installation of live-staking and wattles
CH3	Channel 3	▪ Section of poorly defined channel as shown by encroachment of terrestrial vegetation, no morphological variability, the presence of multiple flow paths and minimal variation between channel and floodplain substrates	▪ Addition of large woody debris or woody vegetation would enhance pool form and function providing low flow refugia and potential for overwintering habitat ▪ Formalized channel through construction of riffle-pool sequence could re-instate low flow fish passage ▪ Restoration improvements to channel would increase the range and access to additional habitat and increased opportunity for species' resilience because of improved connectivity during periods of stress.
P3	Pool 3	▪ Limited pool development at apex of meander bend ▪ Bed material consists of gravel and cobble overlaying till ▪ Feature dry during fish sampling with electrofisher ▪ Brook stickleback, creek chub and blacknose dace observed using instream camera system	▪ Addition of large woody debris or woody vegetation would enhance pool form and function providing low flow refugia and potential for overwintering habitat
P4	Pool 4	▪ Limited pool development at apex of meander bend ▪ Siltation observed along channel bed, which was predominantly composed of a cohesive clay ▪ Brook stickleback, creek chub and blacknose dace sampling using electrofisher	▪ Addition of large woody debris or woody vegetation would enhance pool form and function providing low flow refugia and potential for overwintering habitat
CH4	Channel 4	▪ Section of poorly defined channel as shown by encroachment of terrestrial vegetation, no morphological variability, the presence of multiple flow paths and minimal variation between channel and floodplain substrates ▪ Brook stickleback, creek chub and blacknose dace sampled using electrofisher	▪ Addition of large woody debris or woody vegetation would enhance pool form and function providing low flow refugia and potential for overwintering habitat ▪ Formalized channel through construction of riffle-pool sequence could re-instate low flow fish passage ▪ Restoration improvements to channel would increase the range and access to additional habitat and increased opportunity for species' resilience because of improved connectivity during periods of stress.

5.4.4 Red Stream JC-5

Reach JC-5, a High Constraint Stream Corridor (red stream reach) primarily is contained within Core 11. The aquatic and fluvial conditions of this reach were examined further as part of this Addendum since it will be necessary for SWM Pond 50 to outlet to this reach.

Observations outlined in NOCSS and the *Final Joshua's Creek EIR/FSS* note that the channel is a well-defined, higher-gradient valley system with dense canopy cover along the riparian zone. Instream morphology was diverse with the presence of defined riffles and pools. Groundwater influence was also documented in NOCSS through observations of watercress and low water temperatures.

More recently, additional review of Reach JC-5 was completed by GEO Morphix as part of this EIR/FSS Addendum. The GEO Morphix assessment (June 2019) revealed a single-threaded, irregularly meandering channel with a moderate to high gradient that flows through a defined valley. Riparian vegetation consisted primarily of dense woodland communities. The average width and depth of the bankfull channel was 2.43m and 0.65m, respectively. Minor erosion was observed in the form of undercut banks. Instream morphology was evidence in the form of well-developed riffle/pool sequences. Pool substrate contained mostly clay, silt, sand, and small gravels. Riffles substrate consisted of gravels, cobbles, and boulders. Leaning trees and woody debris were also frequently observed along the reach. Channel characteristics are summarized in **Table 5.12**.

Under NOCSS, the Rapid Geomorphological Assessment (RGA) technique was applied on Reach JC-5 to understand current stream form and potential evolution. Following the RGA, the channel was classified as *In Transition/Stress* (RGA score of 0.23). To confirm previous observations, the RGA protocol was also completed in June 2019 as part of the additional assessments as part of this EIR/FSS Addendum. In June 2019, Reach JC-5 was classified as *In Transition/Stress* (RGA score of 0.30). The slight increase in the RGA score was attributed to evidence of channel widening supported by observations of fallen/leaning trees, exposed tree roots along channel banks, and basal scour through most of the reach.

Based on these assessments, the NOCSS aquatic and fisheries assessment as reported in the *Final Joshua's Creek EIR/FSS* is confirmed. As NOCSS stated and reiterated in the *Final Joshua's Creek EIR/FSS,* for Reach JC-5, the habitat is "rare; highly sensitive, plays critical role in sustaining fisheries" and is "critical habitat" for fisheries.

Table 5.12: Characteristics of Red Stream Reach JC-5

Reach	Average Bankfull Width (m)	Average Bankfull Depth (m)	Substrate	Riparian Vegetation	Notes
JC-5	2.43	0.65	Clay, sand, localized sections of gravel and cobbles	Continuous wooded area	▪ Flows to east and drains to confluence of JC-4 and JC-12 ▪ Continuous riparian cover with established and mature vegetation ▪ Riffle/pool morphology present ▪ Evidence of woody debris and well-developed pools ▪ Range of riffle substrate (gravels, cobbles, boulders) ▪ Active bank erosion (undercutting) and channel/valley wall contact ▪ Leaning trees along channel banks ▪ Surface water monitoring confirms intermittent flow conditions ▪ High water table conditions may support seasonal seepage, however, piezometer monitoring shows the water table is generally more than 0.5m below grade with a recharge gradient

5.5 Stream Corridor Delineation

The *Final Joshua's Creek EIR/FSS* identified stream boundaries for all high and medium constraint streams (i.e., NHS stream corridors) on participating lands (Bressa, Dunoak and 1564984 Ontario Ltd.). This included NHS stream corridor boundaries abutting the Mattamy Phase 3 lands (i.e., Stream Reaches JC-5, JC-6 and JC-7. Consistent with NOCSS recommendations, corridor widths were established based on consideration of the following:

- fluvial geomorphologic requirements;
- stable slope top-of-bank;
- regulatory floodplain;
- fish and fish habitat protection requirements;
- preservation of hydrogeologic functions;
- Hydrologic Features A;
- setback and buffer requirements from these factors/conditions; and,
- linkage requirements.

The *Final Joshua's Creek EIR/FSS* recommended that, as part of the EIR/FSS Addendum for Mattamy lands, the 100yr and Regional Storm peak flow rates on River 1 Reaches 1 & 2 (Main Joshua's Creek) from Section 11.024 to upstream of Burnhamthorpe Road be revisited and compared to NOCSS unit area flow rates times drainage area. It further noted that, if required, hydraulic modeling should be updated with consistent and appropriate flow data to ensure that the extent of the existing and proposed condition floodplain (including impacts from the proposed Reach JC-6 crossing) and the associated

regulated setback will be maintained within the proposed NHS. All other considerations relating to NHS boundaries along Reaches JC-5, JC-6 and JC-7 were finalized as part of the *Final Joshua's Creek EIR/FSS.*

This EIR/FSS Addendum has reviewed the 100 year and Regional Storm flows along the river reaches noted above. The 100yr and Regional flows used in the HECRAS model are consistent with the 100yr and Regional flows from the approved hydrology and floodplain mapping completed by Stantec, dated September 13, 2017. Please refer to Appendix F-2B of the *Final Joshua's Creek EIR/FSS* for the floodplain mapping. Attachment A (Table 1) in Appendix F-2B presents the unit flow rates used in the floodplain mapping. It should be noted that the flows from the September 2017 Stantec floodplain mapping are based on an approved GAWSER hydrologic model.

A comparison of the GAWSER model 100yr and Regional Storm flows has been made to NOCSS unit flow rates times drainage areas; see **Table 5.13**. NOCSS unit rates were taken from the NOCSS Addendum, Table 7.4.1. As shown, there are some variations between the approved GAWSER flows versus NOCSS unit flow calculations depending upon location. For the Regional Storm and 100 year storm, generally:

- along the upper reaches of Joshua's Creek along JC-9/ JC-10A, the GAWSER flows are higher than the flows calculated using NOCSS release rates (3% for the Regional Storm and 7% for the 100 year event);
- GAWSER flows are less than NOCSS calculated flows through Stream Reach JC-7 to the confluence of Stream Reaches JC-5 and JC-12, at JC-4 (-5% to -9% for the Regional Storm and -8% to -13% for the 100 year event); and,
- downstream of the confluence of Stream Reaches JC-4, JC-5 and JC-12, GAWSER flows are generally equal to flows calculated using NOCSS release rates (-1% to 3% for the Regional Storm) and are slightly greater for the 100 year event (1% to 9%).

Differences in flow for the upper reaches of Joshua's Creek are because NOCSS unit release rates were set based on the total flow at Dundas Street divided by the drainage area. So while the GAWSER flows at Dundas Street are equal to the NOCSS calculated flows, the GAWSER flows may differ slightly from the NOCSS calculated flows for the upstream river reaches. Differences in flows are not unexpected and are small.

Along Stream Reaches JC-5, JC-6 and JC-7 abutting the Mattamy Phase 3 Lands, with one exception, the Regional Storm floodline lies well below top of bank; it generally follows the toe of valley slope and does not govern the NHS corridor boundary in these locations. Localized floodline changes resulting from the future Reach JC-6 road crossing shown on **Figure 10.1R** do not alter these conditions. As discussed in Section 10.2.1, the proposed crossing impacts flood elevations from cross sections 11.777 to 11.572, upstream of the future crossing. The Regional water level is increased by up to 23cm at cross section 11.623, before returning to existing flood elevations just upstream of cross section 11.777 (1cm increase at the cross section). For a short distance upstream of cross section 11.777, for a short distance, the floodline plus 7.5m delineates the NHS corridor on the north side of Stream Reach JC-7. Under existing conditions, there is not a defined top of bank in this location. However, future grading will raise the area to the immediate north consistent with adjacent areas with existing defined top of banks. This will be done by filling and retaining walls located outside of the NHS. As a result, the floodline in this location will lie up to 3m below the future lot grades.

Based on the review of Regional Storm flows, and the floodline changes based on the future road crossing of Reach JC-6, the NHS boundaries established along Stream Reaches JC-5, JC-6 and JC-7, presented on **Drawing Joshua's Creek NHS-4** from the *Final Joshua's Creek EIR/FSS* remain valid. They do not require amending based on this review of flows and floodlines.

Table 5.13: Comparison on Approved Floodplain (GAWSER) vs. NOCSS Calculated Flows

Stream Reach	Station (HECRAS Cross Section)	Pre-Development Catchment Area (ha)	100 Year Storm			Regional Storm		
			GAWSER 100 Year Flows per Approved Floodplain Mapping+ [1]	NOCSS Calculated 100 Year Flow++ [2]	Percent Difference, GAWSER Flows and NOCSS Flows [3] = [1]- [2] / [2]	GAWSER Regional Flows per Approved Floodplain Mapping* [4]	NOCSS Calculated Regional Flow** [5]	Percent Difference, GAWSER Flows and NOCSS Flows [6] = [4]- [5] / [5]
JC-9/10A	14.207	126.98	2.86	2.67	7%	6.81	6.60	3%
JC-9/10A	13.019	130.73	2.94	2.75	7%	7.01	6.80	3%
JC-9/10A	12.87	134.06	3.02	2.82	7%	7.19	6.97	3%
JC-9	12.763	137.83	3.1	2.89	7%	7.39	7.17	3%
Burnhamthorpe Road								
JC-7	12.5	243.77	4.71	5.12	-8%	12.07	12.68	-5%
JC-7	12.41	248.2	4.76	5.21	-9%	12.25	12.91	-5%
JC-7	12.358	252.62	4.81	5.31	-9%	12.42	13.14	-5%
JC-7	12.286	290.89	5.25	6.11	-14%	13.91	15.13	-8%
JC-7	12.261	324.16	5.93	6.81	-13%	15.4	16.86	-9%
JC-6	11.867	324.16	5.93	6.81	-13%	15.4	16.86	-9%
JC-6	11.489	324.16	5.93	6.81	-13%	15.4	16.86	-9%

Stream Reach	Station (HECRAS Cross Section)	Pre-Development Catchment Area (ha)	100 Year Storm			Regional Storm		
			GAWSER 100 Year Flows per Approved Floodplain Mapping+ [1]	NOCSS Calculated 100 Year Flow++ [2]	Percent Difference, GAWSER Flows and NOCSS Flows [3] = [1]- [2] / [2]	GAWSER Regional Flows per Approved Floodplain Mapping* [4]	NOCSS Calculated Regional Flow** [5]	Percent Difference, GAWSER Flows and NOCSS Flows [6] = [4]- [5] / [5]
JC-5	11.024	324.16	5.93	6.81	-13%	15.4	16.86	-9%
JC-4	10.95	535.47	12.29	11.24	9%	28.8	27.84	3%
JC-4	10.79	732.87	15.83	15.39	3%	38.11	38.11	0%
JC-3	10.486	758.61	16.32	15.93	2%	39.32	39.45	0%
JC-3	10.008	826.26	17.6	17.35	1%	42.47	42.97	-1%
JC-1	9.328	981.26	21.2	20.61	3%	51.22	51.03	0%
JC-1	9.069	994.69	21.29°	20.89°	2%	51.72	51.72	0%

\+ 100yr flows taken from Joshua's Creek Floodplain Memo, prepared by Stantec Consulting Ltd. dated September 2017

++ 100yr flows calculated by multiplying drainage area by NOCSS Unit Flow Rate for the 100yr Storm Flow Rate (0.021 m^3/s/ha). JC-D1 Unit Flow Rate from NOCSS Table 7.4.1.

Note that 100yr flows are not equal between the GAWSER flows and NOCSS calculated flows due to rounding. The 100yr NOCSS unit flow rates were rounded down from 0.0214 to 0.021. Please refer to Attachment A (Table 1) of the Joshua's Creek Floodplain Memo, prepared by Stantec Consulting Ltd. dated September 2017.

* Regional Storm flows taken from Joshua's Creek Floodplain Memo, prepared by Stantec Consulting Ltd. dated September 2017

** Regional Storm flows calculated by multiplying drainage area by NOCSS Unit Flow Rate for the Regional Storm Flow Rate (0.052 m^3/s/ha). JC-D1 Unit Flow Rate from NOCSS Table 7.4.1.

6.0 LAND USE

6.1 General Description of Development Plans

Section 6.0 of the *Final Joshua's Creek EIR/FSS* provides a general description of the proposed development plans and addresses trail planning matters including the trail alignment and preliminary design on the Mattamy lands. Most discussion relates to the trail system along the Joshua's Creek corridor and through Core 11; although description of the short reach of trail through the Mattamy Dunoak lands in Core 10 is also provided. This Addendum includes:

- Revisions to Section 6.1 and **Figure 6.2** to update the description of the Mattamy Phase 3 land development plan; and,
- Revised Section 6.3 to include discussion on the alignment, design and grading of the Core 11 trail on the Mattamy Phase 3 lands.

Figure 6.1R illustrates the Town's Master Plan for the Subject Lands as defined in the *Final Joshua's Creek EIR/FSS* and adjacent properties.

Figure 6.2R provides the proposed Composite Development Plan illustrating the proposed Mattamy Phase 3 Draft Plan of Subdivision (December 12, 2019), the proposed Argo Draft Plan of Subdivision (December 2019), the proposed Redoak/ Capoak draft plan (October 2019), the proposed Coscorp (Rampen) draft plan (April 2020) and approved Draft Plans of Subdivisions Bressa 24T-12004 and Dunoak 24T-12003.

The Mattamy Phase 3 lands will be developed for a range of residential, institutional and open space uses consistent with the Master Plan for North Oakville East. **Figure 6.2A** illustrates the proposed Mattamy Phase 3 Draft Plan of Subdivision dated March 16, 2020. Proposed residential uses consist of approximately 687 single detached dwelling units and 344 townhouse units. One school, one neighbourhood park, and a portion of another neighbourhood park are located on the Mattamy Phase 3 lands. The Mattamy Phase 3 lands will be serviced by SWM Ponds 52, 55, and 56. A small portion of Core 10 is shown as NHS. The northern boundary of the Mattamy Phase 3 lands is coincident with the NHS boundary along Stream Reaches JC-6 and JC-7.

As shown, primary access to the proposed development will be provided through the Draft Plan approved Mattamy Dunoak lands to the south and from future subdivisions to the east, north and west. One of the north-south roads requires a crossing of Joshua's Creek Stream Reach JC-6, which is addressed in Section 10 of this EIR/FSS Addendum.

6.2 Trail Planning

Trailing planning direction, as provided by Policy 7.4.7.3 of OPA 272, Section 6.3.5.2 of the NOCSS, and the *North Oakville Trails Plan,* May 2013, is presented in detail in the *Final Joshua's Creek EIR/FSS*.

Overall trail planning for North Oakville East was established through the North Oakville Trails Plan, May 2013. As well, in May 2013, the revised EIR/FSS TOR provides explicit direction for the study requirements for trails that are required to be included in an EIR/FSS. This EIR/FSS Addendum addresses all trail requirements for the Mattamy Phase 3 lands as per the TOR.

The location of trails as proposed by the Trails Plan is shown on **Figure 6.3R** (Figure 1 from the Trails Plan document). Within the Mattamy Phase 3 lands, the Trails Plan indicates a Major Trail along the south side of Core 11 and; a Major Trail along the east side of Core 10. The alignments proposed for the trails are generally consistent with the Trails Plan but have been adjusted slightly in some places based on design, grading and other considerations.

6.3 Location of Trails in NHS

6.3.1 Overview

The locations of sections of the Major Trail within the NHS within/adjacent to the Phase 3 Lands are illustrated on **Figure 6.4R**. In the *Final Joshua's Creek EIR/FSS*, the location of the trail within Core 10 on the Phase 3 lands generally was finalized, including site walks and discussions with the Town and CH. Minor modifications may occur at detailed design through discussions with the Town and CH, but no additional investigation was required through this Addendum.

The Major Trail alignment along the south side of Core 11 and the corridors of Stream Reaches JC-6 and JC-7 along the northern boundary of Phase 3 Lands has not been verified in the field with the Town and CH. Through discussion at NOARM with the Town and CH, it was confirmed that the proposed alignment as shown on **Figure 6.4R** would be visited with the agencies after review of this Addendum has occurred.

The sections of the Major Trail along this northern boundary, as determined by the *Final Joshua's Creek EIR/FSS*, are summarized below. The alignment is as proposed in that EIR/FSS but additional field investigations have occurred to assess site-specific conditions of the trail. The majority of the alignment on the Mattamy Phase 3 lands will be located in the buffer to the natural heritage features that define the NHS. Much of the trail footprint will be situated in what currently is agricultural field. The trail will pass through two existing hedgerows and a cultural woodland but will avoid sensitive deciduous forest and top-of-bank areas.

6.3.2 Species at Risk Potential in the Trail Vicinity

To conform to the requirements of NOCSS, CH has been consulted as part of the evaluation of placement of trails within the NHS. In addition, matters related to the *Endangered Species Act*, as of April 2019, are under the jurisdiction of the MECP (previously under the jurisdiction of MNRF). The MECP also has been consulted during the planning of this Major Trail. The EIR/FSS TOR document provides explicit direction for the study requirements of an EIR/FSS to address trails. The TOR section 3.7.1 states that "Trail sections that are exclusively located within buffers that are active agricultural lands (row crops) must undertake Species at Risk (SAR) screening and complete appropriate seasonal field surveys." As discussed in Section 5, botanical inventories, breeding bird surveys, and a bat habitat assessment have been completed. SAR species were not observed specific to trail areas and habitats, including a 50m search area from the trail limits specific for Butternut. Precautionary mitigation measures, including timing windows, have been recommended in Section 5.1.2 Habitat

Protection/Mitigation Requirements of the *Final Joshua's Creek EIR/FSS*) to minimize/eliminate the potential for negative affects to plant and wildlife communities/species. Confirmation from MECP that the proposed mitigation (ensuring that vegetation removal is restricted to outside the April 1 to September 30 window) is appropriate to avoid ESA permitting (as provided in Appendix R-8).

6.3.3 Description of Trail Alignment Sections

As displayed on **Figure 6.4R**, the Major Trail alignment will be located in the existing agricultural field/proposed buffer south of Core 11 to avoid FOD4 and FOD5 habitats (dry-fresh deciduous forest and dry-fresh sugar maple deciduous forest, respectively) abutting the eastern parts of the Phase 3 lands, and will enter portions of CUW1B (cultural woodland dominated by hawthorn, pear, apple), then continue along the southern buffer to the Reach JC-6 and then Reach JC-7, currently agricultural field, adjacent to the western parts of the Phase 3 lands. The proposed alignment has been selected to avoid quality habitats, large trees of native species, watercourses/surface drainage features and slopes.

The trail has been grouped into several segments with respect to location, engineering design requirements, and potential natural heritage implications. Specific requirements for grading within the NHS with respect to the trails and drainage are outlined in **Table 6.1**, below.

The Core 11 trail sections shown on **Drawings 7A** and **7B** have been carried forward from the *Final Joshua's Creek EIR/FSS* to this EIR/FSS Addendum for consistency. Trail sections for the Phase 3 lands associated with Core 11 and the NHS corridors for Stream Reaches JC-6 and JC-7, including general location and characteristics are presented in **Table 6.1**. As noted, there are few trees within the NHS that will require removal to facilitate construction of the proposed trail as summarized in **Table 6.2** and shown on **Drawing 11.** Affected tree species are listed in Appendix U-1.

6.4 Trail Restoration Plantings

For locations within the NHS where disturbance will occur due to the construction of the trail features, a detailed landscape naturalization-restoration plan will be required at detailed design and prepared to the satisfaction of the Town (Parks) and CH, following the CH guidelines. The requirements for this restoration are presented in *Final Joshua's Creek EIR/FSS.*

Table 6.1: Summary of Trail Sections along Northern Boundary of Mattamy Phase 3 Lands

Trail Section	Location	Comment
TR9b	Within the 10m buffer from the Core 11 dripline, through the existing agricultural field.	▪ The Core 11 dripline has been staked ▪ Trail will be located approximately 2.0m inside the NHS boundary defined by the dripline +10m buffer. Trail alignment avoids the dripline of trees ▪ The trail will have a 2% cross fall slope in the north-easterly direction and will drain NHS in keeping with existing drainage conditions ▪ The grade will slope down from the trail at 10:1 (maximum slope permitted with 7.5m from the staked top of bank) for a maximum of 4m, matching existing grade at least 1m from the dripline ▪ The trail will connect to a trail system on the Argo (Joshua's Creek) property to the east. The trail alignment has been coordinated with the neighbouring property and is reflected in the Argo (Joshua's Creek) EIR/FSS Addendum ▪ One dead tree (1547, Red Ash) outside of Core will require removal to mitigate hazard potential ▪ Construction and operation of the trail and associated grading within the Core buffer is not anticipated to adversely impact natural features and functions ▪ Impact analysis for trees beyond the Phase 3 limits has not occurred as these are non-participating lands which will address impacts as respective EIR proceeds
TR9c	Within the 10m buffer from Core 11 dripline, through the existing agricultural field.	▪ The Core 11 dripline has been staked ▪ Trail will be located approximately 2.0m inside the NHS boundary defined by the dripline +10m buffer. Trail alignment avoids the dripline of trees ▪ The trail will have a 1.5% longitudinal slope and a 2% cross fall slope, draining southeast towards the NHS in keeping with existing drainage conditions ▪ The grade will slope down from the trail at 10:1 (maximum slope permitted with 7.5m from the staked top of bank) for a maximum of 4m, matching existing grade at least 1m from the dripline ▪ Construction and operation of the trail and associated grading within the Core buffer is not anticipated to adversely impact natural features and functions

Trail Section	Location	Comment
TR9d	Within the 10m buffer from Core 11 dripline, through the existing agricultural field.	▪ The Core 11 dripline has been staked ▪ Trail will be located approximately 2.0m inside the NHS boundary defined by the dripline +10m buffer. Trail alignment avoids the dripline of trees ▪ The trail will have a 3%-4% longitudinal slope and a 2% cross fall slope, draining southeast towards the NHS in keeping with existing drainage conditions ▪ The grade will slope down from the trail at 10:1 (maximum slope permitted with 7.5m from the staked top of bank) for a maximum of 3m, matching existing grade at least 1m from the dripline ▪ Construction and operation of the trail and associated grading within the Core buffer is not anticipated to adversely impact natural features and functions
TR9e	Within the 10m buffer from Core 11 dripline, through the existing agricultural field.	▪ The Core 11 dripline has been staked and transitions to Thicket boundary (Thicket is west of stake TH59, Core 11 dripline is east of stake TH59) ▪ The trail and associated grading does not affect the Core 11 dripline. A few trees within the Thicket may incur mitigative pruning or removal. ▪ The trail will be located approximately 2.0m inside the NHS boundary (Thicket) but does not affect the Core 11 dripline ▪ The trail will have a 2% cross fall slope, draining northeast towards the NHS in keeping with existing drainage conditions ▪ Grading required for the trail may result in slight encroachment into the Thicket, specifically trees 1293-1294 (white elm, red ash) and canopy and root pruning may be required to alleviate damage to these trees ▪ Tree removals not required ▪ Construction and operation of the trail and associated grading within the NHS/thicket buffer is not anticipated to adversely impact natural features and functions.
TR9f	Within the 10m buffer from NHS dripline, through the existing agricultural field; adjacent to the Reach JC-6 future road crossing.	▪ The NHS/thicket dripline has been staked. ▪ Grading is required to transition the grade of the trail to the road crossing and will result in the removal of trees 1304-1307 (sweet cherry) within the Thicket area west of stake TH59. ▪ The trail will be located approximately 2.0m inside the NHS boundary and will connect to the sidewalk at the road crossing ▪ The trail will have a 1% longitudinal slope and a 2% cross fall slope, draining north towards the NHS in keeping with existing drainage conditions ▪ Construction and operation of the trail and associated grading within the Core buffer is not anticipated to adversely impact natural features and functions.

Trail Section	Location	Comment
TR10	Required trail crossing of Street "B" (road crossing of Reach JC-6)	▪ Recommended that the trail follow the street system south, along the sidewalk so that the crossing occurs at a controlled intersection (Street "B") in accordance with the direction of the Trails Plan. Alternatively, as this intersection is 400m south of where the trail will meet Street "U", a traffic calming island (median) should be considered in this location at detailed design to aid in pedestrian crossing. ▪ A tree impact analysis for proposed road section is presented in Section 10 to avoid duplication.
TR11	Located along the south side of Reaches JC-6 and JC-7 inside the NHS boundary defined by greatest of top-of-bank buffer, floodline buffer, or 100m linkage width	▪ Majority of trail segment is located within agricultural fields; approximately 160m of the trail will be located through cultural thicket dominated by pear, hawthorn, buckthorn, apple, and dead or declining red ash. ▪ The trail will be located approximately 2.0m inside the NHS boundary generally defined by staked top of bank or linkage ▪ The trail will have a 2% cross fall slope, draining in the northerly direction towards the NHS in keeping with existing drainage conditions ▪ The grade will slope down from the trail at 10:1 within the 7.5m buffer to the top of bank ▪ Localized grading is required within the top of bank as discussed in Section 7.11; see Gullies A, B, C ▪ Tree removals will include 14 pear, 10 apple, 3 red ash (2 of which are dead), 1 willow, and 1 white elm, as they conflict with the proposed location of the trail. ▪ Trees which may be impacted as a result of the construction activities in proximity to root/canopy structures include 6 pear, 4 apple, and 2 sweet cherry. ▪ For this portion of the NHS corridor, trees are not the governing factor to define the NHS limit. As such, the trail can be aligned through the thicket area. As confirmed above, the thicket vegetation is dominated by pear, hawthorn, apple, common buckthorn and red ash, none of which would be individually a candidate for retention.

Table 6.2: Trees Within NHS Affected By Trail Alignment

Trail Sections	Trees in Disturbance Zone of Trail Tag# / # of Trees (red on Drawing 11)		Trees within 5m of Disturbance Zone of Trail Tag # / # of Trees (yellow on Drawing 11)		Species	Comments
TR9b	n/a	0	1547	1	Removal: Red Ash	1547 is dead. Remove for hazard mitigation. Remainder of trail segment located in agricultural field within NHS.
TR9c	n/a	0	n/a	0		Trail segment located in agricultural field within NHS.
TR9d	n/a	0	n/a	0		Trail segment located in agricultural field within NHS.
TR9e	n/a	0	1293,1294	2	Impacts: White Elm, Red Ash	Trail segment located in agricultural field, transition grading required in dripline of 1293, 1294 which are within the NHS stream corridor, not Core.
TR9f	1304, 1305, 1306, 1307	4	1303	1	Anticipated Impacts: Sweet Cherry Removals: Sweet Cherry	Trail segment located in agricultural field but grade transition will require the removal of 4 Sweet Cherry and may cause impact to 1 Sweet Cherry.
TR10	n/a	--	--	--	--	Road Crossing of JC6. Impact analysis addressed within Section 10 to avoid duplication.

Trail Sections	Trees in Disturbance Zone of Trail Tag# / # of Trees (red on Drawing 11)		Trees within 5m of Disturbance Zone of Trail Tag # / # of Trees (yellow on Drawing 11)		Species	Comments
TR11	1390 (dead), 1551 (dead), 1555, 1556, 1557, 1558, 1559, 1560, 1561, 1562, 1563, 1564, 1566, 1569, 1570, 1574, 1582, 1584, 1588, 1585, 1586, 1587, 1589, 1592, 1593, 1594	26 (includes 2 dead trees)	1568, 1571, 1572, 1573, 1575, 1576, 1579, 1583, 1590, 1591, 1595, 1596	12	Impacts: Pear, Apple, Sweet Cherry Removals: Apple, Pear, Red Ash, White Elm, Willow	Trail segment through Pear/Apple/Hawthorn cultural thicket and agricultural field inside of NHS stream corridor boundary

7.0 GRADING, DRAINAGE AND STORMWATER MANAGEMENT

7.1 Introduction

Section 7.0 of the *Final Joshua's Creek EIR/FSS* addresses SWM requirements including discussion on OPA 272 and NOCSS recommendations, updated subcatchment boundaries, pre-development flows at Dundas Street, unit target flow rates, storm drainage criteria, drainage area modifications, management of external drainage, proposed SWM pond locations and designs, major/minor system designs, drainage to/from PSWs and preliminary grading plans.

The Mattamy Phase 3 lands are located within portions of subcatchments JC9 and JC10 that drain to the main branch of Joshua's Creek (Stream Reaches JC-5, JC-4, and JC-3), and subcatchments JC17 and JC17C that drain into the western tributary of Joshua's Creek (Stream Reaches JC-6 and JC-7). The developable portions of the Mattamy Phase 3 lands lie within subcatchments JC9, JC10, JC17, and JC17C. Portions of Core 10 on the Mattamy Phase 3 lands lie within subcatchments JC17 and JC17C. Runoff from the Mattamy Phase 3 lands drains southerly towards Stream Reach JC-36 and easterly towards Stream Reach JC-2/JC-3.

The following recommendations, from the *Final Joshua's Creek EIR/FSS,* were utilized to confirm the SWM requirements for the Mattamy Phase 3 lands.

a) The *Final Joshua's Creek EIR/FSS* Sections 7.2 and 7.3 address refined subcatchment boundaries and unit target flows for SWM pond designs. That report updated all Joshua's Creek subcatchment boundaries south of Burnhamthorpe Road based upon LiDAR mapping, compared them to NOCSS drainage area boundaries and concluded that the resulting change in EIR/FSS boundaries is small and that the NOCSS target unit flow rates for Joshua's Creek subcatchments are valid for SWM pond design. This work remains valid and no changes are required to Sections 7.2 and 7.3.

b) *Final Joshua's Creek EIR/FSS* Sections 7.4 and 7.5 discuss the stormwater management plan selection process and downstream regional storm controls. This work remains valid and no changes are required to Sections 7.4 and 7.5.

c) *Final Joshua's Creek EIR/FSS* Section 7.6 discusses erosion control analyses major and minor system design. This work remains valid and no changes are required to Section 7.6.

d) *Final Joshua's Creek EIR/FSS* Section 7.7 discusses SWM Pond requirements. It identified seven SWM ponds to service development within the Joshua's Creek subcatchments south of Burnhamthorpe Road. In accordance with the *Final Joshua's Creek EIR/FSS,* surface runoff from the Mattamy Phase 3 lands will drain to Pond 52 located on the adjacent Draft Plan approved Dunoak lands, Pond 54 located on the adjacent Argo (Joshuas Creek) lands, and Pond 56 located outside of the Phase 3 Draft Plan on the Draft Plan approved Bressa lands. This work remains valid and no changes are required to Section 7.7.

e) *Final Joshua's Creek EIR/FSS* Section 7.8 discusses major and minor system design. Section 7.8 herein addresses major/minor system design on the Mattamy Phase 3 lands.

f) *Final Joshua's Creek EIR/FSS* Section 7.9 discusses drainage area modifications. Updated Section 7.8 noted above, concludes that the Mattamy Phase 3 Draft Plan of Subdivision design generally conforms to the major/minor system design presented in the *Final Joshua's Creek EIR/FSS.* Based on this conclusion, there are no substantive changes to the drainage area modifications presented in Section 7.9 of the *Final Joshua's Creek EIR/FSS*. As a result, Section 7.9 remains valid and no changes are required

g) *Final Joshua's Creek EIR/FSS* Section 7.10 addresses drainage into and out of PSWs. PSWs 29 and 31 lie within Core 10 on and adjacent to the Mattamy Phase 3 lands. Section 7.10 of the *Final Joshua's Creek EIR/FSS* identified drainage conditions into and out of these PSWs and noted specific drainage measures to accommodate flows out of these PSWs. The *Final Joshua's Creek EIR/FSS* recommendations regarding flows out of PSWs 29 and 31 remain valid. The major and minor systems on the Mattamy Phase 3 lands described in Section 7.8 herein confirm that these systems will accommodate drainage out of these wetlands consistent with *Final Joshua's Creek EIR/FSS* requirements. The development of the Mattamy Phase 3 lands does not affect any other PSWs. lll

Final Joshua's Creek EIR/FSS Section 13.2 included the requirement that a future EIR/FSS Addendum assess the PSW 45 water balance. This PSW, located along Stream Reach JC-13, lies within other lands owned by Mattamy that do not form part of the Phase 3 Draft Plan of Subdivision. Regardless, as discussed with the Town and Conservation Halton, this Mattamy Phase 3 EIR/FSS Addendum includes the PSW 45 analyses. See Section 7.10.

h) *Final Joshua's Creek EIR/FSS* Section 7.11 includes discussion and drawings presenting preliminary grading. This Addendum revises **Drawings 7A, 7B, 7D, 7E, 8A,** and **8B** presenting revised preliminary grading information for the Mattamy Phase 3 lands based on the proposed Mattamy Phase 3 Draft Plan of Subdivision.

i) *Final Joshua's Creek EIR/FSS* Section 7.12 discusses SWM Pond Operating Characteristics for seven SWM facilities, three of which will service the Mattamy Phase 3 lands (Ponds 52, 54 and 56). Information presented in support of the design of Pond 52 has been refined since the completion of the *Final Joshua's Creek Tributaries EIR/FSS* by the detailed design of Pond 52 (April 2020). No further changes to this pond design are required at the EIR/FSS stage in support of the Mattamy Phase 3 Draft Plan of Subdivision. Pond 54 design has been refined since the completion of the *Final Joshua' Creek Tributaries EIR/FSS* by Pond 54 design presented in the *Argo (Joshua's Creek) EIR/FSS (December 2019)*. Information presented in support of the design of Pond 56 has been refined since the completion of the *Final Joshua's Creek Tributaries EIR/FSS* by the detailed design of Pond 56 (April 2020). Detailed design of these SWM ponds has incorporated the major/minor system designs presented in this EIR/FSS Addendum and any refinements made at the detailed subdivision design stage.

Pond 50 is located on other lands owned by Mattamy to the north of their Phase 3 lands. As per recommendations from the *Final Joshua's Creek EIR/FSS,* the EIR/FSS design for Pond 50 has been updated to reflect the approved NHS limits adjacent to Pond 50 within Core 11 presented on **Drawing Joshua's Creek Core 11-NHS-3**. This updated design includes revised grading that is presented in updated Section 7.11 in this EIR/FSS Addendum.

For the reasons noted above, the following sections of the *Final Joshua's Creek EIR/FSS* are amended by this Addendum.

7.8 Minor and Major System Designs

The Mattamy Phase 3 lands will be serviced by a conventional storm sewer system designed in accordance with the Town's standards. Conceptual storm servicing is presented on **Figure 7.1R**. The storm sewers will be sized utilizing a 5-year return frequency and Town IDF curves. The ultimate conditions conceptual storm servicing scheme is illustrated in **Figure 7.1R**. As shown, surface runoff from these lands will drain through adjacent lands to SWM Ponds 52, 54 and 56 on the Dunoak, Argo (Joshua's Creek) and Bressa lands respectively.

All runoff from rear lots abutting the NHS will be captured in rear yard catchbasins and directed to SWM ponds. Despite the rear lot elevations frequently being lower than the centre line of the road elevations, the catchbasins are able to drain to the storm sewers within the right-of-ways.

Continuous overland flow routes are included in the grading design of the Mattamy Phase 3 lands to safely convey major system flows in excess of the minor system up to the 100-year event. The excess flows will be contained within either the right-of-way or by other lands in the Town's ownership. For all classes of roads, the product of depth of water (m) at the gutter times the velocity of flow (m/s) shall not exceed $0.65m^2/s$. Should the major system flow exceed the conveyance capacity of any given road, the storm sewer will be sized to accommodate the excess flows such that the road capacity is not exceeded.

The major and minor system designs involved coordination of grading and overland flow routes with the Dunoak lands to the immediate south of the Mattamy Phase 3 lands to direct flows to Pond 52, and to the east through the Argo (Joshua's Creek) lands to direct flows to Pond 54 and Pond 56. Overland flows from external areas to the west on the Coscorp lands are included in the major/minor system, updated from the *Final Joshua's Creek EIR/FSS* based on the latest Coscorp draft plan. This includes External Area 3 (6.2ha to Pond 56) and External Area 4 (5.3ha to Pond 54). These external areas are generally consistent with the areas presented in the *Final Joshua's Creek EIR/FSS*. Additionally, the minor system design includes storm sewer inlets to capture flows out of Core 10 from PSWs 29 and 31 as per recommendations from the *Final Joshua's Creek EIR/FSS.* **Figure 7.2R** presents updated post development drainage areas.

There are no substantive changes to drainage areas to Ponds 52, 54 and 56. As shown in **Table 7.8B,** the drainage areas to Ponds 52, 54 and 56 from the Mattamy Phase 3 lands compare well to the drainage areas presented in the *Final Joshua's Creek EIR/FSS* and/or Ponds 52 and 56 detailed design. Minor changes in drainage area result from more detailed site grading and servicing analyses completed as part of this EIR/FSS Addendum and the detailed designs of SWM Pond 52 and SWM Pond 56.

Table 7.8B: Mattamy Phase 3 Drainage Areas

Area	Drainage Area from Mattamy Phase 3 lands			
	Final Joshua's Creek EIR/FSS	**Argo (Joshuas Creek) EIR/FSS Addm**	**Detailed Design (Pond 52 and 56)**	**Mattamy Phase 3 EIR/FSS Addm**
To Pond 52	40.7	N/A	41.5	41.6
To Pond 54	54.1	54.0	N/A	54.1
To Pond 56	51.2	53.9	50.6	51.1

7.10 PSW Drainage

The *Final Joshua's Creek EIR/FSS* delineated PSW drainage areas and outlet locations on the EIR/FSS Subject Lands, and identified design requirements for drainage into and out of PSWs. This EIR/FSS Addendum confirms design requirements relating to PSWs on or immediately adjacent to the Mattamy Phase 3 lands (see Section 7.8 re: Core 10 PSWs) and includes the water balance analyses for PSW 45 below.

Water Balance to PSW 45

Final Joshua's Creek EIR/FSS Section 13.2 included the requirement that a future EIR/FSS Addendum assess the PSW 45 water balance. This PSW, located along Stream Reach JC-13, lies within other lands owned by Mattamy that do not form part of the Phase 3 Draft Plan of Subdivision. Regardless, as discussed with the Town and Conservation Halton, the Mattamy Phase 3 EIR/FSS Addendum includes the required EIR/FSS PSW 45 analyses.

During previous North Oakville EIR/FSSs, the requirement to address potential development impacts on PSWs in North Oakville was discussed with Conservation Halton. The goal, "*to maintain features and functions of the PSW (as per the PPS) in a manner that is feasible from ecological, engineering and economical perspectives*" was identified to direct analyses, servicing solutions and mitigation strategies for development located within the subcatchments of PSWs.

A detailed analysis was undertaken to simulate the existing and proposed water balance for PSW 45. Consistent with other EIR/FSS analyses, the SWMHYMO model was selected to complete the water balance analyses as this wetland is largely fed by surface water (see below). The water balance analyses included 44 years of continuous hydrologic modeling of rainfall data (from April 1st to October 31st of each year) to generate average annual and monthly runoff volumes to each PSW. See Appendix F-5 for modeling results. The model was simulated for existing and proposed interim conditions to determine differences in runoff volume to the wetlands and identify potential implications to the wetland. This section of the EIR/FSS Addendum summarizes the methodology, existing and post development drainage areas, runoff volumes, water level calculations and implications to the wetland.

Characterization of PSW 45

Development of future phases of the Mattamy lands will occur within the catchment of PSW 45. This 1.33 ha wetland is approximately 675m in length, located in the floodplain of the confined Stream Reach JC-13, running from south of Burnhamthorpe Road to roughly 150m south of the proposed Pond 48 outlet. **Figure 5.1** from the *Final Joshua's Creek EIR/FSS* (see Appendix Q) illustrates its location along Stream Reach JC-13, partially within Core 11. Its boundaries were staked/surveyed as part of the *Final Joshua's Creek EIR/FSS*.

PSW 45 is a reed canary grass mineral meadow marsh. Typically, as here, reed canary grass forms a single-species stand, excluding most other vegetation species. This habitat is robust and tolerates fluctuations in water level and flow conditions.

Stream Reach JC-13 flows through PSW 45. The watercourse is a low-gradient and slightly meandering channel that sits within a wide and densely vegetated floodplain. Riparian vegetation beyond the limit of PSW45 consists primarily of various grasses, shrubs, and tree species. In the summer months, there is extensive encroachment of riparian wetland vegetation (graminoids) within the channel; vegetation also becomes well established on mid-channel deposits. Channel substrate ranges from fine sand to small gravels. Morphological variability is poor with limited riffle or pool development along the reach. Given the local vegetation control, the channel is characteristic of a low-energy and depositional environment.

A representative ground photo of PSW 45 is shown in **Figure 7.8**.

Figure 7.8 – Representative Photo of PSW45 and Stream Reach JC-13

The following excerpt from the *Final Joshua's Creek EIR/FSS* summarizes information on drainage into and out of PSW 45. More detailed drainage patterns review was completed as part of this EIR/FSS Addendum. It is provided in the following sections that refine/augment the information from the *Final Joshua's Creek EIR/FSS*.

Table 7-10: Conveyance of Minor System Flows in Vicinity of Wetlands*
(Source: Excerpt from *Final Joshua's Creek EIR/FSS*, January 2020)

PSW #	Wetland Area (ha)	Description of Wetland Drainage Patterns
45	1.33	• Existing contributing drainage area to PSW = 210.37ha • Drainage area to the PSW originates largely from subcatchments JC 1041, JC 1042, JC 1043, JC 1044, JC 1045, and JC 1-5 which are north of Burnhamthorpe Road, with the rest coming from the lands within subcatchment JC6 adjacent to stream reach JC-13; • Flows from this PSW drain south-east along reach JC-13, and towards the confluence of the main branch and west branch of Joshua's Creek

Existing Contributing Drainage Area

The *Final Joshua's Creek EIR/FSS* delineated PSW drainage areas and outlet locations on the EIR/FSS Subject Lands, including PSW 45. As part of this EIR/FSS Addendum, further review and assessment relating to drainage areas and flows into / out of PSW 45 were completed.

Figures 7.9 and **7.10** illustrates the existing catchment area to PSW 45. Due to the length of the wetland, existing drainage areas were assessed at its upstream and downstream ends. **Table 7.10A** summarizes existing drainage areas to PSW 45. Conditions of note include:

- The large majority of the surface drainage into PSW 45 comes from lands north of Burnhamthorpe Road. At the upstream end of PSW 45, 97% of surface drainage contributions come from lands north Burnhamthorpe Road. At the downstream end of PSW 45, 85% of surface drainage contributions come from lands north Burnhamthorpe Road;

- Drainage from the north half of Burnhamthorpe Road is included in catchment JC1-5 (upstream of Burnhamthorpe Road), while drainage from the south half of Burnhamthorpe Road is included in catchment JC6 (downstream of Burnhamthorpe Road);

- Subcatchment JC6 (located downstream of Burnhamthorpe Road) to the downstream end of PSW 45 is 30.5ha or 15% of the PSW 45 drainage area. At the upstream end of the wetland, the subcatchment JC6 area contribution to the wetland is only 2%;

- Within the 30.5ha downstream of Burnhamthorpe Road, 8.9ha are located in the NHS. Therefore, surface water contributions from developing areas south of Burnhamthorpe Road come from 21.6ha of tableland. The developing areas equate to 2% and 11% of the drainage area to PSW 45 at its upstream and downstream ends respectively; and,

- Within developing lands south of Burnhamthorpe Road, surface flows enter PSW 45 from distributed overland flows and at some more concentrated locations. **Figure 7.10** illustrates surface drainage patterns to this wetland. As shown:

- Surface flows from 6.7ha of contributing tablelands west of the wetland or 3% of the contributing drainage area to the wetland. They enter the wetland from either undefined overland flow routes or at more concentrated locations along its length;

- Surface flows from 14.9ha or 7% of contributing tablelands east of the wetland. Under existing conditions, the large majority of tableland flows enter the wetland via two concentrated locations at/near its downstream end;

- Of the 14.9ha of contributing tablelands to the east, approximately 9.3ha is from the Mattamy Lands while 5.0ha is from lands to the east, not owned by Mattamy. Of the 9.3ha from the Mattamy lands, 1.2ha will be occupied by Pond 48. Note that for the purposes of this hydraulic analysis, the tablelands to the east noted above, not owned by Mattamy, have been modeled as pre-development under the interim post-development condition. This is because the ultimate SWM strategy for these lands is unknown at this time. This area is shown as cemetery area in the NOESP and depending upon cemetery development, it is possible that these lands could be directed to SWM Pond 48 and therefore PSW 45, or directed away from PSW 45 in the future. If this area was sent to PSW 45 in the future, then peak flows would be controlled to NOCSS release rates and the hydraulic modeling would remain no changes in peak flows would result; and,

- Surface flows from 0.8ha or 0.4% within Core 11 (the location of future Pond 50) of the contributing drainage area west of the wetland.

Table 7.10A: PSW 45 Existing Drainage Areas

Existing Drainage Areas (ha)				
Location	Upstream of Burnhamthorpe Road	Downstream of Burhamthorpe Road		Total
Wetland Upstream Node (Node U)	179.8	NHS	1.4	184.3
		Tableland	3.1	
		Total	4.5	
Wetland Downstream Node (Node D)[1]	179.8	NHS	8.9	210.3
		Tableland	21.6	
		Total	30.5	

[1]Cumulative area to this node.

Surface Water Versus Groundwater Inputs

Surface drainage and groundwater conditions along Stream Reach JC-13 were assessed as part of the *Final Joshua's Creek EIR/FSS*. It noted that when surface water flow is present, the tributary loses flow through the feature, suggesting a recharge function. Based on the interpreted groundwater flow conditions presented on Figure 4.11 of the *Final Joshua's Creek EIR/FSS*, the interpreted groundwater elevation is below ground along the PSW and varies from about 173 masl at the west end of the feature to 167 masl at the east end of the feature. The area is interpreted to be underlain by low hydraulic conductivity silty clay till soils that do not transmit groundwater readily, and groundwater discharge to the feature has not been observed.

As part of this EIR/FSS Addendum, piezometer nest PZ5s/d-BS was installed in the central area of PSW 45 in June 2019 to further investigate the potential groundwater/surface water interactions (location

shown on **Figure 4.1R**). The hydrograph for this location is provided on Figure C-4-30 in Appendix C-4 and shows declining water levels over the summer months. The water levels in the initial spring readings showed the groundwater is very close to surface, but as the datalogger information for the deeper piezometer shows, the groundwater levels steadily declined over the summer months. By the fall 2019, the shallow piezometer was dry and only a few centimetres of water remained in the deep piezometer showing the water table is more than 1.2m below grade. These data support the *Final Joshua's Creek EIR/FSS* interpretation that the high water table will help to support the PSW 45 vegetation, particularly in the spring, however, the feature is primarily reliant on surface water inputs.

Interim Post Development Drainage Areas

The *Final Joshua's Creek EIR/FSS* presents the SWM Plan for all developing areas south of Burnhamthorpe Road. SWM Ponds 48 and 50 are proposed to provide the necessary quality and quantity controls. Major and minor system designs for contributing areas to these ponds were included in the *Final Joshua's Creek EIR/FSS*. As previously noted, the Mattamy lands draining to PSW 45 do not form part of the Phase 3 Draft Plan of Subdivision therefore the major and minor system designs from the *Final Joshua's Creek EIR/FSS* remain current. **Figure 7.1** from the *Final Joshua's Creek EIR/FSS* (Appendix Q) illustrates the future drainage areas to these ponds and their general outfall locations. As shown, the Mattamy lands west of PSW 45 will drain to SWM Pond 50 and outlet to Stream Reach JC-5/6; Mattamy lands east of PSW 45 will drain to Pond 48 and outlet to Stream Reach JC-13 near the downstream end of PSW 45. Note that under the post development conditions described above, drainage from Burnhamthorpe Road (both north half and south half) will be directed to SWM Ponds 48 and 50. Therefore a 1.1ha area of Burnhamthorpe Road is not included in catchment JC1-5 under the interim post-development condition. These changes in surface drainage will alter the drainage areas to PSW 45 as noted in **Table 7.10B** and as illustrated on **Figure 7.11**.

Table 7.10B: Drainage Area Changes to PSW 45

Location	Drainage Areas to PSW 45 (ha)		
	Existing	Post Development	Change (ha and %)
Burnhamthorpe Road	179.8	178.7*	-1.1 (0.6%)
PSW Upstream Node U	184.3	179.9	-4.4 (-2.4%)
PSW Downstream Node D	210.3	203.0	-7.3 (-3.5%)

*****Drainage area is less than existing since a portion of Burnhamthorpe Road will drain to Pond 48 and to PSW 45 under proposed conditions

Wetland Water Balance Results

Runoff Volumes

As previously noted, PSW 45 is a reed canary grass riparian wetland; Stream Reach JC-13 flows through it providing surface flows to adjacent overbank areas during certain storm events. Development of lands north of Burnhamthorpe Road will control flows to existing peak flow levels, and there will be increased volumes flowing through the wetland as Stream Reach JC-13 is the only surface water outlet for catchments north of Burnhamthorpe Road. In such situations, it is understood that flow volumes will increase when development occurs. During the interim period when lands south of Burnhamthorpe Road are developed before the lands upstream of Burnhamthorpe Road, there is a small reduction in drainage area in PSW 45 as described above.

Potential issues associated with increases in runoff volume are effects to geomorphology water level changes in the wetland. Concerns for this specific type of wetland can be the potential loss of flows or substantial increases in flows; concerns are not increased flow volumes that will largely flow through the wetland. To confirm runoff volume changes during the interim period, J. F. Sabourin Associates (JFSA) completed PSW water balance analyses for both pre-development and interim post development conditions using the SWMHYMO model. Their memorandum dated April 30 2020, provided in Appendix F-5, outlines the methodology and results.

The natural variability of runoff volumes and average annual and seasonal runoff volumes changes to PSW 45 from the JFSA assessment are summarized in **Tables 7.10C** and **7.10D** respectively.

Table 7.10C: Natural Variability in Average Annual Runoff Volumes to PSW 45

Location	Annual Runoff Volumes to PSW 45 (m^3)		
	Minimum	Average	Maximum
Upstream Node	77,911	195,346	458,153
Downstream Node	87,607	219,938	517,011

Table 7.10D: Runoff Volumes to PSW 45

Time Period	Upstream Node			Downstream Node		
	Average Volume (m^3)		Difference from Existing (%)	Average Volume (m^3)		Difference from Existing (%)
	Pre-Development	Post-Development		Pre-Development	Post-Development	
Annual	195,436	190,983	-2.2	219,938	229,296	4.3
Spring	43,757	42,785	-2.2	49,197	52,321	6.3
Summer	100,523	98,274	-2.2	113,272	117,077	3.4
Fall	51,067	49,924	-2.2	57,469	59,898	4.2

The runoff volumes changes were reviewed from ecological and fluvial geomorphological perspectives. A summary of runoff volume changes and implications to PSW 45 includes:

- Variability of existing runoff volumes – The existing conditions modeling results show significant variability in the historical average annual volumetric contributions to this wetland; see **Table 7.10C.** Existing seasonal variations are noted in the JFSA memo.

- Upstream End of PSW 45 - The small decrease in drainage area to the upstream end of PSW 45 results in a small decrease in average annual and seasonal flow volumes up to 2% at the upstream end of the PSW. This decrease in runoff volume is minor, well within natural variability,

and will be tolerated by the habitat conditions within the floodplain. The minor reduction is also unlikely to result in measurable geomorphic change along stream Reach JC-13.

- Downstream End of PSW 45 - The decrease in direct drainage area to the wetland, combined with the development of a portion of Subcatchment JC6 (i.e., lands draining to Pond 48), result in an increase in flow volume of roughly 4% annually and 6% seasonally to the downstream end of the PSW. Given that Reach JC-13 is a low-energy feature and depositional in nature, and the increases in flow volume are well within the natural variability of the system, there are no anticipated impacts from a geomorphological perspective with regards to channel form and function.

Wetland Water Levels

Reed canary grass wetlands are relatively insensitive water level changes. To confirm water level changes associated with the proposed SWM Plan, the existing approved HECRAS model from the *Final Joshua's Creek EIR/FSS* was run for the 25mm, 2 year and 5 year storm events. The HECRAS model runs are provided in Appendix F-6. **Drawing 12** illustrates the 2 year floodlines; cross sections on this drawing show 2 year and 5 year water levels relative to the surveyed limits of the wetland.

The resulting 25mm event, 2 year and 5 year water levels are summarized in **Table 7.10E** at select typical cross sections through PSW 45. Both the pre-development and post-development 2 year water levels extend beyond the staked limits of the wetland. As shown, the 25mm, 2 year and 5 year future interim conditions water levels are essentially the same as existing conditions; they are less than existing condition water levels by 1 or 2cm. These minor decreases in water levels under interim conditions will not result in a negative impact on the form or function of the wetland, given that the habitat is dominated by reed canary grass.

Based on the proposed SWM Plan, runoff volume and water levels calculations and the review of potential ecological and fluvial geomorphological implications, the features and functions of PSW 45 are expected to be maintained during the interim development scenario.

With full development in the PSW 45 catchment, runoff volumes will increase from those calculated as part of this assessment. However, peak flows north of Burnhamthorpe Road will be controlled to existing levels for a range of storm events, therefore, water levels through PSW 45 should not be affected.

Table 7.10E: 2 year and 5 year Water Levels within PSW 45, Interim Development Conditions

Cross Section*	25mm Event Water Levels (m)			2-year Water Levels (m)			5-Year Water Levels (m)		
	Pre-Development	Post-Development	Difference	Pre-Development	Post-Development	Difference	Pre-Development	Post-Development	Difference
11.670	172.29	172.28	-0.01	172.48	172.47	-0.01	172.61	172.59	-0.02
11.572	171.54	171.54	0	171.68	171.67	-0.01	171.77	171.76	-0.01
11.380	169.98	169.97	-0.01	170.10	170.09	-0.01	170.17	170.16	-0.01
11.172	167.82	167.82	0	167.96	167.95	-0.01	168.05	168.04	-0.01

*Select typical cross sections through PSW 45. Results at all cross sections through PSW 45 are listed in Appendix F-5.

7.11 Preliminary Grading Plans

The *Final Joshua's Creek EIR/FSS* includes preliminary grading plans for the FSS Study Area based on the engineering constraints such as NHS limits, SWM pond location and outlet elevations, and proposed road patterns. **Drawings 7A**, **7B**, **7D** and **7E** have been updated to reflect grading review/revisions within the Mattamy Phase 3 Draft Plan since the *Final Joshua's Creek EIR/FSS* submission, and to address comments from the Town and CH regarding grading in the NHS as per *Final Joshua's Creek EIR/FSS* recommendations. **Drawings 8A** and **8B** include revised cross sections (13-17, 22, and 30) associated with grading along the NHS boundary on the Mattamy Phase 3 lands. As per the *Final Joshua's Creek EIR/FSS, g*rading details are consistent with the Town's standards and compatible with the NOCSS recommendations for grading adjacent to the NHS. In this regard, where it is not possible to match existing grades at the NHS buffer, the grading difference is shared between the development and the NHS buffer in accordance with NOCSS.

Grading within the NHS on the Mattamy Phase 3 lands is associated with the trail system and/or road crossing of Stream Reach JC-6. For a detailed explanation of the trail grading, refer to Section 6.3. The trail grading respects NOCSS grading direction within the NHS; grading is permitted within the outer 9m of the 10m buffer to a woodland dripline and grading is permitted within the outer 20m of the 30m buffer to PSWs, with vertical differences shared between private property and NHS.

Grading into the NHS is required to accommodate the road crossing of Stream Reach JC-6 as illustrated on **Drawing 7B**. The NOCSS allows for grading in the NHS associated with road crossings, which is reflected on the preliminary grading plans within this report. Due to the vertical difference (approximately 6.0m) between the road grades and channel valley corridor at the Stream Reach JC-6 crossing, currently retaining walls are proposed on the east and west side of the road through the NHS. A combination of retaining walls and 3:1 transition sloping has been proposed running parallel to the road to reduce the areas of disturbance required for the road crossing. Refer to Section 10 for further discussion on the NHS road crossing grading design.

As noted in the *Final Joshua's Creek EIR/FSS,* minor filling of localized gullies is required within the regulated area in some locations where existing gullies enter valleys. These areas were viewed in the field with CH staff and discussed with CH and the Town staff at various meetings. Through these discussions, it was agreed that filling could occur in these areas; grading would commence within the valley, such that the re-created top of slope would be consistent across the feature, in line with the top of bank staking. Where this is done, no alterations would be required to the approved NHS limits in these locations. The *Final Joshua's Creek EIR/FSS* noted that where these areas lie outside of the current draft plan applications, "…*requirements to address grading of gullies, vegetation impacts and implications to the NHS limits will be addressed in the EIR/FSS Addenda for affected areas*." While only three locations lie within the Mattamy Phase 3 lands, grading implications in all five of these areas have been addressed herein, including field assessment. Gully-specific vegetation inventories were conducted within the disturbance limits required for grading of three gullies on the Mattamy Phase 3 lands on March 13, 2020 to screen for SAR and for locally rare or uncommon species, based on the Halton Natural Areas Inventory 2006 listings. The two gullies located to the north of the Phase 3 lands were reviewed in the field on April 23, 2020. The locations and descriptions of each of these areas are noted in **Table 7.11A**; revised grading is shown on **Drawings 7A, 7B** and **7D**. The locations of cross sections in the vicinity of the gullies are shown on **Drawings 8A** and **8B**. A gully species list is provided in Appendix U-2. The grading plan has been developed to ensure that the limit of grading does not affect the NHS limit in any of the five locations, and thus the limit of the regulated areas would not be altered by the proposed grading. All

areas of grading will require naturalization based on existing cover type to the satisfaction of CH. At detailed design, permits from CH will be required for approval of grading in these areas.

The *Final Joshua's Creek EIR/FSS* Section 13.1.2 j) noted the requirement to review grading on the north side of Stream Reach JC-6 between Cross Section 19-19 and the future road crossing. This location is approximately 85 upstream of the road crossing where there is a small low area on the north side of JC-6. This area is proposed to be filled in as part of the development to the north. Grading will be contained outside the NHS, within the development limit, and will match existing grade at the NHS limit. Please refer to Cross Section 34 on **Drawing 8B** for the proposed grading. The grading limits in this location should be confirmed in a future EIR/FSS Addendum for these lands.

Table 7.11A: Location and Description of Small Gullies

Location	Drawing/Cross Section	Description of Area
Mattamy Phase 3 Lands		
Gully A South side of NHS, Stream Reach JC-6	Drawings 7B and 8A, X-Section 16	• Approximately 5.5m of 10:1 sloping between the edge of trail and the top of bank limit • A maximum of approximately 3m of 3:1 sloping within the top of bank to fill in the existing gully while maintaining the continuous staked top of bank limit; no change to NHS or regulation limits • Under future conditions, no surface drainage will be directed to this gully • Located within ecosite CUW1b – Mineral Cultural Woodland. • The gully is itself is largely herbaceous in character with a representation of red-panicled dogwood and common buckthorn as a shrub component. • Areas adjacent to the gully are heavily represented by pear, common buckthorn, and hawthorn • Eleven plants were identified to species and 1 was identified to genus only (*Crataegus* sp.). Six of the 11 species, or 54%, are considered non-native. • There were no species considered locally rare or uncommon. • There were no species regulated by the Endangered Species Act, 2007.
Gully B South side of NHS, Stream Reach JC-6	Drawing 7A, West of X- Section 16*	• Approximately 2.5m of 10:1 sloping between the edge of trail and the top of bank limit • A maximum of approximately 2.5m of 3:1 sloping within the top of bank to fill in the existing gully while maintaining the continuous staked top of bank limit; no change to NHS or regulation limits • Under future conditions, no surface drainage will be directed to this gully • Located within ecosite CUW1b – Mineral Cultural Woodland. • Hawthorn, common buckthorn and pear are abundant in this area. • Thirteen plants were identified to species and 2 were identified to genus only (*Amelanchier* and *Crataegus* sp.). Six of the 13 species, or 43%, are considered non-native. • There were no species considered locally rare or uncommon. • There were no species regulated by the Endangered Species Act, 2007.
Gully C South side of NHS, Stream Reach JC-6	Drawings 7A and 8A, X-Section 17	• Approximately 3.5m of 10:1 sloping between the edge of trail and the top of bank limit • A maximum of approximately 5m of 3:1 sloping within the top of bank to fill in the existing gully while maintaining the continuous staked top of bank limit; no change to NHS or regulation limits • Under future conditions, no surface drainage will be directed to this gully • The gully occurs partially in a farm lane and exhibits more openness in comparison to the other gullies

Location	Drawing/Cross Section	Description of Area
		• Located within ecosite CUW1b – Mineral Cultural Woodland and bisected by existing farm access. • Vegetative cover is provided largely by hawthorn • Sixteen plants were identified to species and 3 were identified to genus only (*Aster, Crataegus, Setaria* sp.). Seven of the 16 species, or 44%, are considered non-native. • There were no species considered locally rare or uncommon. • There were no species regulated by the Endangered Species Act, 2007.
Mattamy, Future Draft Plan Lands		
Gully D West side of NHS, Stream Reach JC-13	Drawings 7B and 8B, X-Section 20	• Approximately 12m of 10:1 sloping between the edge of trail and the top of bank limit • A maximum of approximately 3.5m of 3:1 sloping within the top of bank to fill in the existing gully while maintaining the continuous staked top of bank limit; no change to NHS or regulation limits • Under future conditions, no surface drainage will be directed to this gully • Located within a soy cropped agricultural field. • Six plants were identified to species, all of which are introduced and non- native to Ontario. • There were no species considered locally rare or uncommon. • There were no species regulated by the Endangered Species Act, 2007.
Gully E West side of NHS, Stream Reach JC-13	Drawings 7B and 8B, X-Section 30	• Approximately 3.5m of 10:1 sloping between the edge of trail and the top of bank limit • A maximum of approximately 4m of 3:1 sloping within the top of bank to fill in the existing gully while maintaining the continuous staked top of bank limit; no change to NHS or regulation limits • Under future conditions, no surface drainage will be directed to this gully • Located within ecosite CUW1 – Mineral Cultural Woodland that occurs on the tablelands and slope. • Sixteen plants were identified to species and 1 was identified only to genus (*Crataegus* sp.). Nine of the 17 (includes id to genus only) species, or 53%, are considered non-native. • There were no species considered locally rare or uncommon. • There were no species regulated by the Endangered Species Act, 2007.

*No cross section is shown in this location since it is adjacent to X-Section 16 with less sloping required than at X-Section 16

Pond 50

As per the *Final Joshua's Creek EIR/FSS* recommendations, the EIR/FSS design of Pond 50, located outside of the Mattamy Phase 3 lands, was updated address agency comments on the *Final Joshua's Creek EIR/FSS* in the following areas:

- Adjacent to the northwest corner of Pond 50 (P50) on Drawing 7B)
- Additional grading detail around P50 (western edge and south eastern corner near the outfall) is required to confirm that the proposed pond grades can be achieved without adjustment to the regulation limit (Drawing 7B)

All other discussion in the *Final Joshua's Creek EIR/FSS* relating to Pond 50 target release rates, design elements, groundwater levels, pond operating characteristics, etc., remain valid.

To address the outstanding grading comments, **Figure 7.3B** from the *Final Joshua's Creek EIR/FSS* has been revised*;* see **Figure 7.3BR.** As discussed in Section 7.7 of *Final Joshua's Creek EIR/FSS*, SWM Pond 50 is located within Core 11. With few exceptions, grading associated with SWM Pond 50 terminates outside the buffers to regulated hazards. More specifically,

- **Grading along the south limit of the pond** will match existing ground 7.5m from the staked top of bank

- **Grading along the west limit of the pond** will generally match existing ground 7.5m from the staked top of bank. The only exception is at the northwest corner of the pond block where the pond access road connects to the trail within the NHS. The trail within the NHS, on the north side of JC-6, generally matches existing grades. The pond, however, is cut into existing grade and the pond access road is therefore up to 2m lower than the adjacent trail. To provide a connection to the access road, the trail must slope down at a maximum 5% towards the access road, which results in 3:1 sloping down from the top of bank to the trail/ access road connection. This is similar to the grading of SWM Pond 55, within the draft plan approved Bressa lands, where the pond berm was below the top of bank limit and some 3:1 transition sloping was used to transition back up to the top of bank. The grading and match existing limits have been shown on **Drawing 7B** and **Figure 7.3BR**. Alternatively, the trail could connect back into the sidewalk on the adjacent road instead of providing a connection to the pond access road. This would allow the trail to be higher and eliminate the need for transition sloping down from the top of bank to the trail.

- **Along the southeast corner of the pond**, the limit of grading will match existing 10m from the dripline.

- **Along the east side of the pond block**, the pond is located outside the 30m setback to PSW, with the exception of the trail and a portion of the pond access road. Similar to the northwest corner of the pond, the adjacent trail within the NHS is proposed to tie into the pond access road. The trail directly to the north is located within the 30m wetland buffer. Thus, the pond access road ties into the trail within the 30m wetland buffer. The grading associated with this trail and access road connection matches existing grade 11m into the wetland buffer, well removed from the 10m no-touch portion of the wetland buffer.

The location for the outlet for Pond 50 shown on **Figure 7.3BR** was reviewed in the field with CH staff on several occasions throughout the *Final Joshua's Creek EIR/FSS* process. It was agreed that any location along the pond block boundary with the NHS along Stream Reach JC-5 would be appropriate for the Pond 50 outfall. Its exact location will be determined at detailed design.

7.12 SWM Pond Operating Characteristics

As noted in Section 7.0, SWM Ponds 52, 54 and 56 will provide the required water quality and quantity controls for the Mattamy Phase 3 lands. The review of servicing requirements completed as part of this EIR/FSS Addendum does not warrant any changes to the design of Pond 52 or 56 as currently presented through detailed design or to the design of Pond 54 as presented in the *Argo (Joshua's Creek) EIR/FSS Addendum.*

The future Neighbourhood Park located near the top end of Stream Reach JC-31 is required to control post-development flows to pre-development levels to maintain approved NOCSS flows at Dundas Street. A portion of this park is located on the Mattamy Phase 3 lands. Flows from the park are to be directed to the upper end of JC-31. Park design is not currently available and therefore the need for onsite post- to pre-development controls cannot be confirmed at this time. The *Final Joshua's Creek EIR/FSS* notes that the use of on-site controls may be required or, it may be feasible to direct some flows to Pond 54. Through detailed design and future discussions with the Town, the proposed park storage needs will be addressed.

7.12.1 Pond Design Elements

The *Final Joshua's Creek EIR/FSS* included discussion of various pond design elements including design recommendations for sediment forebays, permanent pools, storage, pond outlets, thermal mitigation, pond liners, access roads emergency overflows, etc. Those recommendations remain valid.

There are no stormwater management facility outfalls proposed in association with the Phase 3 lands. However, SWM outfalls will be required north of the Phase 3 lands for future storm drainage discharges from Ponds 48 and 50 to Reaches JC -13 and JC-5 or JC-6 respectively. At the March 2019 NOARM, general guidelines for locating pond outfalls were discussed. The following suggested guidelines should be considered when locating pond outfalls in the NHS at detailed design.

Stormwater management pond outfalls should be appropriately sited to limit impacts to the NHS. . Specifically, outfall siting should consider the following:

- Avoid/minimize disturbance to forested valley slopes and adjacent wooded or wetland habitats;
- Place infrastructure outside of channel meander belt width where possible;
- Avoid erosion prone areas;
- Avoid/minimize disturbance to low-flow channel;
- Include flow dissipation features (e.g., plunge pools, outfall swales, flow spreaders, pocket wetlands) to reduce erosive velocities and encourage infiltration and evaporation; and,
- Orient outfall appropriately to minimize impact to receiving watercourse and minimize risk of channel bank scour (i.e., at an oblique angle to the channel).

8.0 GROUNDWATER ASSESSMENT

In order to assess potential development impacts on the groundwater conditions in the Joshua's Creek Subwatersheds, detailed pre and post-development water balance calculations were provided for each EIR Subcatchment Area in Appendix C-7 of the *Final Joshua's Creek EIR/FSS.* The groundwater balance components, approach and methodology for the calculations were discussed in Section 8 of the *Final Joshua's Creek EIR/FSS.* These analyses included all lands in subcatchments JC9A, JC12West and JC17 including the Mattamy Phase 3 lands. Pre-development groundwater recharge volumes (based on existing land use conditions) and the potential post development groundwater recharge volumes were calculated based on the Composite Land Use Plan. Section 8.8 of the *Joshua's Creek Tributaries EIR/FSS* outlined the water balance mitigation measures to be incorporated into the development design to minimize development impacts and changes to the pre-development water balance and to control runoff.

The proposed Mattamy Phase 3 Draft Plan of Subdivision has modified the development concept from that shown in the *Final Joshua's Creek EIR/FSS*. While substantive changes have not been made, refinements to lotting, road patterns and some land uses have been made based on further planning study and coordination with adjacent lands. The overall imperviousness of the proposed Mattamy Phase 3 Draft Plan of Subdivision has not changed from the 55% imperviousness calculated in the *Final Joshua's Creek EIR/FSS*. As a result, there will not be changes to the *Final Joshua's Creek EIR/FSS* water balance calculations. Recommended water balance mitigation measures (LID measures) set out in the *Final Joshua's Creek EIR*/FSS remain current. Section 7.4 and **Figure 7.6R** of this EIR/FSS Addendum present the locations and types of LID measures included in the Phase 3 storm drainage plan, consistent with *Final Joshua's Creek EIR/FSS* recommendations.

9.0 WATER AND WASTEWATER SERVICING

The *Joshua's Creek Tributaries EIR/FSS* addresses wastewater and water servicing requirements in the FSS Study Area. From a wastewater perspective, it identified wastewater design criteria, external wastewater requirements, existing infrastructure and future servicing requirements. Water supply design criteria, pressure zone boundaries, external water requirements and existing/proposed water infrastructure are also addressed. The proposed water and wastewater servicing strategies, outlined in the *Final Joshua's Creek EIR/FSS,* were prepared in accordance with the strategies put forth in the ASP and comments received from the Region on the proposed water and wastewater servicing in North Oakville.

Wastewater and water servicing requirements for the Mattamy Phase 3 lands are generally consistent with the overall servicing requirements presented in the *Final Joshua's Creek EIR/FSS*. Infrastructure to service the Mattamy Phase 3 lands includes:

- Wastewater – As shown on **Figure 9.2R**, the Mattamy Phase 3 lands will be serviced by the existing sanitary pump station on the north side of Dundas Street via the proposed collector road / trunk sewer on the draft approved Bressa lands. The pump station discharges to the existing 675mm diameter wastewater main located on the north side of Dundas Street at Prince Michael Drive via a twin 400mm forcemain. In accordance with the Master Plan, this existing 675mm diameter trunk is proposed to function as the outlet for the majority of the lands located within the FSS Study Limits. Design sheets and tributary area plans are included in Appendix I. They have been updated to reflect the land uses and drainage areas on the Mattamy Phase 3 lands.

- Water – As shown on **Figure 9.4R**, the Mattamy Phase 3 lands will be serviced by a network of new local watermains designed in accordance with the Region's design criteria and MECP's guidelines. Two separate watermain feeds will service the subdivision, the 400mm watermain extending from the adjacent Argo (Joshuas Creek) lands and a watermain service from the adjacent Dunoak Developments.

These servicing solutions rely on connections and servicing through the adjacent Argo (Joshuas Creek) or Dunoak lands. The development of the Dunoak and Argo (Joshuas Creek) lands will proceed prior to or concurrent with the Mattamy Phase 3 lands, hence external services for these lands are expected to be available at the time Mattamy proceeds with construction.

10.0 ROADS

10.1 Background

The *Final Joshua's Creek EIR/FSS* discusses policy direction, road creek crossing requirements, and the preliminary analyses of the location and design of the future creek crossings of Stream Reaches JC-6 and JC-27A located on the Mattamy and Argo lands, respectively. OPA 272 and the Town's Master Plan includes a road, referred to as an Avenue/Transit Corridor, through the Mattamy Phase 3 lands that extends outside of the Phase 3 lands to Burnhamthorpe Road, crossing Stream Reach JC-6. The *Final Joshua's Creek EIR/FSS* included a recommended location to cross this stream with a 9.6m wide by 1.2m high concrete open bottom culvert. Through agency review of the *Final Joshua's Creek EIR/FSS*, additional information was requested to finalize a road crossing location and design. As required by the *Final Joshua's Creek EIR/FSS*, this EIR/FSS Addendum refines and / or confirms those findings associated with the Stream Reach JC-6 stream crossing, and addresses NOCSS management strategy and recommendations relating to crossing locations and engineering designs from the following sections of NOCSS:

- Appendix GG - Management Approach and Criteria for Stream Systems - High Constraint Stream (Riparian) Corridors (Red hatch);
- Figure 6.3.12 Core Area 11;
- Section 6.3.3.5, Preferred Management Approach to Terrestrial Features;
- Section 6.3.4.2, Environmental/Fisheries;
- Section 6.3.4.2, Environmental/Fisheries -Table 6.3.4: Aquatic and Riparian Habitat Management by Reach;
- Section 6.3.4.2, Environmental/ Fisheries - Reach Specific Management Recommendations;
- Section 6.3.4.5, Riparian Corridor Management; and
- Core 11, Appendix X – Physical Stream Characteristics.

10.2 Road Crossing Design, Stream Reach JC-6

10.2.1 Road Crossing Location

As noted in the *Final Joshua's Creek Tributaries EIR/FSS,* the proposed Stream Reach JC-6 crossing location was reviewed in the field with CH on October 24, 2012 and deemed an acceptable location. This location was also viewed in the field with Town and CH staff on May 19, 2017 and again confirmed to be an acceptable location. The alignment and design were also discussed with the Town and CH at NOARM meetings on April 5, 2018 and March 18, 2019, where it was agreed that they would be reviewed through the EIR/FSS Addendum required for these lands to confirm this road crossing location and design. The following examination of the crossing location was completed to satisfy this EIR/FSS Addendum requirement.

Characterization of Existing Conditions in Vicinity of the Road Crossing

The assessment of the proposed road alignment completed as part of this EIR/FSS Addendum included the review of findings from the *Final Joshua's Creek EIR/FSS,* NOCSS management recommendations, existing topography, vegetation, aquatic and terrestrial habitats, SAR, surface water and groundwater conditions. This included completion of 2019 aquatic and terrestrial inventories and further geotechnical investigations in the vicinity of the proposed road crossing to augment data available in the *Final Joshua's Creek Tributaries EIR/FSS*. The following discussions summarize the form and function of the NHS in the vicinity of the proposed road crossing to assist in determining crossing impacts and design, and finalization of a crossing alignment. **Figure 10.0** presents the existing conditions in the general location of the road crossing including the following:

- **Stream Reach JC-6 is a red-hatch or high constraint stream with rehabilitation opportunities**, as indicated in Section 2.1 of the *Final Joshua's Creek EIR/FSS*. Due to past agricultural practices, the cover type, species and plan form are reflective of disturbed conditions, and there are opportunities for rehabilitation to protect and improve portions of this Stream Reach. As such, this reach does not meet the standard of a no-touch stream; rather NOCSS recommends stream and valley habitat conditions rehabilitation to improve the function of the stream and corridor.

- A **channel centerline and planform survey** were completed on July 15, 2019 in the immediate vicinity of the crossing to confirm existing bankfull dimensions of the channel documented in the *Final Joshua's Creek EIR/FSS*. As noted in Section 5.4, an average bankfull channel width of 1.33m was documented for the entire reach. Although, in the immediate vicinity of the crossing, the detailed channel survey resulted in an average bankfull channel width of 1.9m. The existing reach in this location is a small watercourse with low to moderate stream energy that displays evidence of planimetric form adjustment in the form of multiple flow paths and poor instream morphology variability. The condition of the stream in the vicinity of the proposed crossing exhibits substantial disturbance due to agricultural practices and, as per NOCSS direction, rehabilitation would improve existing channel form and function. Improvements to channel morphology will also provide additional benefits to sediment balance, and instream aquatic habitat and fish passage. A restoration approach for the existing channel affected for the proposed crossing of Stream Reach JC-6 is recommended based on natural channel design principles.

- **Fish sampling** occurred by capturing continuous underwater camera footage (June 12 and 17, 2019) and by electrofishing (July 12, 2019). The sampling was completed at stagnant pools because of dry channel conditions between these features. These pools are likely to be the only refuge habitat provided during periods of low flow and are therefore the best locations to confirm fish community assemblage. The dry conditions confirm the intermittent conditions of the stream consistent with the conditions found during NOCSS work. Species found comprise creek chub, blacknose dace, and brook stickleback. The aquatic/geomorphological assessment determined that the riparian vegetation consisted primarily of graminoids and herbaceous vegetation encroaching within the channel, with woody coverage on the southern bank. There is evidence of woody debris within the channel, along with active bank erosion (undercutting) and a riffle/pool morphology. Under the NOCSS investigations, the reach was classified as important fish habitat, however the lack of well-developed pool features reduces fish refugia during low flow conditions.

- **Core 11** is located to the east of the proposed road crossing location. The west end of the Core boundary is located in the vicinity of the proposed road crossing location. In this location, the Core boundary was established by NOCSS to encompass the forested steep slopes along the south side of Reach JC-6. As illustrated on NOCSS Figure 6.3.12, the Core boundary is shown as located 10m beyond the dripline of the forested habitat unit that occurs on steeply sloped areas.

- The **valley is confined** at the general location of the proposed road crossing, approximately 125m wide and a maximum of 6m deep at the creek. On the north side, the valley side slopes slope at 5H:1V while on the south side, which is steeper, the side slopes slope at 3H:1V. The valley is generally uniform along this reach.

- A **geotechnical investigation** was completed by Shad & Associates Inc. for the proposed road crossing in October, 2019. A copy of the report is provided in Appendix K-7. The drilling of three boreholes was completed at the locations shown on **Figure 10.0** to assess the soil and groundwater conditions. The borehole logs provided in the Shad report were consistent with the stratigraphy described in Section 4.5.1 of the *Final Joshua's Creek EIR/FSS*, with two of the boreholes (BH4001 and BH4002) at the watercourse showing thin (<1m) till over shale bedrock, and BH4000 to the north of the watercourse valley encountering thicker overburden sediments (>11.5m) including a fine sand layer between the surficial till and shale bedrock. BH4000 is located in a bedrock valley feature that crosses the Subject Lands. The boreholes completed as part of the creek crossing investigation show the bedrock valley is absent in the immediate vicinity of the watercourse.

  Monitoring wells were installed in two of the boreholes and these are referred to as MW4000 and MW4001 on **Figure 10.0**. **Groundwater elevation data** recorded since September 2019 indicate that the groundwater level in the underlying shale formation (MW4000) was found at a potentiometric elevation of approximately 168.5masl in the fall and rose to 169.25masl following a large rain event in January 2020 (refer to Figure C-4-32 in Appendix C-4). These data are consistent with the interpreted groundwater elevations for this area presented in the *Joshua's Creek Tributaries EIR/FSS*. Along the watercourse at MW4001, shallow groundwater in the highly weathered shale zone was encountered at about 168.8masl in the fall of 2019 and rose to 169.6masl in January 2020 (Figure C-4-33, Appendix C-4). These water levels are within about 1m of grade.

  A drive point piezometer nest was installed in June 2019 in this same area (PZ6s/d-BS, **Figure 10.0**) to investigate the potential groundwater/surface water interactions in the vicinity of the proposed crossing. The monitoring data collected are shown on Figure C-4-31 in Appendix C-4. The datalogger hydrograph shows the groundwater elevation in the shallow overburden was above grade in the spring of 2019, and then the water level steadily declined and PZ6s-BS was dry by September 2019. Over the late fall and winter months, the water levels seasonally rose again, and during rainfall events, the datalogger shows groundwater levels at or above grade (Figure C-4-31, Appendix C-4). There is very limited potential for groundwater discharge through the low hydraulic conductivity till soils, however, as noted in the geotechnical report (Shad, 2019; Appendix K-7), these seasonally high groundwater conditions must be considered during construction; appropriate dewatering methods will be required to maintain a reasonably dry subgrade for construction in this area.

- **Vegetation in the vicinity of the road crossing** is a described in the *Final Joshua's Creek Tributaries EIR/FSS* as being, *"… dominated by regenerating pasture (young cultural thicket with substantial graminoid areas persisting). To the northwest and southeast of this section, and especially to the southwest of the channel, the thicket community becomes more mature and supports trees specimens. The valley corridor, which is 100m wide, has a flat floor with relatively gentle side slopes (conditions are evident on Drawing Core 11-NHS-3). Photos JC-6-3 and JC-6-4 (Appendix D-1) provide an indication of the habitat conditions (foreground of Photo JC-6-3 is in vicinity of road crossing; the left side of Photo JC-6-4 shows habitat, showing the woodier vegetation cover that is being avoided on the right side). There are no habitat units or physical conditions that would preclude the road crossing in this section of Joshua's Creek Reach JC-6."*

- **More detailed ELC mapping** was prepared (applicable to the larger scale of the investigation) (see Appendix U-1) and a **detailed tree inventory** (see Appendix U-2) was completed as part of this EIR/FSS Addendum to confirm the nature of vegetation in the general vicinity of the road crossing and determine the species, size, health, and wildlife habitat potential of the habitats in the area of the proposed crossing. **Figure 10.0** presents the detailed ELC mapping based on June 2019 investigations. As shown, through the proposed area of the crossing, the majority of the habitat in the vicinity of the flow channel is a mineral reed canary grass meadow marsh, with a small area of mineral willow thicket swamp. Woodland habitat of basswood and ironwood dominate the southern bank while a cultural woodland of pear, hawthorn, apple, and buckthorn occupies the much of the northern bank.

- A screening for **tree and other vegetation species at risk** was completed in the vicinity of the proposed road crossing. There were no species at risk (notably Butternut) found within 50 metres of the Reach JC-6 crossing.

- **Bat hibernacula** is not found within or near the proposed road crossing and mature trees considered to offer suitable conditions as bat maternal roosts were few in number. Several candidate roost trees were found on the narrow slope/ridge of FOD5 deciduous forest on the south side of Reach JC-6, in an area east of the proposed crossing. MECP confirmed (March 22, 2019) that an authorization under the ESA would not be required.

Crossing Location Assessment

Based upon the Secondary Plan requirement for a road crossing of Stream Reach JC-6, and the existing conditions of the stream (i.e., identified for rehabilitation), a number of ecological and engineering factors associated with the *Final Joshua's Creek EIR/FSS* crossing design were reviewed and an alternate refined crossing location was identified for further review and investigation in addition to the *Final Joshua's Creek EIR/FSS* alignment. These alignments, referred to as Options 1 and 2, include:

- **Option 1** is the same alignment and design presented in the *Final Joshua's Creek EIR/FSS*. **Figure 10A** illustrates its location and areas of disturbance (grading and adjacent 3m allowance for working areas) in the vicinity of the crossing. This crossing location refined the Secondary Plan road crossing location to locate it where the valley floor was narrow and align it to provide a near perpendicular crossing of the Stream Reach. These factors minimized the width and length of the valley impacted. This alignment is located within the area that was viewed in the field and endorsed by CH in the past.

- **Option 2** further refined the road alignment shifting it 10m upstream to move it away from Core 11. Its near perpendicular alignment was maintained. **Figure 10B** illustrates its location and areas of disturbance (grading and adjacent 3m allowance for working areas) in the vicinity of this crossing. This alignment also is located within the area that was viewed in the field and endorsed by CH in the past.

The crossing design in both options is a clear span, open bottom culvert, 9.6m wide by 1.2m high (height is measured above dry shoulder wildlife shelf). The length of the culvert in Option 1 is 46.8m. Since the completion of the *Final Joshua's Creek EIR/FSS*, the grading design has been refined and Option 2 reduces the length of the culvert to 40m. Both options include some retaining walls (extensions of wingwalls) to limit the extent of grading required on both sides of the crossing. The Option 1 road height has been reduced in Option 2 by up to 2.3m thereby also reducing the amount of grading in the valley.

A review of these options concluded that:

- Option 2 results in a smaller area of impact to the stream due to the shorter culvert length
- There are no differences to stream hydraulics between the two options
- Groundwater conditions are consistent throughout the entire alignment study area
- Geological conditions are consistent throughout the entire alignment study area
- Fisheries habitat and fluvial geomorphological conditions generally are similar throughout the entire study area

The main differences between the two options are the impacts to trees and the habitat types, and the wildlife habitat potential in the valley. To determine the more appropriate crossing location to minimize these impacts, an impact analysis was prepared by overlaying the two proposed alignment options on the 2019 tree data and ELC mapping. The assessment considers several components to evaluate the expected environmental impacts of the proposed alignment options:

- the quantity of live and dead tree removals;
- tree species anticipated to be removed;
- the composition of native and non-native species anticipated to be removed;
- presence of candidate wildlife habitat trees (specifically, trees which may provide summer bat habitat), and,
- the extent of permanent and temporary disturbance within Core 11 and within the Reach JC-6 NHS Corridor outside of the Core.

Tree removal is required where grading (cut or fill) or road infrastructure/footprint conflicts with tree locations. Trees located outside of the limits of disturbance areas have been identified for preservation. The analysis of implications to trees and habitat of the two road crossing options is presented in **Table 10A**.

While the quantity of live and dead tree removals, the species affected, the size of trees, and composition of exotic species were similar for both alignment options, the upstream alignment is preferred as the disturbance would be largely confined to the Core 11 buffer with minimal intrusion to Core 11. With the exception of the headwall, there will not be any permanent intrusion into the Core area. The larger trees, greater canopy coverage, and wildlife habitat trees are located to the east of the proposed Option 1 and 2 (as described in the *Final Joshua's Creek EIR/FSS*). As shown on **Figure 10B**, the narrow slope/ridge of FOD5 deciduous forest on the south side of Reach JC-6 has been avoided to minimize impacts to natural heritage features and functions. Previously disturbed areas, such as CUW1B and FOD4 are preferable for the proposed crossing due to fewer habitat complexities and sensitivities. Areas of 6028m^2 and 5831m^2

are proposed for vegetation removal in order to facilitate the construction of the Option 1 and Option 2, respectively. Local bat populations are not expected to be affected by the proposed crossing, provided that the recommended mitigation is implemented, specifically that vegetation removals not be permitted during the active bat season, considered April 1 to September 30. A detailed habitat screening, impact analysis and mitigation strategy was provided for the road crossing study area to the MECP on March 13, 2019 (Appendix R-7)**,** with a response from MECP March 22, 2019, confirming that an authorization under the ESA would not be required (Appendix R-8).

Detailed tree inventories and impacts of each alignment on trees and vegetation habitat types are provided in Appendix U-3. This analysis concludes that road alignment Option 2, which is defined by a 10m shift upstream for the crossing location, is preferred due to the shorter culvert length, and reduced road elevations which minimize impacts to the NHS, Core 11 buffer, and Core 11. **Drawing 11** illustrates that this crossing is located in the least densely treed area along Stream Reach JC-6.

Table 10A: Reach JC-6 Crossing Alignment Terrestrial Option Analysis

	Live Tree Removals Required (quantity)	Dead Tree Removals (quantity)	Tree Species/Quantities to be Removed[1]	Average Diameter (cm) of Removals[2]	Removals-Non-native Species Composition (%)	Ecosite Area Affected (m^2)	Candidate Bat Habitat Trees (quantity)[4]	Core Area Intrusion (m^2)	Option Preference
Option 1 (Final Joshua's Ck EIR/FSS)	Core 11 - 8 Core buffer - 8 NHS – 74 Total - 90	Core 11 - 7 Core buffer - 1 NHS – 11 Total -19	*Apple/10 Bur Oak/1 *Manitoba Maple/1 *Pear/24 Red Ash/45 (18 dead) Sugar Maple/1 *Sweet Cherry/4 White Elm/1 (1 dead)	15.9	39	**Ecosite** / **Core 11** / **NHS Corridor Outside Core 11** / **Total** **CUW1B** 17 1822.5 **1839.5** **FOD4** 287.9 1890.7 **2178.6** **MAM2-2** 357.6 988.9 **1346.5** **SWT2-2** 663.3 **663.3** **Total** **662.4** **5365.6** **6028**	1 (Bur Oak, no cavities) within NHS area	662.4	Feasible, but less preferred in comparison to Option 2 due to minor grading required in Core 11
Option 2 (10m Shifted Alignment)	Core 11 - 0 Core buffer - 7 NHS – 80 Total - 87	Core 11 - 0 Core buffer - 0 NHS – 11 Total -11	*Apple/9 Black Cherry/1 Bur Oak/1 *Manitoba Maple/1 *Pear/23 Red Ash/46 (11 dead), *Sweet Cherry/5	16.8	38	**Ecosite** / **Core 11** / **NHS Corridor Outside Core 11** / **Total** **CUW1B** 1.4 1897.8 **1899.2** **FOD4** 89.2 1931.5 **2020.7** **MAM2-2** 130.2 988.9 **1119.1** **SWT2-2** 792.6 **792.6** **Total** **220.7** **5610.8** **5831.5**	1 (Bur Oak, no cavities) within NHS area	220.7	Preferred due to greater avoidance of Core 11
Summary	Similar quantity of trees to be removed, though, no trees to be removed in Core 11 with Option 2		Species assemblage similar	Size similar	Similar, but Option 2 has slightly greater component of non-natives species	Option 2 has slightly less impact to FOD4 and MAM2, slightly greater impact to SWT2 and CUW1B	Same Bur Oak in both instances, in NHS and outside of Core 11 and Core 11 buffer. Considered candidate due to species only -, no cavities, cracks, crevices observed.	Option 2 is better than Option 1 by a difference of 441.7 m^2	Option 2

[1] Assuming native species have greater ecosystem services
[2] Diameter at breast height (DBH) and assuming larger diameter trees have greater ecosyste
less easily replaced
[3] Assuming FOD, MAM, SWT have greater ecosystem services than cultural ecosites
[4] Bat Habitat Assessment has undergone MNRF review and acceptance conditional upon implementation of timing Window Mitigation
* Non-native tree species

In summary, for the preferred Option 2, the areas to be affected by the crossing are presented in **Table 10B**.

Table 10B: Summary of Areas Affected by Preferred Crossing Option[1]

Location	Area Within R.O.W. (m^2)	Area between R.O.W. and Grading Limit (m^2)	Area between Grading Limit and Disturbance Limit (m^2)
In Core 11	0	195	200
In Corridor outside Core 11	2730	3205	565
Totals	2730	3400	765

[1] Does not include the face of the retaining walls, and may not include area affected by culvert headwall

As this table illustrates and as shown on **Figure 10C**, the permanent disturbance to the NHS is located outside of Core 11. Moreover, only the area within the right-of-way will not be returned to a natural condition. The area between the grading limit and the limit of disturbance will be re-naturalized completely, to the satisfaction of CH and the Town, following the CH guidelines and NOCSS direction (specifically Section 6.3.3.5, *Preferred Management Approach to Terrestrial Features*). The area between the right-of-way and the limit of grading, also will be re-naturalized (with the exception of the face of the retaining wall); however, for the safety of both wildlife and vehicular traffic, a herbaceous band will be established contiguous with and on both sides of the hard travelled surface (width to be confirmed at detailed design, through discussions with agencies). The detailed planting plan to implement this restoration will be prepared at detailed design.

10.2.2 Creek Crossing Sizing

Stream Rehabilitation

As previously noted, the road crossing is located across a section of Stream Reach JC-6 that is classified as a Red-Hatch High Constraint Stream Corridor. There are rehabilitation opportunities in this location due to past agricultural practices. Specifically, the cover type, species and plan form are not reflective of the undisturbed wooded nature of the stream corridor, just downstream within Core 11. Also, the local channel is undergoing planimetric form adjustment, evident by observations of multiple flow paths and poor instream morphological variability.

The proposed crossing therefore provides an opportunity to improve existing channel form and function. A restoration approach for the existing channel is recommended based on natural channel design principles. The restoration would implement the requirements of NOCSS Table 6.3.4, where it recommends the "removal of online ponds, repair of bank erosion, removal of evidence of negative land management practices (e.g., farm crossings)".

To help mitigate any potential erosion hazard, natural erosion control measures are recommended for immediate and long-term stabilization of the channel through the crossing. These measures include biodegradable erosion control mats, live staking, and planting of deep rooting native plants. Furthermore,

vegetated rock buttresses will be constructed along outer meander bends and on both banks immediately upstream and downstream of the proposed crossing structure. The restoration approach will also include resting pools to allow for fish passage under the crossing, providing an overall benefit to the system.

To address the potential for erosive forces at the entrance and exit of the crossing, scour pools have been designed upstream and downstream of the new road crossing. The scour pool transitions into the existing channel and will provide resting opportunities for fish. Rootwads will be installed along the banks of these pools to induce bed scouring and for the maintenance of pool depths. The rootwads will also directly offer a habitat enhancement through the provision of cover and interstitial microhabitats within the rootwads.

Channel design dimensions are determined by bankfull discharge, as this represents what is generally referred to as the "channel-forming discharge". In this case, a conservative approach to the bankfull channel sizing through the crossing was taken based on a 2-year return period flow, or bankfull discharge of 2.27m^3/s. A simple Manning's approach was used to iteratively back-calculate bankfull dimensions for the proposed channel. The pools were oversized to provide additional refugia. As such, the modelled dimensions for the riffles give a better prediction of the channel's capacity. Riffle and pool dimensions, as well as anticipated flow conditions in the vicinity of the crossing are provided in **Table 10C.** The dimensions provided for riffles and pools through the crossing are conservative and slightly larger than the channel upstream and downstream of the structure. A 2-year flow was used to size the channel; however, the bankfull capacity for channels is generally in the range of the 1- to 2-year return events. As such, we anticipate smaller dimensions for the channel as part of detailed design.

Table 10C: Bankfull Parameters of the Proposed Channel through JC-6 Crossing

Channel parameter	Reach 1	
	Riffle††	Pool†
Bankfull width (m)	3.05	3.80
Average bankfull depth (m)	0.32	0.41
Maximum bankfull depth (m)	0.45	0.75
Bankfull width-to-depth ratio	6.78	5.07
Channel gradient (%)	4.95	1.50
Bankfull gradient (%)	1.50	1.50
Manning's roughness coefficient, *n*	0.04	0.03
Mean bankfull velocity (m/s) *	2.30	1.99
Bankfull discharge (m^3/s) *	2.27	3.13
Discharge to accommodate (m^3/s)	2.27	2.27
Tractive force at bankfull (N/m^2)	219	110
Stream power (W/m)	1102	460
Unit stream power (W/m^2)	361	121
Froude Number (unitless)	1.30	0.99
Maximum grain size entrained (m) **	0.23	0.11
Mean grain size entrained (m)**	0.16	0.06

† Based on bankfull gradient
†† Based on riffle gradient
* Based on Manning's equation; as pools contain ineffective space, the velocity and discharge conveyed in them are not presented
** Based on Shields equation (Miller et al. (1977)), assuming Shields parameter equals 0.06 (gravel)

Crossing Sizing

An open bottom, clear span culvert with sizes noted above and in **Table 10.1** is recommended for the crossing. The extension of wing walls is proposed to minimize grading requirements in the NHS and impeded wildlife access onto the future road. A combination of 3:1 transition sloping and extended wing walls will be used to minimize the extent of grading within the Core associated with the road crossing. 3:1 sloping will be used for approximately 10m from the right of way to the top of the culvert. The extended wing walls will range from 0.2m to 1.35m in height on either side of the road crossing. This minimizes the extent of grading within the Core to approximately 4.5m on the south side of the road crossing without encroaching into the Core features.

A limited meander is proposed through the crossing structure, with an overall meander from outside bend to outside bend of 4.0m. Based on the proposed alignment of channel through the culvert with a span of 9.60m, this provides a minimum of 1.8m between the outside banks of the pools and the culvert wall on one side, and 4m for terrestrial movement on the other side.

An opening size of 9.6m wide by 1.2m high by 40m long provides an openness index of 0.29. For small-medium mammals and amphibians, the literature suggests a large range from 0.08 to 1.5; this value is within the suggested range.

Table 10.1: Design Recommendations for Road Crossing of Stream Reach JC-6

Creek Crossing	Width (m)	Height (m)	Length (m)	Downstream Invert (m)*	Upstream Invert (m)*	Top of Road Elevation (m)
Road crossing, JC-6	9.60	1.20	40	169.70	170.10	175.96

*Invert elevations for JC-6 are based on LiDAR elevations. Exact invert elevations to be confirmed at detailed design. The inverts provided in this table are the low-flow channel within the culvert.

Given that Stream Reach JC-6 is a small watercourse with low to moderate energy, which shows limited evidence of active erosion, the proposed dimension of 9.60m provides an effective geomorphic solution as well as providing suitable integration with other considerations, including wildlife passage, fish passage, and hydraulics. Also, recognizing that the general requirement for crossing size is three times the bankfull width, this crossing width exceeds a minimum crossing size of 5.7m. This value is based on three times the surveyed bankfull channel width of 1.9m. Using the designed channel width of 3.05m still results in a minimum opening size of 9.15m which is within the proposed 9.6m crossing width. The design dimensions are conservative and can be refined at detailed design. As such, the 9.6m crossing width is appropriate from a geomorphological perspective.

The crossing design for Reach JC-6 is presented in **Drawings GEO-1, RES-1** and **RES-2**. Consultation with the Department of Fisheries and Oceans (DFO) should be undertaken at the detailed design stage for the Reach JC-6 crossing. As a result of changes to the *Fisheries Act, 1985* (effective August 31, 2019), there is no longer a proponent-driven self-assessment process for in water works. As such, formal review will be required at the detailed design stage.

During detailed design, stone should be hydraulically sized throughout the culvert. Stone should be sized to provide for a stable bed and a level of sorting. Also, the stone size should limit entrainment during the proposed post-development regional storm flow. A larger stone sizing is proposed for the crossing, as this is expected to be stable under the range of predicted flow conditions and especially given that vegetation will not establish underneath the structure.

The near-bed velocity within the channel was modelled to determine whether fish passage is possible under the range of conditions expected for the low-flow channel. The velocity increases logarithmically with height above the bed surface in turbulent flows, through a relationship known as the von Karman equation, or the law of the wall. Based on a knowledge of the bed materials, a theoretical height above the bed where the velocity equals zero, can be determined. The von Karman equation is typically used to estimate the shear stress at the bed surface. However, a near-bed velocity can be back-calculated using the average shear stress predicted for the low flow channel.

Analyses were performed to ensure fish passage at bankfull discharge and half bankfull discharge. The velocity at the riffle crest was assessed at height above the bed. Predicted velocities are based on the

average depth. Velocities along the margin and near the channel bed are substantially lower. A substantial portion of the channel will have velocities at least 30 percent lower than the velocity based on the average channel depth. At bankfull discharge, the velocity in the channel at 0.01m was 0.17m/s, and the velocity in the channel at 0.10m was 1.12m/s. At half bankfull discharge, the velocity in the channel at 0.01m was 0.04m/s and at 0.19m was 1.10m/s. Comparing these velocities with the range of velocities tolerated by various minnow species found within the watershed (**Table 10D**), demonstrates that fish passage is ensured through the riffles at these lower flows.

Table 10D: Swimming Speeds for Forage Fish (m/s)

Fish type, Size (mm)	Sustained Speed [1]	Prolonged Speed [2]	Burst Speed [3]
Medium forage fish, 90-110	0 - 0.31	0.31 - 0.68	0.68 - 0.76
Large forage fish, 180-230	0 - 0.42	0.42 - 0.95	0.95 - 1.11

Hydraulic Design

Hydraulically, the proposed Joshua's Creek crossing was analyzed with HEC-RAS. The recommended culvert size, based on fluvial geomorphologic and wildlife passage requirements, were found to be more than adequate to accommodate future flows. Under future conditions and for the 100 year and Regional Storm flows, the water level on the upstream side of this new road is noted in **Table 10.2**. Appendix F-3B includes the HEC-RAS models that provide supporting hydraulic calculations for the proposed road crossing size along JC-6.

Post-development hydraulic model flows in the main branch of Joshua's Creek at the JC-6 crossing are based on Appendix F-2B pre-development flows taken from the 2016 hydrologic assessment completed by Stantec (See Appendix F-2B). The flows upstream of the crossing will generally be the same as pre-development conditions.

As per the water levels in **Table 10.2**, the future road will not be overtopped during the 100 year or Regional Storm events.

Table 10.2: Water Levels Upstream of Road Crossing of Stream Reach JC-6

Road Location	100 Year		Regional Storm		Road Elevation (m)
	Flow (m^3/s)	Water Level (m)	Flow (m^3/s)	Water Level (m)	
Road Crossing of JC-6	5.93	170.71	15.40	171.12	175.96

Existing and proposed floodlines are plotted on **Figure 10.1R.** Modeling results show that upstream of the proposed JC-6 crossing, Regional Storm flood levels are equal to existing flood levels at all locations along this reach with the exception of cross-sections 11.777 to 11.572, upstream of the future crossing. Regional Storm flood levels increase up to 23cm under proposed conditions upstream of the crossing. These increases are contained within the NHS and do not affect upstream external areas. As shown on

F**igure 10.1R**, the proposed floodline plus 7.5m remains within the NHS boundary presented on **Drawing NHS-4**.

Corridor Restoration

The portion of the riparian corridor that will be disturbed, including for grading and access, will be rehabilitated and naturalized, to the satisfaction of the Town and CH. An improvement in channel morphology and function will be provided through a natural channel design approach. Improvements to channel form and function will provide additional benefits to sediment balance and fish passage. To mitigate any potential erosion hazard during construction, natural erosion control measures should be used for immediate and long-term stabilization of the channel (e.g., biodegradable erosion control mats, live staking, deep rooting native plants).

To further enhance the potential for wildlife use of the culverts, the valley design and naturalization plan and final plans, which will be completed at the detailed design stage, should meet the following requirements:

- The road embankments (from both sides of the road to the valley system) should not have steep grades (i.e., should not be greater than 3:1 (H:V));

- The embankments on both sides of the road should be planted with structurally diverse native indigenous species that would provide cover in the vicinity of the road but that would not impede sight of the opening; and,

- To enhance the visibility of the opening for wildlife, to encourage funnelling of wildlife to the opening, and to discourage them from exiting the culvert to the road surface, wingwalls are hard-surfaced around the entrance and a lip around the top of the opening are recommended.

Geotechnical Design Considerations

A geotechnical investigation was completed based on the road crossing design to obtain information about the existing subsurface conditions at the location of the crossing. This investigation has been provided in Appendix K-7. The investigation consisted of augering and sampling altogether three boreholes down to depths ranging from 1.6m to about 13.9m below existing ground surface in the vicinity of the crossing.

Topsoil and fill were contacted, extending down to depths ranging from approximately 0.7 to 0.9m below existing ground surface. The fill layer at road crossing was underlain by highly weathered shale/silty clay matrix down to depth of about 1.4m below existing grade and underlain by highly weathered to weathered shale extending to greater than 10m below the existing surface.

Considering the subsurface conditions encountered at these boreholes, the proposed culvert structure could be supported on spread footings founded on the undisturbed and hard highly weathered shale/silty clay matrix or on the highly weathered to weathered shale. A permanent soil cover of 1.2m or its thermal equivalent is required for frost protection of foundations. Creek flow diversion and appropriate dewatering methods, such as pumping from sumps, should be employed to maintain a reasonably dry subgrade.

10.3 Road Allowance Design

Through the Secondary Plan process, alternate road allowance design standards were proposed by the Town. The road allowance design was sufficient to support the establishment of right-of-way (ROW) widths for the various road types.

The road allowance design has continued to evolve to accommodate the detailed requirements for the various stakeholders within the proposed road allowances. In accordance with the ROWs depicted on the Draft Plans and Composite Development Plan, standard ROW cross-sections are provided as outlined in **Appendix J**.

10.4 Sidewalk Design

The preliminary sidewalk locations are illustrated in **Figure 6.4R**. The sidewalks will provide trail connectivity between the south and north sides of Joshua's Creek, minimizing the disturbance to the NHS.

10.5 Utility Crossings of Street A

Watermain and wastewater crossings are required across Joshua's Creek Reach JC-6 to service the future Mattamy lands to the north. As noted in Section 9, the watermain and sanitary trunk sewer will extend through the Mattamy Phase 3 lands and across the NHS to service the future lands to the north. The locations of the water and wastewater crossings are illustrated in **Figure 10.1**. In order to minimize the impact on the creeks, the services crossings will be located in the proposed road allowance. The proposed watermain can cross over top of the culvert and mainta

in frost cover below the road. The sanitary sewer, whose depth is governed by the lands to the north of the NHS, will be required to cross underneath the creek. The watermain will be installed by open cut; the majority of the watermain is located within fill which will minimize the impact to the creek.

The sanitary sewer will be installed using a combination of open cut and trenchless installation (such as jack and bore, microtunnelling, or directional drilling) underneath the creek. Along the valley wall, the sanitary sewer can be installed by open cut since the area will be disturbed as part of the road crossing grading. The disturbance limit for the open cut installation would be restricted to the area disturbed by the ultimate road crossing (i.e. approximately 50m wide section along the north valley wall and a 45m wide section along the south valley wall). Any areas disturbed by the open cut will be restored as part of the road grading work. As the proposed sanitary sewer is up to 15m deep, a combination of trench boxes and 1:1 sloping will be required for excavation to minimize the disturbance to the valley. Pits will be installed at the bottom of the valley, on either side, for the trenchless installation underneath the creek. The exact method and details of the trenchless installation can be determined at detailed design.

10.6 Conformity of Crossing with NOCSS

As indicated in the *Final Joshua's Creek EIR/FSS* conformity of the crossing location and engineering design with NOCSS management strategy and recommendations is required. This conformity is summarized in **Table 10.3.**

Table 10.3: Road Crossing Location and Design Conformity with NOCSS

NOCSS Reference	NOCSS Direction Applicable to Road Crossing	Conformity of Recommended Road Crossing Location/Design to NOCSS (Option 2)
Figure 6.3.12 Core Area 11, and Section 6.3.3.5, Preferred Management Approach to Terrestrial Features	• The figure establishes the limits of Core 11 which defines the lands to which the following management requirements apply. o The existing woodlands and wetlands within Core 11 are recommended for retention. o The Core includes forested slope and critical aquatic habitat (groundwater); any groundwater discharges are to be preserved.	• The western location of the boundary helped define the road crossing analysis study area and was used in the assessment of alternatives to help identify the preferred location for the road crossing, with the aim to minimizing impacts to the Core, as per the management requirements. Figure 10.0 shows the study area that was investigated related to the road crossing, and was defined to ensure that portions of the Core in the vicinity of the road crossing were included in the assessment of impacts. This objective of the assessment was to ensure that there would be no or minimal impact to the Features within Core 11. • The preferred alignment is located near the western Core 11 boundary, with the grading and/or construction access area extending by 7m into the buffer of the Woodland feature that helped define the Core boundary. The general crossing location was identified in the field with agencies to exclude the forested slopes along the reach within the Core in the alignment area. • The road right-of-way is outside the Core boundary. Grading to accommodate the road requires that approximately 195m^2 of the Core buffer be disturbed with no trees in the Core buffer be removed. See Table 10B. With the exception of the headwall area of the crossing opening, this entire 195m^2 will be completely re-naturalized, to the satisfaction of the Town and CH, following CH guidelines. • The dominant habitat in the immediate vicinity of the flow channel is meadow marsh (not part of the North Oakville East Wetland Complex). Portions of this wetland area will be disturbed but the conceptual natural channel design for this red-hatch stream (see Section 10.2) will enhance the aquatic habitat function of the stream. • These small area changes within the Core will not result in negative impacts to the defining features or functions of this Core. • This western portion of the Core has been investigated for SAR. No SAR specimens were noted and, as per consultation with MNRF, with the recommended mitigation will ensure that there are no negative impacts to SAR habitat. • No critical aquatic habitat due to groundwater is present and no groundwater seeps or discharge have been identified through the road study area and groundwater flow volumes and patterns will not be affected.
Section 6.3.4.2, Environmental/ Fisheries, Reach Specific Management, including Table 6.3.4, Aquatic and Riparian Habitat	• Reach JC-6 forms part of the Linkage between Cores 11 and 10, for which the preferred management is "*to retain existing woody and wetland vegetation within the corridor, and allow for the establishment of woody vegetation*",	• The crossing width has been minimized by proposing sections of retaining walls. • Beyond the right-of-way, any area that will be disturbed will be naturalized, to the satisfaction of the Town and CH, following CH guidelines. Native, indigenous woody species and specimens consistent with the existing habitat of Core 11 will be included in the naturalization plan. • The conceptual natural channel design for this red-hatch stream (see Section 10.2) will enhance the aquatic habitat function of the stream

NOCSS Reference	NOCSS Direction Applicable to Road Crossing	Conformity of Recommended Road Crossing Location/Design to NOCSS (Option 2)
Management	• For this red-hatch stream, Table 6.3.4 recommends removal of online ponds, repair of bank erosion, removal of evidence of negative land management practices (e.g., farm crossings)	• The channel design will address/correct existing erosion/adverse land use impacts along this portion of the reach. • The crossing design permits aquatic and terrestrial habitat connectivity along the channel, retaining the linkage function between Cores 11 and 10.
Section 6.3.4.5, Riparian Corridor Management	• NOCSS does not provide direction related to crossing of a red-hatch stream but the Master Plan (Figure NOE3), informed by NOCSS, identifies a road crossing in this location.	• In the absence of specific direction, the reach specific management and terrestrial management requirements (highlighted above in this table) and the results of the detailed geomorphological investigations (see Section 5.4) have been applied in locating and designing the crossing. • The geomorphological width requirement in this case is addressed by the meander amplitude of the designed channel (4m), • The integrity and function of the reach will be improved and the realignment will provide morphological variability and enhanced aquatic function.
Appendix GG, Management Approach and Criteria for Stream Systems - High Constraint Stream (Riparian) Corridors (Red)	• The Appendix does not have a specific 'red-hatch' section but states for red corridors that "*The features in these areas are to be protected and enhanced. No intrusion is permitted except for service crossings at locations that minimize potential impact. Full restoration is required*."	• The reach specific management and terrestrial management requirements (highlighted above in this table) have been addressed to ensure that the road location and design minimize the potential impact to the aquatic features and functions and ensures corridor connectivity is maintained. • As per Section 10.5, the services associated with the crossing will be either installed over top of the culvert by open cut or using a combination of open cut along the valley wall and trenchless installation across the creek bed to minimize potential impact to the stream.
Appendix X, Physical Stream Characteristics	• Appendix provides the following information that can inform location and design of crossing. o *Appendix X – Aquatic* identifies characteristics as "*moderately sensitive, important in sustaining fisheries, no groundwater discharge, highly modified*" o *Appendix X – Geomorphology* identifies characteristics as "*silt to sand; bank slumping; poor riffle-pool; aggradation; farm impacts; spring flow*."	• Detailed investigations confirmed the conditions outlined in this NOCSS appendix, including no groundwater discharge; warmwater forage fish community present; bed materials; anthropogenic disturbances; etc. • The conceptual natural channel design addresses the issues, correcting existing problems, and enhancing the aquatic habitat function of the stream.

11.0 CONSTRUCTION PRACTICES

Section 11 of the *Final Joshua's Creek EIR/FSS* includes discussion of key geotechnical findings, erosion and sediment control requirements, general guidance on construction phasing, dewatering requirements, implications of development on private water wells, well decommissioning and topsoil management. With the exception of Section 11.1, all other sections remain current and apply to the Mattamy Phase 3 lands.

Section 11.1 currently provides discussion on geotechnical conditions on the Dunoak, 1564984 Ontario Ltd. and Bressa properties. This Addendum amends Section 11.1 to include discussion of the latest geotechnical conditions on the Mattamy Phase 3 lands (which encompasses portions of the Dunoak and 1564984 Ontario Ltd. properties previously investigated). Amendments include:

- The first sentence of Section 11.1 is amended to:

  "The subsurface conditions within the area were evaluated through four separate geotechnical investigations completed by AMEC Earth & Environmental and DS Consultants Ltd."

- The following summary of the geotechnical conditions on the Mattamy Phase 3 lands is added to the end of Section 11.1.

Mattamy Phase 3 Lands
DS Consultants Ltd., Preliminary Geotechnical Investigation, Proposed Residential Development Mattamy Phase 3 lands, dated February 28, 2020.

Further to the preliminary geotechnical investigations for the Dunoak and 1564984 Ontario Ltd. Properties, an additional geotechnical investigation was conducted for the Mattamy Phase 3 lands. A copy of the above noted report is provided in Appendix K-7; a summary of the key findings/recommendations are presented in the following sections.

Fieldwork

A total of eight (8) boreholes were drilled to depths ranging from 1.6m to 8.0m within the Mattamy Phase 3 lands. Boreholes were drilled with solid stem continuous flight augers equipment by a drilling subcontractor under the direction and supervision of DS personnel. Samples were retrieved at regular intervals with a 50 mm O.D. split-barrel sampler driven with a hammer weighing 624 N and dropping 760 mm in accordance with the Standard Penetration Test (SPT) method. A total of three (3) groundwater monitoring wells (50mm diameter) were installed at the site to facilitate groundwater level measurements.

Subsurface Conditions

The boreholes advanced on the Mattamy Phase 3 lands encountered surficial topsoil, ranging in thickness from 100mm to 250mm. Fill material or weathered/ disturbed native soil were found in boreholes, extending to a depth of about 0.8m below the existing grade. Fill material or weathered/disturbed native soils consisted of very soft to stiff silty clay, with measured SPT 'N' values of 1 to 9 blows per 300mm of spoon penetration.

Below the fill materials or weathered/ disturbed native soils, silty clay till deposits were encountered in all boreholes, overlying shale bedrock or till/shale complex. These deposits were found to have a very stiff to hard consistency, with measured SPT 'N' values ranging from 20 to more than 50 blows per 300 mm of penetration. Occasional cobble/boulder were inferred within the till deposits during drilling.

Sandy silt till deposit was encountered below or embedded within the silty clay till in boreholes BH20-1 and BH20-5. This deposit was present in a dense to very dense state, with measured SPT 'N' values ranging from 31 to more than 50 blows per 300 mm of penetration. Occasional cobble/boulder were encountered within the till deposits during drilling.

A till/shale complex unit consisting of silty clay till unit mixed with highly weathered shale was encountered in boreholes BH20-1, BH20-5 and BH20-8 below the silty clay till deposit. This unit is transition zone from till to shale bedrock and contain properties of both hard silty clay till mixed with highly weathered shale bedrock.

Shale bedrock of Queenston Formation was encountered in boreholes at depths ranging from 1.5 to 7.9m below the existing grade. Shale bedrock was not proven by rock coring. Because of the method of drilling and sampling, the surface elevations of the bedrock can be different than indicated on the borehole logs. With augering, the auger may penetrate some of the more weathered shale and the coring may therefore begin below the bedrock surface. Commonly the overburden overlying the shale contains slabs of limestone which would give a false indication of the bedrock level. Similarly, the depth of weathering cannot be determined accurately due to the presence of limestone layers.

Geotechnical Recommendations

Excavations can be carried out with heavy hydraulic backhoe. Excavation of the shale can be carried out using heaviest available single tooth ripper equipment; however, progress is expected to be slow and laboured and will be hard on excavation equipment. The top weaker portion of the bedrock can generally be removed with a powerful excavator equipped with a rock bucket and rock teeth, assisted by hoe ramming. The removal of the underlying sound rock and especially the interbedded limestone and siltstone layers will be arduous and time consuming and may require use of impact breakers/jackhammers and line-drilling. All excavations must be carried out in accordance with the most recent Occupational Health and Safety Act (OHSA). The sides of excavations in the natural strata can be expected to be temporarily stable at relatively steep side slopes for short periods of time but they should be cut back at slopes no steeper than 1V:1.5H in fill material and 1V:1H in silty clay and sandy silt till in order to comply with the safety regulations.

The geotechnical report indicates that native soils encountered in the boreholes are competent to support the proposed houses on conventional footings founded on undisturbed native soils or engineered fill. The spread and strip footings founded on the undisturbed native soils and/or engineered fill can be designed for a bearing capacity of 150 kPa at SLS (Serviceability Limit State), and for a factored geotechnical resistance of 225 kPa at ULS (Ultimate Limit State).

12.0 MONITORING

Final Joshua's Creek EIR/FSS Section 12 addresses monitoring requirements including erosion and sediment control requirements, SWM facility monitoring (baseline and post development monitoring terms of reference to be provided to Town of Oakville and Conservation Halton prior to commencement), trails and stream modifications. The *Final Joshua's Creek EIR/FSS* monitoring requirements apply to the Mattamy Phase 3 lands.

The *Final Joshua's Creek EIR/FSS* includes a Water Quality and Temperature Monitoring Work Plan that outlines specific monitoring activities and locations upstream and downstream of proposed SWM pond locations to characterize baseline conditions. Fieldwork was completed in 2016, 2017 and 2018 along various stream reaches at/near future pond outfalls to obtain baseline conditions, where possible, including water temperature and water quality. This work, being done being completed by Mattamy, will satisfy Ponds 52, 54 and 56 baseline monitoring requirements.

A post-construction monitoring program is recommended to assess the performance of the implemented channel design through the Stream Reach JC-6 crossing (as outlined in Section 10.2). Monitoring activities should include general observations of the channel works after construction and after the first large flooding event to identify channel. Monumented channel cross sections should also be established to observe potential changes in channel geometry. Monitoring should include monumented photographs and review of the low flow channel through the crossing to ensure fish passage is maintained. A formal monitoring program should be developed for the channel at detailed design and through consultation with regulatory agencies.

13.0 SUMMARY OF RECOMMENDATIONS

Section 13.0 of the *Final Joshua's Creek EIR/FSS* summarizes the main report findings and recommendations, and provides direction to future EIR/FSS's and addenda for non-participating lands and on certain environmental matters for detailed design work.

This Addendum has addressed all EIR/FSS Terms of reference requirements, addressed specific recommendations from the *Final Joshua's Creek EIR/FSS* for EIR/FSS work related to the Mattamy Phase 3 lands in support of their Draft Plan of Subdivision, and incorporated environmental, storm drainage, servicing and grading findings from the *Final Joshua's Creek EIR/FSS* applicable to the Mattamy Phase 3 lands.

Table 13.1 presents Mattamy Phase 3 EIR/FSS Addendum findings and recommendations. **Table 13.2** summarizes how requirements from the *Final Joshua's Creek EIR/FSS* specific to the Mattamy Phase 3 lands have been addressed in this EIR/FSS Addendum. The listing below notes additional EIR/FSS findings relating to detailed design requirements for the Mattamy Phase 3 lands.

a) A site walk with the approval agencies to identify the best route for the trail alignment is recommended to identify meandering alignments of the trail associated with Core 10 and along NHS abutting the north boundary of the Mattamy Phase 3 lands. The trail may meander by approximately 1m to 3m beyond the currently shown locations within the NHS in 30m wetland buffer areas (associated with Core 10) and more so where there are no natural features present.

b) Detailed restoration/planting plans associated with the trails as outlined in the *Final Joshua's Creek EIR/FSS* will be prepared.

c) An Erosion and Sediment Control (ESC) strategy will be prepared and implemented in accordance with the Town's and CH's "Erosion and Sediment Control Guideline for Urban Construction" prior to any earthworks or grading activities on the Subject Lands. This strategy should employ a multi-barrier approach where appropriate to prevent soil erosion and sedimentation. The plan must be reviewed and approved by the Town prior to any clearing and grading.

d) Final sizing for watermains less than the minimum 300mm diameter mains, modeled in the ASP, will be completed based on the actual development characteristics. Water modeling is required to confirm watermain sizing and address phasing and dead end watermains.

Table 13.1: Summary of EIR/FSS Recommendations and Mitigative Measures

Topic	Recommendations	Report Section
Areas Studied	In accordance with OPA 272 requirements, Joshua's Creek Subcatchment Areas JC6, JC8B, JC9A, JC12, JC16 and JC17 and a small portion of EM4 and JC9B were studied as part of the *Final Joshua's Creek EIR/FSS*. It included all of the Mattamy lands as well as lands owned by others in the Joshua's Creek subcatchments in North Oakville south of Burnhamthorpe Road. This EIR/FSS Addendum addresses EIR and FSS requirements for the Mattamy Phase 3 lands only.	1.2
Mattamy Phase 3 Draft Plan of Subdivision	This EIR/FSS Addendum was prepared in support of the proposed Draft Plan of Subdivision for the Mattamy Phase 3 lands. See **Figure 6.2A**. The Draft Plan and servicing requirements were coordinated with the adjacent approved Draft Plan of Subdivision for the Dunoak lands, the proposed Draft Plan of Subdivision for the adjacent Argo (Joshua's Creek) lands and NHS delineation work completed by the adjacent Coscorp lands.	6.0 Figure 6.2A
Subcatchment Drainage Boundaries	The *Final Joshua's Creek EIR/FSS (*Sections 7.2 and 7.3) address refined subcatchment boundaries and predevelopment flows. That report updated all subcatchment boundaries based upon LiDAR mapping (Section 5.2), compared them to NOCSS drainage area boundaries, and included refinements made to reflect the conclusions of the *Final North Oakville East Drainage Area Exchange Repor*t (DAE Report, January 2017). It determined that the resulting changes in EIR/FSS boundaries is small and that the NOCSS target unit flow rates for Joshua's Creek subcatchments are valid for SWM pond design. This work remains valid and no changes are required as part of the Mattamy Phase 3 EIR/FSS Addendum.	7.0
NHS Framework and Associated Components	Components of the NHS framework identified on **Figure 2.1R** from the *Final Joshua's Creek EIR/FSS* have not changed. The NHS stream corridors associated with Reaches JC-6 and JC-7 form the northern boundary of the Mattamy Phase 3 lands. The NHS adjacent to the Mattamy Phase 3 lands includes: • Portions of Core Preserve Areas 10 and 11; • Two High Constraint Streams (JC-5, JC-6), one of which, Reach JC-6, is categorized as a 'red-hatched' or 'high constraint stream with rehabilitation opportunities' • One Medium Constraint Stream Reach, JC-7; • A Linkage Preserve Area along Reaches JC-6 and JC-7; • One Optional Linkage Preserve Area, which will not be implemented Portions of two PSWs located in Core 10 (PSW 29 and PSW 31) lie within the western portion of the Mattamy Phase 3 lands. A very small portion of one Low Constraint Stream Reach, JC-31A, exists along the eastern boundary of the Mattamy Phase 3 lands.	2.1, 3.0, 7.10

Table 13.1: Summary of EIR/FSS Recommendations and Mitigative Measures

Topic	Recommendations	Report Section
	While not located within the Mattamy Phase 3 lands, PSW 45 located along Stream Reach JC-13 was assessed as part of this EIR/FSS Addendum to address water balance requirements from the *Final Joshua's Creek EIR/FSS.*	
NHS Boundaries	The NHS boundaries as established in the *Final Joshua's Creek EIR/FSS* have not changed with the exception of the interface of the NHS boundary between the Mattamy Phase 3 and adjacent Argo (Joshuas Creek) lands. The boundary of Core 11 on the adjacent Argo lands was finalized in the Addendum for those lands (Addendum 2). **Figure 3.1** and **Drawing Core 11-NHS-3R** reflects this modified NHS boundary along the eastern boundary of the Mattamy Phase 3 lands. The NHS boundary at the upper end of Stream Reach JC-7, comprising a Linkage Preserve Area, was coordinated with Coscorp. **Drawing NHS-4** from the *Final Joshua's Creek EIR/FSS* remains unchanged. The Core 10 boundary on the Mattamy Phase 3 lands remains as shown in the *Final Joshua's Creek EIR/FSS* (**Drawing Core 10-NHS-6**). A Reference Plan illustrating the final NHS boundaries on the Mattamy Phase 3 lands will be prepared and submitted to the Town and CH.	3.0
Species At Risk	Additional SAR screening was undertaken on and adjacent to the Mattamy Phase 3 lands within areas considered the highest likelihood of SAR potential. This included the western portion of Core 11 and within the stream corridor of Stream Reach JC-6 with respect to the road crossing of Reach JC-6 and the trail along Stream Reaches JC-6 and JC-7. Consultation with MECP was conducted to identify SAR with potential to occur within and adjacent to the Mattamy Phase 3 lands. A list of all SAR recorded in the municipality was provided and used to assess SAR potential based on SAR habitat preferences compared with habitat conditions and flora/fauna inventories in the Subject Lands. Several species could not be ruled out given their general and commonly available habitat preference and in these instances precautionary mitigation has been recommended regarding no vegetation removals between April 1st and September 30th. With respect to SAR bats which can be difficult to confirm as survey methods are imprecise, the MECP was presented with the results of tree inventories and targeted habitat assessments for the road crossing and trail as they relate to potential bat habitat. Upon review, the MECP confirmed that the proposed vegetation removal timing window mitigation was sufficient and that Endangered Species Act permitting would not be necessary.	5.1, 6.3.2, 10.2
Joshua's Creek Low Constraint Reaches	Consistent with OPA 272 policies and NOCSS recommendations, the upstream end of one Low Constraint Stream Reach (Green Stream)(JC-31A) of Joshua's Creek will be incorporated into the development plan. No further site visits or analyses are required in these areas.	2.0

Table 13.1: Summary of EIR/FSS Recommendations and Mitigative Measures

Topic	Recommendations	Report Section
Joshua's Creek Medium Constraint Reach JC-7	The existing and proposed limits of the one Medium Constraint Stream (Blue Stream) of Joshua's Creek within the FSS Study Area are provided on **Drawings Joshua's Creek NHS-4**. Reach JC-7 will be retained as-is, with no modifications proposed as part of this EIR/FSS Addendum.	5.4
Joshua's Creek High Constraint Reaches JC-5 and JC-6	The existing and proposed limits of the two High Constraint Streams (Red Streams) of Joshua's Creek within the FSS Study Area are shown on **Drawings Joshua's Creek NHS-4** and **Joshua's Creek Core 11-NHS-3** and remain unchanged from limits presented in the *Final Joshua's Creek EIR/FSS* with the one exception noted at the interface between the Mattamy and Argo lands. Stream Reaches JC-5 will be retained as-is, with no modifications to the existing corridor. Stream Reach JC-6 is a 'high constraint stream with rehabilitation opportunities'. A restoration approach has been outlined for Reach JC-6 in association with the proposed road crossing location. The OMB Settlement established that aside from works completed by the Owners, such as trails and road crossings, any NHS enhancement measures would be the responsibility of the CH and/or the Town and not the Landowners. Potential opportunities for restoration along Reach JC-6 by others are noted in Table 5.11.	5.4.3 and 5.5.2 10.2
Trail System	In accordance with OPA 272 NOE4 and the North Oakville East Trails Plan, a Major Trail system has been sited adjacent to the Mattamy Phase 3 lands in the NHS north of the site and in the NHS in the southwest corner of the site. Section 6 outlines trail alignment, design and grading requirements. Timing windows shall be employed for vegetation removals to alleviate potential impacts to habitat. Erosion and sediment controls shall be employed to minimize the potential for impacts to vegetation communities and aquatic habitat. Additional scrutiny shall be given to areas of concentrated drainage.	6.2, 6.3 and **Drawings 7A, 7B, 7D,** and **7E**
Stormwater Management	The Mattamy Phase 3 lands will be serviced by three SWM ponds (Ponds 52, 54 and 56) located on adjacent lands. These SWM ponds will provide water quality and quantity control requirements as recommended in the *Final Joshua's Creek EIR/FSS*. Major and minor system design on the Mattamy Phase 3 lands has been coordinated with designs on adjacent lands. This EIR/FSS Addendum refines the major/minor system design based on the proposed Draft Plan of Subdivision and grading assessments.	7.1 7.8

Table 13.1: Summary of EIR/FSS Recommendations and Mitigative Measures

Topic	Recommendations	Report Section
LID Measures	The *Final Joshua's Creek EIR/FSS* evaluated and recommended various LID measure requirements. Consistent with that strategy, the design of the Mattamy Phase 3 development includes techniques such as designing grades to direct roof runoff towards lawns, side and rear yard swales, boulevards, parks, and other open space areas throughout the development, as well as increased topsoil depths to improve the potential for water storage and infiltration. Additionally, approximately 695m of swales associated with trail design will function as vegetated conveyance swales that will provide some infiltration and evapotranspiration.	7.1
Pond 50 Grading	While not located within the Mattamy Phase 3 lands, as per direction from the *Final Joshua's Creek EIR/FSS,* proposed grading of Pond 50 has been reviewed and revised to address agency comments regarding pond grading limits and adjacent NHS features.	7.11
Mattamy Phase 3 Grading Plan	A grading plan for the Mattamy Phase 3 Lands is illustrated on **Drawings 7A, 7B, 7D** and **7E**. In general, the proposed grading design will match the existing ground elevations at the NHS boundary, and will not require grading within the buffer (where available), with the exception of some localized areas where grading into the NHS is required for road crossings, trail design and localized gullies. Where grading is required within the buffers, it will be undertaken in accordance with the NOCSS recommendations. Grading in five areas of localized gullies has been reviewed and refined based on discussions with CH.	7.11
PSW 45 Water Balance	As per direction from the *Final Joshua's Creek EIR/FSS,* wetland water balance analyses were completed for PSW 45, located outside of the Mattamy Phase 3 lands, along Stream Reach JC-13. The analyses included characterization of the wetland, review of existing and future drainage patterns, and hydrologic and hydraulic analyses to assess potential changes to runoff volumes and frequent water levels in the wetland. Analyses concluded that based on the proposed SWM Plan, the features and functions of PSW 45 are expected to be maintained during the interim development scenario with the development of lands south of Burnhamthorpe Road.	7.10
Sanitary Servicing	Two sub-trunk sanitary sewers, extending north from the Dunoak and Bressa Phase 1 lands, are required to service the Mattamy Phase 3 Lands. The west sub-trunk, from the Dunoak Phase 1 lands, will service the west portion of the Phase 3 lands by gravity. The east sub-trunk will drain by gravity through the Argo (Joshuas Creek) lands to a new Regional pumping station within the Bressa Phase 1 lands adjacent to Pond 55, where it will be pumped westerly to the gravity sewer on Dundas Street. **Figure 9.2R** illustrates conceptual wastewater servicing.	9.2

Table 13.1: Summary of EIR/FSS Recommendations and Mitigative Measures

Topic	Recommendations	Report Section
Water Servicing	Extensions of external supply and transmission watermains from the adjacent Dunoak and Bressa Phase 1 lands are required to service the Study Area. **Figure 9.4R** illustrates conceptual water servicing.	9.3
Road Crossing of Reach JC-6	The assessment of the proposed road alignment completed as part of this EIR/FSS Addendum included the review of findings from the *Final Joshua's Creek EIR/FSS,* NOCSS management recommendations, existing topography, vegetation, aquatic and terrestrial habitats, SAR, surface water and groundwater conditions. In 2019, aquatic and terrestrial inventories and further geotechnical investigations were completed in the vicinity of the proposed road crossing. Two road crossing design options were assessed. The analyses concluded that road alignment Option 2 is preferred due to the shorter culvert length, and the 10m shift upstream and reduced road elevations to minimize impacts to the NHS including to the buffer to Core 11. **Table 10.1** lists the proposed crossing sizing. **Figure 10B** shows the crossing location. **Table 10.4** illustrates conformity with NOCSS requirements. Suggested monitoring of the future road crossing is included in Section 12.	10.0 12.0

Table 13.2: Final Joshua's Creek EIR/FSS Recommendations for EIR/FSS Addendums

***Final Joshua's Creek EIR/FSS* Recommendations (Section 13.1.2)**	**Where Addressed in the Phase 3 EIR/FSS Addendum**
a) Further discussions may be required with Coscorp (former Rampen lands), the owners of the lands to the west of the northwest portion of the Subject Lands to ensure that the location of 100m Linkage width along Reach JC-7 is coordinated between the two landowners.	The NHS boundary at the upper end of Stream Reach JC-7 was coordinated with Coscorp. Section 3.0 includes the NHS boundary reflecting the coordinated 100m linkage location.
b) Additional fisheries and aquatic information may be required for Reaches JC-6 and JC-7 as per the NOCSS EIR-FSS Terms of Reference, and in consultation with CH.	Additional fisheries and aquatic data were acquired for Stream Reaches JC-6 and JC-7 based on fieldwork completed in June and July 2019. The sampling methodology was developed through consultation with Conservation Halton staff. This information is summarized in Section 5.4, **Figures 5.1C and 5.1D**, and Appendix E-4.
c) The water balance requirements for PSW 45 will need to be determined.	PSW 45 water balance analyses were completed. See Section 7.10.
d) The design of SWM Ponds 48 and 50 will need to be confirmed. The current EIR/FSS has confirmed their general locations. Site visits have confirmed that the Pond 50 outfall can be located anywhere along its south boundary. The Pond 48 outfall requires refinement adjacent to PSW 45. Consultation with and review by CH of the configuration and alignment of the SWM ponds outlets will be required. The need for subdrains or perimeter drainage systems to direct groundwater around the ponds should be investigated at detailed design.	SWM Pond 50 design has been revised to address agency comments regarding pond grading and the adjacent NHS features. While some grading changes have resulted, it is generally consistent with the *Final Joshua's Creek EIR/FSS*. See Section 7.11. The SWM Pond 50 outlet location has been shown on **Figure 7.3BR**. The design of Pond 48 will be confirmed in a future EIR/FSS for the lands north of the NHS.
e) Consideration should be given to implementing the following pond design measure or measures for Ponds 48 and 50 on the basis that such measures will not impact the pond block sizing: ▪ 3m deep pools at the pond outlet; and/or, ▪ Pocket wetlands at the outfall to shade the pond effluent before discharge to Joshua's Creek.	Consideration of specific design measures for Ponds 48 and 50 will be confirmed in a future EIR/FSS Addendum for the lands north of the NHS.

***Final Joshua's Creek EIR/FSS* Recommendations (Section 13.1.2)**	**Where Addressed in the Phase 3 EIR/FSS Addendum**
f) Data acquisition and assessments in addition to the fisheries and aquatic requirements (bullet b) above) will be necessary in support of the road crossing of JC-6, related to: i. The crossing alignment and design, including crossing size and span width, taking into account the requirement for it to be three times the bankfull width, will have to be confirmed. In addition, an open-footed culvert is recommended to maintain fisheries potential. The road design requirements would be finalized at detailed design for these lands. ii. Conformity with NOCSS management strategy and recommendations for this reach will have to be confirmed, reviewing and addressing all items outlined in Section 10.2.	Additional data acquisition and assessments related to road crossing location and sizing are addressed in Section 10. This included geotechnical, fluvial geomorphology, grading, fish and wildlife passage, and updated hydraulic modeling. The assessment of two road crossing options was completed in support of the proposed road crossing location and sizing. Further details supporting the proposed road crossing design will be finalized at detailed design. Conformity with NOCSS management strategy is presented in **Table 10.4.**
g) Associated with the crossing of Reach JC-6, DFO should be contacted to determine their level of interest related to these activities and the need for any approvals from them.	Due to changes to the Federal Fisheries Act (effective August 31, 2019), there is no longer a self-assessment process for in-water works. At detailed design, a Request for Review would be submitted to DFO. This is in keeping with the various updates and changes to the act as of August 31, 2019. Further direction on DFO approvals has been outlined in Section 10.2.
h) Further SAR investigations related to bats will be required, including associated with the road alignment across Reach JC-6 and trail locations. Additional SAR investigations, and mitigation as necessary, and tree assessment related to trail locations will be required.	Additional SAR investigations were undertaken in April, June and July, 2019 related to trail alignment along Reaches JC-6 and JC-7 and as part of the assessment of the preferred crossing location. Results of the bat habitat assessment were provided to MECP. Upon review, MECP concluded that the proposed mitigation is sufficient to avoid Endangered Species Act permitting. Specific mitigation includes avoidance of vegetation removals during the bat roosting season, considered to be April 1st to September 30th. Vegetation removals should be scheduled between November to March. In addition to SAR bats, SAR investigations included a screening for preferred habitats of SAR species recorded previously within the municipality boundary. Breeding Bird surveys and incidental observations were used assess the potential for SAR to occur within the Phase 3 lands. Where SAR were confirmed or could not be confirmed but were considered to have potential to occur cautionary mitigation has been recommended. This includes timing windows for vegetation removals to avoid impacts to breeding birds, consistent with the Migratory Birds

***Final Joshua's Creek EIR/FSS* Recommendations (Section 13.1.2)**	**Where Addressed in the Phase 3 EIR/FSS Addendum**
	Convention Act. Vegetation removals are to be avoided between April 1 to September 30 (to meet requirements related to potential bat habitat, which also will address the MBC Act requirements). Isolation of work zones and avoidance of sensitive habitats has also been recommended to minimize the potential for impacts to individuals of SAR wildlife and plants if they were to occur during site alteration practices. These recommendations are consistent with those found in Section 5.1.2 of the Final EIR/FSS.
i) Finalization of the trail locations and associated grading and drainage designs will be required, along the NHS limit along Reaches JC-6, JC-7, and JC-13, as well as across Reach JC-6, following the recommendations in Section 6.3 and Appendix N-1, and in consultation with the Town and CH.	The trail location along Reaches JC-6 and JC-7 are addressed in Section 6.3. A tree impact analysis and protection plan has been prepared for the proposed trail alignment (Section 6). As per discussions with Town and CH, these alignments will be finalized and reviewed in the field with the agencies at detailed design. The trail location along Reach JC-13 will be revisited as part of an Addendum for those lands, which are to the north of the Mattamy Phase 3 lands.
j) There are several areas where grading has the potential to alter the regulation limit and/or affect future draft plans lotting/limits. Grading should be reviewed and revised in the following areas: <u>Grading related to Trails</u> • Surrounding Cross Section 17-17 (Drawing 7A) • Adjacent to and east of Cross Section 16-16 (Drawings 7A & 7B) extending to the crossing of JC-6 • Surrounding Cross Section 20-20 (Drawing 7B) • Surrounding Cross Section 30-30 (Drawing 7B) • Adjacent to and extending southeast of Cross Section 13-13 (Drawing 7B) <u>Grading related to Ponds and Valley</u> • Between Pond P48 and JC-13 (Drawing 7B) • On the north side of JC-6 between Cross Section 19-19 and the crossing (Drawing 7B) • Adjacent to the northwest corner of Pond P50 (Drawing 7B)	<u>Grading related to Trails</u> Grading related to trails has been updated to confirm no impact to the NHS limit. See Section 6.3 for discussion of revised trail grading. See Section 7.11 and Table 7.11 for discussion of grading within the localized gullies. The proposed grading does not affect the NHS boundary or the regulation limits. **Drawings 7A** to **7D** and **8A** present the new trail grading. <u>Grading related to Ponds and Valley</u> Grading related to SWM Pond 50 has been updated to confirm no impact to the NHS limits. See Section 7.11. **Figure 7.3BR** and **Drawing 7B** present revised Pond 50 grading. The design and grading of Pond 48 will be confirmed in a future EIR/FSS

***Final Joshua's Creek EIR/FSS* Recommendations (Section 13.1.2)**	**Where Addressed in the Phase 3 EIR/FSS Addendum**
• Additional grading detail around P50 (western edge and south eastern corner near the outfall) is required to confirm that the proposed pond grades can be achieved without adjustment to the regulation limit (Drawing 7B) <u>Grading related to NHS Crossing</u> • Grading associated with the trail, which may result in an adjustment to the top of bank downstream of the new JC-6 crossing	Addendum for the lands north of the NHS. <u>Grading related to NHS Crossing</u> The NHS crossing alignment, grading, and associated trail grading have been updated. See Section 6.3 and Section 10 for details of the proposed NHS crossing. The proposed grading does not affect the top of bank downstream of the new JC-6 crossing. **Drawing 7B** and **Figure 10B** present the revised road crossing and associated trail grading.
k) The need for restoration/plantings and monitoring requirements associated with trails as outlined in Sections 6.3 and 12.3.4 must be incorporated into the EIR/FSS.	A detailed landscape naturalization restoration plan will be required at detailed design and prepared to the satisfaction of the Town and CH, following CH guidelines for all areas disturbed during trail construction. Direction provided in Section 6.3.4 of the *Final Joshua's Creek EIR/FSS* should be incorporated into the restoration plan.
l) The habitat and SAR protection and mitigation requirements as outlined in Section 5.1.2 and Appendix N-2, for all trails and any other construction activities within the NHS will need to be determined.	Consultation with MECP confirmed that timing windows are to be employed for vegetation removals to mitigate impacts to potential SAR bat habitats. Delineation of disturbance limits/work areas are to be defined on construction drawings and on the Subject Lands. Tree protection measures are to be implemented to restrict construction activities from protected/sensitive habitats. Precautionary mitigation recommendations for potential SAR are provided in Appendix R-4 and the comprehensive list of recommendations for the trail and Reach JC-6 crossing are listed in section 5.1.2 and Appendix N of the *Final Joshua's EIR/FSS*.
m) Watermain and wastewater crossings are required under Joshua's Creek Reaches JC-6. In order to minimize the impact on the creeks, the services crossings will be located in the proposed road allowances with details provided at the detailed design stage.	Watermain and wastewater crossings under Reach JC-6 are discussed in Section10.5. **Figure 10.1R** depicts the proposed service crossings of the creek.

***Final Joshua's Creek EIR/FSS* Recommendations (Section 13.1.2)**	**Where Addressed in the Phase 3 EIR/FSS Addendum**
n) Review of location, ownership, maintenance access, drainage, and setbacks associated with proposed retaining walls shown on Drawings 7A and 7B. The risk due to failure of the proposed retaining wall adjacent to the Condominium block should be assessed.	Grading, including retaining walls, associated with the lands north of the NHS will be provided in a future EIR/FSS Addendum. There are no retaining walls proposed on the Phase 3 lands.
o) As part of the EIR/FSS Addenda for Mattamy lands, revisit 100yr and Regional Storm peak flow rates on River 1 Reaches 1 &2 (Main Joshua's Creek) from Section 11.024 to upstream of Burnhamthorpe Road and compare to NOCSS unit area flow rates times drainage area. If required, update hydraulic modeling with consistent and appropriate flow data to ensure that the extent of the existing and proposed condition floodplain (including impacts from the proposed JC-6 crossing) and the associated regulated setback will be maintained within the proposed NHS.	Discussion of the 100yr and Regional Storm peak flow rates is presented in Section 5.5.
p) The location of the Core 10 to JC-36 clean water pipe will be finalized through discussions with Argo, as part of Dunoak Phase 2 detailed design.	The location of the JC-36 clean water pipe will be determined as part of the Dunoak Phase 2 detailed design.