Mimico Creek Stabilization - Project File Report

Mimico Creek Erosion Control, Rena Road and Etude Drive to Derry Road East
Mississauga, Ontario
Project # TPB198091

Prepared for:

City of Mississauga

300 City Centre Drive, Mississauga Ontario L5B 3C1

3/1/2022

Wood Environment & Infrastructure Solutions, a Division
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3/1/2022

Greg Frew, P. Eng.
Stormwater Drainage Engineer
Infrastructure Planning and Engineering Services Division
Transportation and Works Department
City of Mississauga
300 City Centre Drive, Mississauga Ontario L5B 3C1

Dear Mr. Frew,

Please accept this Project File Report for Mimico Creek Erosion Control Project. This report has been developed to document the planning and consultation process for Mimico Creek Erosion Control Project in accordance with the Schedule 'B' Municipal Class Environmental Assessment process.

Please contact the undersigned if you have any questions.

Sincerely,

Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited

M.A.Talpur

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1.0 Introduction

1.1 Background/Purpose

Urban Creeks and valleys are important elements of the urban landscape. In addition to stormwater conveyance, they provide terrestrial and aquatic habitat and social uses such as trails, and enjoyment of greenspace. The City of Mississauga (the City) conducts regular erosion assessments of all of its watercourses, and the reaches of Mimico Creek West Branch and East Branch that comprise the study area have several locations of significant active erosion. The City has assigned a high priority for erosion mitigaion on these reaches.

Wood and Aqualogic were retained by the City to evaluate the existing condition of the study area, to determine the processes causing the erosion problems, generate alternatives to mitigate the problem, and recommend a preferred alternative that best meets the requirements of all stakeholders.

1.2 Study Area

The West Branch study area extends from the CNR located approximately 300m north of Rena Road to approximately 650m south of Rena Road (**Figure 1**). The East Branch study area extends from Etude Drive to Derry Road East, which is a distance of approximately 800 m (**Figure 2**). For the purposes of fisheries habitat investigation, the creek reaches will also be investigated approximately 50 m upstream and 200 m downstream of the channel reaches.

The City is the primary landowner for both of these study areas, with the exception of the following:

- private properties located at the upstream end of the West Branch and the section between Goreway Drive and Derry Road for the East Branch, and
- TRCA owned lands immediately on the north and south sides of Etude Drive as well as immediately to the west of Goreway Drive within the East Branch Study Area.
- The TRCA properties are under a management agreement with the City of Mississauga, Parks Department. For any works on these properties, a permission to enter will be required from the TRCA.

Figure 1: Mimico Creek West Branch (Rena Road)

Figure 2: Mimico Creek East Branch (Etude Drive to Derry Road East)

1.3 Class Environmental Assessment (EA) Process

This study is following the process outlined in the Municipal Engineers Association (MEA), Municipal Class Environmental Assessment (October, 2000, as amended in 2007, 2011, and 2015). The Municipal Class EA process outlines mandatory principles, details of project consultation and technical requirements. A Municipal Class EA is considered a legal document which outlines project recommendations and next steps, based on a technical assessment, to the public and to technical practisioners and agencies, who have to review and implement the findings of the study.

Municipal Class EA undertakings are classified using 'Schedules' which depend on the potential scope of the solutions and the environmental impact (ref. Municipal Engineers Association, Municipal Class Environmental Assessment, October, 2000, as amended in 2007, and 2011). Where the various potential solutions for a given study require different project Schedules, the most rigorous Schedule is applied. This study is being conducted as a 'Schedule B' undertaking. Depending on the nature of the proposed works, some components may be of a repair and maintenance nature. These works may be classifed as Schedule A or Schedule A+.

1.4 Project Team

The Wood/AquaLogic project team for this Class EA Study was made up of the following discipline areas:

Wood Environment and Infrastructure Solutions

- Project Management
- Water Resoureces Engineering
- Environemntal Assessment
- Consultation and Engagement
- Aquatic Biology
- Terrestrial Biology
- Archaeology
- Geotechnical Engineering

AquaLogic Consulting

- Fluvial geomorphology

2.0 Baseline Inventory / Existing Conditions

Establishing the exiting conditions/baseline inventory within the Study Area involves assessing the condition and performance of the existing environment and systems within the Study Area. For the current study, specific assessments were completed for the following: stream morphology, hydrology, hydraulics, terrestrial resources and species at risk (SAR), fish and fish habitat, archaeological resources, and soil conditions. These specific assessments were completed as a requirement of the Municipal Class EA process, because they either influence the existing erosion problem or are required to understand potential impacts or opportunities related to mitigation alternatives.

2.1 Stream Morphology

2.1.1 Purpose

Fluvial geomorphology, or stream morphology, involves the detailed study and understanding of natural watercourses as well as altered systems such as urban creeks. Development and man-made alterations to the watersheds may have negative effects to the watercourse systems, as a result of changing the hydrologic and hydraulic regime of the runoff. Changes to the flow regime, typically increases in flow and velocity, may lead to changes include bank erosion, flooding, and valley wall failure. The purpose of the assessment is to determine the impacts on the watercourse, and to guide the selection of a preferred alternative for stream restoration, balancing the objectives of cost associated with watercourse management, and objectives of protecting public safety and property.

2.1.2 Background Information

The primary sources of background information for the study reaches of the East and West Branch of Mimico Creek are the Toronto Region Conservation Authority Etobicoke and Mimico Creeks Watersheds Technical Update Report (2010) and the MMM Group Ltd. Final Report, Hydrologic Modelling, Mimico Creek (2009). Additional background information is listed in the references section of the report.

2.1.3 Policy

The creek falls within the Regulation Limit defined by the Toronto Region Conservation Authority (TRCA), and in accordance with the Conservation Authorities Act—Ontario Regulation 166/06, a permit would be required from TRCA for any alterations to the Mimico Creek channel (i.e. change and realign existing creek).

2.1.4 Methodology

To characterize the existing conditions of the channel, and observe trends of change, both desktop and field assessments were undertaken.

2.1.5 Results/Recommendations

2.1.5.1 Watershed Characterization

East Branch

The Mimico Creek East Branch is a 3rd order watercourse with a topographic drainage area of 23.6km^2 (OMNRF 2019) to the downstream study area limits at Derry Road. The watershed falls within the Peel Plain physiographic region (surficial clay dominant soils), with a small part of the uppermost catchment in the South Slope physiographic region (surficial clay-loam dominant soils). Approximately 15% of the watershed is in the City of Mississauga with the remainder in the City of Brampton. The watershed is 89% urbanized (OMNRF 2019), dominated by industrial, rail yard, low density residential, and highway corridor land use. Vacant, hydro corridor, golf course, natural valley corridors, some remnant agricultural, and Professors Lake (25ha) make up the remaining open space components of the watershed, with some additional minor forested pockets. Based on the level of existing urbanization there are no major land development plans that would significantly modify future land use within the catchment. Infill intensification and site redevelopment are assumed to be generic to future development.

Most of the urbanized area predates contemporary stormwater management with the exception of infill industrial sites and the Highway 407 corridor. Toronto Region Conservation (2010b) reporting notes that quantity control and some combined quantity-quality control practices were implemented within the Brampton component of the watershed in the 1980s. Three dry ponds, identified as online (TRC 2010a), and 6 wet ponds exist through the watershed in Brampton, and 4 ponds (3 dry, 1 wet) exist specifically along Highway 407. Prior to urbanization and the enclosure of minor tributaries, the watercourse was potentially a 4th or higher order feature. The lack of stormwater management and the low surface drainage density will typically result in flashy rainfall runoff response, with magnitude relative to high impervious land use. Channel forming flow conditions will typically happen several times a year while infrequent events will compound impacts with artificially high-volume flows as compared to predevelopment.

West Branch

The Mimico Creek West Branch is a 2nd order watercourse with a topographic drainage area of 6.8km^2 (OMNRF 2019) to the downstream study area limits below Rena Road.

The watershed falls within the Peel Plain physiographic region, with a small part of the uppermost catchment in the South Slope physiographic region. Approximately 6% of the watershed is in the City of Mississauga with the remainder in the City of Brampton. The watershed is 88% urbanized (OMNRF 2019), dominated by low density residential, with industrial, rail line, and highway corridor components. Hydro corridor, natural valley corridor, and a minor vacant component make up the majority of remaining land use. Based on the level of existing urbanization there are no major land development plans that would significantly modify future land use within the catchment. Infill intensification and site redevelopment are assumed to be generic to future development.

Most of the urbanized area predates contemporary stormwater management and only a few recent small stormwater ponds are seen related to industrial site plans and the Highway 407 corridor (2 dry, 2 wet). The lack of stormwater management and the low surface drainage density will typically result in flashy rainfall runoff response, with magnitude relative to high impervious land use. Channel forming flow conditions will typically happen several times a year while infrequent events will compound impacts with artificially high-volume flows as compared to predevelopment.

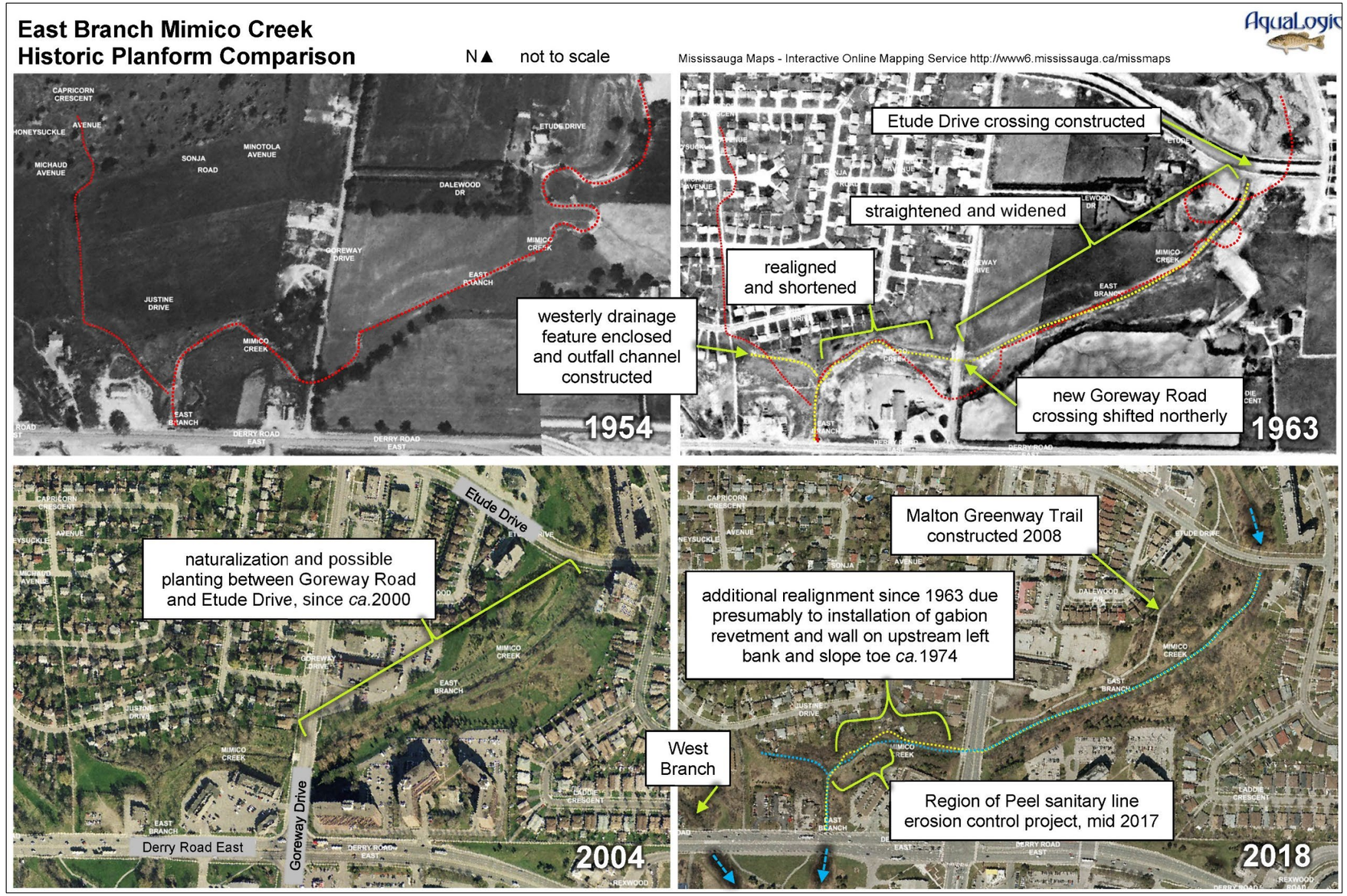
2.1.5.2 Watercourse and Sub-Reach Characterization

East Branch

Historic Summary and Channel Evolution

A historic planform analysis was done using available air photos from 1954 to present. Time step comparisons reflecting distinct condition changes from 1954, 1963, 2004, and 2018 are shown in **Figure 3**. The advance of surrounding urbanization and engineered channel realignment replacing the already altered agricultural alignment are apparent in the 1963 time step. In the 2004 air photo, the degree of naturalization along the channel is beginning to be more distinct than other intervening year photos also reviewed. Some tree planting also seems likely to also have occurred in the ca. 2000 period. Moderate levels of incision and widening are also deemed to have occurred since original channelization and alignment alterations. By 2018 the entire riparian corridor is naturalized and adjacent trail development is seen (as constructed in 2008). Other notable details are annotated on the comparison figures.

Figure 3: Mimico Creek East Branch Historic Planform Comparison



2.1.5.3 Sub-Reach Identification

The East Branch study area consists of the primary tributary channel, a storm outfall channel, and one road crossing. The primary tributary has general characteristics that are consistent along its entire length but also has specific characteristics that can be used to identify sub-reaches. The westerly storm outfall channel also has specific sub-reach characteristics. Sub-reaches have been determined based on characteristics of morphology, vegetation, geology, and flow changes. Detailed listing of features and detailed erosion site descriptions will be discussed in the subsequent section.

From Etude Drive downstream to Goreway Drive the 1st sub-reach of the primary tributary has an approximate centre line length of 491m. This sub-reach falls completely within the City of Mississauga's Malton Greenway Park. As described in the historic summary, this sub-reach has a continuous riparian zone of naturalized conditions but with discontinuous bank erosion that has resulted in localized vegetation losses. Vegetation along the top of bank is a dense and variable mix of groundcover, shrub thicket, and young forest cover. Channel gradient and morphology due to past alteration and subsequent incision and widening is also generally consistent between sub-reach limits. Exposure of hardpan till along the interface between the bed and the lower bank face is seen at multiple points within sub-reach limits. The veneer of bed pavement sediments is similar throughout the sub-reach, as defined generally by gravel-cobble riffles and silt to sand in long intervening runs. Bank angles are generally steep, and entrenched depth up to 2m results in no continuous terrestrial access along the low flow. Immediately below Etude Drive the easterly valley wall, up to 5m high and 75m long, is coincident with the creek, resulting in enhanced erosion and weathering up the slope face. Storm outfalls within the Etude Drive crossing and in daylight locations along the sub-reach arguably result in incremental modifications to flow regime. Despite the cumulative flow contributions, the overriding consistency of vegetation, morphology, and geology, are deemed to be the key factors defining the sub-reach.

The Goreway Drive crossing defines the next sub-reach and is a 33m long open bottom bridge structure with two internal storm outfall connections in opposite walls. The creek low flow is biased to the upstream right-hand wall which has a poorly founded gabion wingwall extension on the upstream side. The upstream low flow left bank within the crossing is a point bar deposit along the entire length of the structure. The storm outfall in the upstream left wall results in a small entrenched channel across the point bar.

The 3rd sub-reach of the creek is defined by 79m of low gradient channel below Goreway, ending at the upstream end of recent erosion control works on the upstream right bank. This sub-reach has generally similar conditions to sub-reach 1 except for some variance in cross-sectional geometry. The upstream right bank is consistently

steep with the lower bank face almost completely void of vegetative cover, while the upper bank face appears to be discontinuously stabilizing with newer growth. The upstream left bank is generally at a lower angle and lower height and has better cover and rooting reinforcement. The upstream left essentially connects to a small flood plain terrace while the upstream right acts as a fully confined bank up to 1.75m high. A woody debris jam across the low flow and a partially failed large willow tree cantilevered over the full bank to bank channel height are distinct mid sub-reach features. Occasional riffles with long intervening runs along the bed profile are similar to sub-reach one. The upstream left valley wall swings towards the creek at the downstream end of the sub-reach and the transition into the coincident creek bank helps to define the start of the next sub-reach.

The next sub-reach is dominated by a 136m long vegetated boulder revetment on the upstream right bank, constructed in 2017 to protect a parallel alignment of a Region of Peel sanitary sewer. The revetment vegetation consists of continuous and dense willow cuttings within boulder face voids and along the top of bank. Opposite the revetment, the upstream left bank is coincident with the valley wall. The upstream left bank/slope at the apex of a slight northerly meander is protected by a gabion revetment, as noted in historic conditions discussion, which also surrounds a storm outfall that serves the local adjacent residential area. The 5m high slope up from the meander apex, over a distance of approximately 40m, is also noticeably steeper than the remainder of the valley wall beyond the apex. Based on the slope confinement and height of opposite bank erosion works, this sub-reach is highly entrenched for frequent event flows. Mixed age forest and shrub cover on the upstream left slope is generally good but many trees are leaning towards the creek. Branches and cuttings from the adjacent tableland residential lots are also seen dumped on the slope face. Channel gradient appears moderately steeper than upstream and some minor bar development is seen. The downstream end of the sub-reach is defined by the confluence of the west outfall channel from Justine Drive which also correlates approximately to the creek turning away southerly from the coincident valley wall.

The 5th sub-reach is a short 10m section where the protected sanitary sewer passes under the creek and both banks are protected by vegetated boulder revetment over the sewer.

Sub-reach 6 is defined by 67m of moderate gradient channel above Derry Road. Grown over and failed remains of single gabion rows define parts of each bank, based on former straightening. Bank/slope height on the upstream left, up to 3.5m, is higher than upstream right, possibly due to past filling and grading. The upstream left bank/slope is also covered by more mature trees, many of which are leaning and showing slight

cantilevered curvature. The low flow has mixed bed conditions with random rip-rap stone from failed gabions added to native materials.

The west outfall channel is defined by two sub-reaches. The upstream sub-reach is a 33m long by 2.5m high gabion wall lined moderate gradient section that starts at the outfall face of a 1650mm Ø storm sewer. A mix of rip-rap and native materials lines the bed between gabions. The downstream sub-reach is a naturalized moderate gradient section with lower bank height than the entrenched gabions. Past widening and some development of sand-gravel bars and moderate bank angles provides some terrestrial corridor along the low flow.

2.1.5.4 Erosion Site Priorities and Feature Inventory

Erosion sites, fish barrier locations, terrestrial corridor barriers, and associated storm outfalls, bridge features, and existing erosion control treatments have been inventoried and summarized. **Figure 4** to **Figure 12** show annotation of feature details with pictures of existing conditions for the priority locations. Erosion site priorities have been identified based on existing City of Mississauga assessment documentation and based on field work judgement of current and potential future conditions. Figures are also annotated with fish passage barriers and terrestrial corridor barriers

Four locations have been identified as 'high priority' erosion sites on the East Branch.

Starting upstream, the first location is the downstream face of Etude Drive which has gabion wingwalls extended from crossing wall limits. The base or toe of each gabion has broken open due to rusted wire and stone displacement has occurred. Further failure of the wingwalls could result in expansion scour and lateral flanking of the crossing limits. The low flow is already at wall limits so there is no riparian width leading into the crossing which thus also results in no continuous terrestrial corridor. The original gabions were installed ca. 1963 with the crossing.

The next location is just downstream of the first on the upstream right along the coincident valley slope toe and channel bank. Channel bank erosion has resulted in additional slope failure up the slope face with associated loss of thicket vegetation. The exposed scar is subject to additional weathering from exfiltration and freeze thaw influence due to the height of exposure and lack of rooting reinforcement and surface groundcover.

The next erosion site priority is the upstream left side gabion wingwall leading into Goreway Drive. The gabion is slightly undermined and the base is sitting on soft saturated sediment that was easily probed and dislodged during field work.

The next site is in sub-reach 3 at the apex of a northerly trending meander, downstream of Goreway and opposite recent erosion control works on the opposite bank that

protect a Region of Peel sanitary line. The slope face is over steepened, protected by an existing gabion revetment, and has a storm outfall headwall in the middle of the gabions. A base row of gabions acting as a foundation for the revetment is failing along the low flow due to rusted wire. Scour below the storm outfall apron also appears to have likely occurred and displaced whatever treatment may have pre-existed as connected to the channel. This may have been enhanced by incision happening along the tributary itself. The original works were installed ca. 1974.

Figure 4: Mimico Creek East Branch – Priority Sites - Key Map

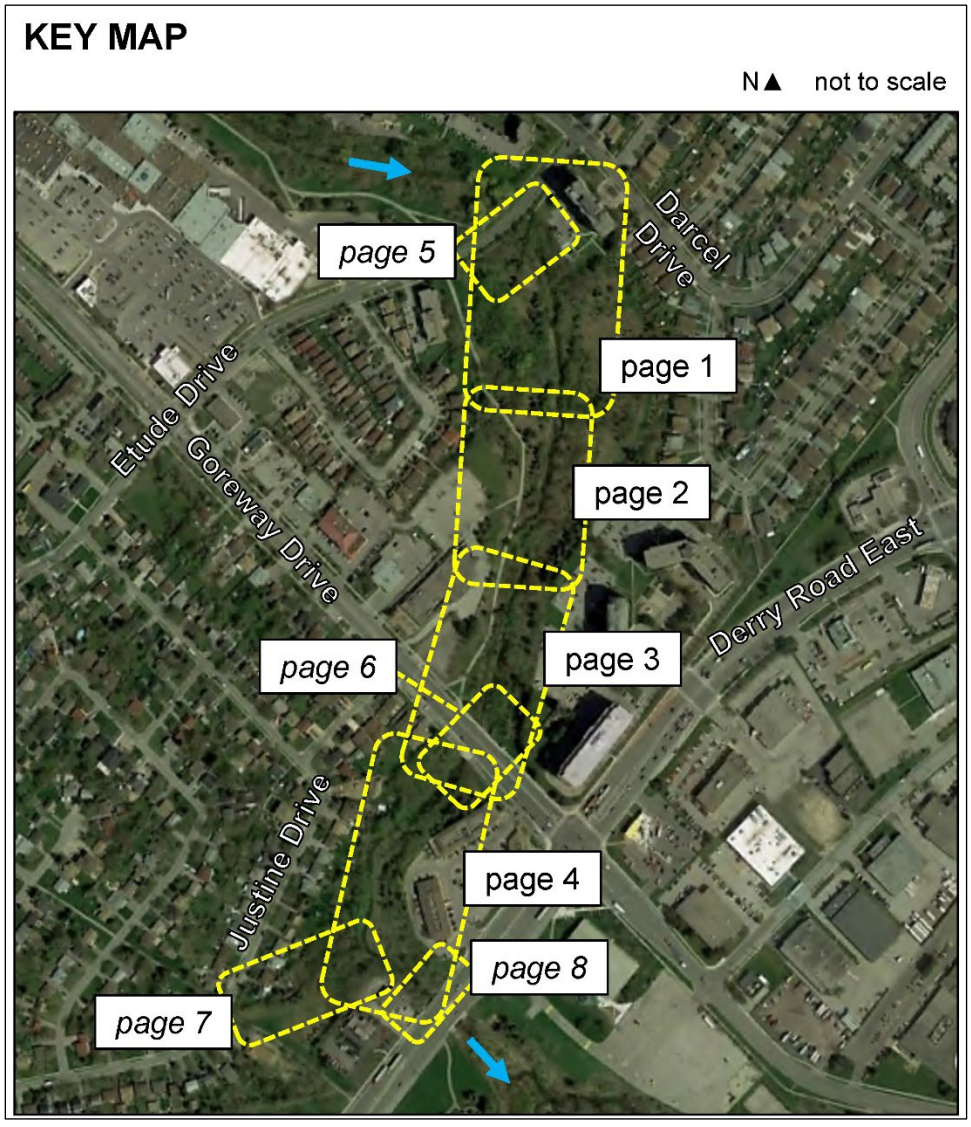


Figure 5: Mimico Creek East Branch – Priority Sites – Map 1

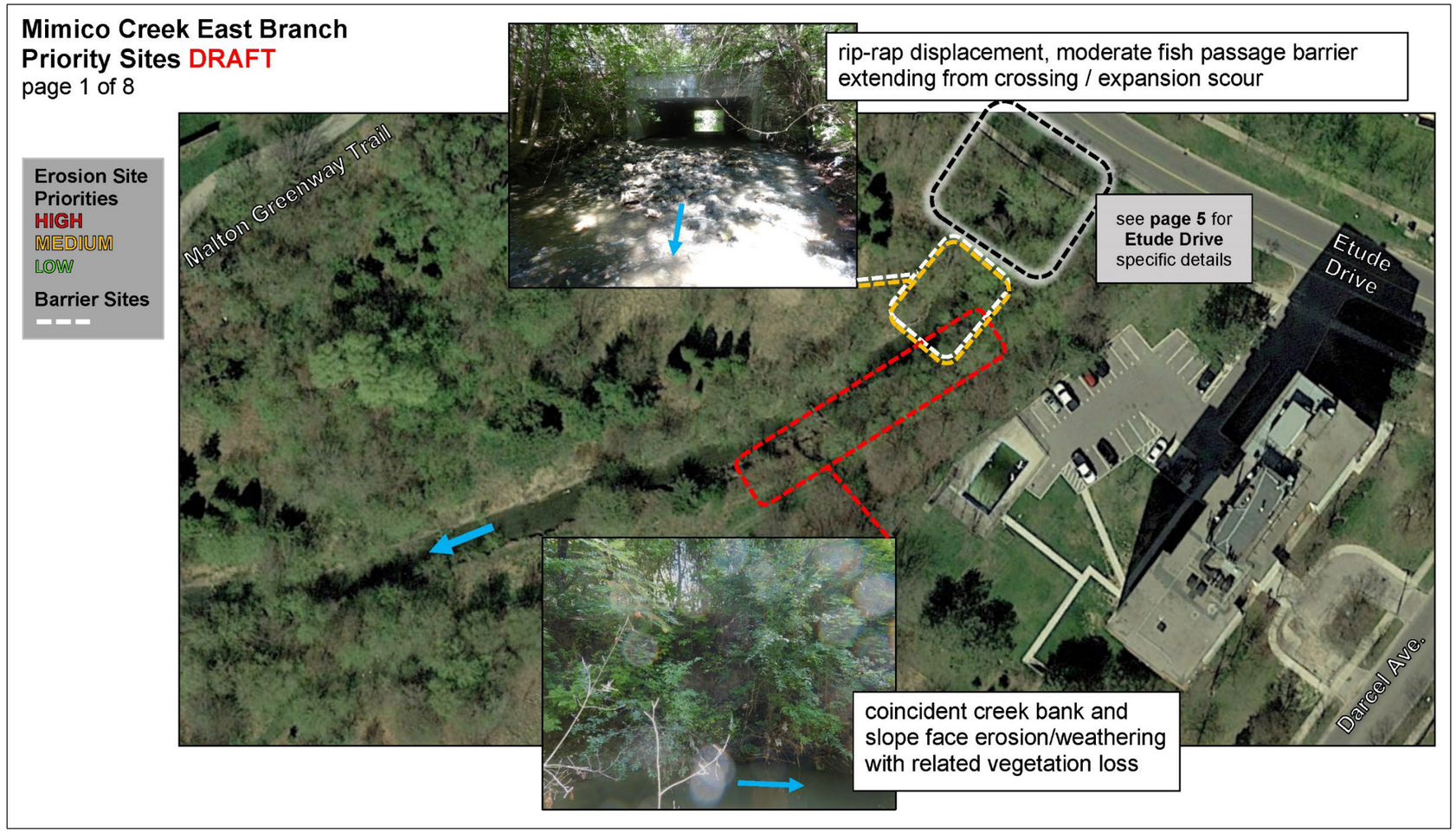


Figure 6: Mimico Creek East Branch – Priority Sites – Map 2

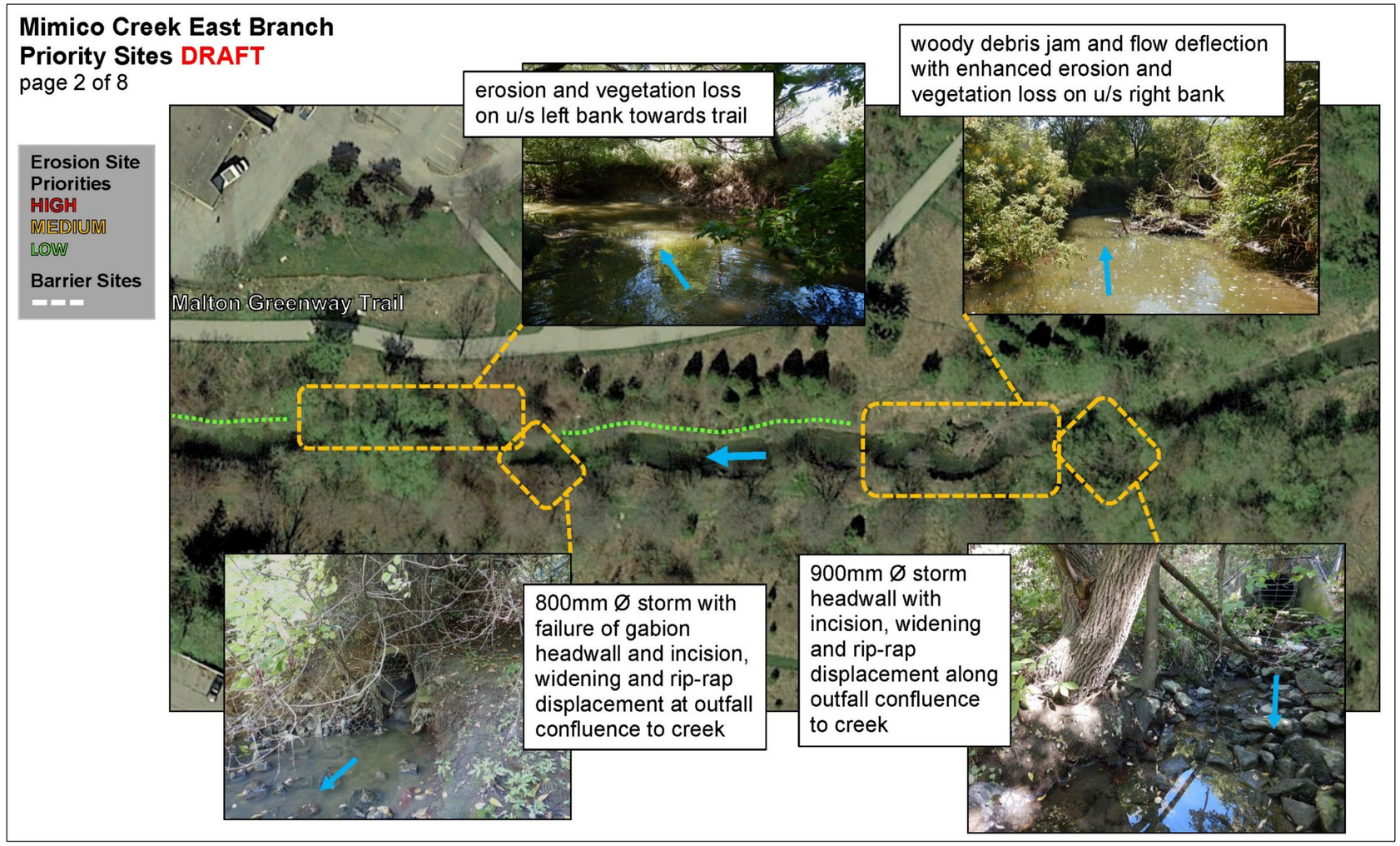


Figure 7: Mimico Creek East Branch – Priority Sites – Map 3

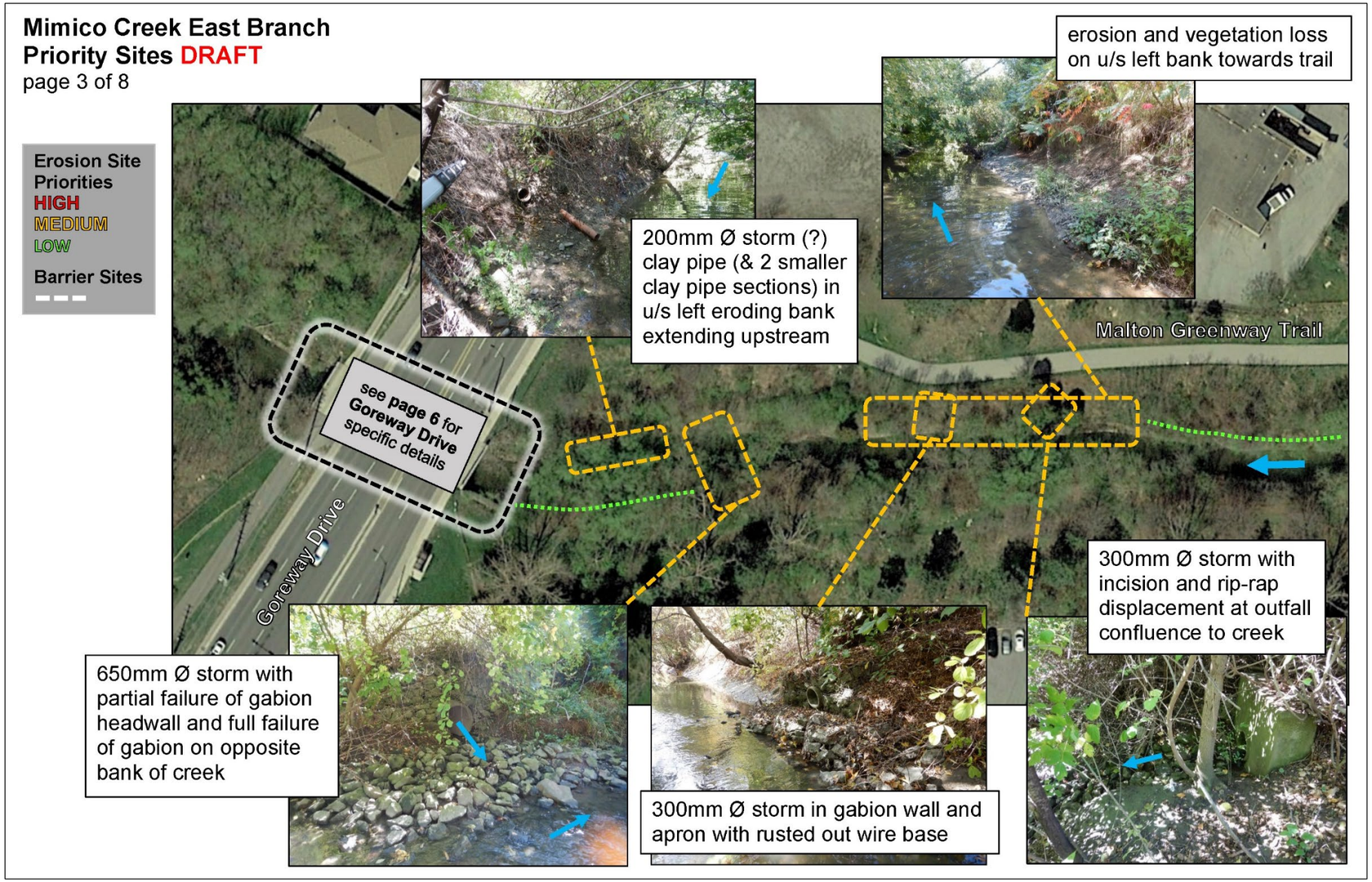


Figure 8: Mimico Creek East Branch – Priority Sites – Map 4

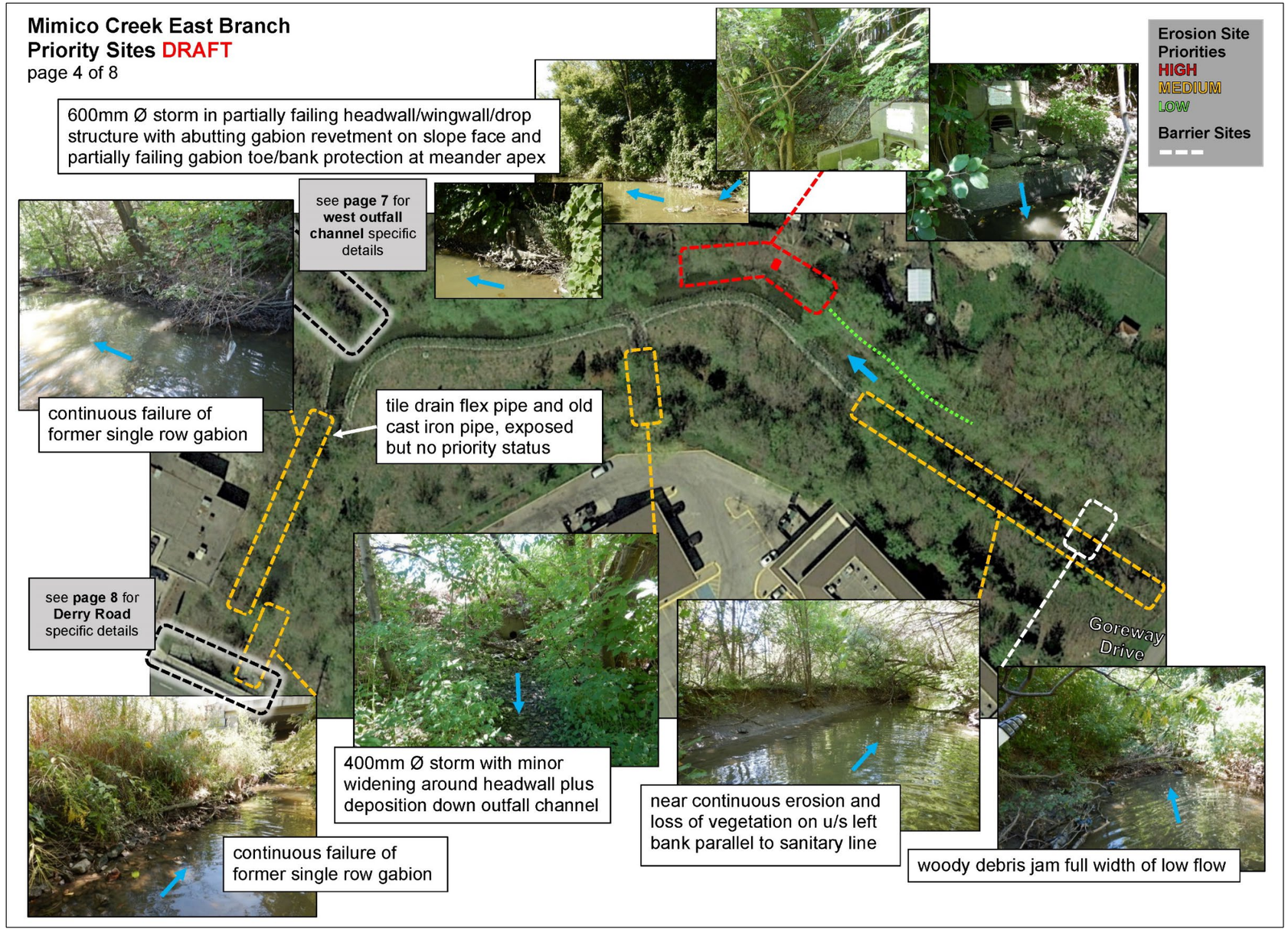


Figure 9: Mimico Creek East Branch – Priority Sites – Map 5

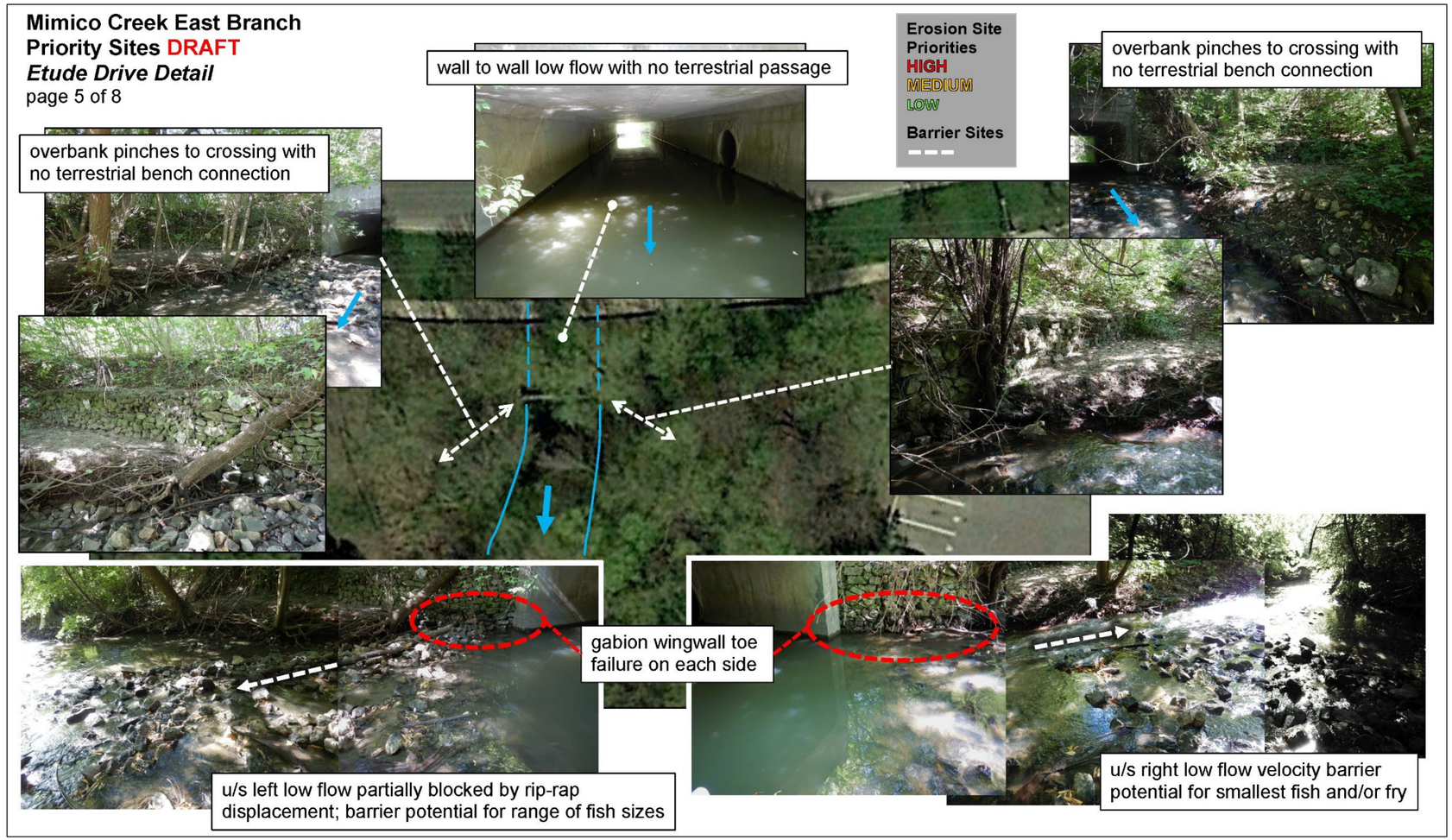


Figure 10: Mimico Creek East Branch – Priority Sites – Map 6

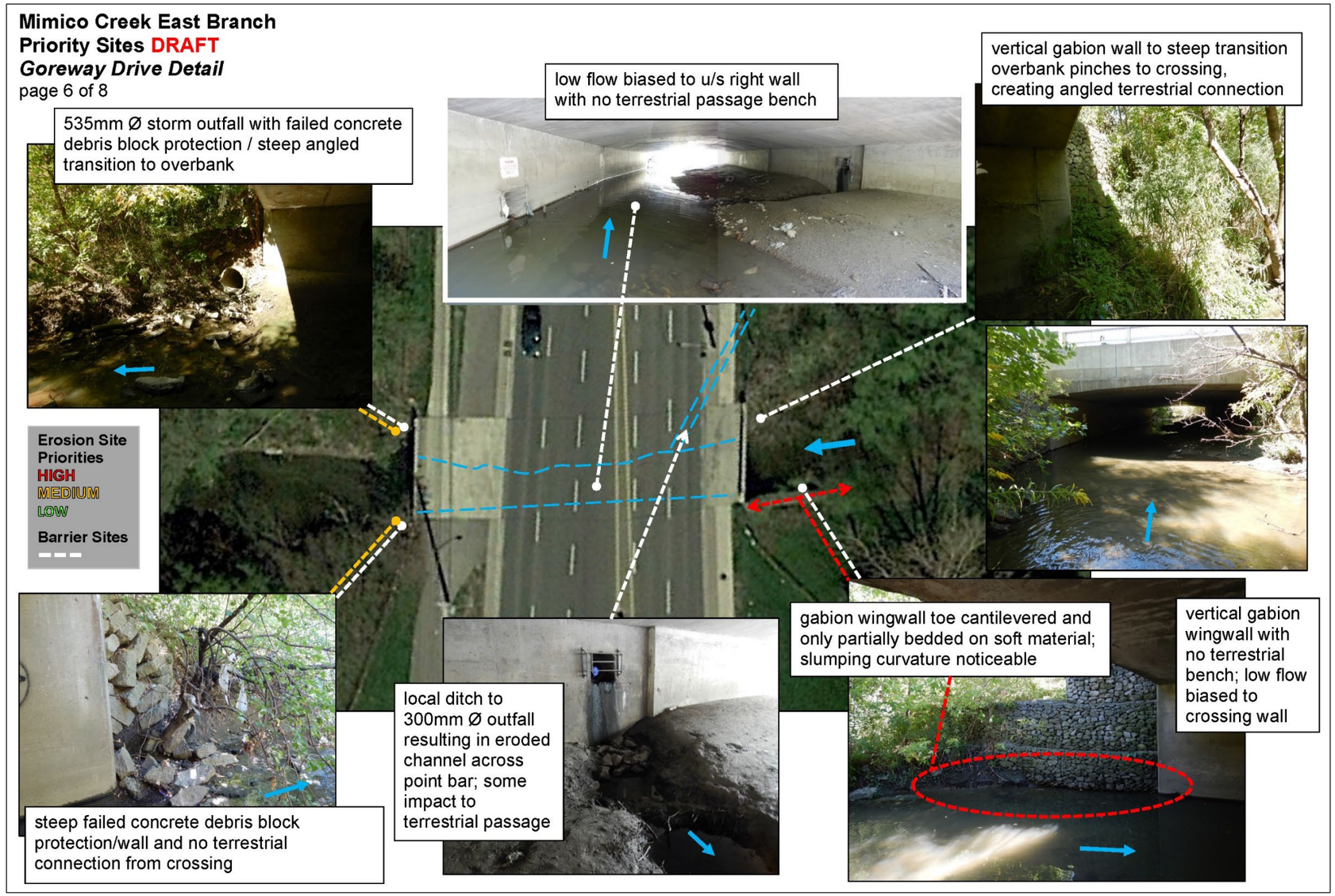


Figure 11: Mimico Creek East Branch – Priority Sites – Map 7

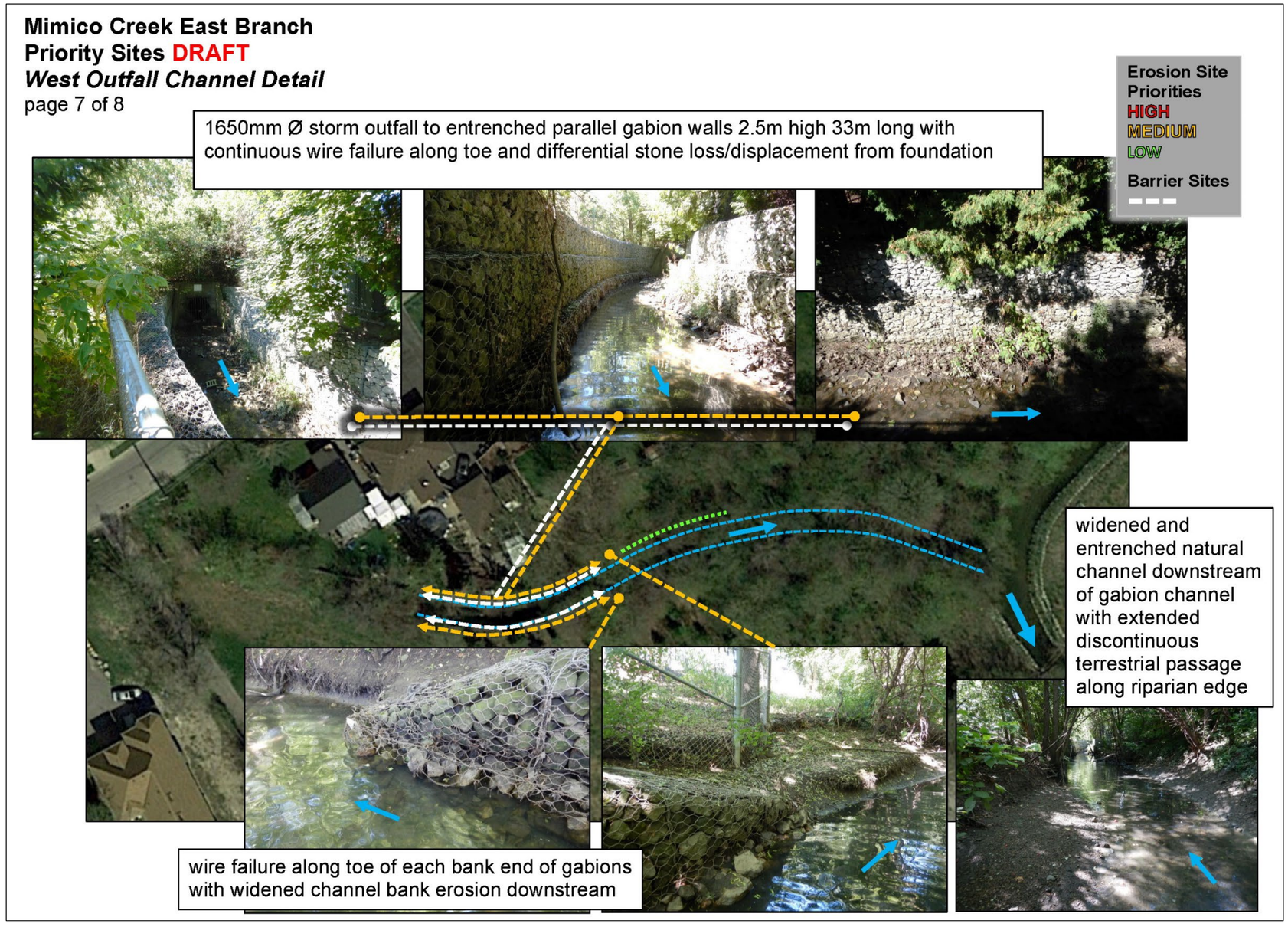
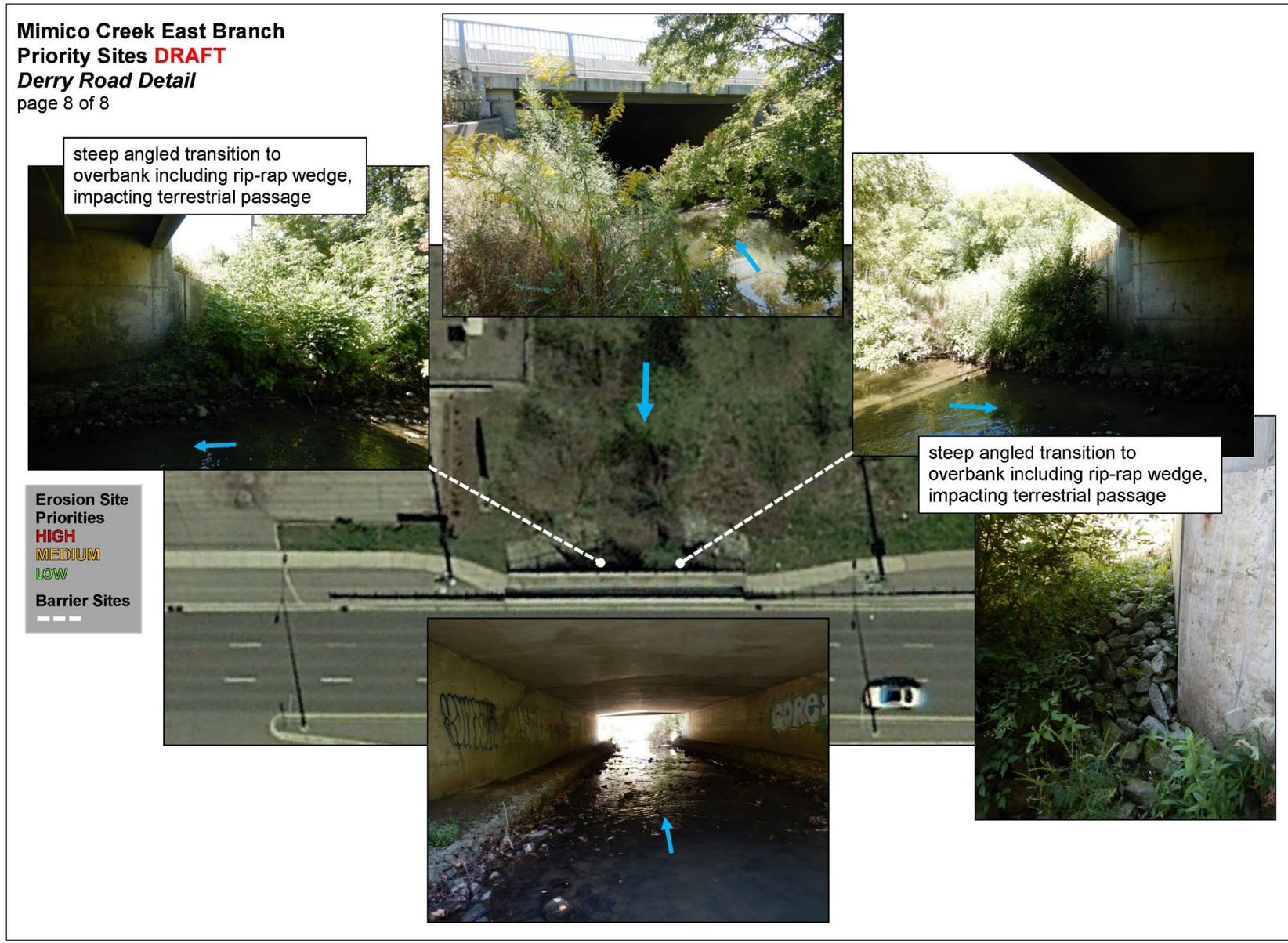


Figure 12: Mimico Creek East Branch – Priority Sites – Map 8



West Branch

Historic Summary and Channel Evolution

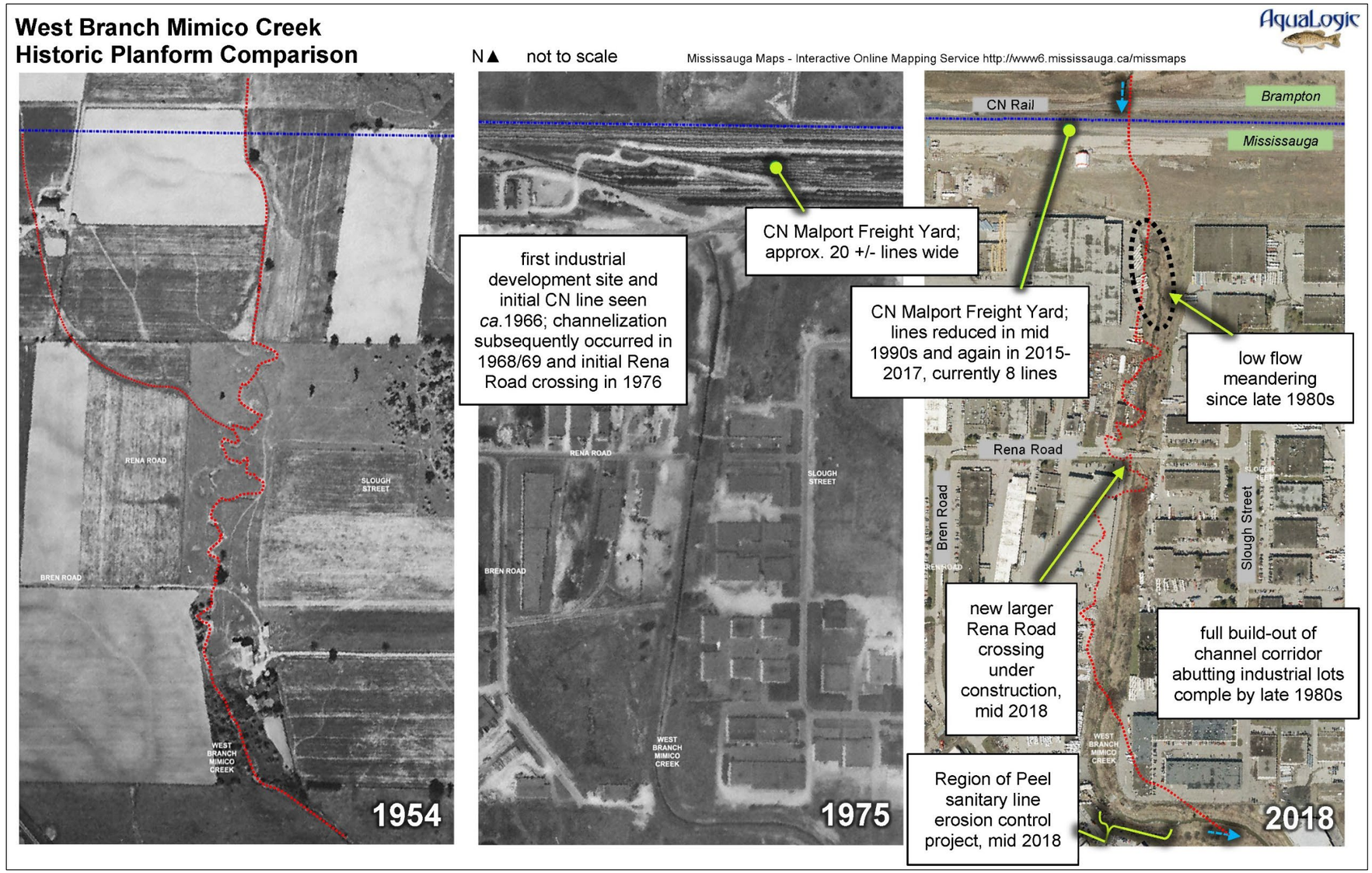
A historic planform analysis was done using available air photos from 1954, 1975, and 2018. **Figure 13** shows agricultural conditions in 1954 and the results of engineered channelization, rail corridor development at the upstream limits, and the start of surrounding industrial development by 1975. Major changes along the corridor are not apparent over subsequent decades and by 2018 the only localized distinct change in planform pattern is meander development below the rail line outfall. Some subtle or muted low flow meandering appears to be occurring or starting in other areas in current times. Moderate levels of incision and widening are also deemed to have occurred since original channelization. The degree of naturalization along the channel has been gradual and it appears that some relatively recent tree planting has occurred in the upstream sub-reach. Other notable details are annotated on the comparison figures.

Sub-Reach Identification

The West Branch study area consists of the primary tributary channel and one road crossing. The primary tributary has general characteristics that are consistent along its entire length and is arguably a single sub-reach except for the interruption of the Rena Road crossing which thus creates three sub-reaches total. Detailed listing of features and detailed erosion site descriptions will be discussed in the subsequent section.

From the upstream limits CNR crossing downstream to Rena Road the corridor was historically straightened over 285m, and the active channel has entrenched and widened into native till bed geology. Entrenchment depth is on average about 1-1.5m before side slope definition, with confinement of approximately 2.5m specifically at one erosion site apex near the upper end. Dense groundcover to shrub thicket riparian zones has developed naturally and there is some evidence of recent past tree planting on the east side, setback by several metres from the tributary (rodent guards seen on small diameter trees). Some localized meandering of about one and half channel wavelengths, near the upstream end, adds moderate diversity. Gradient is low due to the engineered construction and two grade control structures built online. Bed profile development is limited to interruptions from the grade structures which includes localized rip-rap that appears to be part of the original construction. Rip-rap used for one storm outfall connection and the upstream limits crossing is also seen. Moderate exposure of gravel and cobble occurs in the meandering at the upstream end. The majority of the reach is a continuous run channel typology over a silt to gravel pavement on dense silt-clay dominant till.

Figure 13: Mimico Creek West Branch Historic Planform Comparison



The Rena Road crossing was reconstructed in the summer of 2018. It consists of a 19m long open bottom bridge structure and an approximate 30m length of channel work (AECOM 2017). Pre-existing storm sewers connect to the channel within the crossing walls. The channel work is defined on plans with granular to 150mm river stone and some boulders in the range of 200mm to 300mm. The constructed work appears however to be end to end of consistent river stone in the 100-300mm diameter range with no granular and some larger boulders in the 500-700mm range. Just upstream of the downstream limits, a boulder weir has been specifically installed across the low flow, approximately 3.5-4m wide.

The third sub-reach is approximately 450m long from the end of Rena Road work to the downstream study limits. This sub-reach is similar to the first with a generally straight, entrenched, and widened active channel. Some muted meander development appears to be starting near the downstream end with lateral adjustment and bar formation. Invasive canary grass riparian areas are more distinct in this sub-reach than the upper reach. One online drop structure contributes to long low gradient intervening runs with lack of distinct bed features. Slightly higher amounts of gravel and cobble materials are seen in the reach compared to the upper, as sourced from dense till seen discontinuously along the bed and banks. The quantity of stone material increases towards the downstream end and a few boulders are also exposed in the low flow. Random concrete debris and rip-rap associated with the drop structure are also present.

2.1.5.5 Erosion Site Priorities and Feature Inventory

Erosion sites, fish barrier locations, terrestrial corridor barriers, and associated storm outfalls, bridge features, and existing erosion control treatments have been inventoried and summarized. **Figure 14** to **Figure 18** show annotation of feature details with pictures of existing conditions for the priority locations. Erosion site priorities have been identified based on existing City of Mississauga assessment documentation and based on field work judgement of current and potential future conditions. Figures are also annotated with fish passage barriers and terrestrial corridor barriers.

Two locations have been identified as ‘high priority’ erosion sites on the West Branch.

The first high priority erosion site is the first westerly meander apex downstream of the CN crossing outfall armour stone wall and plunge pool. The channel meanders easterly below the plunge pool and then turns back westerly into the corridor side slope, resulting in a coincident bank and slope erosion scar with vertical exposure and vegetation failure into the channel. The exposed scar is subject to additional weathering from exfiltration and freeze thaw influence due to the height and lack of vegetative protection.

The second high priority site is just above the downstream limits of the study area. It consists of a storm outfall and headwall structure that has been exposed perpendicular from the creek alignment through meander movement and widening. The pipe is exposed for approximately 3m laterally, vertically over its full 1.2m diameter, plus bedding depth of approximately an additional metre, and with loss of some sloping cover above the pipe. The northerly wingwall, or downstream pipe face left, has failed and rests on the creek bed. The splash apron of the headwall has also been partially undermined and is separated from abutting walls and is angled into the low flow.

Figure 14: Mimico Creek West Branch – Priority Sites – Key Map

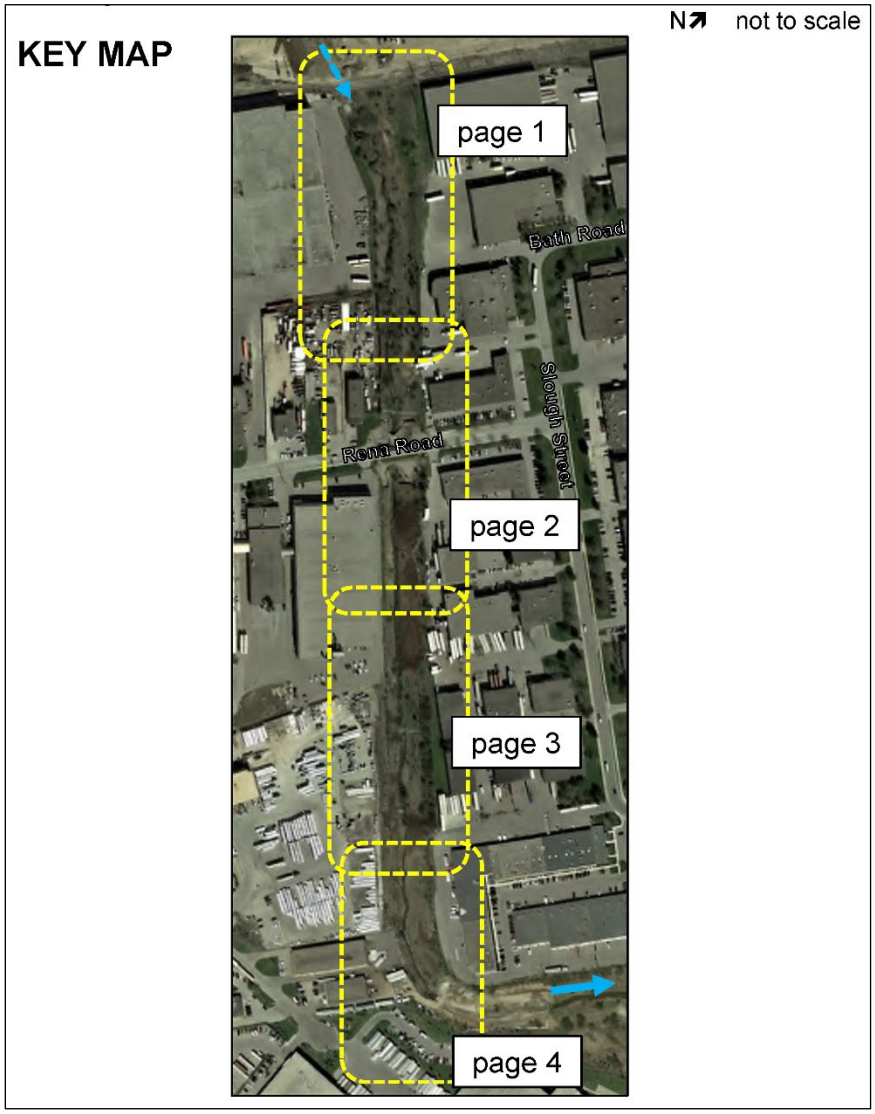


Figure 15: Mimico Creek West Branch – Priority Sites – Map 1

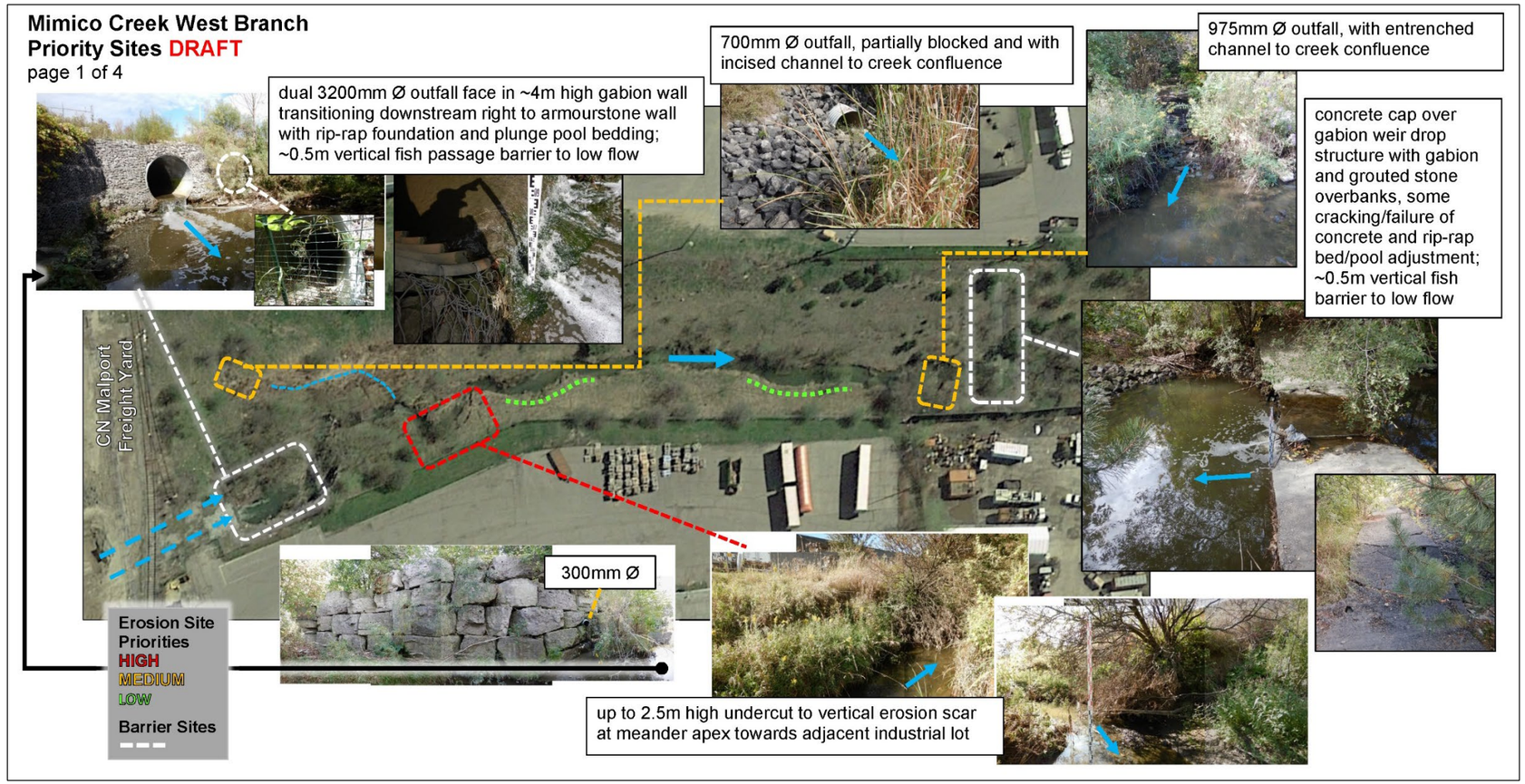


Figure 16: Mimico Creek West Branch – Priority Sites – Map 2

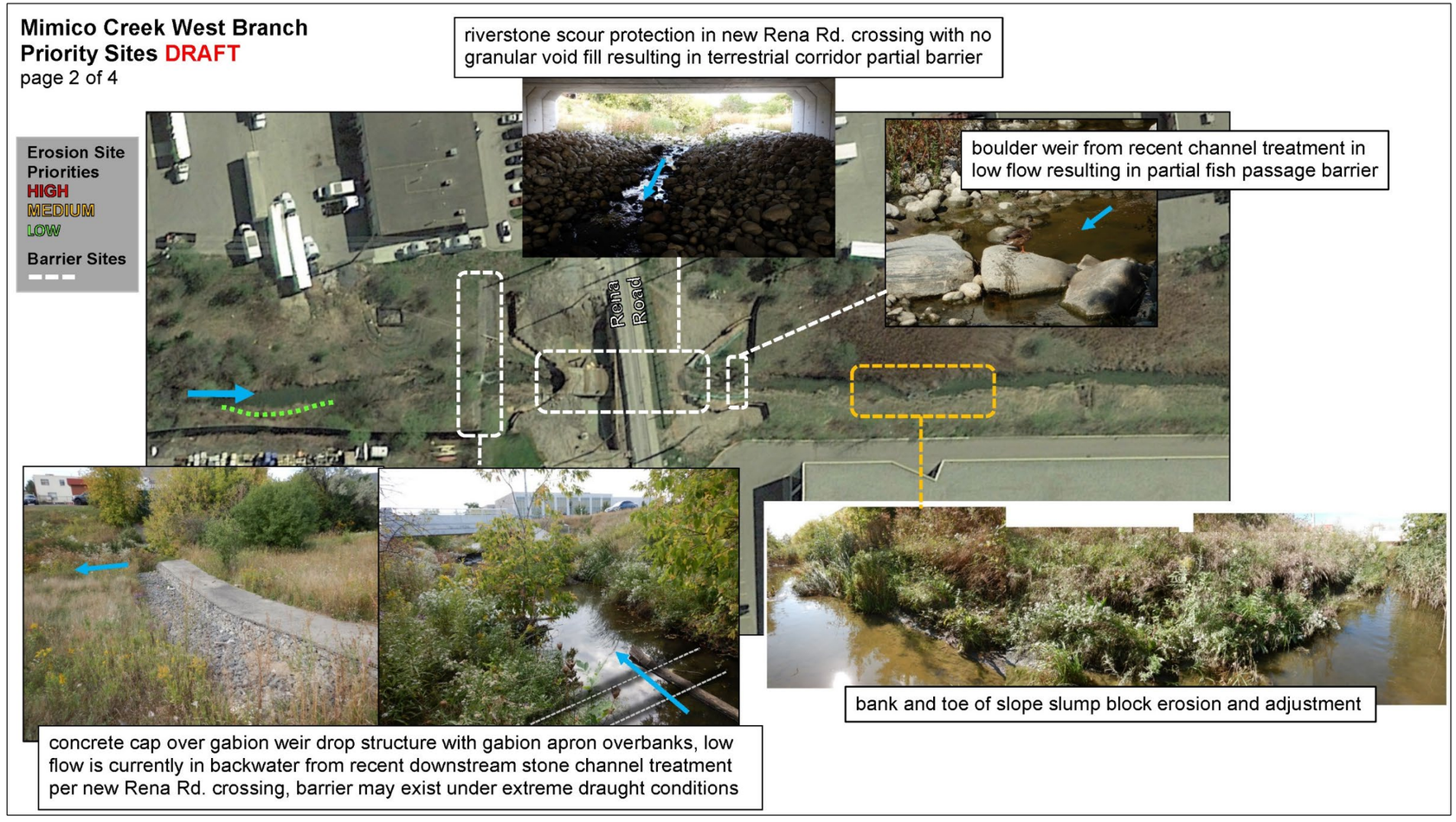


Figure 17: Mimico Creek West Branch – Priority Sites – Map 3

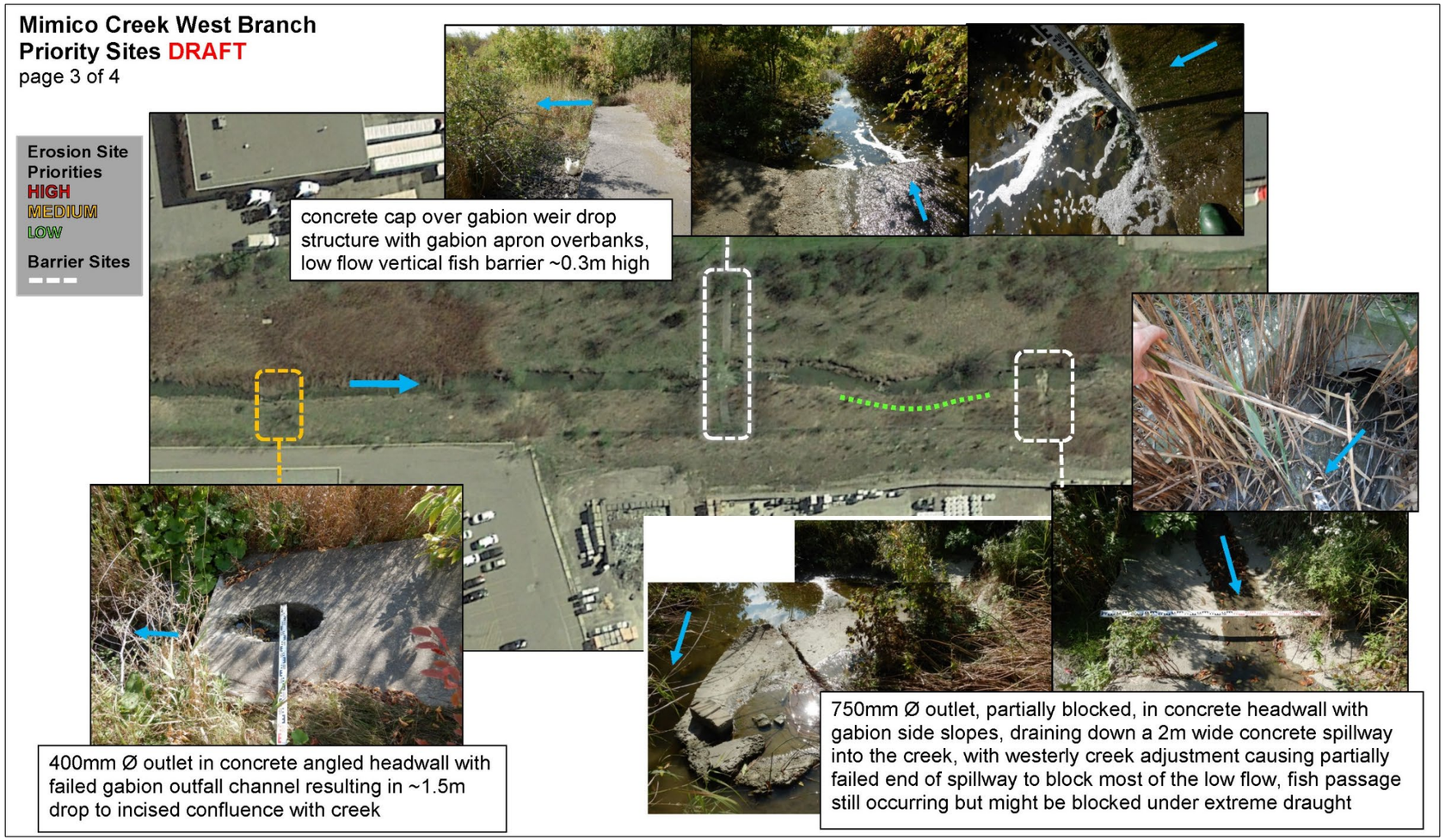
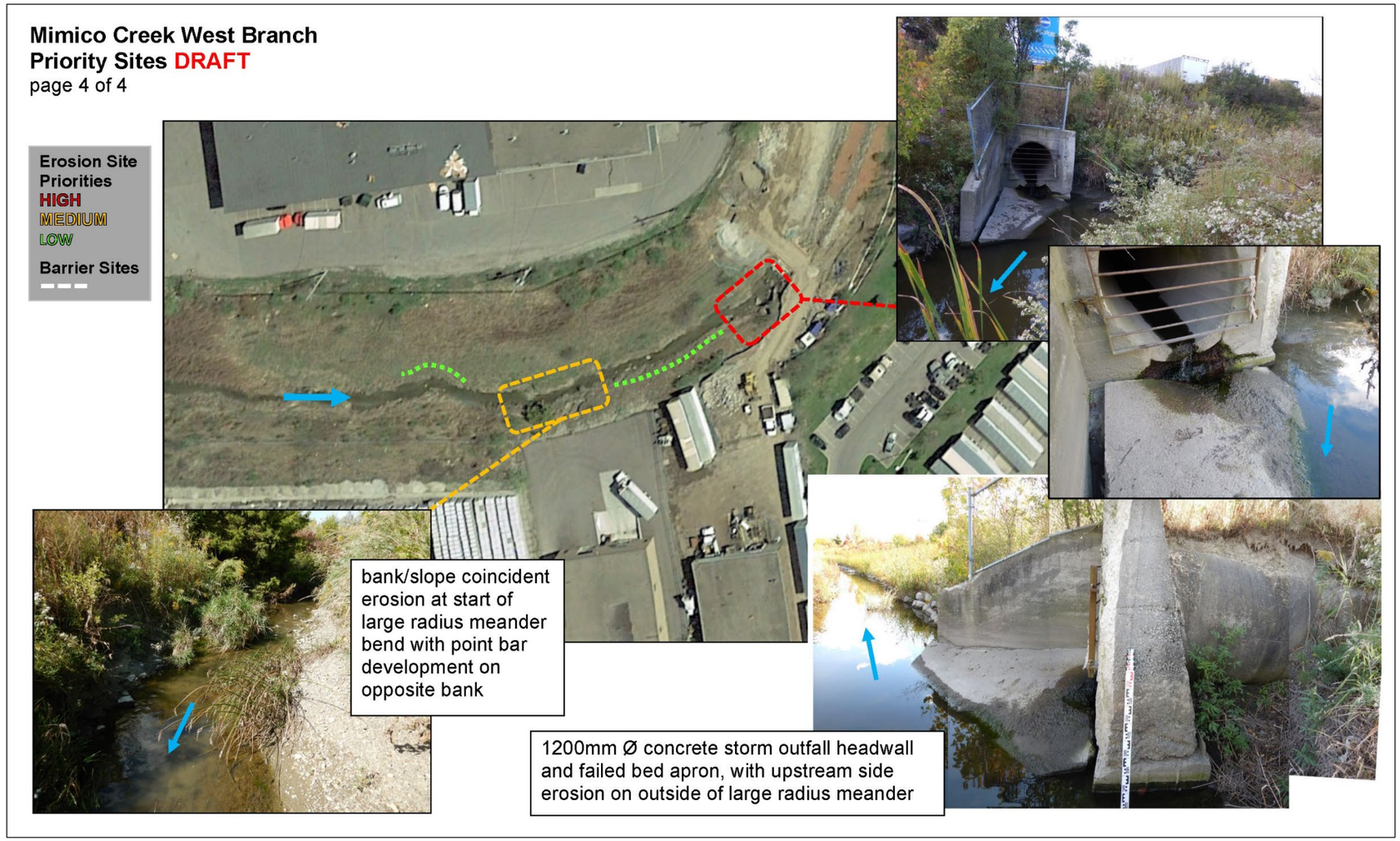


Figure 18: Mimico Creek West Branch – Priority Sites – Map 4



2.1.5.6 Channel Forming Flow

In addition to hydrology and hydraulics available from existing studies and modelling, active channel flow regime and erosion threshold analysis has been done based on channel sensitivity of cross-section surveys corresponding to the high priority erosion sites in each study reach. Project target establishment of the 100-year event design standard for erosion control means that information gathered on channel forming flow and high frequency erosion threshold flow is for information only. As a result, exhaustive geomorphic measurement and field work was not necessary because this assignment is not a realignment natural channel design-based approach.

Channel forming debris flow lines, matted vegetation lines, and well-defined scour lines in undercuts or exposed bank faces were used as field indicators to identify cross-section width. Channel geometry was measured laterally at each cross-section and the local longitudinal profile was shot using bankfull and channel bed indicators, and subsequently checked with available topographic mapping. Channel bed substrates were measured through random-step Wolman pebble counts and recorded using the Wentworth sediment distribution scale. Estimates of cohesive clay-silt percentages were made with due consideration of variable hardpan dense till, loose, and composite mixture conditions.

Geomorphic open channel flow models were created for each cross-section location. Each model required input of the channel bed substrate data, cross-section dimensions, gradient, and bank geometry, for calculation of a range of hydraulic geometry, flow condition, and sediment transport results. Modelling tests were done for each cross-section and erosion indicators and thresholds were reviewed.

Subsequent checks were done to determine the critical stability threshold discharge. This discharge represents the typical point at which channel instability is deemed to begin with rising flow stage and rising discharge, and conversely when instability stops with falling flow stage and falling discharge. Iterative flow stage adjustments were made in cross-section models until appropriate stability criteria were judged to have been achieved over the primary shear stress and velocity threshold tests, with secondary checks made of stream power and Froude number. **Table 1** presents the threshold criteria used for this analysis based on small watercourse channel typology which displays some influence of vegetation control.

Table 1: Critical Stability Threshold Criteria

	Low Flow Morphology		
	Riffle	**Run**	**Pool / Glide**
Semi-alluvial Firm to Dense Till Channels	D_{84} pavement	D_{84} pavement or vegetation control*	D_{100} pavement or vegetation control*
Alluvial Cohesionless Channels	D_{50} pavement	D_{50} pavement or vegetation control*	D_{84} pavement or vegetation control*

*vegetation control criteria varies depending on vegetation type and density note: step-pool and cascade-step-pool channels require case by case study

The second-row criteria are considered conservative in this study given the presence of a thin veneer of heterogeneous bed sediments and introduced rip-rap in both systems. Cohesive sub-pavement bed and bank toe conditions would arguably lean to the first-row criteria but it is this material that is weathering, winnowing, and adjusting to produce the suspended and bed load material defining the profile conditions. A mix of low flow morphology types, wide ranging sediment sizing, and degrees of partial vegetation control exist over the scale of surveyed sections.

As already noted, average density vegetation control criteria for channel banks are identified as 40N m^{-2} for shear stress and 1.2m s^{-1} for channel velocity. Higher thresholds for vegetation control are viable at approximately 80N m^{-2} and 1.8m s^{-l} under very high levels of vegetative encroachment. Channel run and pool sections that have partial vegetation control but are not judged to be fully protected are deemed to have thresholds of approximately 0.4-0.7m s^{-1} for velocities acting on pure sand to graded sediments, with shear stress values approximately 10-15N m^{-1} being acceptable, especially when deep deposits and bedload of sub coarse sand sized sediment forms banks and channel pavement and sub-pavement (individual sand particle size values would be too low to be practical). More cohesive gradations of clay-silt or gradations that include some gravel with sand are deemed to have thresholds of approximately 30N m^{-2} and 0.8m s^{-1} respectively for shear stress and velocity. Firmer cohesive clay-silt will have higher thresholds depending on degree of density with 40N m^{-2} and 1.0m s^{-1} being realistic yet conservative (ranges summarized in Fischenich 2001). Particle sizing tests for granular materials were done with the Hjulstrom transport function for velocity acting on very coarse sand and larger particles, and with the Newbury-Shields relationship for shear stress acting on gravel and larger particles. Several technical

references vary on specific erosion threshold levels for sediment sizing, mixes of sizes, imbrication influence, vegetative influence, entrenchment risk, and duration of flow effects. Notwithstanding the multiplicity of methods, the noted targets have proven to be well integrated and practical over several similar studies and modelling efforts. Best efforts to judge the convergence of thresholds with parallel review of stream power and sub or supercritical flow conditions is also required. Judgement is used to identify channel condition as having 1) dynamic stability, 2) cautionary dynamic stability, or 3) potential instability. The adjustments necessary to identify the threshold or to achieve stability reflect bump ups from cautionary dynamic stability to full dynamic stability and from unstable to cautionary dynamic stability or full dynamic stability, with an averaged final condition judged to be a realistic stable regime in the watercourse.

Existing conditions cross-section models at active or channel forming flows are appended, followed by the adjusted models showing stability conditions. The conditions seen in modelling are not uncommon in urbanized systems. Channel adjustment activity and erosion scarring are evident but the active channel indicators are not highly adverse. Altered flow regime due to urbanization results in active channel flows occurring multiple times per year. Over time as channels adjust the indicators adjust and improve in step as a channel seeks equilibrium. Adverse erosion occurs on a more episodic basis under less frequent peak flows, after the timing and response cycles of frequent flows have already altered the active channel through incision and widening. As a result, three of the six surveyed sections are deemed to be stable under active flows. Specifically, sections 3 and 4 on the East Branch and section 2 on the West Branch meet criteria for both stable vegetation control and partial vegetation control, plus D84 stability on the channel bed. Adjustments were made for East Branch sections 1 and 2 and West Branch section 1 to lower velocity and shear stress to the targets for partial vegetation control. Defined erosion exposure in the cohesive but weathered bank materials at these locations reflects less than full vegetative cover, therefore the slightly more conservative ‘partial’ threshold was used instead of the average density vegetation control criteria. Active channel flow on the East Branch was determined be approximately 3.2cms and on the West Branch 1.8cms. Adjustments in East Branch sections 1 and 2 were made of 15 and 20cm lower flow stage which resulted in a threshold flow reduction to 1-1.3cms. Adjustment in West Branch section 1 of 17cm lower stage resulted in a threshold flow of 0.9cms.

2.1.5.7 Fish Habitat Integration Objectives

The primary opportunities for fish habitat improvement as determined through initial project discussion of goals and objectives include: 1) use of natural material treatments for erosion control that add physical aquatic environment complexity, and 2)

identification of instream fish passage barriers. Secondary opportunities that could also be considered when working within an existing watercourse include: 1) enhancing bed profiling through grading and/or adding substrates which will facilitate improved spawning, and 3) enlarged plan and cross-section geometry specifically for pools, that adds refugia and wetted perimeter habitat volume. Secondary opportunities have not been explored in detail because they have not been identified within the core goals and objectives.

2.1.5.8 Natural Material Treatments

The 100-year event erosion potential indicator results from HEC-RAS modelling show velocities in the range of 1.03 - 2.54 (East) / 1.54 and 4.40 (West) (m/s) and shear stress in the range of 8.66 - 53.54 (East) / 18.37 – 186.16 (West) (N/m^2). The velocity range is relatively high and the range supersedes the shear stress range in terms of erosion resistance requirements for treatment sizing. The short list of preferred natural material treatment solutions is limited to large stone size ranges with complimentary vegetation. Wall types such as armour stone, live crib walls, and gabions are deemed less desirable than revetment types such as vegetated rock revetment or reinforced earth revetment with stone foundation, or hybrid combinations thereof.

Based on widespread success and ease of construction in numerous other projects throughout the GTA and Central Ontario, the vegetated rock revetment is deemed as the preferred first option. Boulder sized round to subangular shaped stone will be specifically required as the primary revetment material for a rock revetment. Channel and valley slope geometry constraints, plus the need for slope stability design integration, will result in site specific use of steeper treatments and armour stone with vegetative softening is deemed as the second preferred alternative.

Native groundcover seeding in void spaces filled with topsoil, shrub planting along the top of works and in void spaces, live willow staking and pole installation in voids and specifically armour stone gaps, and ground/rock spreading vine cover, are the proposed vegetative components of revetment and wall construction. This seeding and planting will add vegetative softening, biotechnical reinforcement, and overhanging canopy, shade, and organic input along the riparian zone.

Proposed treatments should mimic the look and function of stable reference conditions that already exist in other locations of the study area and should represent enhanced channel edge conditions from typical eroded exposure. After completion of erosion control, sedimentation will decrease and interstitial space habitat will typically increase along and within the low flow.

The integrated works will replicate natural channel condition stability and should be viewed as self-mitigating and self-compensating in terms of fish habitat.

2.1.5.9 Barrier Removal

The cumulative positive effects of barrier removal are identified as universal targets in numerous GTA watershed reports. Toronto Region Conservation notes approximately 80 full or partial barriers in the Mimico Creek system below the main branch confluence of the East and West Branches (TRC 2010a). Four barriers have been previously mapped within the East Branch study reach and 6 barriers within the West Branch. There are an additional 15 mapped barriers on the West Branch between the downstream study area limit and the confluence with the East Branch. Previous mapping also suggests that Etude Drive on the East Branch and the CNR rail culvert on the West Branch are full barriers preventing passage of all species, while the remaining barriers are mapped as partial and impact passage by a mix of jumping and non-jumping species. Etude Drive is identified as a second level priority within the entire Mimico Creek watershed but no other barriers in either study reach have been mapped with priority status in TRC documentation. Multiple barriers also exist upstream of the study areas on each tributary.

Observations and field work in this study have confirmed different inventory results than TRC documentation, with regard to barriers. As identified and discussed in the Feature Inventories (**Section 2.1.5.4** and **Section 2.1.5.5**) there is only one partial fish passage barrier on the East Branch and there are 3 vertical barriers and 3 partial barriers on the West Branch.

The East Branch potential barrier is the downstream face area of Etude Drive. This barrier is due to displaced and rearranged rip-rap on the channel bed that differentially blocks part but not all of the low flow. This location is also moderately steep so low flows are shallow, fast, and divergent around stone. Nonetheless, a moderately open bias to the upstream right appears to be passable by the majority of fish typical of the system. Fish can potentially also use velocity shelters in pockets behind rocks and move through the centre and upstream left in step-by-step fashion. Passage conditions may change with any future adjustment to the channel bed.

The West Branch full barriers include a vertical drop at the upstream study limits CNR pipe crossing, vertical drops at two grade control structures, and partial barriers at two spots with low flow blockage by stone and concrete, and one drop structure in backwater. The CNR crossing and furthest upstream grade structure each create an approximate 0.5m drop between low flow levels. An approximate 1m deep plunge pool exists below the drop at the CNR, and a shallower 0.5m deep pool is seen at the drop structure. The next drop structure, closest to Rena Road, is in backwater from channel

adjustment stone placement done for the crossing replacement in 2018. Fluctuating low flows may result in some barrier influence at lowest base flows. Based on observations at seasonally high base flow in early fall there was no barrier impact. The downstream end of channel stone work done for Rena Road includes a boulder weir through the channel perimeter which physically diverges the low flow. The intent may have been to create a riffle or step with backwater. There is not enough void seal present however, so the low flow is pinched between stone gaps and likely impacts some passage by larger typical stream fish. The next barrier is another online grade control structure with an approximate 0.3m vertical drop at low flow. Original rip-rap placement is still relatively sound below the drop and a plunge pool is not present. The furthest downstream partial barrier is the partially failed end of a concrete spillway that connects to the tributary from a perpendicular storm outfall. The end of the spillway likely ended at the low flow bank when constructed but channel widening has exposed more of the concrete over time. As observed at time of field work, low flow passes around the upstream right side of the concrete and fish passage is likely occurring. Under lower base flow in mid-summer conditions a more distinct barrier may exist.

Mitigation of the 0.3 m and 0.5 m vertical fish passage barriers would require grade control work at channel slopes deemed suitable for low flow to bankfull passage. Passage confirmation would be subject to analysis of water column and boundary condition velocities. Moderately steep channel slopes of 2-3%, that may allow passage, would require at a minimum 10 m for 0.3 m at 3% and at a maximum 25 m for 0.5 m at 2%, of instream work. In addition, lateral cut-fill grading over several metres of flood plain, perpendicular to the respective locations, would be needed to create appropriate grade blends and maintain hydraulic conveyance of flood flows. The steep grade change would require stone treatment, both instream and in the flood plain, at a typically high stability standard of the 100 yr event, to ensure integrity. To specifically address the CNR crossing at the upstream end of the site, the need to increase backwater into the crossing and the need to potentially retrofit the crossing itself would complicate analysis. The technical study area boundary for this project does not include the crossing structure. Relative effort, costs, impacts, and net benefits to the quality of the resident fish communities would need further analysis to determine the feasibility and recommendation of any barrier removals.

2.2 Hydrology and Hydraulics

2.2.1 Purpose

Surface water hydrology is a component of the science of hydrology which encompasses the occurrence, movement, and properties of water on earth. Surface water hydrology specifically examines the interactions of water on the surface and in the case of the current assessment, the stormwater generated from rainfall runoff.

The hydrologic assessment has two specific objectives, as follows:

I. **Flood Assessment**

   Determines design flows for existing and future land use conditions, which have been used to delineate the Regional floodplain and assess Study Areas watercourses and stormwater conveyance infrastructure.

II. **Erosion Assessment**

   Determines the erosion susceptibility of the existing Study Area watercourses and supports the development of a stable natural channel solution.

Hydraulics relates to the calculation of water surface elevations and channel velocities for the design storm peak flows generated by the hydrologic models, the delineation of Regulatory floodplains and the assessment of stormwater conveyance infrastructure.

2.2.2 Background Information

The following data sources have been provided by the City of Mississauga, the Toronto and Region Conservation Authority (TRCA) and the Region of Peel.

Base Mapping

The City of Mississauga provided the supporting GIS shape files for both the Rena Road Study Area reach and the Etude Road to Derry Road East Study Area reach. TRCA provided floodline mapping and models. Floodline maps are provided in **Appendix A**.

Other

Region of Peel and TRCA have provided plans for past restoration projects related to the protection of sanitary sewer infrastructure adjacent to the study area streams.

Reports

The following reports have been reviewed to obtain background information for the Mimico Creek EA. The information has been obtained from the City of Mississauga, Aqualogic Consulting, and the TRCA.

Portions of the reporting which can be attributed to Rena Road and Etude Drive to Derry Road East have been summarized as follows:

Rena Road Hydraulic Report and Updated Floodplain Mapping for Torbram Road Grade Separation Works, AECOM, December, 2014

AECOM was retained by the City of Mississauga to undertake the detailed design of two road and railway grade separations on Torbram Road between Highway 407 and Kimbal Street.

The culvert on Rena Road located on the West Tributary of Mimico Creek (Reach 4) is located east of Torbram Road. This branch begins north of Steeles Avenue and flows southeast where it crosses Rena Road, ultimately joining Reach 3 with the confluence located north of the CN Weston Subdivision tracks, north of Beverly Street. The existing culvert at Rena Road is a 35 m long CSP with dimensions of 6.1 m span x 2.7 m rise, with the culvert obvert being 1.0 m below the road surface.

Based upon the HEC-RAS model provided by the TRCA, the culvert was undersized and obstructed the flow resulting in roadway overtopping during the 100-year and Regional Storm events. The flooding depth of 0.86 m under the Regional Storm event could not be used as safe passage based upon the MNDMNRF flood proofing criteria.

This structure was subsequently replaced with a larger concrete bridge in 2018, and that safe access is now provided for the 100-yr and Regional Storm events.

Malton Flood Characterization Study, Matrix Solutions, March, 2018

Flood characterization study for the community of Malton, assessing risk and flood mechanisms across the 670 ha study area. Study scope included updating the existing HEC-RAS model of Mimico Creek as provided by TRCA to update flood mapping, characterize riverine flooding throughout the given study area, while providing a high level prioritized mitigation plan for flooding locations within the study area.

Malton Flood Mitigation Study, AECOM, ongoing

In 2020, the City of Mississauga initiated Malton Flood Mitigation Study to develop a flood mitigation plan for the general area between Etude Drive and Justine Drive in the Malton community. The goal of this study is to mitigate urban flooding risks to people, property and infrastructure and will identified a preferred solution to help mitigate flooding.

Mimico Creek Study, MMM, 2009

Hydrologic characterization and peak flows have been abstracted from this report.

2.2.3 Policy

Provincial Policy Statement

A proponent cannot increase flood risk on adjacent properties under the natural hazards policies of the Provincial Policy Statement of the Planning Act. For example, any watercourse rehabilitation works cannot increase flood levels off site.

Several other policies and regulations would be relevant to any potential works in the Study Area.

2.2.4 Methodology

2.2.4.1 Hydrology

Existing hydrology modelling for the Mimico Creek watershed from 2009 is the current standard used by TRC for floodline mapping (MMM 2009), and the flows have been used in the analysis of the hydraulics for this study.

The 2009 model has several local flow nodes on the west and east branches upstream of the study areas, and one at the confluence downstream of the study areas, as noted in the subsequent results section.

2.2.4.2 Hydraulics

Existing conditions HEC-RAS hydraulic modelling and mapping was obtained from Toronto Region Conservation. This modelling has been used to assess the existing erosion conditions, and will be used in the detailed design stage, to confirm the design of all channel bed and bank works.

2.2.5 Results

2.2.5.1 Hydrology

Existing Study Modelling and Gauge Records

Existing hydrology modelling for the Mimico Creek watershed from 2009 is the current standard used by TRC for floodline mapping (MMM 2009). The 2009 model has local flow nodes on the west branch at the CNR (Node 8), at the tributary confluence upstream of Airport Road near old Malton Village (Node 9), and at the main confluence of the west and east branches downstream of Derry Road (Node 13) (Ref. **Appendix A** for locations and subcatchment plan). The model has local flow nodes on the east branch tributaries at the CNR (Nodes 10 and 11), at the tributary confluence upstream of Morning Star Drive (Node 12) and at the main confluence of the west and east branches downstream of Derry Road (Node 13).

Hydrology work for a Torbram Road grade separation project was done on a tributary confluent to the West Branch in 2014 (AECOM 2010, 2014). A Water Survey of Canada gauge station (# 02HC033 / DA=67.8km2) exists downstream of the study sites on the main branch of Mimico Creek between Bloor St. and Islington Ave. The gauge has near continuous data from 1965 to present.

Peak flows from the MMM 2009 hydrology study are summarized as:

Event	East Q (cms)	West Q (cms)
2yr	17.8	16.0
5yr	26.7	24.2
10yr	32.9	30.0
25yr	40.6	37.1
50yr	46.5	41.9
100yr	52.2	46.5
Regional	199.2	88.9

The existing hydrology modelling does not include flow nodes within either current study area boundaries, therefore there is no indication of flow changes due to confluent storm connections, or in the case of the East Branch specifically to the westerly connecting storm channel from Justine Drive just above Derry Road.

Using the peak frequent event flows of the 2 to 25-year range, power regression plots were created and back cast to estimate the annual peak event and 0.25-year and 0.125-year events, analysis is shown in **Appendix A** and is summarized as:

East: $y = 14.957x^{0.3247}$ ($R^2 = 0.974$), West: $y = 13.4x^{0.3314}$ ($R^2 = 0.9735$)

Event	East Q (cms)	West Q (cms)
1yr	15.0	13.4
0.25yr	9.5	8.5
0.125yr	7.6	6.7

It can be seen from both the peak event frequent flows and the calculated annual and sub-annual flows that despite the large difference in drainage areas, the east watershed being roughly 3.5 times larger than the west, that the relative flows are similar. It is beyond the scope of this study to determine why the flow calibration from the 2009 study produced these results. It can be noted however that the east catchment appears

to have more stormwater management controls in place than the west, including online facilities, as noted in the watershed characterization summaries in **Section 2.1.5.1**.

Compared to the above, the AECOM 2014 hydrology modelling for a tributary confluent to the West Branch just below the current study area, found a range of 20-44% lower flows for the 2 to 100-year events, than the MMM 2009 study. These comparison results hypothetically suggest that the 2009 study flows on the West Branch are thus too high and reinforces the point made above that the west catchment flows appear superficially high relative to the east catchment.

Further comparison for added perspective is possible using the downstream main branch gauge station records. The annual peak event record from the Water Survey of Canada gauge station was used to create flow frequency plots over the available record (WSC 2019). **Appendix A** shows the plotting of annual peaks and subsequent frequency analysis using Weibull and Cunnane methods. Based on the results, the following flow summary applies to frequent event estimates at the gauge station:

Event	Weibull (cms)	Cunnane (cms)
1yr	16	16
2yr	34	34
5yr	48	48
10yr	50	50
25yr	66	64

where: $y = 20.827x^{0.3931}$ ($R^2 = 0.8515$), therefore: 0.125yr = 9.2cms, 0.25yr = 12.1cms

The proportional difference in study site drainage areas to the gauge station is too large that a simple proration comparison of flows is possible. The gauge with a drainage area of 67.8km2 has a roughly 2.9 times larger catchment than the east branch and 10 times larger catchment than the west branch study sites. Nonetheless it can be seen that the 2 through 25-year events at the gauge are consistently larger than the study sites but not appreciably larger than might be expected if the study site flows are accurate. Given that the gauge records are field calibrated data, not empirically derived from modelling, a hypothesis results that study site hydrology from the 2009 work may be too high. This hypothesis is reinforced most strongly by the 1-year event results that show specifically the gauge flow of 16cms and the 1-year regressions for the east and west sites respectively of 15cms and 13.4cms. The study site 1-year peaks should be appreciably lower than the gauge station based on the large differences in drainage area contribution. The calculated sub-annual events from gauge data, as also shown in

Appendix A analysis, also reflect that the comparative study area sub-annual flows from modelling projections may be high.

Notwithstanding the above review and discussion on peak flow estimates, for the purposes of the detailed design, and any associated flood impact assessment, the TRCA approved flows from the 2009 study will be used.

2.2.5.2 Hydraulics

Existing conditions HEC-RAS hydraulic modelling and mapping was obtained from Toronto Region Conservation. This modelling has been used to assess the existing erosion conditions, and will be used in the detailed design stage, with the approve 2009 peak flows, to confirm the design of all channel bed and bank works.

Reduced copies of the existing approved TRCA flood plain mapping for the east branch and west branch sites is included in **Appendix A**.

2.2.5.3 Erosion Assessment

Hydraulic Erosion Indicators and Design Event Standard

Existing conditions HEC-RAS hydraulic modelling has been summarized over all flow events for erosion potential indicators. **Appendix A** presents the detailed results of analysis.

Primary erosion potential indicators for velocity and shear stress, and secondary indicator of stream power are highlighted in the appended summary. Additional key parameters are also shown for reference and context. The summary presents threshold conditions based on vegetation control levels of stability, as relevant to the inherent goals of this assignment to provide channel bank erosion control solutions. Average density of vegetative rooting and surface stem cover characterizes vegetation control for channel banks at thresholds of 40N m-2 for shear stress and 1.2m s-1 for channel velocity. Higher thresholds for vegetation control are viable at approximately 80N m-2 and 1.8m s-l under very high levels of vegetative encroachment (ranges summarized in Fischenich 2001). The detailed results highlighted condition of ‘stable by vegetation control, low density’ therefore represents less than 40N m-2 for shear stress and 1.2m s-1 for channel velocity. The condition of ‘dynamic stability, high density vegetation’ represents the range of 40-80N m-2 for shear stress and 1.2-1.8m s-1 for channel velocity, and ‘vegetation control unstable’ represents over 80N m-2 for shear stress and 1.8m s-1 for channel velocity. The stream power threshold for dynamic stability over a broad range of watercourse sizes and natural conditions is generally considered to be 400N m-1 s-1 (Sear et. al. 2003).

The summary shows that both branches have similar general trend in primary indicators. Channel specific erosion potential indicators increase in step with increasing magnitude flow events. Overbank indicators in the East Branch are stable over the entire study area. Some overbank indicators increase to unstable in the expansion zones below crossings on the West Branch. Based on the increasing channel specific erosion potential with increasing flow, the design standard for proposed treatments defaults to the largest low frequency event deemed appropriate. The results show that the combination of channel geometry and corridor geometry do not result in channel specific thresholds being attenuated as flows rise above top of bank and enter the flood plain or vertically increase against side slopes. This confirms the relative characterization of entrenchment already noted for each study area. It also confirms that there is no intermediate return event flow where thresholds drop off.

In both study areas the channel specific highest erosion potential is at the Regional event, however the typical high standard deemed appropriate for design is the 100-year event. Long-term constraint planning for erosion issues presented in Provincial guidelines and TRC policy (MNR 2002, MTO 2008, TRC 2014) use the 100-year approach. Specifically, MNR guidelines and TRC policy require the 100-year horizon for erosion setbacks, and MTO guidelines require the 100-year event be used for design of scour protection. The primary velocity and shear stress erosion potential indicators at the 100-year event are thus proposed for choosing and sizing treatments. The flow stage elevation at the 100-year event is also required for determining the finished height of treatments. Applying factors of safety to design is also appropriate with due consideration of any physical constraints or limitations of site-specific conditions.

2.3 Geotechnical

2.3.1 Background Information

A geological background study indicates the surficial soils in the two project areas are likely to consist of glaciolacustrine deposits of silt and clay, clay to silt textured till, or modern alluvial deposits (Map 2223, Quaternary Geology of the Brampton Area, Southern Ontario, published by the Ministry of Northern Development & Mines). The bedrock in the area consists of grey-green and blue-grey shale, siltstone and limestone of the Georgian Bay Formation (Map P. 953, Paleozoic Geology of the Brampton Area, published by the Ontario Division of Mines) which can be expected to be encountered at or near 10 m below existing grade (Map 2179 Drift Thickness Map of the Brampton Area, published by the Ontario Division of Mines).

Wood had identified four sites, two each along the West and East Branches of the Mimico Creek which will require geotechnical design input regarding erosion control / slope stability / structure rehabilitation.

2.3.2 Methodology

A visual inspection of the slopes at all four areas of concern was performed by senior geo-material personnel on December 12, 2019, the results of which are provided in the following sections.

2.3.3 Results/Recommendations

Mimico Creek west branch ~50 m south of the CN Rail CSP culvert at the north end of the study area

The west bank overall slope height is ~3.5 m. A slope failure has occurred at the apex of the meander on the west bank. The failure extends ~3 m above the creek. Sloughed material remains at the toe of the slope/creek bank. A near vertical head scarp of ~1 m was observed. The face of the slope failure is currently ~5 m east of the 7615 Torbram Road industrial property fence line. This is an active erosion area where further erosion and sloughing are expected without remediation.

To assess the slope stability and provide geotechnical recommendations regarding erosion control / slope stabilization, the subsurface investigation should be completed. The subsurface investigation will consist of a single borehole with a groundwater water monitoring well. Due to site access restrictions the borehole will have to be located at the 7615 Torbram Road industrial property.

Mimico Creek west branch from the south limit of the study area to 50 m northwards

The west bank overall slope height is ~3.5 m. The lower ~1 m of the west slope, which is along the out-side of the meander bend has eroded and sloughed into the creek. The surface slope is vegetated with tall grass and was previously stabilized with a rope mesh vegetation blanket as remnants were visible on the surface. At the south limit of the study area, the erosion has undermined the 1200 mm diameter sewer headwall and bed apron. The concrete pipe is partially exposed behind the headwall. This is an active erosion area where further erosion and sloughing are expected without remediation.

To assess the slope stability and provide geotechnical recommendations regarding erosion control / slope stabilization / outfall repair, the subsurface investigation should be completed. The subsurface investigation will consist of a single borehole with a groundwater water monitoring well. Due to site access restrictions the borehole will have to be located at the 7385 Bren Road commercial property.

Mimico Creek east branch from Etude Drive to ~ 70 m southwards

The east bank overall slope height is ~6 m high. The lower ~1 m to ~3 m of the east slope along the out-side of this large diameter meander has active toe erosion and surficial sloughing of the slope face as evidenced by sections of bare slope. The remaining surface slope is vegetated with tall grass and vertical mature trees.

While continued gradual undercutting of the toe and surficial sloughing of the slope are expected, significant changes to the physical top of slope are not anticipated in the near term.

To assess the slope stability and provide geotechnical recommendations regarding erosion control / slope stabilization, the subsurface investigation should be completed. The subsurface investigation will consist of a single borehole with a groundwater water monitoring well. Site access is available from Etude Drive along the Malton Greenway Park pedestrian trail.

Mimico Creek east branch from ~135 to ~150 m west of Goreway Drive to the rear of the residence at 6938 Justine Drive

The north bank overall slope height is ~4 m high. The lower ~1 to ~2 m portion of the north slope along the out-side of this large diameter meander has eroded and sloughed into the creek. The surface slope is generally bare of vegetation with only scattered downhill leaning trees. While continued gradual undercutting of the toe and surficial sloughing of the slope are expected, significant changes to the physical top of slope are not anticipated in the near term.

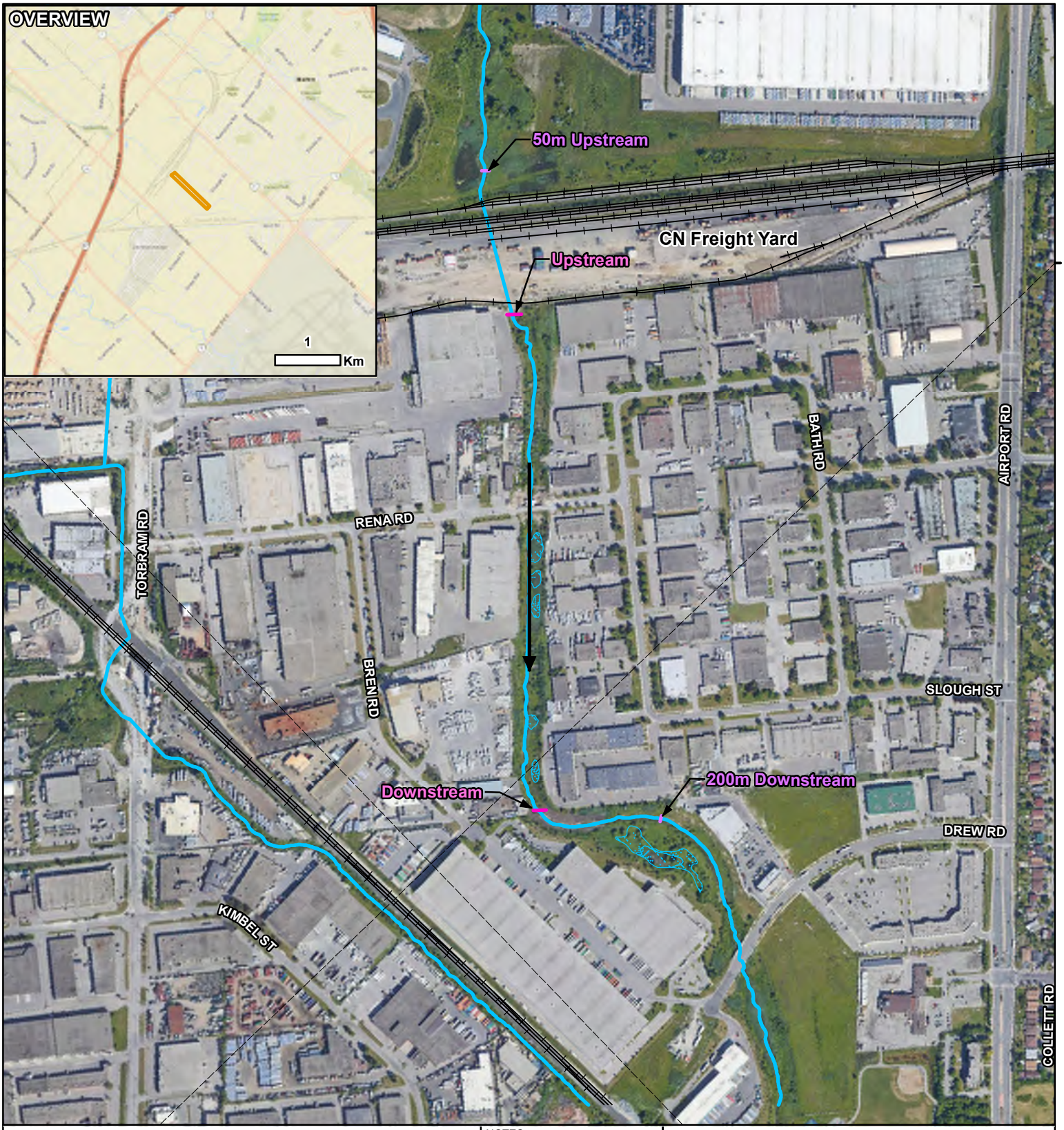
Site access for standard drilling equipment is not available. The subsurface investigation to assess the slope stability and provide geotechnical recommendations regarding erosion control / slope stabilization will be required. The subsurface investigation will consist of hand excavated test pits.

2.4 Fisheries

2.4.1 Purpose

A fish habitat assessment was completed by Wood in support of this Class EA Study. It was completed based on background information review, and a one (1) season field investigation executed on November 5, 6 and 8, 2019 by a qualified aquatic biologist. Results of the fish and fish habitat assessment are provided in this report, whereas the aquatic field sheets and representative photographs are provided in **Appendix B**. Please refer to **Figure 19** and **Figure 20** for the study areas reviewed as part of this assessment for the West and East Branch, respectively. As part of the Fish Habitat Assessment, an

additional 50 m upstream and 200 m downstream of each identified channel reach was assessed during field investigations.



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LEGEND

- Additional Area Surveyed
- Flow Direction
- Identified Channel Reach
- Unevaluated Wetland
- Railway
- Watercourse

NOTES:
- Imagery from Google, 2018
- Overview Image from ESRI

0 0.05 0.1 0.2 0.3 0.4 0.5 Kilometres

Datum: NAD83
Projection: UTM Zone 17N

wood.

MIMICO CREEK EROSION

Mimico Creek West Branch Study Area

PROJECT N°: TPB198091	**FIGURE: 19**
SCALE: 1:8,000	DATE: January 2020

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LEGEND

- Additional Area Surveyed
- Flow Direction
- Identified Channel Reach
- Watercourse

NOTES:
- Imagery from Google, 2018
- Overview Image from ESRI

0 0.045 0.09 0.18 0.27 0.36 0.45 Kilometres

Datum: NAD83
Projection: UTM Zone 17N

wood.

MIMICO CREEK EROSION

Mimico Creek East Branch Study Area

PROJECT N°: TPB198091	**FIGURE: 20**
SCALE: 1:5,000	DATE: January 2020

2.4.2 Background Information

The West Branch study area contains a vegetated riparian area ranging from 10 m to 30 m wide, on each side of Mimico Creek, surrounded by industrial and commercial development. The development is less dense along the upstream end (50 m length) of the study area, which is bordered by a wide (> 100 m) naturally vegetated area. The riparian area throughout the study area contains herbaceous vegetation, grasses and deciduous trees, which provide some cover for the creek. The West Branch study area begins 50 m north of the CN freight yard. From here, the creek flows through a large corrugated steel pipe (CSP) culvert under the freight yard. The creek flows in a southeast direction, with a sloped and vegetated riparian area, meandering to the northeast for the final 200 m of the study area. The East Branch study area contains a vegetated riparian area on each side of the creek, ranging from 20 m to 90 m in width, with dense tree cover. Public trails within the riparian area was observed between Goreway Drive and Etude Drive. Residential and commercial development make up the land cover just outside the riparian area.

Table 2: Mimico Creek Watercourse Locations

Waterbody	Location	Municipality	Location (GPS Coordinates)
Mimico Creek (West Branch)	50 m north of CN freight yard to 600 m south of Rena Road	City of Mississauga	17T 610177E 4841220N
Mimico Creek (East Branch)	50 m north of Etude Drive to 200 m south of Derry Road	City of Mississauga	17T 607723E 4840504N

2.4.3 Policy

Information pertaining to fisheries legislation, policies and planning components relative to federal, provincial, and municipal sections associated with the study area are outlined below.

2.4.3.1 Federal Legislative Requirements

Fisheries Act, 1985

The Federal Fisheries Act was established in 1985 with amendments that came into effect on November 25, 2013 and June 21, 2019. This Act provides protection to fish and fish habitat such that:

"No person shall carry on any work, undertaking or activity that results in the harmful alteration, disruption or destruction of fish habitat" (Section 35 (1)).

Fish habitat is defined by the Act as "water frequented by fish and any other areas on which fish depend directly or indirectly to carry out their life processes, including spawning grounds and nursery, rearing, food supply and migration areas".

The Fisheries Act requires that any development project avoid harmful alteration, disruption or destruction of fish habitat (HADD) unless authorized by Fisheries and Oceans Canada (DFO). If mitigation measures cannot be applied, and residual effects will cause HADD, then provisions under the Act may apply (i.e., approval).

Applicability to the Project

Any waterbody or watercourse that contains fish or is any other area on which fish depend directly or indirectly to carry out their life processes as described in the Fisheries Act, is provided protection under the Act.

2.4.3.2 Provincial Legislative Requirements

Endangered Species Act

The Ontario Endangered Species Act, 2007 (ESA) was passed into law in 2007 and came into effect on June 30, 2008. Under the ESA, species in Ontario are identified as extirpated, endangered, threatened, or of special concern. Section 9 of the ESA generally prohibits the killing or harming of a threatened or endangered species. Section 10 of the ESA prohibits the damage or destruction of the habitat of all endangered and threatened species. Habitat is broadly characterized within the ESA (2007) as the area prescribed by a regulation as the habitat of the species or an area on which the species depends directly or indirectly, to carry on its life processes, including reproduction, rearing of young, hibernation, migration or feeding.

Applicability to the Project

If threatened and/or endangered species or their habitat are encountered, the Project may be subject to a permit under the ESA and/or its regulatory exemptions under the Act.

2.4.3.3 Conservation Authorities Act

The TRCA regulates watercourses, wetlands, and hazard lands (valleylands, shorelines, floodplains) through application of Ontario Regulation 166/06, under Section 28 of the Conservation Authorities Act (Conservation Authorities Act, 1990). Ontario Regulation 166/06 applies to hazardous lands that are defined in Section 28(25) of the Conservation Authorities Act as lands that could be unsafe for development because of naturally occurring processes associated with flooding, erosion, dynamic beaches or unstable soil or bedrock. The regulation limit for Ontario Regulation 166/06 is the applicable hazard limits for a property.

The main purpose of Ontario Regulation 166/06 is to ensure public health and safety, and protection of life and property in relation to natural hazards. This regulation establishes guidelines for development, interference with wetlands and alterations to shorelines and watercourses.

Applicability to the Project

Based on review of the TRCA's Mapping Tool (accessed November 2019) (Toronto and Region Conservation Authority, 2019), both the East and West branch study areas are regulated. Further consultation with TRCA will be required when the Project moves forward into the design and construction phases to determine permit requirements.

2.4.3.4 Fish and Wildlife Conservation Act, 1997

The Fish and Wildlife Conservation Act, 1997, (FWCA), applies to 'fish and wildlife' whereby fish are defined as having the same meaning as in the Fisheries Act, and wildlife are defined as "an animal that belongs to a species that is wild by nature, and includes game wildlife and specially protected wildlife". Those species considered specially protected wildlife include those specially protected amphibians, birds, invertebrates, mammals or reptiles, as identified within Schedules 6 to 11 under the Act.

Applicability to the Project

The FWCA is managed by the Ministry of Northern Development, Mines, Natural Resources and Forestry (MNDMNRF) and is applicable to fish as defined under the Act. In instances where fish will require collection or relocation at any point in a Project, (i.e., during field surveys via trapping or during construction through trapping/collection and relocation), permits and/or approvals under the Act may apply. More specifically, the contractor responsible for completing the work will be required to obtain approvals required under the Act, such as a Fish Scientific Collectors Permit, issued by MNDMNRF .

2.4.3.5 Municipal Legislative Requirements

City of Mississauga

The City of Mississauga Official Plan protects the Natural Heritage System (NHS) and Natural Hazard Land. Although significant valley lands, valleys and watercourses are part of Natural Hazard lands they are also considered Significant Natural Areas and form part of the City's NHS. The main focus is to ensure the preservation and enhancement of fish habitat, whereby significant natural areas are considered fish habitat and mapped on Schedule 3 (City of Mississauga, 2015).

Applicability to the Project

The East and West Branch study areas contain fish, and are considered fish habitat. In accordance with Section 6.3.28 of the City's Official Plan development and site alteration is not permitted in fish habitat, except in accordance with Provincial and Federal requirements.

2.4.4 Methodology

As previously noted, a combination of a desktop review of secondary source information, and a one season field investigation were completed to characterize the study area.

2.4.5 Results/Recommendations

2.4.5.1 Secondary Source Review

A desktop review of Secondary source information for fish and fish habitat information pertaining to Mimico Creek within the East and West Branch study areas was completed. Secondary sources reviewed included:

- Species at Risk (SAR) in Ontario List (Ministry of Environment, Conservation and Parks, 2019)
- Ministry of Northern Development, Mines, Natural Resources and Forestry (MNDMNRF) Natural Heritage Information Centre (NHIC) database square (1 km x 1 km) encompassing the Project, includes square 1007624 and 1007604 (MNRF, 2019);
- Species at Risk Public Registry database (Environment Canada and Climate Change, 2018);
- Department of Fisheries and Oceans Canada (DFO) Aquatic SAR Mapping (DFO, 2019);
- Land Information Ontario (LIO) (MNDMNRF, 2019);
- The Corporation of the City of Mississauga Consulting Services for Mimico Creek Erosion Control Projects: Rena Rd. & Etude Dr. to Derry Rd. E (City of Mississauga, 2019);
- Toronto and Region Conservation Authority (TRCA) Mimico Creek Watershed Report Card (TRCA, 2018);
- TRCA Etobicoke and Mimico Creek Watersheds Technical Update Report Executive Summary (TRCA, 2010);
- TRCA Malton Greenway Sanitary Infrastructure Protection Project – Natural Heritage Impact Study (NHIS), City of Mississauga; and
- City of Mississauga Official Plan (City of Mississauga, 2015).

2.4.5.2 Aquatic Field Investigation

Qualified Wood staff executed a field program of Mimico Creek East and West Branch on November 5, 6 and 8, 2019 by performing an aquatic habitat assessment and fish survey (field investigation), using a Smith-Root LR24 backpack electrofisher, to identify fish species present. The habitat assessment included the channel reach identified for restoration work plus an additional 50 m upstream and 200 m downstream for both the East and West Branch study area. Field conditions were assessed following the MTO Environmental Guide for Fish and Fish Habitat (MTO, 2009).

2.4.5.3 Aquatic Species at Risk

The potential for aquatic SAR and SAR habitat (i.e., candidate) to occur within the East and West Branch study areas was determined based on a review of secondary source information and 2019 field investigations. More specifically a series of online databases (e.g., DFO online aquatic SAR mapping) were used to perform searches for the East and West Branch study areas, in addition to background reports.

The DFO online aquatic SAR mapping was reviewed for SAR and/or SAR habitat within the area surveyed and did not contain records of SAR or SAR habitat within the East and West Branch study areas. An online search of the Natural Heritage Information Centre (NHIC) was conducted in the immediate vicinity of the study area to identify any significant fish or mussel species within watercourse the East and West Branch study area. A search of the one (1) km^2 blocks encompassing the East and West Branch study areas did not result in any aquatic SAR. Fish species information reviewed from LIO did not include any aquatic SAR species. Additionally, no SAR were observed during field investigations.

2.4.5.4 Natural Areas

A review of natural areas was completed, more specifically the City of Mississauga NHS. No PSWs are identified by the City for either study area (City of Mississauga, 2015). Based on review of the MNDMNRF NHIC data (MNRF, 2019), the West Branch contains unevaluated wetlands along the creek south of Rena Road. The value of these wetlands appeared to be minor based on Wood 2019 field investigations. Additionally, based on review of NHIC data (MNRF, 2019), no Areas of Natural or Scientific Interest or Environmentally Significant Areas are within the study areas. City mapping identified the West Branch as within Significant Natural Areas and Natural Green Spaces and both study areas as Natural Hazard Lands, which contain valley lands and floodplains (City of Mississauga, 2015).

2.4.5.5 Aquatic Existing Conditions

The identified priority locations for restoration work are presented in **Figure 4** to **Figure 18**, along with the identification of fish habitat characteristics. Additionally, a summary of Mimico Creek characteristics are presented in **Table 3**. Mimico Creek is a permanent watercourse, with a warm water thermal regime, containing common fish species which are tolerant of conditions generally found in urban settings. Mimico Creek flows in a generally southern direction within the areas investigated.

The TRCA has designated Mimico Creek surface water quality as “Poor”, based on phosphorus and Escherichia coli measurements recorded at two (2) monitoring stations and information derived from benthic invertebrate sampling at five (5) stations within

the Mimico Creek watershed (TRCA, 2018). The Mimico Creek watershed is located in a heavily urbanized area with limited and outdated stormwater management infrastructure. High water flows associated with stormwater has eroded the creek banks combined with poor stormwater management, has resulted in accumulation of sediment and contaminants in the creek (TRCA, 2018).

Table 3: Existing Fish and Fish Habitat Conditions

Mimico Creek Site	Latitude Longitude	Date	Flow	Thermal Regime	Fish Habitat	Fish Species Present	Substrate Type	Vegetation	Constraints and Opportunities	Specialized, Limiting, or Rare Fish Habitat Features	Species at Risk Present	In-water Works Timing Window[4]
West Branch	43˚42'41.10 N -79˚39'57.37W	Nov 5, 6 & 8, 2019	Permanent	Warm[1]	Direct	Brook Stickleback[2], Creek Chub[2], Fathead Minnow[2], young-of-the-year (YOY) cyprinidae[3]	Cobble, gravel, sand, silt	Aquatic algae, riparian – Common Reed, Canada Goldenrod, European Buckthorn and Reed Canary Grass	Constraints: eroding and slumping banks, fish passage impediments Opportunities: stormwater outfall pipe repairs, gabion basket repairs, alteration of grade control structures, stabilization of banks	None	None	July 16 – Mar 14
East Branch	43˚42'44.61 N -79˚38'00.57W	Nov 5, 6 & 8, 2019	Permanent	Warm[1]	Direct	Blacknose Dace[1], Bluntnose Minnow[1], Brook Stickleback[2], Common Shiner[1], Creek Chub[2], Fathead Minnow[2], Mottles Sculpin[1], White Sucker[1], YOY cyprinidae[3]	Cobble, gravel, sand, silt, muck	Aquatic algae, riparian – Manitoba Maple, Canada goldenrod, Staghorn sumac and Reed Canary Grass	Constraints: eroding banks, fish passage impediments Opportunities: stormwater outfall pipe repairs, gabion basket repairs, stabilization of banks, removal of debris	None	None	July 16 – Mar 14

[1] LIO data (2011), [2] LIO data and Wood investigations (2019), [3] Wood investigations, [4] based on thermal regime

West Branch

The riparian area was densely vegetated along the entire stretch of the West Branch surveyed. Trees, along with shrubs, grasses and herbaceous vegetation were present within the riparian area and provided 40% to 80% riparian cover. This overhanging riparian vegetation resulted in large woody debris and leaf litter occurring within the creek channel. Dense industrial and commercial development is present outside of the vegetated riparian area. Erosion and barrier sites identified for the Mimico Creek West Branch are shown on **Figure 14** to **Figure 18**. Fish habitat characteristics for Mimico Creek West Branch are shown on **Figure 21** to **Figure 23**. Field sheets and representative photographs are provided in **Appendix B**.

Downstream of the identified channel reach

The 200 m downstream of the channel reach identified for erosion control work was comprised of pool and flat morphology with water depth ranging from 0.5 m to 0.8 m and a general wetted width of 3.5 m. The initial 100 m contained woven erosion matting on the right bank and riparian area, with little to no vegetation on the bank or the initial three (3) m to four (4) m of the riparian area. Along this section, cobble was present along the left bank, presumably placed at the site, with dense herbaceous vegetation and shrubs on the riparian area. A row of cobble was also observed along the left riparian area , approximately two (2) m to four (4) m from the watercourse. Continuing downstream for the remaining 100 m, the right bank showed signs of erosion, with undercutting present while the left bank was lined with cobble, similar to the initial 100 m upstream. Dense herbaceous vegetation and grass, including European Common Reed (phragmites australis), was present along this 100 m, within the riparian area on both sides of the watercourse, which sloped upwards. Aquatic vegetation was not present and substrate was comprised of cobble, gravel and sand. No barriers to fish passage were observed within this 200 m stretch of the watercourse.

Within the identified channel reach

Downstream of Rena Road, wetted width ranged from 1.5 m to 4 m and water depth ranged from 0.04 m to 0.5 m. However, at the most downstream stormwater outfall pipe (Location 1), the water depth was one (1) m. Upstream of Rena Road, wetted width ranged from 1.5 m to 4.5 m and water depth ranged from 0.05 m to 0.8 m. A pool at the upstream end of the site, immediately downstream of the CN freight yard was approximately nine (9) m wide and > one (1) m deep. Erosion and undercutting was present on both sides of the bank throughout this approximately 750 m long stretch of Mimico Creek, with slumping observed in several locations. The banks and riparian area were vegetated with trees, shrubs and herbaceous species, with vegetation overhanging the watercourse on both sides. Substrate varied, with cobble, gravel, sand and clay

present, with cobble present in varying proportions throughout the majority of this stretch. Morphology consisted of flats, runs, riffles and pools. Dense patches of Common Reed were present in in various location along the right bank and within the riparian area, particularly downstream of Rena Road.

Upstream of the identified channel reach

The initial 50 m upstream of the CN freight yard culvert recorded a wetted width ranging from 1.5 m to 3.8 m, and depth ranging from 0.08 m to 0.8 m. The creek was the most narrow and shallow at the culvert. Substrate was comprised of cobble, silt, gravel and sand. A narrow channel, approximately one (1) m wide and 0.1 m deep flowed into the creek from the east, approximately five (5) m upstream of the culvert. Low water level near the culvert and within the east channel, which appeared to receive flow from stormwater outfall pipes, were potential impediments to fish passage. Within this section the creek was bordered by a wider area of natural vegetation (> 100 m) than downstream of the CN freight yard, with decreased development on the surrounding landscape.

Existing Fish and Fish Habitat

Based on background information review and field investigations, Mimico Creek within the West Branch study area provides direct fish habitat. Low water levels and structures within the channel provide impediments to fish passage during certain times of the year. The varied morphology and substrate, along with overhanging vegetation and undercut banks would provide opportunities for mating, foraging and cover. The existing riparian area along both sides of the West Branch provides varying degrees of shade which may help moderate water temperature during the summer months.

Potential impediments to fish passage and areas of instability due to erosion were present in several locations and are summarized below. Areas with water depth of 0.1 m or less are identified as potential impediments to fish passage due to low water level:

Location 1 – erosion on the upstream side of the stormwater outfall around the structure may result in bank failure and the partial and/or complete blockage of the creek by bank material. Slumping was not observed however the soil was undercut around the structure.

Location 2 - slumping along the west bank may result in bank failure and the partial and/or complete blockage of the creek by bank material.

Location 3 - slumping along the west bank may result in bank failure and the partial and/or complete blockage of the creek by bank material.

Location 5 - low water levels present immediately downstream of this location may impede fish passage. Additionally, the concrete spillway from the stormwater outlet was cracked and extended approximately three (3) m across the width of the watercourse, with 0.8 m remaining open for fish passage.

Location 6 – low water levels present in a portion of the creek adjacent within this location which may impede fish passage. The slumping along the west bank may result in bank failure and the partial and/or complete blockage of the creek by bank material.

Location 7 – low water level flowing over the concrete structure crossing the creek at this location. Additionally, the concrete structure crossing the creek is a potential impediment to fish passage. At the time of the field investigation the concrete structure extended 0.2 m above the water level immediately downstream.

Upstream of Location 7 – slumping along the west bank may result in bank failure and the partial and/or complete blockage of the creek by bank material.

Location 9 - low water levels were observed in sections of the creek at this location. The slumping along the west bank may result in bank failure and the partial and/or complete blockage of the creek by bank material. The creek narrows within this location, with dense Common Reed within the eastern side of the channel and along the riparian area. If the conditions facilitate the spread Common Reed (highly invasive) into the creek, this may impede fish passage in the future.

Downstream of Location 10 – low water levels may impede fish passage.

Location 10 – low water levels combined with boulders across the channel may impede fish passage.

Location 12 – the concrete structure was below the water level during the field investigation, however, this structure could impede fish passage during low flow conditions. This concrete structure crossed the entire 4.5 m width of the creek, for a length of 1.8 m within the creek.

Location 13 - the slumping along the west bank may result in bank failure and the partial and/or complete blockage of the creek by bank material.

Location 14 – low water levels immediately downstream of the concrete structure may impede fish passage. Additionally, the concrete structure within this location was 0.4 m higher than the water level immediately downstream and may impede fish passage.

Location 16 – low water levels within portions of the creek at this location may impede fish movement. Slumping along the west bank may result in bank failure and the partial and/or complete blockage of the creek by bank material.

Location 17 – low water levels within a portion of the creek at this location may impede fish movement. Slumping along the west bank may result in bank failure and the partial and/or complete blockage of the creek by bank material.

Location 18 - low water levels within a portion of the creek at this location may impede fish movement. Slumping along the west bank may result in bank failure and the partial and/or complete blockage of the creek by bank material.

Upstream of Location 18 – low water levels may impede fish passage.

Location 20 – the vertical distance between the culvert and the creek may impede fish movement, at the time of the field investigation, the west culvert was approximately 0.5 m higher than the creek immediately downstream. Water was not present within the east culvert.

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LEGEND

- Additional Area Surveyed
- Water Depth ≤ 0.1 m
- Pool > 1 m
- Fish Barrier
- Riffle
- Channel Reach Boundary
- Run
- Railway
- Watercourse
- Fish Barrier #
- Erosion #
- Terrestrial Barrier #

NOTES:
- Imagery from Google, 2018
- Overview Image from ESRI

wood.

MIMICO CREEK EROSION

Mimico Creek West Branch Fish Habitat

Datum: NAD83
Projection: UTM Zone 17N

0 0.0175 0.035 0.07 0.105 0.14 0.175 Kilometres

PROJECT N°: TPB198091	**FIGURE: 21**
SCALE: 1:2,000	DATE: January 2020

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LEGEND

- Additional Area Surveyed
- Water Depth ≤ 0.1 m
- Pool > 1 m
- Fish Barrier
- Riffle
- Channel Reach Boundary
- Run
- Railway
- Watercourse
- Fish Barrier #
- Erosion #
- Terrestrial Barrier #

NOTES:
- Imagery from Google, 2018
- Overview Image from ESRI

0 0.0175 0.035 0.07 0.105 0.14 0.175 Kilometres

Datum: NAD83
Projection: UTM Zone 17N

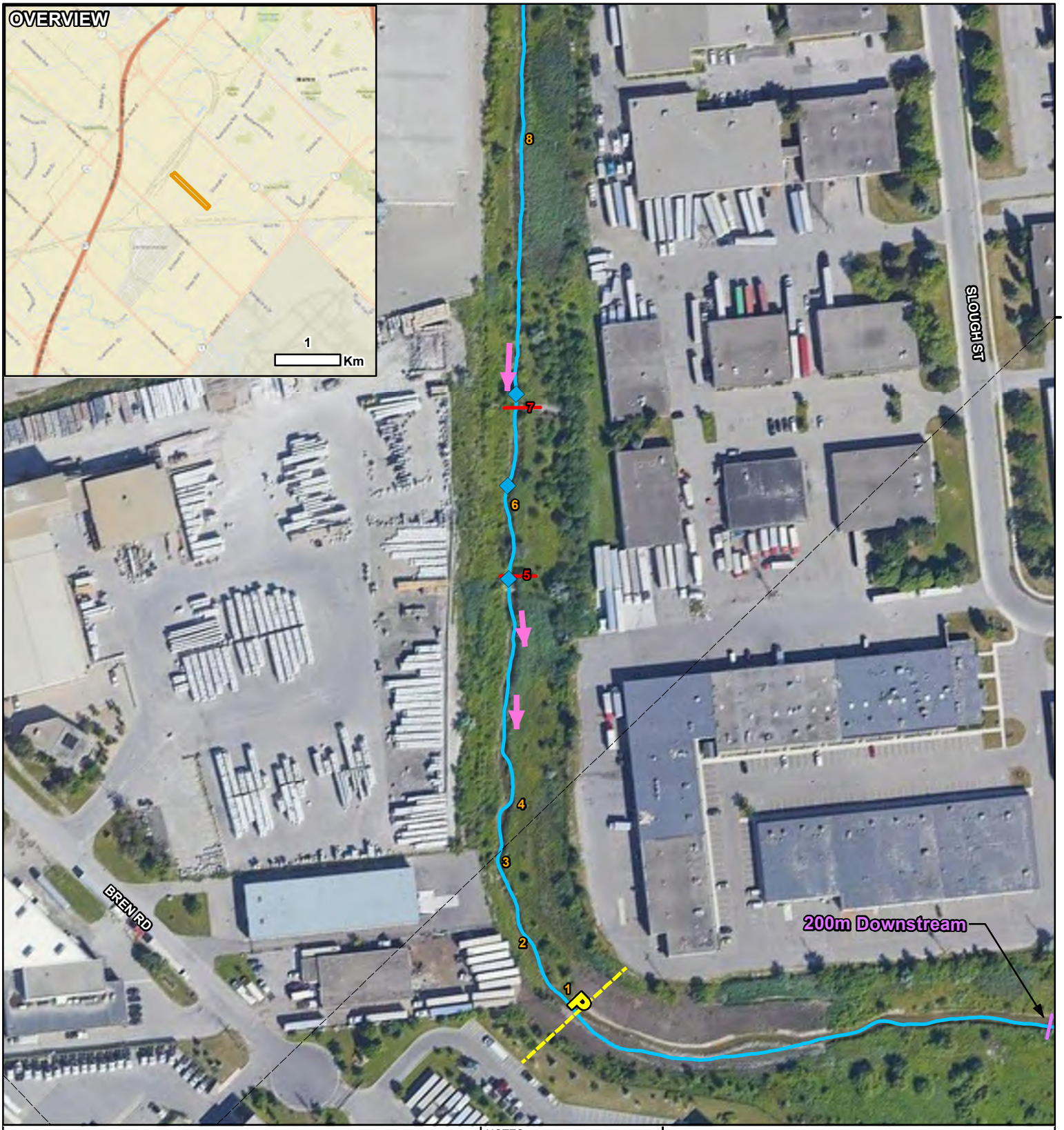
wood.

MIMICO CREEK EROSION

Mimico Creek West Branch Fish Habitat

PROJECT N°: TPB198091 | **FIGURE: 22**

SCALE: 1:2,000 | DATE: January 2020



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LEGEND

- Additional Area Surveyed
- Water Depth ≤ 0.1 m
- Pool > 1 m
- Fish Barrier
- Riffle
- Channel Reach Boundary
- Run
- Railway
- Watercourse
- Fish Barrier #
- Erosion #
- Terrestrial Barrier #

NOTES:
- Imagery from Google, 2018
- Overview Image from ESRI

0 0.0175 0.035 0.07 0.105 0.14 0.175 Kilometres

Datum: NAD83
Projection: UTM Zone 17N

wood.

MIMICO CREEK EROSION

Mimico Creek West Branch Fish Habitat

PROJECT N°: TPB198091 | **FIGURE: 23**

SCALE: 1:2,000 | DATE: January 2020

East Branch

The riparian area was densely vegetated along the entire stretch of the East Branch study area. The riparian area was comprised of trees, shrubs, and herbaceous vegetation, which provided 40% to 80% cover. This overhanging vegetation resulted in large woody debris and leaf litter depositing into the creek. Residential and commercial development made up the land use adjacent to the vegetated riparian area. Erosion and barrier sites identified for the Mimico Creek East Branch are shown on **Figure 4** to **Figure 12**. Fish habitat characteristics for Mimico Creek West Branch Study Area are shown on **Figure 24** and **Figure 25**. Field sheets and representative photographs are provided in **Appendix B**.

Downstream of the identified channel reach

Downstream of Derry Road, the wetted width generally ranged from 3.5 m to four (4) m, with an eight (8) m wide pool present. Depth within this stretch of the creek ranged from 0.05 m to 0.75 m during the field investigations. Run, riffle and pool morphology was present. Substrate consisted of cobble, gravel, sand and silt, with a minor amount of clay. Erosion and undercut banks were present on both sides, with a densely treed riparian area providing 50% cover. The west slope was noticeably steeper and higher than the east slope. Low water levels within this area may impede fish passage.

Downstream of Goreway Drive

The west tributary of Mimico Creek that flows into the East Branch had a recorded a wetted width ranging from 2.8 m to 4.2 m and depth ranging from 0.07 m to 0.25 m, and is dominated by flat morphology. This section of the creek was comprised of cobble, sand, silt and muck substrate with gravel also present. Gabion baskets were present on both sides of the creek along the initial 35 m downstream of the stormwater outfall pipe, with repairs required in some locations to stabilize the wall and wiring. Downstream of this, erosion and undercutting was present on both banks. The riparian area was densely treed on both sides of the channel providing 60% cover for the creek.

The East Branch within the Derry Road culvert had a wetted width of four (4) m and depths ranging from 0.1 m to 0.25 m. Substrate was comprised of predominantly cobble and gravel, with sand and silt also present. This section of the creek exhibited a flat and riffle morphology. The creek was bordered on each side with gabion baskets, approximately 0.55 m high.

The East Branch of Mimico Creek between Derry Road and Goreway Drive recorded wetted widths ranging from four (4) m to 5.8 m and depths ranging from 0.08 m to 0.55 m. Substrate material was comprised of cobble, gravel, silt, sand and clay with varying proportions of gravel throughout the majority of this section. Morphology consisted of

flats, pools, runs and riffles. Gabion baskets were present along both banks within sections of the creek, though the baskets are in need of repair to remain stable in certain areas. Boulders were also present along a portion of the channel to assist with bank stabilization, completed as work conducted by the Region of Peel (City of Mississauga, 2019). Erosion and undercutting was observed on both sides of the creek, with a densely treed riparian area. This riparian vegetation provided an approximate 50% cover over the creek.

Within the Goreway Drive culvert the wetted width was approximately four (4) m, with a sand bar present along the north side. Depths ranged from 0.1 m to 0.5 m with sand, cobble, gravel and silt substrate and flat morphology.

Upstream of Goreway Drive

The East Branch between Goreway Drive and Etude Drive wetted width ranged from four (4) m to six (6) m with depths ranging from 0.05 m to 0.5 m. Morphology varied with flats, pools runs and riffles present. Substrate was comprised of cobble, sand, gravel and silt. The banks on both sides showed signs of erosion, with undercut banks present. The densely treed riparian area provided approximately 75% cover. Close to Etude Drive, cobble along the west side of the creek resulted in the flow mainly confined to the east side of the creek.

Within the Etude Drive culvert water depth ranged from 0.4 m to >0.8 m. Water depth increased at the downstream end of the culvert. The cobble within the creek downstream of the culvert somewhat restricted flow, resulting in a backup of water within the culvert.

Upstream of the identified channel reach

The 50 m assessed upstream of Etude Drive was generally consistent with the downstream sections, with a mean wetted width and depth of five (5) m and 0.55 m, respectively. Flat morphology dominated the channel with sand, clay, gravel and silt substrate. The banks on both sides of the creek were undercut, and the densely treed riparian area provided 75% cover. Litter was present within the riparian area and woody debris has accumulated on the west side of the creek. No impediments to fish passage were observed.

Existing Fish and Fish Habitat

Based on the background information reviewed and field investigations, the East Branch provides direct fish habitat. Low water levels and barriers within the creek provide impediments to fish movement, particularly during low flow conditions. Varying habitat characteristics, overhanging vegetation, woody debris and leaf litter provide

opportunities for cover, mating and foraging. The riparian cover could help with moderating water temperature during the summer months.

Potential impediments to fish passage and areas of instability due to erosion were present in several locations and are summarized below. Areas with water depth of 0.1 m or less are identified as potential impediments to fish passage due to low water levels (**Figure 24**):

Location 1 – low water levels within the Derry Road culvert may impede fish passage.

Location 2 – failure of the gabion wall could result in bank failure and deposition of material in the creek and impede fish passage.

Location 3 - failure of the gabion wall could result in bank failure and deposition of material in the creek and impede fish passage.

Location 4 – broken wiring and fallen cobble from the gabion wall could result in bank failure and deposition of material in the creek and impede fish passage.

Downstream of Location 6 – low water levels, approximately 20 m downstream of the outfall, may impede fish passage.

Location 6 – erosion observed above the outfall pipe headwall.

Location 7 – failure of gabion baskets could result in bank failure and deposition of material in the creek and impede fish passage.

Location 9 – lack of vegetation on sloped bank susceptible to erosion and bank instability.

Location 10 – woody debris could impede fish passage during low flow conditions.

Location 11 – low water levels may impede fish passage within the Goreway Drive culvert. Additionally, the slumping of the gabion wall on the south side of creek, immediately upstream of the Goreway Drive culvert, may result in bank failure and deposition of material in the creek and impede fish passage.

Downstream & Upstream of Location 12 – low water levels may impede fish passage. High, steep banks with no vegetation on the slope may result in bank failure and deposition of material in the creek, which may impede fish passage.

Location 14 – failing gabion baskets may result in bank failure and deposition of material in the creek, which may impede fish passage.

Location 15 – steep slopes with lack of vegetation may result in bank failure and deposition of material in the creek, which may impede fish passage.

Location 16 – low water levels may impede fish passage. Rusting gabion wire may result in bank failure and deposition of material in the creek, which may impede fish passage.

Location 17 – exposed sloping bank with loose gabions may result in bank failure and deposition of material in the creek, which may impede fish passage.

Location 18 - steep slope with lack of vegetation may result in bank failure and deposition of material in the creek, which may impede fish passage.

Location 19 - steep slope with lack of vegetation may result in bank failure and deposition of material in the creek, which may impede fish passage.

Location 20 – eroding banks downstream of the outfall pipe with loose rip rap along the slope, may result in bank failure and deposition of material in the creek, which may impede fish passage.

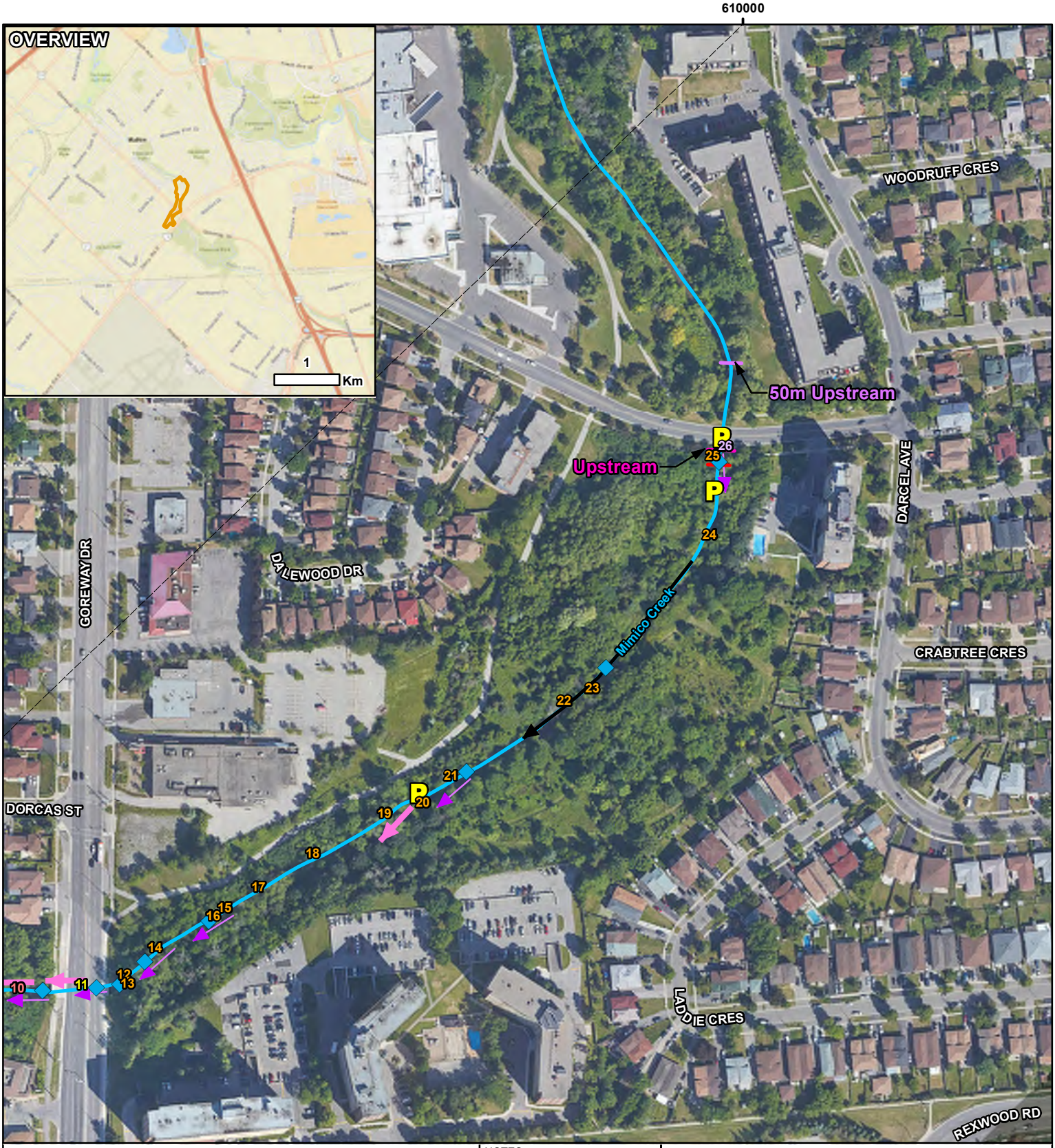
Location 21 - low water levels may impede fish passage.

Location 22 - steep slope with lack of vegetation may result in bank failure and deposition of material in the creek, which may impede fish passage.

Location 23 – low water levels combined with increased cobble within the channel immediately downstream of the stormwater outfall provide a potential impediment to fish passage. Loose rip rap and lack of stabilization downstream of outfall pipe with potential bank failure and deposition of material in the creek may impede fish passage.

Location 24 – high, steep slope with lack of vegetation on the slope may result in bank failure and deposition of material in the creek, which may impede fish passage.

Location 25 – low water levels and the accumulation of cobble within the channel provide a potential impediment to fish passage.



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LEGEND

- Additional Area Surveyed
- Water Depth ≤ 0.1 m
- Pool > 0.5 m
- Fish Barrier
- Riffle
- Run
- Flow Direction
- Identified Channel Reach
- Railway
- Watercourse
- Erosion #
- Erosion/Fish/Terrestrial #
- Erosion/Terrestrial #
- Fish Passage #
- Terrestrial Passage #

NOTES:
- Imagery from Google, 2018
- Overview Image from ESRI

Datum: NAD83
Projection: UTM Zone 17N

0 0.025 0.05 0.1 0.15 0.2 0.25 Kilometres

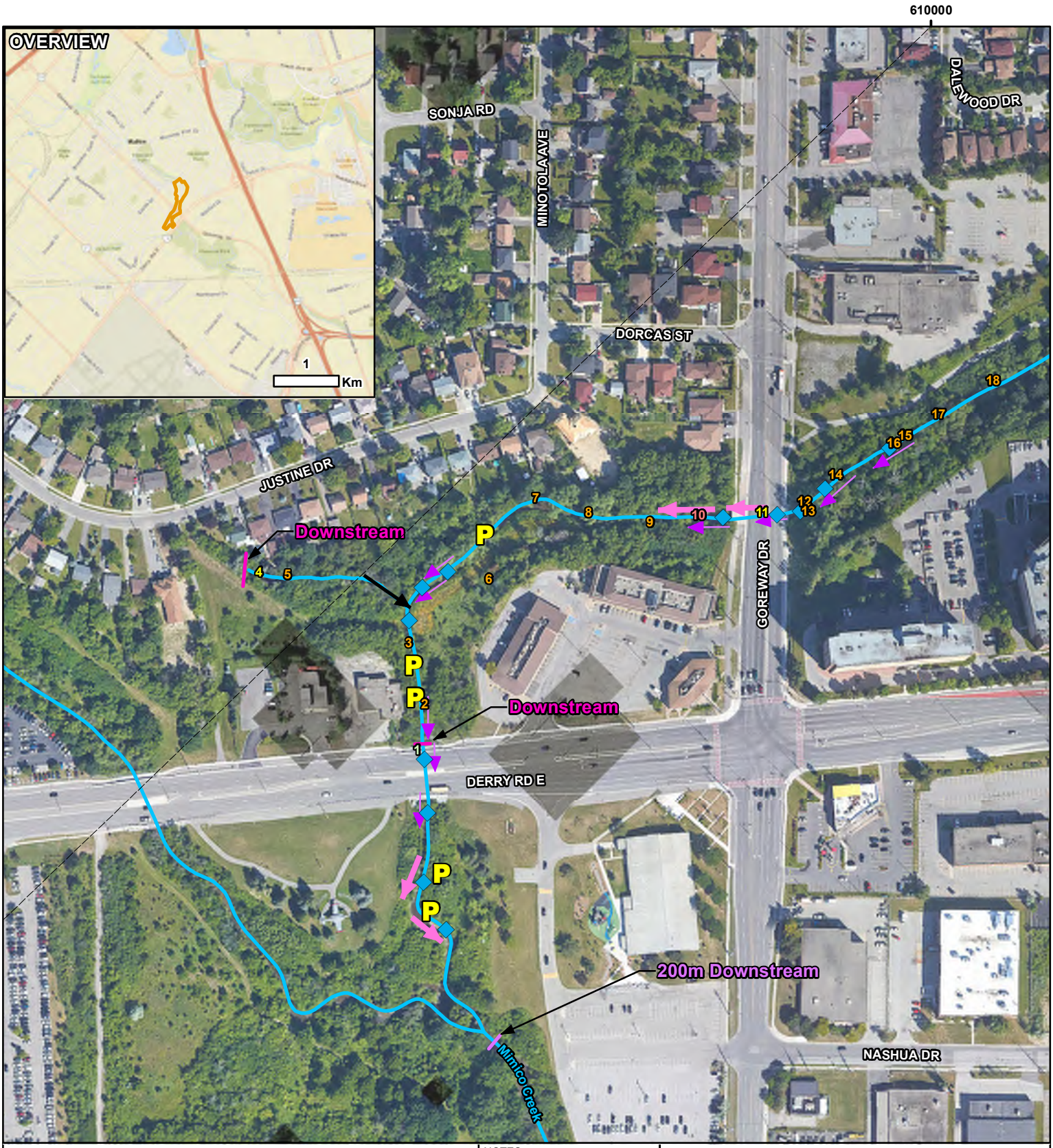
wood.

MIMICO CREEK EROSION

Mimico Creek East Branch Fish Habitat

PROJECT N°: TPB198091 | **FIGURE: 24**

SCALE: 1:3,000 | DATE: January 2020



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LEGEND

- Additional Area Surveyed
- Water Depth ≤ 0.1 m
- Pool > 0.5 m
- Fish Barrier
- Riffle
- Run
- Flow Direction
- Identified Channel Reach
- Railway
- Watercourse
- Erosion #
- Erosion/Fish/Terrestrial #
- Erosion/Terrestrial #
- Fish Passage #
- Terrestrial Passage #

NOTES:
- Imagery from Google, 2018
- Overview Image from ESRI

Datum: NAD83
Projection: UTM Zone 17N

0 0.025 0.05 0.1 0.15 0.2 0.25 Kilometres

wood.

MIMICO CREEK EROSION

Mimico Creek East Branch Fish Habitat

PROJECT N°: TPB198091 | **FIGURE: 25**

SCALE: 1:3,000 | DATE: January 2020

2.5 Terrestrial

2.5.1 Purpose

A Terrestrial Resource Assessment and Species-at-Risk (SAR) Screening Report was completed by Wood in support of this Class EA Study. Please refer to **Figure 26** and **Figure 27** for the study areas reviewed as part of this assessment for the West and East Branch respectively.

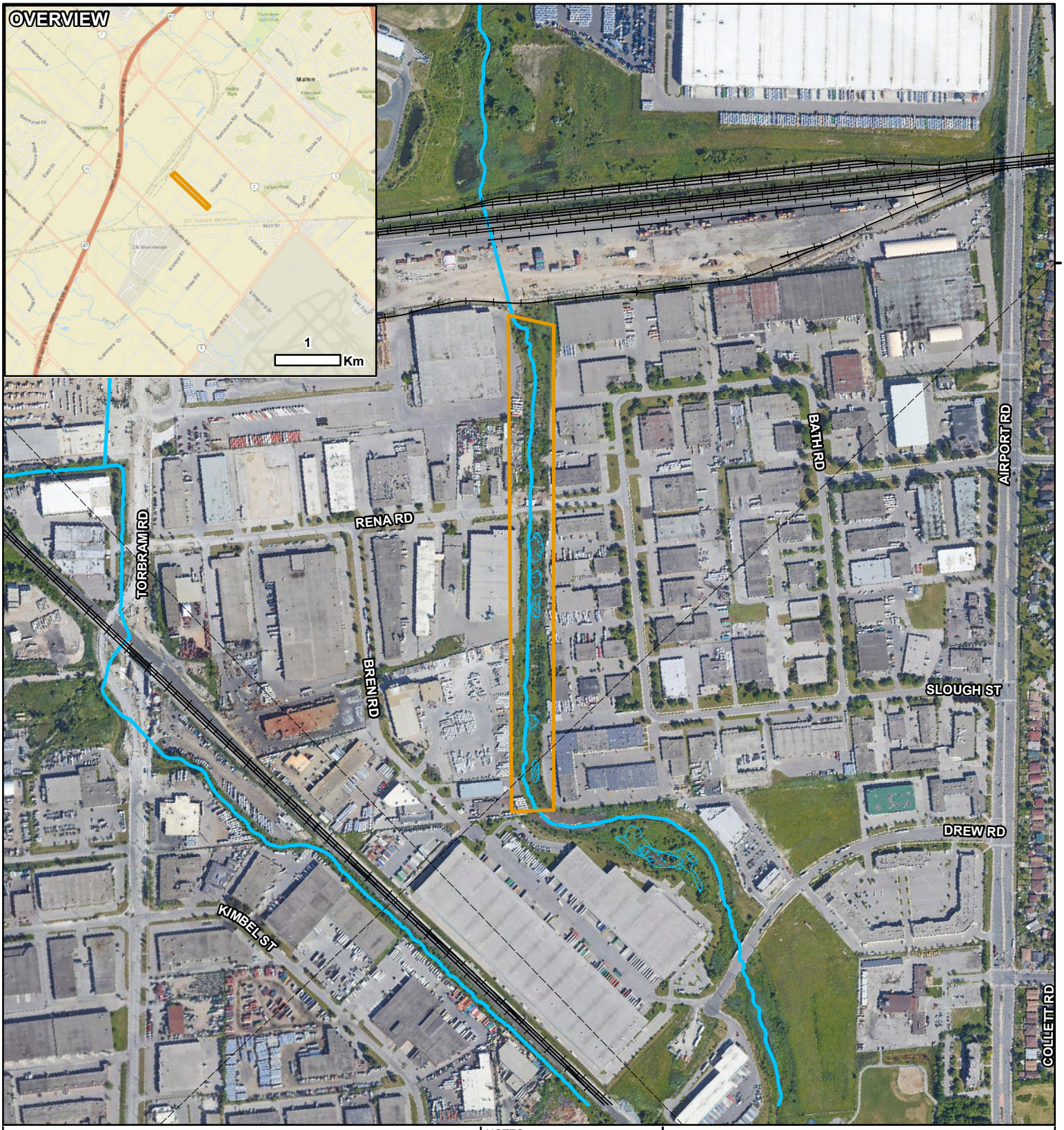
2.5.2 Background Information

The West Branch study area is approximately 300m north of Rena Road to about 450m south of Rena Road. The East Branch study area extends from Etude Drive to Derry Road East, which is a distance of about 800m. The City is the primary landowner for both of these study areas, with the exception of the following:

- private properties located at the upstream end of the West Branch and the section between Goreway Drive and Derry Road for the East Branch, and
- TRCA owned lands immediately on the north and south sides of Etude Drive as well as immediately to the west of Goreway Drive within the East Branch Study Area.

The TRCA properties are under a management agreement with the City of Mississauga, Parks Department. For any works on these properties, a permission to enter will be required from the TRCA.

Several erosion priority sites were identified based on the City of Mississauga erosion assessment documentation, as well as stream morphology field work completed by Aqualogic as part of this study.



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LEGEND

- Unevaluated Wetland
- Study Area
- Railway
- Watercourse

NOTES:
- Imagery from Google, 2018
- Overview Image from ESRI

wood.

MIMICO CREEK EROSION

Study Area No. 1
West Mimico Creek at Rena Road

Datum: NAD83
Projection: UTM Zone 17N

0 0.05 0.1 0.2 0.3 0.4 0.5 Kilometres

PROJECT N°: TPB198091 | **FIGURE: 26**

SCALE: 1:8,000 | DATE: January 2020

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LEGEND

- Study Area
- Watercourse

NOTES:
- Imagery from Google, 2018
- Overview Image from ESRI

wood.

MIMICO CREEK EROSION

Study Area No. 2
East Mimico Creek from Etude Dr. to Derry Rd. E.

Datum: NAD83
Projection: UTM Zone 17N

0 0.045 0.09 0.18 0.27 0.36 0.45 Kilometres

PROJECT N°: TPB198091 | **FIGURE: 27**

SCALE: 1:5,000 | DATE: November 2019

2.5.3 Policy

Information pertaining to the natural heritage legislation, policies and planning components relative to federal, provincial, and municipal sections associated with the study area are outlined below.

2.5.3.1 Federal Legislative Requirements

Federal Species at Risk Act

The federal Species at Risk Act (SARA), (2002), prevents wildlife species in Canada from disappearing and provides recovery of wildlife species that are extirpated (no longer exist in the wild in Canada), endangered, or threatened as a result of human activity, and aims to manage species of special concern to prevent them from becoming endangered or threatened. Those species provided protection under SARA are listed under Schedule 1, with several prohibitions identified under Sections 32 and 33 of SARA.

Applicability to the Project

As none of the lands within the East and West Branch study areas are federal lands, the SARA does not apply to this Project for terrestrial listed species.

Migratory Birds Convention Act

The *Migratory Birds Convention Act* (MBCA) was passed in 1917 and updated in 1994. The MBCA protects migratory bird populations by regulating potentially harmful anthropogenic activities. The MBCA (1994) and the *Migratory Bird Regulations* (MBR) are federal legislative requirements that are binding on members of the public and all levels of government, including federal and provincial governments.

Protected species are listed under Article I of the MBCA, and are native or naturally occurring in Canada, and are species that are known to occur regularly in Canada. The legislation protects certain species, controls the harvest of others, and prohibits commercial sale of all species. As described in Section 6 of the associated MBR:

"Subject to subsection 5(9), no person shall:

- Disturb, destroy or take a nest, egg, nest shelter, Eider Duck shelter or duck box of a migratory bird, or
- Have in his possession a live migratory bird, or a carcass, skin, nest or egg of a migratory bird except under authority of a permit therefor."

The "incidental take" of migratory birds and the disturbance, destruction or taking of the nest of a migratory bird is prohibited. No permit can be issued for the incidental take of migratory birds.

Bird species not regulated under the Act include: Rock Dove, American Crow, Brown-headed Cowbird, Common Grackle, House Sparrow, Red-winged Blackbird, and European Starling. Furthermore, if the species identified is protected under Ontario's Endangered Species Act, (ESA) or the federal SARA, additional restrictions may apply.

Environment and Climate Change Canada (ECCC) and the Canadian Wildlife Service have compiled nesting calendars that show the variation in nesting intensity by habitat type and nesting zone, within broad geographical areas distributed across Canada. While this does not mean nesting birds will not nest outside of these periods, the calendars can be used to greatly reduce the risk of encountering a nest.

Applicability to the Project

The MBCA applies to all of Canada. As such, the MBCA is applicable to the entire Project. Therefore, if a protected species or their nest is encountered during future works, the project must comply with the prohibitions of the Act.

2.5.3.2 Provincial Legislative Requirements

Endangered Species Act

The Ontario Endangered Species Act, 2007 (ESA) was passed into law in 2007 and came into effect on June 30, 2008. Under the ESA, species in Ontario are identified as extirpated, endangered, threatened, or of special concern. Section 9 of the ESA generally prohibits the killing or harming of a threatened or endangered species. Section 10 of the ESA prohibits the damage or destruction of the habitat of all endangered and threatened species. Habitat is broadly characterized within the ESA (2007) as the area prescribed by a regulation as the habitat of the species or an area on which the species depends directly or indirectly, to carry on its life processes, including reproduction, rearing of young, hibernation, migration or feeding.

Applicability to the Project

If threatened and/or endangered species or their habitat are encountered, the Project may be subject to a permit under the ESA and/or its regulatory exemptions under the Act.

Conservation Authorities Act

The TRCA regulates watercourses, wetlands, and hazard lands (valleylands, shorelines, floodplains) through application of Ontario Regulation 166/06, under Section 28 of the Conservation Authorities Act (Conservation Authorities Act, 1990). Ontario Regulation 166/06 applies to hazardous lands that are defined in Section 28(25) of the Conservation Authorities Act as lands that could be unsafe for development because of naturally occurring processes associated with flooding, erosion, dynamic beaches or unstable soil

or bedrock. The regulation limit for Ontario Regulation 166/06 is the applicable hazard limits for a property.

The main purpose of Ontario Regulation 166/06 is to ensure public health and safety, and protection of life and property in relation to natural hazards. This regulation establishes guidelines for development, interference with wetlands and alterations to shorelines and watercourses.

Applicability to the Project

Based on review of the TRCA's Mapping Tool (accessed November 2019) (Toronto and Region Conservation Authority, 2019), both the East and West branch study areas are regulated. Further consultation with TRCA will be required when the Project moves forward into the design and construction phases to determine permit requirements.

Fish and Wildlife Conservation Act, 1997

The Fish and Wildlife Conservation Act, 1997, (FWCA), applies to 'wildlife' which are defined as "an animal that belongs to a species that is wild by nature, and includes game wildlife and specially protected wildlife". Those species considered specially protected wildlife include those specially protected amphibians, birds, invertebrates, mammals or reptiles, as identified within Schedules 6 to 11 under the Act.

Applicability to the Project

The FWCA is managed by the MNDMNRF and is applicable to all wildlife as defined under the Act. In instances where wildlife will require collection or relocation at any point in a project, (i.e., during field surveys via trapping or during construction through trapping/collection and relocation), permits and/or approvals under the Act may apply.

2.5.3.3 Municipal Legislative Requirements

City of Mississauga

The City of Mississauga Official Plan protects the Natural Heritage System (NHS) and Natural Hazard Land. The NHS is comprised of significant natural areas, natural green spaces, special management areas, and residential woodlands. Schedule 3 of the City of Mississauga Official Plan shows the NHS and Hazard Lands (City of Mississauga, 2015). Section 6.3.26 states that lands designated as significant natural area and its buffers can be used for conservation flood and/or erosion control, essential infrastructure and passive recreation. Natural Hazard Lands and their buffers also have the same limited uses as the significant natural areas. Natural Hazard Lands are defined as the significant valleyland and the valley of the watercourse within the City.

Applicability to the Project

The East and West Branch study areas are within the City of Mississauga and contain natural heritage features. Essential infrastructure and erosion control works such as those proposed by this projected are an allowed use of a significant natural area as per Section 6.3.26 of the City's Official Plan (City of Mississauga, 2015). Although this work is allowed it must be demonstrated that that all reasonable alternatives have been considered, and negative impacts are minimized. This is required to be demonstrated in accordance with the Environmental Assessment Act, (if the Project is undertaken as a Municipal Class EA) and if the project is not a subject to the Environmental Assessment Act an Environmental Impact Study is required. According to Schedule 3 of the Official plan the East Branch study area has been mapped as significant natural area and hazard lands, which identifies significant valleylands (City of Mississauga, 2015). Schedule 3 of the Official plan shows the West Branch study area as hazard lands therefore there are significant valleylands (City of Mississauga, 2015). Section 6.3.12.f of the City's Official plan defines the criteria of significant woodlands. These criteria include woodlands that are 0.5 ha or larger and their proximity to watercourses. Using these criteria significant woodland within the East Branch study area would be considered significant and woodlands located within the West Branch Study area are too small to qualify.

City of Mississauga Private Tree Protection By-law

The City of Mississauga By-law (Municipal Code, Chapter 254, Article 12) (City of Mississauga, 2012) applies to private trees. This By-law prevents the injury or removal of Heritage trees, and the injury or removal of three (3) or more trees that have a diameter great than 15 cm on a lot per calendar year without a permit under this By-law. A permit is obtained by the owner of the lot applying for a "Permit of the Injury or Destruction of a Tree(s)."

Applicability to the Project

Those trees located within lands currently owned by the City of Mississauga are managed by the City. Those trees situated on private property would require review under the Private Tree Protection By-law if trees within these areas require removal or injury as a result of the Project.

2.5.4 Methodology

A combination of a desktop review of secondary source information, and field investigations were used to characterize the study area.

2.5.5 Results/Recommendations

2.5.5.1 Secondary Source Review Methods

A desktop review of secondary source information for natural heritage information was completed in November 2019. Secondary sources of information were gathered to identify the terrestrial biological dataset for the East and West Branch study areas (i.e., potential occurrences of SAR, woodlands, provincially significant wetlands (PSW) etc.). Secondary sources reviewed included:

- City of Mississauga Natural Areas Survey (City of Mississauga, 2018);
- TRCA Bren Road Sanitary Infrastructure Protection Project- Natural Heritage Impact Study (GHD, 2017);
- TRCA Malton Greenway Sanitary Infrastructure Protection Project – Natural Heritage Impact Study (GHD, 2016);
- TRCA publications including watershed report cards (Toronto and Region Conservation Authority, 2010);
- Species at Risk in Ontario List (Ontario Ministry of Natural Resources and Forestry, 2019);
- MNDMNRF Natural Heritage Information Centre (NHIC) database square (1 km x 1 km) encompassing the Project, includes square 1007624, 1017534, and 1017535for the East Branch, and 1007614 and 1007604 for the West Branch (Ontario Ministry of Natural Resources and Forestry, 2019);
- Species at Risk Public Registry database (Environment Canada and Climate Change, 2018);
- Reptile and Amphibians of Ontario (ORAA) (squares 17PJ04 (West Branch) and 17PJ14(East Branch)) (Ontario Nature, 2019);
- The Atlas of the Mammals of Ontario (AMO) (Dobbyn, 1994);
- Bat species profiles and range maps for the province of Ontario provided by Bat Conservation International, Inc. (Bat Conservation International, Inc , 2018);
- The Second Atlas (2001 to 2005) of Breeding Birds of Ontario (ABBO) 10 x 10 km survey square 17PJ04 and 17PJ14 (Cadman, Sutherland, Beck, Lepage, & Couturier, 2007);
- The Ontario Butterfly Atlas (TEA) 10 x 10 km survey square 17PJ04 and 17PJ14 (MacNaughton, 2019);
- iNaturalist (iNaturalist, 2019); and

- Topographic data extracted from LIO (Ontario Ministry of Natural Resources and Forestry, 2019).

2.5.5.2 Terrestrial Field Investigations

Natural heritage features and functions, including identifying candidate Significant Wildlife Habitat (SWH), feature connectivity, and SAR candidate habitat were identified through the review of background information as well as through completion of a high-level botanical inventory within the East and West Branch study areas.

Botanical Inventory

A high-level botanical inventory was completed for the study areas by Wood's terrestrial ecologist on November 5, 6, and 8, 2019 to document existing conditions including classifying vegetation communities using the Ecological Land Classification (ELC) system and identifying the potential for SWH (i.e., candidate habitat). Due to the late date of the visits, additional vegetation investigations were desirable in summer. As such, Wood completed additional vegetation field visits again on September 16 and 17, 2020 to confirm the results of 2019 vegetation investigations.

ELC was utilized to broadly characterize the ecosites within the East and West Branch study areas, as well as to identify the potential presence of rare and/or sensitive vegetation communities and/or species to the extent possible. The First Approximation of ELC (Lee, et al., 1998) was applied for the determination of ecosite type. The occurrence of ELC communities were cross-referenced with provincially significant vegetation communities as identified in the SWH Technical Guide (Ontario Ministry of Natural Resources, 2000) and SWHCS for Ecoregion 7E (Ontario Ministry of Natural Resources and Forestry, 2015). This cross-reference was conducted to determine whether these SWHs exist within the East and West Branch study areas. The basal area of wooded ELC communities was conducted with a x2 factor prism.

Species at Risk

The potential for SAR and SAR habitat (i.e., candidate) to occur within the East and West Branch study areas was determined based on a review of secondary source information relative to the vegetation communities identified during the botanical inventory. Information collected was then used to evaluate the potential for SAR occurrence based on habitat preferences for each species.

2.5.6 Existing Conditions

2.5.6.1 Physiography and Topography

The East and West Branch study areas are situated within the Peel Plain physiographic region and Bevelled Till Plains physiographic landform (Ministry of Energy, Northern

Development and Mines, 2019). The topography of the West Branch study area are plateaus on either side of the creek channel, and a small slope down to the creek. The slopes along the East Branch study area had a larger distance between the top of the slope and the toe of the slope, thus greater in height. This section of channel of Mimico Creek flows in a north east direction, ultimately flowing towards Lake Ontario.

2.5.6.2 Terrestrial Environment

The organizational framework contained within the ELC protocol (Lee, et al., 1998) describes communities according to six (6) nested levels: Site Region, System, Community Class, Community Series, Ecosite, and Vegetation Type. These nested levels vary in spatial scale, with the Ecoregion classifying communities at the largest spatial scale, and Vegetation Type describing communities at the finest spatial scale (Lee, et al., 1998).

There are two (2) Ecoregions in Southern Ontario: 6E and 7E (Lee, et al., 1998). Both the East and West Branch study areas are situated within Ecoregion 7E, the Lakes Erie-Ontario Ecoregion, which occupies the southern portion of Ontario. A tabulation of 90 noted species comprised of trees, shrubs and herbaceous plants was collected during the botanical inventory in November 2019 (and confirmed in September 2020), and is provided in **Appendix C**. The ELC community types are illustrated on **Figure 28** to **Figure 31** for the West and East Branch study areas respectively, with representative photographs provided in **Appendix C**. A summary of communities observed is provided below, along with the TRCA species status ranks based on their regional jurisdiction. TRCA Species Ranks are defined in the table below.

Table 4: TRCA Status Ranks

Rank	Definition
L1-L3	Species of regional conservation concern
L4	Species of conservation concern in urban area
L5	Species of not of conservation concern at this time
L+	Introduces Species, not native to TRCA

Mimico Creek - West Branch

The following vegetation communities were identified in the West Branch Study Area:

- MEGM3 – Dry -Fresh Graminoid meadow Ecosite (L+);
- MEGM3-8 Reed Canary Grass Graminoid Meadow Type (L+);
- MAMM1-12 Common Reed Graminoid Mineral Meadow Marsh Type (L+);

- THDM2-4 Gray Dogwood Deciduous Shrub Thicket Type (L4);
- THDM2 – Deciduous Shrub Thicket Ecosite (L4);
- MEFM1 – Dry – Fresh Forb Meadow Ecosite (L5);
- THDM2-6 - Buckthorn Deciduous Shrub Thicket Type (L+); and
- FODM7-9 Fresh -Moist Exotic Lowland Deciduous Forest (L+).

Mimico Creek – East Branch

The following vegetation communities were identified in the East Branch Study Area:

- FODM7-9 – Fresh – Moist Exotic Lowland Deciduous Forest Type (L+);
- MEFM1-1 – Goldenrod Forb Meadow Type (L5);
- THMM1-1 – Native Mixed Regeneration Thicket Type (L5); and
- FODM12 – Naturalized Deciduous Plantation Ecosite (L5).

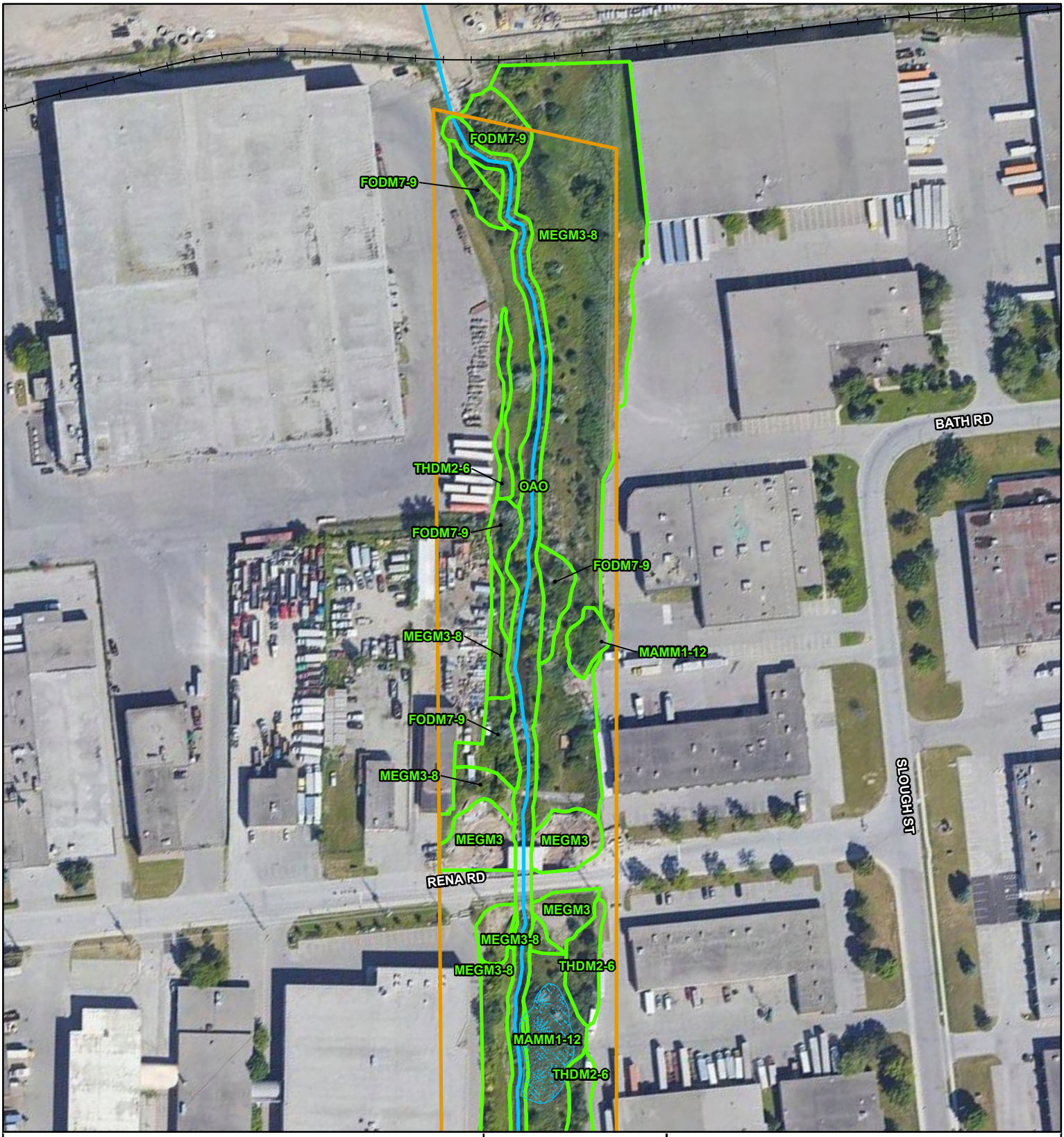
None of these ELC communities are of regional concern. Several plant species found within the ELC communities documented are considered of regional concern, these plants include Speckled Alder, White Spruce, White Oak, Common Snowberry and Highbush Cranberry (Toronto and Region Conservation Authority, 2019). In the East Branch study area 10 species of plants are ranked between regional conservation concern (L2 and L3) and conservation concern in the urban area (L4). The West Branch study area held five (5) plant species that were either of conservation concern on a regional or urban area level. None of the ELC communities are of provincial concern (Ontario Ministry of Natural Resources, 2000). Both the East and West Branch study areas were characterized by ELC communities found within areas with high disturbance typically associated with urban areas.

Many ELC communities have areas with uniform tree age and growing in definable patterns suggesting some trees have been planted in restoration efforts. Evidence that these ELC communities are disturbed by anthropogenic activities included, vegetation clearing, dumping, and informal foot trails. The basal area calculation in the ELC communities where trees were found is provided in the table below.

Table 5: Basal Area of Treed ELC Communities within the Study Areas

Mimico Creek Branch	ELC Community	Basal Area (m^2/ha)
West	THDM2-4	4
West	THDM2	4
West	THDM2-6	2
West	FODM7-9	8
East	FODM7-9	16
East	THMM1-1	6

Many of the trees observed within the West Branch study area as part of the MEGM3-8, MEGM3, THDM2-4, and THDM2, are thought to planted. Evidence to support these communities were planted include the uniform shapes, and plant age. Some plants within MEGM3 community are thought to have been planted as recently as 2019 for restoration efforts to the Rena Road Bridge construction. The trees near the bridge are staked and wrapped in tree guards. The ELC communities upstream and downstream of the Rena Road Bridge are estimated to have been planted within the last 20 years. Similarly, planted trees are thought to be within the communities THMM1-1, MEFM1-1, and FODM12 along the East Branch study area. Evidence to support that some of these trees were planted include the uniform age, uniform distance between trees, and generally young aged tees with disturbed soils around their base. Naturalization of a previously manicured parkland was also noted within the East Branch study area, just upstream of Goreway Drive. This naturalization effort was marked by a City sign indicating as much. Overall, the West Branch study area was comprised of meadows and thickets as the dominant communities, and the East Branch study area contained a larger forest land coverage. No SAR plants were observed within the East and West Branch study areas during the botanical inventory.



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LEGEND

- ELC
- Study Area
- Railway
- Watercourse
- Unevaluated Wetland

Ecological Land Classification

- FODM7-9, Fresh-Moist Exotic Lowland Deciduous Forest Type
- MAMM1-12, Common Reed Graminoid Mineral Meadow Marsh Type
- MEGM3, Dry-Fresh Graminoid Meadow Ecosite
- MEGM3-8, Reed Canary Grass Graminoid Meadow Type
- OAO, Open Aquatic
- THDM2-6, Buckthorn Deciduous Shrub Thicket Type

NOTES:
- Imagery from Google, 2018

0 12.5 25 50 75 100 Meters

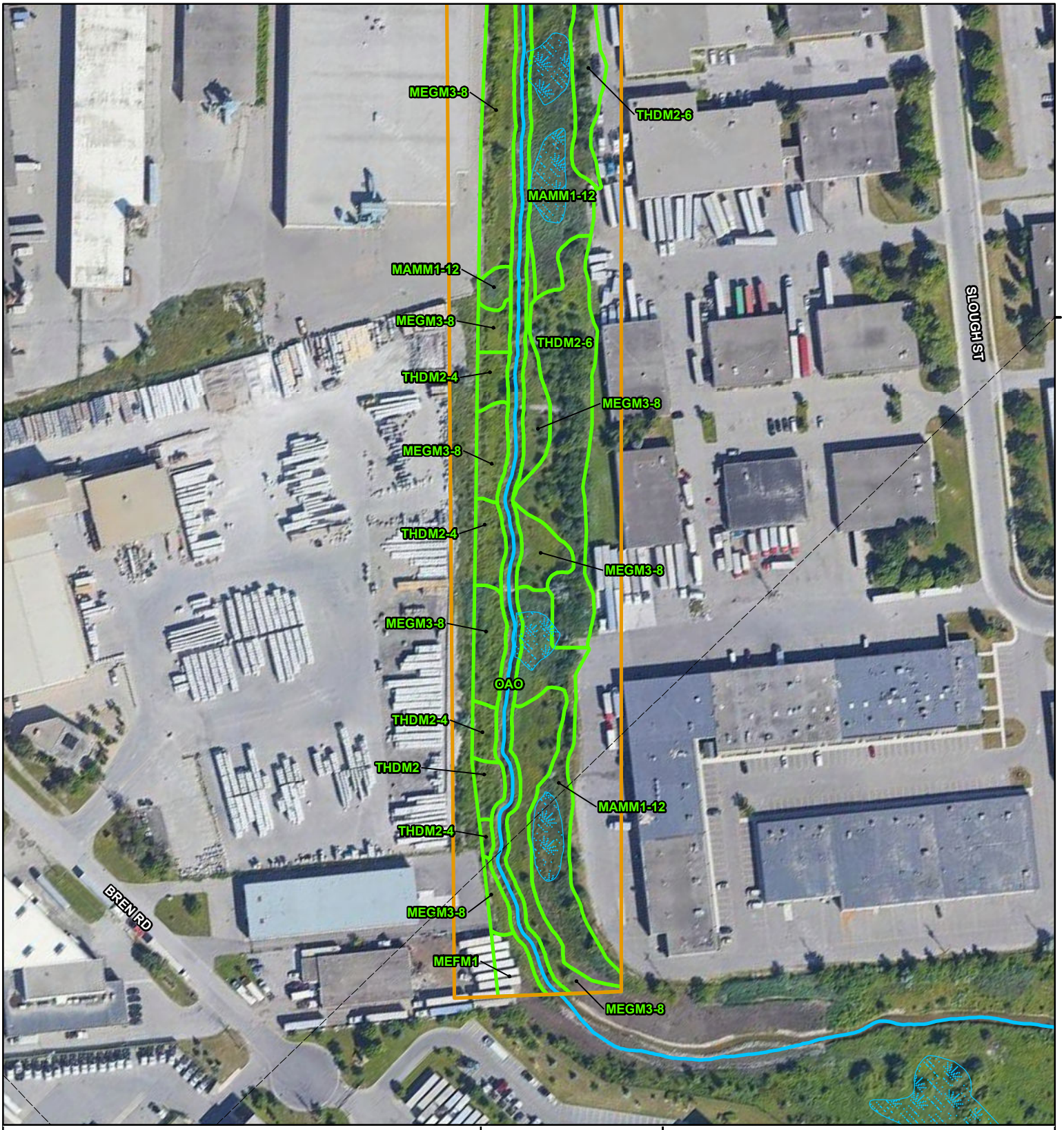
Datum: NAD83
Projection: UTM Zone 17N

wood.

MIMICO CREEK EROSION

Ecological Land Classification
Study Area No. 1
West Mimico Creek at Rena Road

PROJECT N°: TPB198091	**FIGURE: 28**
SCALE: 1:2,000	DATE: January 2020



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LEGEND

- ELC
- Study Area
- Watercourse
- Unevaluated Wetland

Ecological Land Classification

- MAMM1-12, Common Reed Graminoid Mineral Meadow Marsh Type
- MEFM1, Dry-Fresh Forb Meadow Ecosite
- MEGM3-8, Reed Canary Grass Graminoid Meadow Type
- OAO, Open Aquatic
- THDM2, Deciduous Shrub Thicket Ecosite
- THDM2-4, Gray Dogwood Deciduous Shrub Thicket Type
- THDM2-6, Buckthorn Deciduous Shrub Thicket Type

NOTES:
- Imagery from Google, 2018

0 12.5 25 50 75 100 Meters

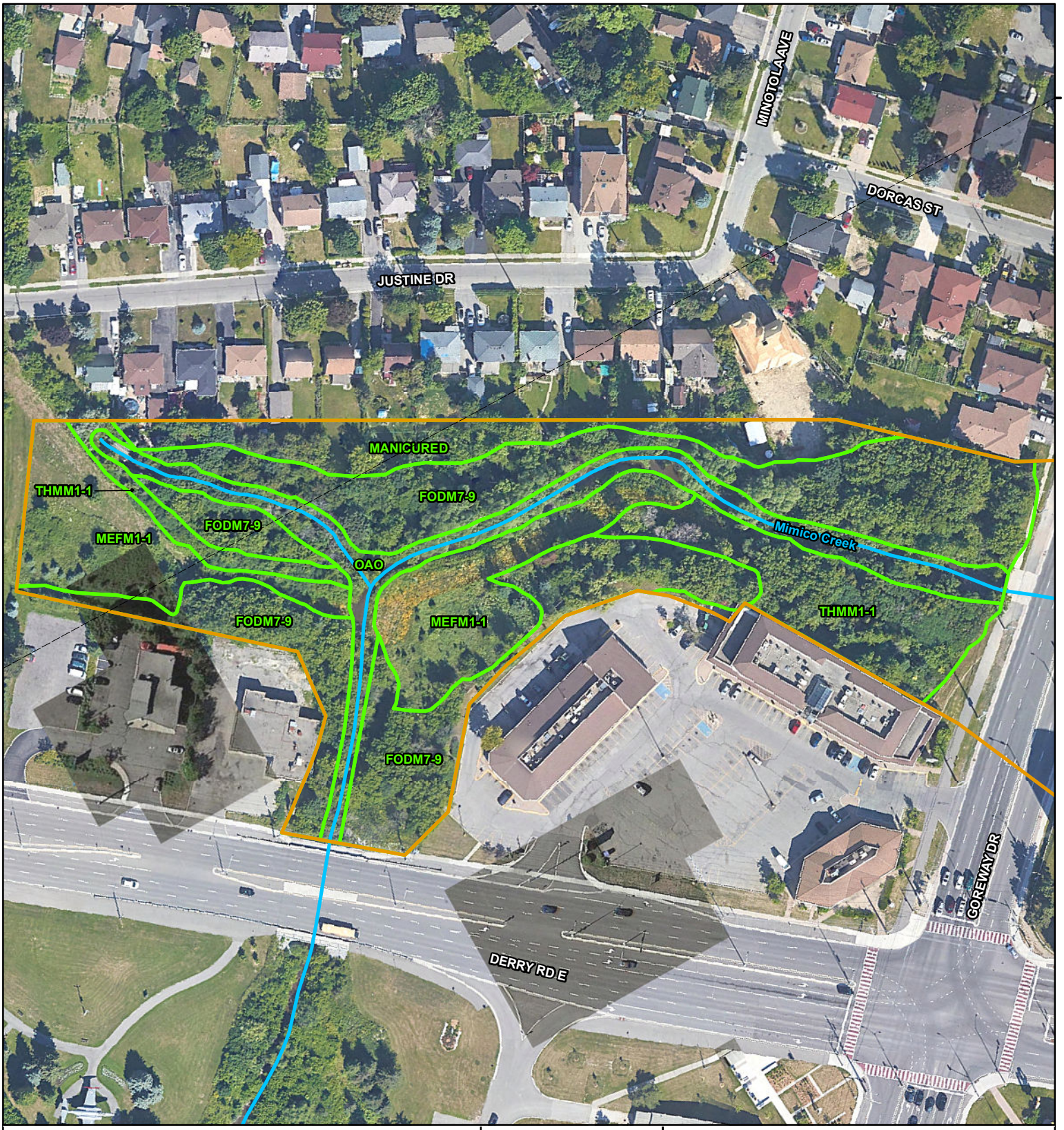
Datum: NAD83
Projection: UTM Zone 17N

wood.

MIMICO CREEK EROSION

Ecological Land Classification
Study Area No. 1
West Mimico Creek at Rena Road

PROJECT N°: TPB198091	**FIGURE: 29**
SCALE: 1:2,000	DATE: January 2020



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LEGEND

- Study Area
- ELC
- Watercourse

Ecological Land Classification

FODM7-9, Fresh-Moist Exotic Lowland Deciduous Forest Type

MANICURED, Manicured

MEFM1-1, Goldenrod Forb Meadow Type

OAO, Open Aquatic

THMM1-1, Native Mixed Regeneration Thicket Type

NOTES:
- Imagery from Google, 2018

0 12.5 25 50 75 100 Meters

Datum: NAD83
Projection: UTM Zone 17N

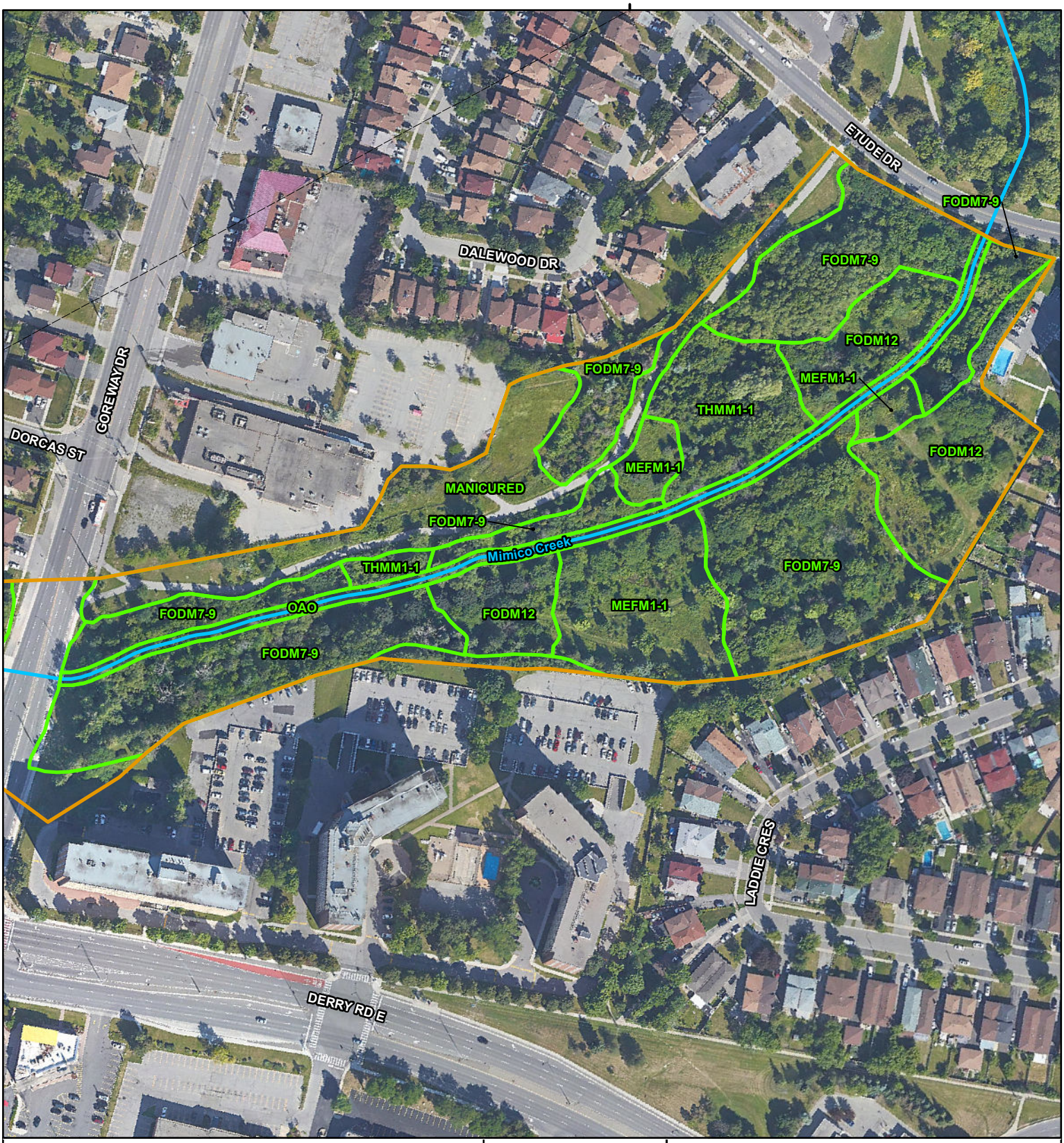
wood.

MIMICO CREEK EROSION

Ecological Land Classification
Study Area No. 2 East Mimico Creek from Etude Dr. to Derry Rd. E.

PROJECT N°: TPB198091 | **FIGURE: 30**

SCALE: 1:1,600 | DATE: January 2020



P:\2019\Projects_Other\TPB198091_MimicoCreekErosion\MXD\ELC_Study_Area_No2_v2.mxd

LEGEND

- Study Area
- ELC
- Watercourse

Ecological Land Classification

- FODM12, Naturalized Deciduous Plantation Ecosite
- FODM7-9, Fresh-Moist Exotic Lowland Deciduous Forest Type
- MANICURED, Manicured
- MEFM1-1, Goldenrod Forb Meadow Type
- OAO, Open Aquatic
- THMM1-1, Native Mixed Regeneration Thicket Type

NOTES:
- Imagery from Google, 2018

0 12.5 25 50 75 100 Meters

Datum: NAD83
Projection: UTM Zone 17N

wood.

MIMICO CREEK EROSION

Ecological Land Classification
Study Area No. 2 East Mimico Creek from Etude Dr. to Derry Rd. E.

PROJECT N°: TPB198091 | **FIGURE: 31**

SCALE: 1:2,400 | DATE: January 2020

2.5.6.3 Wildlife Summary

Based on the review of available literature, resources atlases and databases, 105 species of birds, 41 species of mammals, nine (9) species of amphibians, and 6 (six) species of reptiles, 32 species of butterflies, are reported to occur within the West Branch study area. The East Branch study area had records of 94 species of birds, 41 species of mammals, nine (9) species of amphibians, seven (7) species of reptiles, and 52 species of butterflies. A tabulation of compiled species lists are provided in the Terrestrial Resource Assessment and Species at Risk Screening (**Appendix C**).

Birds

Combining the secondary resources, for the West Branch study area identified 105 species of birds. In the East Branch study area 94 species of birds were found. A total of 114 birds were seen between the West and East Branch study area including five (5) threatened and, three (3) special concern SAR. A summary of those SAR are as follows:

- Bank Swallow (Riparia riparia) – Threatened;
- Barn Swallow (Hirundo rustica) – Threatened;
- Bobolink (Dolichonyx oryzivorus) – Threatened;
- Chimney Swift (Chaetura pelagica) – Threatened;
- Common Nighthawk (Chordeiles minor) – Special Concern;
- Eastern Meadowlark (Sturnella magna) – Threatened;
- Eastern Wood-pewee (Contopus virens) – Special Concern; and
- Wood Thrush (Hylocichla mustelina) – Special Concern.

During the botanical inventory, a limited number of birds were noted incidentally, both visibly and audibly which include: Cooper's Hawk, American Kestrel and House Finch for the West Branch study area, and Northern Cardinal, Red-tailed Hawk, and Ruby-crowned Kinglet for the East Branch study area. The culverts and bridges within both the East and West Branch study areas were checked for any visible signs of nesting (i.e., remnant nests). No nests were found.

In accordance with the TRCA (Toronto and Region Conservation Authority, 2019) 38 of the reported bird species from the background search would be considered regionally rare. Most of the birds reported were identified from the OBBA data, which is based on a 10km X 10km square area. As such, the exact locations of these birds (SAR, regional or other) are unknown relative to the East and West Branch study areas. A summary of all bird records is provided in the Terrestrial Resource Assessment and Species at Risk Screening (**Appendix C**).

Mammals

Within the East and West Branch study areas, 41 species of mammals have habitat ranges as reported in the AMO (Dobbyn, 1994). Bat Conservation International (BCI) ranges for bats in Ontario includes five (5) species whose ranges encompass the East and West Branch study areas (Bat Conservation International, Inc , 2018), four (4) of which are considered SAR. It is important to note that the exact locations of species occurrences are not available from the atlas or BCI. Given the vegetative characteristics and habitat suitability, there is a moderate probability for non-SAR and SAR bats, to occur within the East and West Branch study areas.

During the botanical inventory, Wood observed evidence of Beaver, and Racoons within the East Branch study area, and had visual sightings of Eastern Cottontail, Gray Squirrel, and a White-tailed Deer. The evidence of mammals observed by Wood at the West Branch study area was that of Raccoon. Historical wildlife reporting by GHD, include Red Fox and White-tailed deer within the West Branch study area (GHD, 2016). The City of Mississauga reported Gray Squirrel within the East Branch study area (City of Mississauga, 2018).

Reptiles and Amphibians

Within the East and West Branch study areas, a total of 10 species of amphibians and 10 species of reptiles were reported in the ORAA (Ontario Nature, 2019). The West Branch study area was found to have records of nine (9) amphibians and six (6) reptiles. The East Branch study area had nine (9) species of amphibians and seven (7) species of reptiles. SAR reptiles and amphibians with historic records within the East and West Branch study areas include, one (1) threatened turtle, and two (2) turtles that are special concern. They are as follows:

- Blanding's Turtle (Emydoidea blandingii) – Threatened;
- Snapping Turtle (Chelydra serpentina) – Special Concern; and
- Northern Map Turtle (Graptemys geographica) – Special Concern.

A summary of all species records is provided in the Terrestrial Resource Assessment and Species at Risk Screening (**Appendix C**). It is important to note that the exact locations of species occurrences are not available from the atlas. Given the characteristics of the East and West Branch study areas, there is a probability for amphibians and reptiles to occur due to the presence of wetland pockets, particularly along the West Branch. There is also suitable habitat for SAR, specifically to that of Snapping Turtle (special concern). Historical reporting by GHD noted observation of Eastern Gartersnake within the West Branch study area (GHD, 2016). The City Mississauga (2018) document had no records of reptiles or amphibians.

Butterflies

Background research using the NHIC and the Ontario Butterfly Atlas (Toronto Entomologists Association (TEA) revealed a total of 52 species to have occurrences within the East and West Branch study areas, including one (1) special concern species (Monarch (Dananus plexippus)) (MacNaughton, 2019). The East Branch study area was found to contain all 52 species of butterflies while the West Branch study area only contained 32 species. It is important to note that the exact locations of species occurrences are not available from these sources. Consequently, it is possible that some of these species do not occur in the East and West Branch study areas. Based on the field investigations completed, there is meadow habitat within both the West and East Branch study areas. These meadow communities could be used as feeding habitat for the Monarch. Common Milkweed, which is considered the host plant for the Monarch was found in the MEFM1-1 Goldenrod Forb Meadow Type community in the East Branch study area. Although no Common Milkweed was noted within the West Branch study area, additional nectar plants (e.g., Goldenrod and Aster spp. etc.) were observed in the West Branch study area as well.

2.5.6.4 Species At Risk

A NHIC search was completed for the one (1) X one (1) km, squares that overlap the East and West Branch study areas. It is important to note that the NHIC search is based on element occurrences and does not necessarily mean species presence and/or absence. The NHIC search revealed no occurrences of SAR or rare species for both the East and West Branch study areas. Based on a review of the habitat characteristics for SAR relative to the East and West Branch study areas, there is possible habitat for SAR.

A summary of SAR known to the East and West Branch study areas, as documented from secondary source information is provided in **Table 6** below. The probabilities provided in **Table 6** are based on an assessment of each species' habitat preferences/needs in conjunction through the review of background information. It is important to note, SAR may come into the area or species already occurring in the area may be up-listed at any time. The probabilities of occurrence are defined as 'High', 'Moderate', 'Low', and 'None' and are based on the following definitions:

- **High**: Those species recorded in the vicinity of the study area and whose preferred habitat is abundant within the study area. Species with high probability of occurrence would be expected to breed within or frequently use the habitats available within the East and West Branch study areas.
- **Moderate**: Those species in the vicinity of the study area but have limited suitable habitat within the study area. Species with moderate probabilities of occurrence may

not occur within the study areas frequently, but may intermittently use it for foraging, migration or movement to other parts of their home-range.

- **Low**: Those species recorded in the vicinity of the study area, but whose preferred habitat does not occur or is extremely limited within the study areas. These species may intermittently move through the study areas but are unlikely to become permanent residents.
- **None**: Those species whose preferred habitat is completely absent from the study area and may only migrate intermittently through.

As noted herein, species identified as endangered and threated are provided protection under the ESA. Those species, identified as special concern, are not afforded protection under Sections 9 and 10 of the ESA however, may be afforded protection as part of SWH. As such, due diligence should be enforced if a special concern species or their habitat is determined present.

Table 6: Species at Risk Screening East and West Branch Mimico Creek

Species Name, Status (SARA, ESA, S-Rank), and Data Source	Preferred Habitat	Potential for SAR Habitat/ Occurrence within the West Branch study area	Potential for SAR Habitat/ Occurrence within the East Branch study area
Birds			
Bank Swallow (*Riparia riparia*) SARA: Threatened ESA: Threatened S-Rank: S4B Source: GHD and OBBA	Bank Swallows nest in burrows in natural and human-made settings where there are vertical faces in silt and sand deposits. Many nests are on banks of rivers and lakes, but they are also found in active sand and gravel pits or former ones where the banks remain suitable (COSEWIC , 2013).	Low – No suitable nesting habitat present though this species may intermittently move through the area.	Low – No suitable nesting habitat present though this species may intermittently move through the area.
Barn Swallow (*Hirundo rustica*) SARA: Threatened ESA: Threatened S-Rank: S4B Source: OBBA	Barn Swallows have shifted largely to nesting in and on artificial structures, including buildings, bridges and road culverts, and prefer various open habitats for foraging including grassy fields, pastures, agricultural crops and over open water (Heagy, et al., 2014).	Moderate – Suitable nesting habitat present within the bridge and culverts. They may also use the area for foraging. Note, the bridge and culverts within the West Branch study area were reviewed during the botanical inventory in November 2019, and no nests were observed in any structures.	Moderate – Suitable nesting habitat present within the bridges and culvert. They may also use the area for foraging. Note, the bridges and culvert within the East Branch study area were reviewed during the botanical inventory in November 2019, and no nests were observed in any structures.
Bobolink (*Dolichonyx oryzivorus*) SARA: Threatened ESA: Threatened S-Rank: S4B Source: GHD and OBBA	Bobolink nest primarily in forage crops, hayfields and associated pastures. Bobolink also occur in wet prairie, graminoid peatlands and abandoned fields dominated by tall grasses, no-till cropland, small-grain fields, reed beds and irrigated fields in arid regions. The species does not generally occupy fields of row crops such as corn, soybean and wheat, pastures in valleys with high shrub density or intensively grazed pastures (McCracken, et al., 2013).	Low – No suitable nesting habitat present though this species may intermittently move through the area.	Low – No suitable nesting habitat present though this species may intermittently move through the area.

Species Name, Status (SARA, ESA, S-Rank), and Data Source	Preferred Habitat	Potential for SAR Habitat/ Occurrence within the West Branch study area	Potential for SAR Habitat/ Occurrence within the East Branch study area
Chimney Swift (*Chaetura pelagica*) SARA: Threatened ESA: Threatened S-Rank: S4B, S4N Source: OBBA	Chimney swifts forage aerially over virtually any habitat. Nesting and roosting takes place in a dark sheltered spot with vertical surfaces to cling to. This may include large hollow trees, chimneys, and other structures (COSEWIC, 2007).	Low – No suitable nesting habitat present though this species may intermittently move through the area.	Low – No suitable nesting habitat present though this species may intermittently move through the area.
Common Nighthawk (*Chordeiles minor*) SARA: Threatened ESA: Special Concern S-Rank: S4B Source: OBBA	Breeding habitat of Common Nighthawk includes a huge variety of open habitats such as clearings, grasslands, open forests, cropfields and urban areas. In urban areas, gravel rooftops are used. Foraging is aerial over virtually any habitat (COSEWIC, 2007).	Moderate – No suitable nesting habitat present though this species could use the study area for foraging periodically.	Moderate – No suitable nesting habitat present though this species could use the study area for foraging periodically.
Eastern Meadowlark (*Sturnella magna*) SARA: Threatened ESA: Threatened S-Rank: S4B Source: GHD and OBBA	Eastern Meadowlarks nest in a variety of open grassy habitats, preferring native grasslands, pastures and savannahs. Larger tracts of grassland are preferred (McCracken, et al., 2013).	Low – Grassland habitat present but too small. They may intermittently move through the area.	Low – Grassland habitat present but too small. They may intermittently move through the area.

Species Name, Status (SARA, ESA, S-Rank), and Data Source	Preferred Habitat	Potential for SAR Habitat/ Occurrence within the West Branch study area	Potential for SAR Habitat/ Occurrence within the East Branch study area
Eastern Wood-pewee (*Contopus virens*) SARA: Special Concern ESA: Special Concern S-Rank: S4B Source: GHD and OBBA	Eastern Wood-pewee breed in mature to intermediate-aged forests with an open understory, often being associated with clearings and edges. Migrants may occur in a wide variety of habitats (COSEWIC, 2012).	Moderate – Pockets of suitable habitat within the West Branch study area. Species may intermittently use it for movement.	High – Reported in the area during the breeding season by the City (City of Mississauga, 2018)
Wood Thrush (*Hylocichla mustelina)* SARA: Threatened ESA: Special Concern S-Rank: S4B Source: GHD and OBBA	Wood Thrush breed in mature or second growth deciduous and mixed wood forests. They prefer forests with dense understory and large continuous areas of forest but are not reliant on this. Habitat fragmentation due to human development and over-grazing by White-tailed Deer are the main threats to this species (COSEWIC, 2012).	Low – Species may intermittently use the area for movement.	Low – Species may intermittently use the area for movement
Reptiles			
Snapping Turtle (*Chelydra serpentina*) SARA: Special Concern ESA: Special Concern S-Rank: S4 Source: ORAA	Snapping Turtles prefer slow-moving waters with a soft mud bottom and dense aquatic vegetation. Established populations are most often located in ponds, sloughs, shallow bays or river edges and slow streams and wetlands. Individuals can also exist in developed areas (e.g., golf course ponds, irrigation canals); however, it is unlikely that populations persist in such habitats. Snapping Turtles can occur in highly polluted waterways, but environmental contamination is known to limit reproductive success (COSEWIC, 2008).	Moderate – Suitable habitat limited within the West Branch study area.	Moderate – Suitable habitat limited within the East Branch study area.

Species Name, Status (SARA, ESA, S-Rank), and Data Source	Preferred Habitat	Potential for SAR Habitat/ Occurrence within the West Branch study area	Potential for SAR Habitat/ Occurrence within the East Branch study area
Blanding's Turtle (*Emydoidea blandingii*) SARA: Threatened ESA: Threatened S-Rank: S3 Source: ORAA	Blanding's Turtles are found in a variety of productive wetlands, occurring primarily in shallow-water habitats. Females nest on various substrates on land, while overwintering occurs underwater in permanent pools (COSEWIC, 2016).	None – Not reported in the West Branch study area	None – No suitable habitat is present in the East Branch study area.
Northern Map Turtle (*Graptemys geographica*) SARA: Special Concern ESA: Special Concern S-Rank: S3 Source: ORAA	Northern Map Turtles are found in rivers and lakes with emergent rock and logs for basking. Shallow, soft-bottomed habitats are preferred, with wintering occurring in deeper sections (COSEWIC, 2012).	None – No suitable habitat is present in the West Branch study area.	None – Not reported in the East Branch study area
Mammals			
Tri-colored Bat (*Perimyotis subflavus*) SARA: Endangered ESA: Endangered S-Rank: S3 Source: Ontario Mammal Atlas	Within treed habitats, Tri-colored Bat primarily roosts in tree foliage (mainly within oak leaves). Leaf roosts are shaped like umbrellas with a "roof" and a hollow core where bats rest. Studies have shown that oak leaves are a preferred roost site. Maple leaves are also selected, although less commonly. It is thought that Tri-colored Bat may prefer roost trees in more open woodlands, as opposed to deep woods. Roosts in tree cavity are used less frequently than Myotis species (Ontario Ministry of Natural Resources, 2011).	Moderate – Possible habitat in the West Branch study area.	Moderate – Possible habitat in the East Branch study area.

Species Name, Status (SARA, ESA, S-Rank), and Data Source	Preferred Habitat	Potential for SAR Habitat/ Occurrence within the West Branch study area	Potential for SAR Habitat/ Occurrence within the East Branch study area
Little Brown Myotis (*Myotis lucifugus*) SARA: Endangered ESA: Endangered S-Rank: S3 Source: Ontario Mammal Atlas	The Little Brown Myotis is wide-spread throughout the southern half of Canada and is especially associated with humans, often forming nursery colonies in buildings, attics, and other man-made structures. Little Brown Myotis forage over water where their diet consists of aquatic insects, mainly midges, mosquitoes, mayflies, and caddisflies. They also feed over forest trails, cliff faces, meadows, and farmland where they consume a wide variety of insects, from moths and beetles to crane flies (COSEWIC, 2013).	Moderate – Possible habitat in the West Branch Study area.	Moderate – Possible habitat in the East Branch study area.
Northern Myotis (*Myotis septentrionalis*) SARA: Endangered ESA: Endangered S-Rank: S3 Source: Ontario Mammal Atlas	The Northern Myotis is one of the less common species found to hibernate in Ontario. This species is closely associated with woodlands and uses trees as maternity sites (Ontario Ministry of Natural Resources, 2011).	Moderate – Possible habitat in the West Branch Study area.	Moderate – Possible habitat in the East Branch study area.
Eastern Small-footed Myotis (*Myotis leibii*) SARA: No status ESA: Endangered S-Rank: S2S3 Source: Ontario Mammal Atlas	The Eastern Small-footed Bat is one of the less common species found to hibernate in Ontario. Caves and mines serve as significant hibernacula while streams and ponds serve as foraging areas (Ontario Ministry of Natural Resources, 2011).	Moderate – Possible habitat in the West Branch Study area.	Moderate – Possible habitat in the East Branch study area.

Species Name, Status (SARA, ESA, S-Rank), and Data Source	Preferred Habitat	Potential for SAR Habitat/ Occurrence within the West Branch study area	Potential for SAR Habitat/ Occurrence within the East Branch study area
Invertebrates			
Monarch (*Danaus plexippus*) SARA: Special Concern ESA: Special Concern S-Rank: S2N,S4B Source: OBA	Monarch is very widely distributed across North America and found in a wide variety of habitats. Populations fluctuate dramatically but have been generally declining likely due to habitat destruction on the hibernation grounds in Mexico, as well as pesticide use and other factors on the vast breeding grounds. Monarchs require Milkweeds (*Asclepias*) to lay their eggs and will use a variety of other flowers for adult food (COSEWIC, 2016).	Moderate – Possible habitat in the West Branch study area.	Moderate – Possible habitat in the West Branch study area.
Plants			
Butternut (*Juglans cinerea*) SARA: Endangered ESA: Endangered S-Rank: S3? Source: No source	Generally, grows in rich, moist, and well-drained soils often found along streams. It may also be found on well-drained gravel sites, especially those made up of limestone. It is also found, though seldomly, on dry, rocky and sterile soils. In Ontario, the Butternut generally grows alone or in small groups in deciduous forests as well as in hedgerows (Ontairo Ministry of Natural Resources and Forestry, 2014)	Low - None – Suitable habitat is located within the West Branch study area, however, no Butternut were observed during the November 2019 botanical investigation.	Low - None – Suitable habitat is located within the East Branch study area, however, no Butternut were observed during the November 2019 botanical investigation.

[1] *Species At Risk Act, 2002* (SARA). Schedule 1 status.

[2] *Endangered Species Act, 2007* (ESA).

[3] S1 - Extremely rare throughout its range in the province; S2 - Rare throughout its range in the province; S3 - Uncommon or vulnerable species; S4 - Apparently Secure Species; S5 - Secure Species; SX - Extirpated; B - Breeding; N - Non-breeding; ? - Uncertainty

2.5.6.5 Natural Heritage System

The NHS includes natural areas (e.g., wildlife habitat) wetlands, valleys and watercourse corridors. Some features that make up the NHS are of higher quality than others and may be considered significant. A review of the NHS is provided in the following sections.

Significant Wetlands

Wetlands are defined as areas that are seasonally or permanently covered by shallow water, as well as lands where the water table is close to or at the surface (Lee, et al., 1998). A significant wetland is an area identified as Provincially Significant (PSW) by the MNDMNRF using evaluation procedures established by the Province, as amended from time to time (Lee, et al., 1998). There are no PSWs associated with either the East or West Branch study areas.

Based on review of the MNDMNRF Make a Map: Natural Heritage Areas and NHIC data (Ontario Ministry of Natural Resources and Forestry, 2019), the West Branch study area contains unevaluated wetlands. Additional pockets of wetlands were also observed by Wood staff during the botanical inventory. All wetland communities associated with the West Branch Study Area are documented on **Figure 28** and **Figure 29**. No wetland pockets were identified during the secondary source review for the East Branch study area, and no wetland communities were observed by Wood staff.

Areas of Natural and Scientific Interest (ANSI)

The PPS defines ANSIs as areas of land and water containing natural landscapes or features that have been identified as having life science or earth science values related to protection, scientific study or education. Those listed as provincially significant life science ANSIs are the best examples of that particular natural heritage feature in the Province (Ministry of Natural Resources, 2010). In contrast, earth science ANSIs are representative examples of geological processes in Ontario (i.e., exposed bedrock on road cuts, fossils and landforms) (Ministry of Natural Resources, 2010).

Based on review of the MNDMNRF Make a Map: Natural Heritage Areas and NHIC data (Ontario Ministry of Natural Resources and Forestry, 2019), no ANSIs are within the East and West Branch study areas.

Significant Valleylands

The PPS (Ministry of Municipal Affairs and Housing, 2014) identifies significant valleylands as a “natural area that occurs in a valley or landform depression that has “water” for some period of the year. Based on the field investigations, and secondary sources, significant valleylands are likely associated with both the East and West Branch

study areas. In accordance with Schedule 3 of the City's Official Plan, the East and West Branch study areas have been identified as hazard land.

Significant Woodlands

Woodlands are treed areas that provide environmental or economic benefits such as erosion prevention, water retention, recreation and the sustainable harvest of woodland products. Woodlands include treed areas, woodlots or forested areas, and vary in their level of significance (Ministry of Municipal Affairs and Housing, 2014). Woodland significance is typically determined by evaluating key criteria which relate to woodland size, ecological function, uncommon woodland species, and economic and social value.

Based on the field investigations, there are woodlands located within both the East and West Branch study areas. Given the size of those woodlands observed within the East Branch study area (>0.5 ha) and their association with the watercourse corridor and valleyland, they would be considered significant in accordance with the Section 6.3.12.f of the City's Official Plan. The woodlands located within the West Branch study area would be considered too small to meet significance levels.

Significant Wildlife Habitat

Wildlife habitat is defined as areas where plants, animals and other organisms live and are able to find adequate amounts of food, water, shelter and space needed to sustain their populations. SWH of concern may include areas where species concentrate at a point in their annual life cycle, and those areas which are important to migratory and non-migratory species. A wildlife habitat is considered "significant" if it is deemed ecologically important in terms of feature, function, representation or amount, and contributing to the quality and diversity of an identifiable geographic area or NHS (Ministry of Municipal Affairs and Housing, 2014). According to the SWHCS for Ecoregion 7E (Ontario Ministry of Natural Resources and Forestry, 2015) SWH may consist of:

- Seasonal concentration areas for animals;
- Rare vegetation communities;
- Specialized habitat for wildlife; and
- Habitat for species of conservation concern.

Seasonal Concentrations Areas

Seasonal concentration areas are those habitats where large numbers of a single species or many species congregate at one (or several) times a year. The SWHCS for Ecoregion 7E outlines a series of seasonal concentration areas. Given that no formal wildlife

surveys were completed for the East and West Branch study areas, the below information is based solely on vegetation community presence identified during the botanical inventory. A summary of the findings is identified in **Table 7**.

Table 7: Season Concentration Areas

Habitat	ELC Communities	Candidate Habitat Occurrence with the West Branch study area	Candidate Habitat Occurrence within the East Branch study area
Waterfowl Stopover & Staging Areas (Terrestrial)	Mineral Cultural Meadow & Thicket (CUM1, CUT1) with annual spring flooding.	Several meadow and thicket communities were observed – however the probability that this serves as a waterfowl stopover or staging area is limited given the size of the communities, and absence of wildlife species that would utilize this area through the review secondary source material. Water along the valley would likely flow towards Mimico Creek rather than pooling as sheets and flats. Candidate habitat deemed absent.	Several meadow and thicket communities were observed – however the probability that this serves as a Waterfowl stopover or staging area is limited given the size of the communities, and absence of wildlife species that would utilize this area through the review secondary source material. Water along the valley would likely flow down Mimico Creek rather than pooling as sheets and flats. Candidate habitat deemed absent.
Waterfowl Stopover & Staging Areas (Aquatic)	Meadow Marsh (MAM1-6), Shallow Marsh (MAS1-3), Shallow Water (SAS1, SAM1, SAF1), & Deciduous Swamp (SWD1-7).	Several marsh communities were observed, however these were associated with Common Reed patches and small in size. Candidate habitat deemed absent.	No marsh communities were observed. Candidate habitat deemed absent.
Shorebird Migratory Stopover Area	Beach/Bar (BBO1-2, BBS1-2, BBT1-2), Sand Dune (SDO1, SDS1, SDT1), & Meadow Marsh (MAM1-5).	Meadow Marsh habitat is not large enough to support shorebird migratory stopover area. Candidate habitat deemed absent.	ELC communities absent.
Raptor Wintering Area	Combination of Forest (FOD, FOM, FOC) & Upland Cultural (CUM, CUT, CUS, CUW) sites.	ELC communities present in the West Branch study area, but likely not large enough to support this SWH. Candidate habitat deemed absent.	ELC communities present in the East Branch study area, but likely not large enough to support this SWH. Candidate habitat deemed absent.
Bat Hibernacula	Crevice (CCR1-2) & Cave (CCA1-2)	ELC communities absent.	ELC communities absent.
Bat Maternity Colonies	Mature Deciduous or Mixed Forests (FOD, FOM) with >10 large diameter (>25 cm dbh) trees per hectare.	ELC communities FODM7-9 could support this SWH. Candidate habitat deemed present.	FODM7-9, and THMM1-1 could support this SWH. Candidate habitat deemed present.
Bat Migratory Stopover Area	No specific ELC communities. Location & characteristics of habitat unknown & being determined.	This identification of stopover areas is relatively unknown in the Province of Ontario. The West Branch study area is not near Long Point, ON. Candidate habitat deemed absent.	This identification of stopover areas is relatively unknown in the Province of Ontario. The East Branch study area is not near Long Point, ON. Candidate habitat deemed absent.
Turtle Wintering Areas	Swamp (SW), Marsh (MA), Open & Shallow Water (OA, SA), Open Bog (BOO), & Open Fen (FEO).	ELC communities present in the West Branch study area, however water levels not likely deep enough to not freeze. Candidate habitat deemed absent.	ELC communities present in the East Branch study area, however water levels not likely deep enough to not freeze. Candidate habitat deemed absent.

Habitat	ELC Communities	Candidate Habitat Occurrence with the West Branch study area	Candidate Habitat Occurrence within the East Branch study area
Snake Hibernaculum	Talus (TA), Rock Barren (RB), Crevice & Cave (CC), Alvar (AL), & other dry ecosites.	Dry ecosites can be found within FODM7-9, MEGM3, and THDM2-6. Candidate habitat deemed present.	Dry ecosite can be found within FODM12, FODM7-9, MEFM1-1, and THMM1-1. Candidate habitat deemed present.
Colonially-Nesting Bird Breeding Habitat (Bank & Cliff)	Mineral Cultural (CUM1, CUT1, CUS1), Bluff (BLO1, BLS1, BLT1), Carbonate Cliff (CLO1, CLS1, CLT1), & other areas with eroding banks, sandy hills, borrow pits, steep slopes, sand piles, cliff faces, bridge abutments, silos or barns.	ELC communities present in the West Branch study area but not large enough to a support colony of nesting bank or cliff birds. Candidate habitat deemed absent.	ELC communities present in the East Branch study area but not large enough to support a colony of nesting bank or cliff birds. Candidate habitat deemed absent.
Colonially-Nesting Bird Breeding Habitat (Tree/Shrubs)	Deciduous & Mixed Swamp (SWD1-7, SWM2-3, SWM5-6), & Treed Fen (FET1).	ELC communities absent.	ELC communities absent.
Colonially-Nesting Bird Breeding Habitat (Ground)	Meadow & Shallow Marsh (MAM1-6, MAS1-3), & Cultural (CUM, CUS, CUT) with rocky islands or peninsulas or in close proximity to a watercourse.	ELC communities MAMM1-12 is present but meadow marsh habitat is not large enough to support colonially-nesting bird breeding habitat (ground). Candidate habitat deemed absent.	ELC communities absent. The cultural communities present are not large enough, or close enough to large watercourses. Candidate habitat deemed absent.
Migratory Butterfly Stopover Areas	Combination of Cultural field (CUM, CUS, CUT) & Forest/Plantation (FOD, FOM, FOC, CUP) that are >10 ha & within 5 km of Lake Ontario and Lake Erie.	West Branch study area more than 5km away from Lake Ontario and ELC communities are too small. Candidate habitat deemed absent.	West Branch study area more than 5km away from Lake Ontario and ELC communities are too small. Candidate habitat deemed absent.
Landbird Migratory Stopover Areas	Forest (FOD, FOM, FOC), & Swamp (SWD, SWM, SWC) that are >10 ha & within 5 km of Lake Ontario and Lake Erie.	Study areas more than 5km away from Lake Ontario and ELC communities are too small. Candidate habitat deemed absent.	Study areas more than 5km away from Lake Ontario and ELC communities are too small. Candidate habitat deemed absent.
Deer Winter Congregation Areas	Forest (FOD, FOM, FOC), & Swamp (SWD, SWM, SWC) that are >100 ha.	Absent from the West Branch study area. Although a White-tailed Deer was observed in the West Branch study area the study area is not large enough to support this SWH. Candidate habitat deemed absent.	Absent from the East Branch study area. Although a White-tailed Deer was observed in the East Branch study area the study area is not large enough to support this SWH. Candidate habitat deemed absent.

Rare Vegetation Communities

Rare vegetation communities are those that contain provincially rare vegetation communities, or those which are rare to the area. A search for rare vegetation communities was made at the study areas during the botanical inventory, with a review of those areas based on secondary source material. A summary of the findings is identified in **Table 8**.

Table 8: Rare Vegetation Communities

Habitat	ELC Communities	Presence within the West Branch study area	Presence within the East Branch study area
Cliffs & Talus Slopes	Open, Shrub & Treed Talus (TAO, TAS, TAT) Open, Shrub & Treed Cliff (CLO, CLS, CLT).	ELC communities absent.	ELC communities absent.
Sand Barren	Open, Shrub & Treed Sand Barren (SBO1, SBS1, SBT1).	ELC communities absent.	ELC communities absent.
Alvar	Open, Shrub & Treed Alvar (ALO1, ALS1, ALT1), Dry-Fresh Pine or Cedar Coniferous Forest (FOC1, FOC2), Bedrock Cultural Meadow, Thicket, Savannah & Woodland (CUM2, CUT1, CUS2, CUW2).	ELC communities absent.	ELC communities absent.
Old Growth Forest	Deciduous, Coniferous & Mixed Forest (FOD, FOC, FOM).	ELC communities present but community (FODM7-9) is too young to be considered old growth. Candidate habitat deemed absent.	ELC communities present but community (FODM12, and FODM7-9) are too young to be considered old growth. Candidate habitat deemed absent.
Savannah	Tallgrass Savannah (TPS1, TPS2) Tallgrass Woodland (TPW1, TPW2) Bedrock Cultural Savannah (CUS2).	ELC communities absent.	ELC communities absent.
Tallgrass Prairie	Open Tallgrass Prairie (TPO1, TPO2).	ELC communities absent.	ELC communities absent.
Other Rare Vegetation Communities	Provincially rare S1-S3 vegetation communities.	ELC communities absent.	ELC communities absent.

Specialized Habitats for Wildlife

Specialized habitats for wildlife consist of that which support wildlife that have highly specific habitat requirements (e.g., nesting habitat – vernal pools), those areas that contain high species and community diversity and those which provide habitat that can greatly enhance species survival (Ontario Ministry of Natural Resources, 2000). Similar to seasonal concentration areas, the assumptions and presence of specialized habitats for wildlife is based solely on vegetation community presence identified during the field investigations. A summary of the findings is identified in **Table 9**.

Table 9: Specialized Habitats for Wildlife

Habitat	ELC Communities	Presence within the West Branch study area	Presence within the East Branch study area
Waterfowl Nesting Area	Include all upland areas that are adjacent to: Meadow & Shallow Marsh (MAM, MAS), Shallow Water (SA), Bedrock & Mineral Thicket Swamp (SWT1, SWT2), & Mineral Deciduous Swamp (SWD1, SWD2, SWD3, SWD4).	ELC communities present are not large enough to support this habitat. Candidate habitat deemed absent.	ELC communities present are not large enough to support this habitat. Candidate habitat deemed absent.
Bald Eagle & Osprey Nesting, Foraging & Perching Habitat	Deciduous, Mixed & Coniferous Forest (FOD, FOM, FOC), & Deciduous, Mixed & Coniferous Swamp (SWD, SWM, SWC) communities adjacent to riparian areas.	ELC communities present in the West Branch study area, but the creek and woodlands are not large enough to support Bald Eagle and Osprey habitat. There is a lot of disturbance in the area of the FOD7-9 due to the adjacent railway line. Candidate habitat deemed absent.	ELC communities present in the East Branch study area but disturbance due to the urban environment, and the small size of the creek likely make the East Branch study area unusable for habitat. Candidate habitat deemed absent.
Woodland Raptor Nesting Habitat	Deciduous, Mixed & Coniferous Forest (FOD, FOM, FOC), Deciduous, Mixed & Coniferous Swamp (SWD, SWM, SWC), & Coniferous Plantation (CUP3).	ELC communities present are not large enough to support this habitat. Candidate habitat deemed absent.	ELC communities present are not large enough to support this habitat. Candidate habitat deemed absent.
Turtle Nesting Areas	Exposed mineral soil areas (sand/gravel) adjacent to: Meadow Marsh (MAM), Shallow Marsh (MAS), Shallow Water (SA), Open Bog (BOO1) & Open Fen (FEO1).	ELC communities present in the West Branch study area along the creek. Candidate habitat deemed present.	ELC communities present in the East Branch study area along the creek. Candidate habitat deemed present.
Seeps & Springs	Any forested ecosite (FOD, FOM, FOC) located in headwater areas.	ELC communities present but no seeps or springs found. Candidate habitat deemed absent.	ELC communities present but no seeps or springs found. Candidate habitat deemed absent.
Amphibian Breeding Habitat (Woodland)	Deciduous, Mixed & Coniferous Forest (FOD, FOM, FOC), & Deciduous, Mixed & Coniferous Swamp (SWD, SWM, SWC).	No wetland, ponds or woodland pools found within the woodlands. Candidate habitat deemed absent.	No wetland, ponds or woodland pools found within the woodlands. Candidate habitat deemed absent.
Amphibian Breeding Habitat (Wetlands)	Swamp (SW), Marsh (MA), Fen (FE), Bog (BO), Open water (OA) & Shallow Water (SA).	MAMM1-12 communities are small, isolated and historically disturbed. There is a low plant species diversity. These factors would make it difficult for amphibians to breed in large numbers in the West Branch study area. Candidate habitat deemed absent.	No wetlands found and existing criteria within the OA did not seem suitable. Candidate habitat deemed absent.
Woodland Area-Sensitive Bird Breeding habitat	All Ecosites associated with FOC, FOM, FOD, SWC, SWM, SWD.	The forested ELC communities present in the West Branch study area but not large enough to support this habitat. Candidate habitat deemed absent.	The forested ELC communities present in the East Branch study area but not large enough to support this habitat. Candidate habitat deemed absent.

Habitat for Species of Conservation Concern

Habitats for species of conservation concern are those that contain species that are rare or substantially declining or have high percentage of their global population in Ontario and are rare or uncommon in the planning area. These habitats are often associated with special concern species as identified under the ESA or the SARO list. Assumptions of presence of habitat for species of conservation concern is based solely on vegetation community presence identified during the field investigations. A summary of the findings is identified in the table below.

Table 10: Habitat for Species of Conservation Concerns

Habitat	ELC Communities	Presence within the Project Locations and study areas	
Marsh Bird Breeding Habitat	Meadow Marsh (MAM), Shallow Water (SA), Open Fen (FEO1) & Open Bog (BOO1).	ELC communities present. Candidate habitat deemed present.	ELC communities absent.
Open Country Bird Breeding Habitat	Mineral & Bedrock Cultural Meadow (CUM1, CUM2).	ELC communities present but not large enough to support this SWH. Candidate habitat deemed absent.	ELC communities present but not large enough to support this SWH. Candidate habitat deemed absent.
Shrub/Early Successional Bird Breeding Habitat	Cultural Thicket (CUT1, CUT2), Cultural Savannah (CUS1, CUS2), & Cultural Woodland (CUW1, CUW2).	ELC communities present, but too small to support SWH. Candidate habitat deemed absent.	ELC communities present, but not large enough to support this SWH. Candidate habitat deemed absent.
Terrestrial Crayfish	Meadow Marsh (MAM) & Shallow Marsh (MAS).	ELC communities present in the West Branch study area. Candidate habitat present, although no burrows were observed during the 2019 survey.	ELC communities absent.
Special Concern (SC) & Rare (S1-S3, SH) Wildlife Species	Ecosites associated with any SC, S1-S3 or SH plant or animal element occurrences within 1 or 10 km from project location.	Several species of special concern were found to have low to moderate probability to be within the West Branch study area. Candidate habitat present.	Eastern Wood-pewee has a high probability of breeding in the East Branch study area. Other species of special concern have low to moderate probability to occur within the East Branch study area. Candidate habitat present.

Habitats for species of conservation concern are those that contain species that are rare or substantially declining or have high percentage of their global population in Ontario and are rare or uncommon in the planning area. These habitats are often associated with special concern species as identified under the ESA or the SARO list.

The probability of species of special concern in the West and East Branch study areas was based on habitat preferences of these species, element records from secondary source information, and available habitat within the West and East Branch study areas. Species of special concern that have a low to high probability to occur within the West and East Branch study areas include:

- Common Nighthawk (moderate probability in both the West and East Branch study areas)
- Eastern Wood-pewee (moderate probability in the West Branch study area, and high probability in the East Branch study area)
- Wood Thrush (low probability in both the West and East Branch study areas)
- Snapping Turtle (moderate probability in both the West and East Branch study areas); and
- Monarch (moderate probability in both the West and East Branch study areas).

The preferred habitat and likelihood of occurrence for these species is further discussed in **Table 6**.

2.5.6.6 Wildlife Movement Corridors

Wildlife movement corridors are habitats that link two (2) or more other wildlife habitats that are critical to the maintenance of a population of a particular species or group of species. The key ecological function of wildlife movement corridors is to enable wildlife to move between areas of significant habitat or core natural areas with minimum mortality. Wildlife movement corridors can provide critical links between shelter, feeding, watering, growing and nesting locations (Lee, et al., 1998).

According to the SWHCS for Ecoregion 7E (Ontario Ministry of Natural Resources and Forestry, 2015), wildlife movement corridors to be considered include amphibian movement corridors. Wildlife movement corridors must be considered when amphibian breeding habitat is confirmed as SWH for amphibian breeding habitat (wetland). Based on the criteria, there is a low probability the East Branch would serve as an amphibian movement corridor. The wetland pockets within the West Branch study area are small, and largely dominated by Phragmites australis. Given the characteristics of these features, and their proximity to woodland pockets, and the characteristics of those

woodland pockets, there is a low probability for amphibian movement corridor SWH to be associated with the West Branch as well.

2.6 Archaeological

2.6.1 Purpose

A Stage 1 Archaeological Assessment was completed by Wood in 2020 in support of this Class EA Study. The Stage 1 Archaeological Assessment Report is provided in **Appendix D**. The total study area for Stage 1 Archaeological Assessment encompasses approximately 9.4 ha (23.6 acres) and consists of lands associated with two branches of Mimico Creek located at Rena Road (Study Area 1) and Etude Drive to Derry Road (Study Area 2a-b) in the City of Mississauga. Historically, the study areas were located in: Lots 13 and 14, Concession 6 East of Centre Street, Township of Toronto North, County of Peel; and Lot 11, Concessions 7 and 8, Township of Gore, County of Peel. This assessment was conducted prior to any development related activities.

2.6.2 Background Information

As part of the Stage 1 archaeological assessment, Wood first searched MHSTCI's PastPort system to determine if archaeological sites have been registered within 1 km of the subject property, and if previous archaeological assessments have been carried out within a 50-m radius. Secondly, the principal determinants of archaeological potential– proximity to water sources, fairly level topography, good drainage and fertile soils, and proximity to important resources and historical transportation routes and settlements– were examined to evaluate the property's overall archaeological potential. Thirdly, the specific potential for historic period archaeological resources was assessed through an examination of available historical maps and other archival sources.

2.6.3 Policy

The Stage 1 assessment was carried out in accordance with the Ministry of Heritage, Sport, Tourism and Culture Industries Standards and Guidelines for Consultant Archaeologists (2011), under an Ontario Professional Licence to Conduct Archaeological Fieldwork (P141) held by Dr. Shaun Austin, Associate Archaeologist at Wood. The project information was acknowledged by the MHSTCI on 28 October 2019 with the approval of PIF number P141-0364-2019.

2.6.4 Methodology

A Stage 1 archaeological assessment is a systematic qualitative process executed to assess the archaeological potential of a property based on its historical use and its potential for early Euro- Canadian (early settler) and pre-contact Aboriginal occupation. The objectives of a Stage 1 background study are: 1) to provide information about the property's geography, history, previous archaeological fieldwork and current land condition; 2) to evaluate in detail the property's archaeological potential which will

support recommendations for Stage 2 property assessment for all or parts of the property if warranted; and, 3) to recommend appropriate strategies for Stage 2 property assessment if warranted. The Stage 1 background study was conducted in accordance with the Standards and Guidelines for Consultant Archaeologists (MHSTCI 2011), pursuant to the Ontario Heritage Act, R.S.O. 1990, c.0.18.

2.6.5 Results

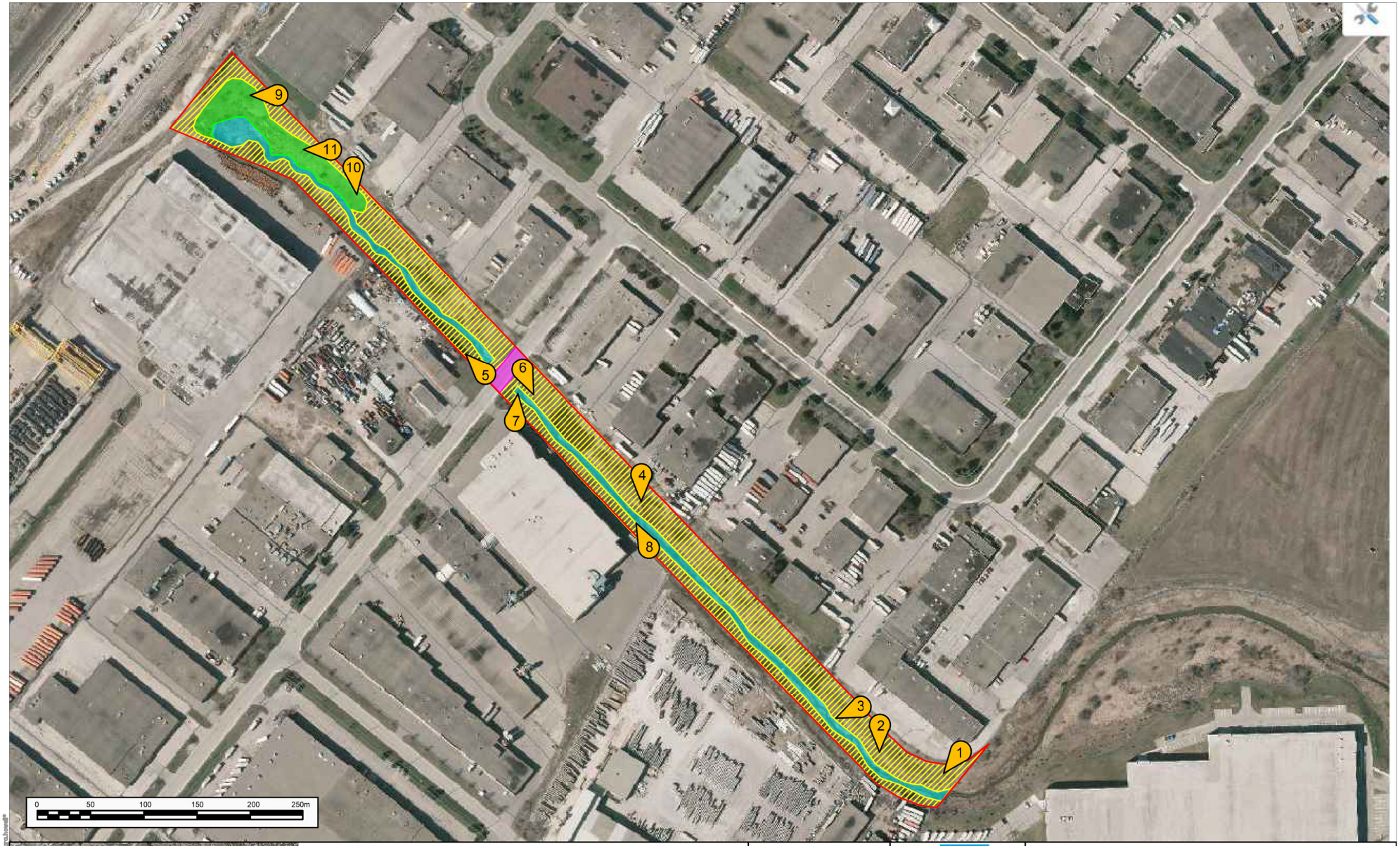
This Stage 1 background study indicates that undisturbed, fairly level and well-drained portions of the study area have archaeological potential for the following reasons: 1) the presence of four previously registered archaeological sites within a 1-km radius; 2) the proximity of historical transportation routes (Derry Road and Goreway Drive); 3) the proximity of an historical structure to Study Area 2b; and 4) the proximity of Mimico Creek.

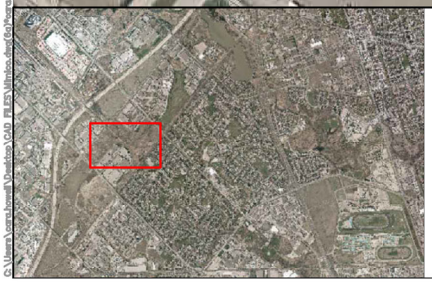
The areas of archaeological potential within Study Area 1 are shown on **Figure 32**. For Study Area 1, relatively level and dry lands visually confirmed to exhibit archaeological potential constitute 11% (0.3 ha) of the overall study area (). Elsewhere, 2% (0.1 ha) has been extensively disturbed, and archaeological potential has been removed, by previous embankment stabilization efforts. Additional areas with low or no archaeological potential include excessive slopes (71%, 1.9 ha) and standing water (Mimico Creek) (16%, 0.4 ha). Stage 2 assessment is recommended for the areas of archaeological potential. Since ploughing of these urban lands is not viable due to limited spaces and/or tree cover, Stage 2 assessment should be carried out by means of hand shovel test-pit survey at 5-m intervals.

The areas of archaeological potential within Study Area 2a are shown on **Figure 33**. For Study 2a, relatively level and dry lands visually confirmed to exhibit archaeological potential constitute 89% (4.4 ha) of the overall study area. Elsewhere, 4.1% (0.2 ha) has been extensively disturbed, and archaeological potential has been removed, as a result of the installation of a paved pathway. Additional areas with low or no archaeological potential include standing water (Mimico Creek) (6.9%, 0.4 ha). Stage 2 assessment is recommended for the areas of archaeological potential. Since ploughing of these urban lands is not viable due to limited spaces and/or tree cover, Stage 2 assessment should be carried out by means of hand shovel test-pit survey at 5-m intervals.

The areas of archaeological potential within Study Area 2b are shown on **Figure 34**. For Study Area 2b, relatively level and dry lands visually confirmed to exhibit archaeological potential constitute 57% (0.9 ha) of the overall study area. Elsewhere, 12.6% (0.5 ha) contains low or no archaeological potential due to excessive slopes, and 30.4% (0.3 ha) and standing water (Mimico Creek). Stage 2 assessment is recommended for the areas of archaeological potential. Since ploughing of these urban lands is not viable due to

limited spaces and/or tree cover, Stage 2 assessment should be carried out by means of hand shovel test- pit survey at 5-m intervals.





LEGEND

- Study area
- Area of archaeological potential, Stage 2 test pitting recommended
- Area of low archaeological potential due to road construction, no further assessment recommended
- Area of low archaeological potential due to excessive slope, no further assessment recommended
- Mimico Creek, standing water, no further work recommended
- 1 Photograph location, number and direction

NOTES:

THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS REPORT No.TPB1981091.

Conditions encountered in the field may be different from the interpreted information presented on this figure.

SOURCE: Canadian Topographic Map

CLIENT: MISSISSAUGA

Drawn By:	CH
Checked By:	SA
Revision N°:	01
Scale:	1: 5,000

STAGE 1 ARCHAEOLOGICAL ASSESSMENT,
Mimico Creek, City of Mississauga, Ontario

Stage 1 Results for Area 1 with Photograph Locations, Numbers and Directions

PROJECT N°: TPB1981091

DATE: 17 Jan 2020

FIGURE: 32

Wood Environment and Infrastructure Solutions
3450 Harvester Road, Suite 100, Burlington, ON L7N 3W5
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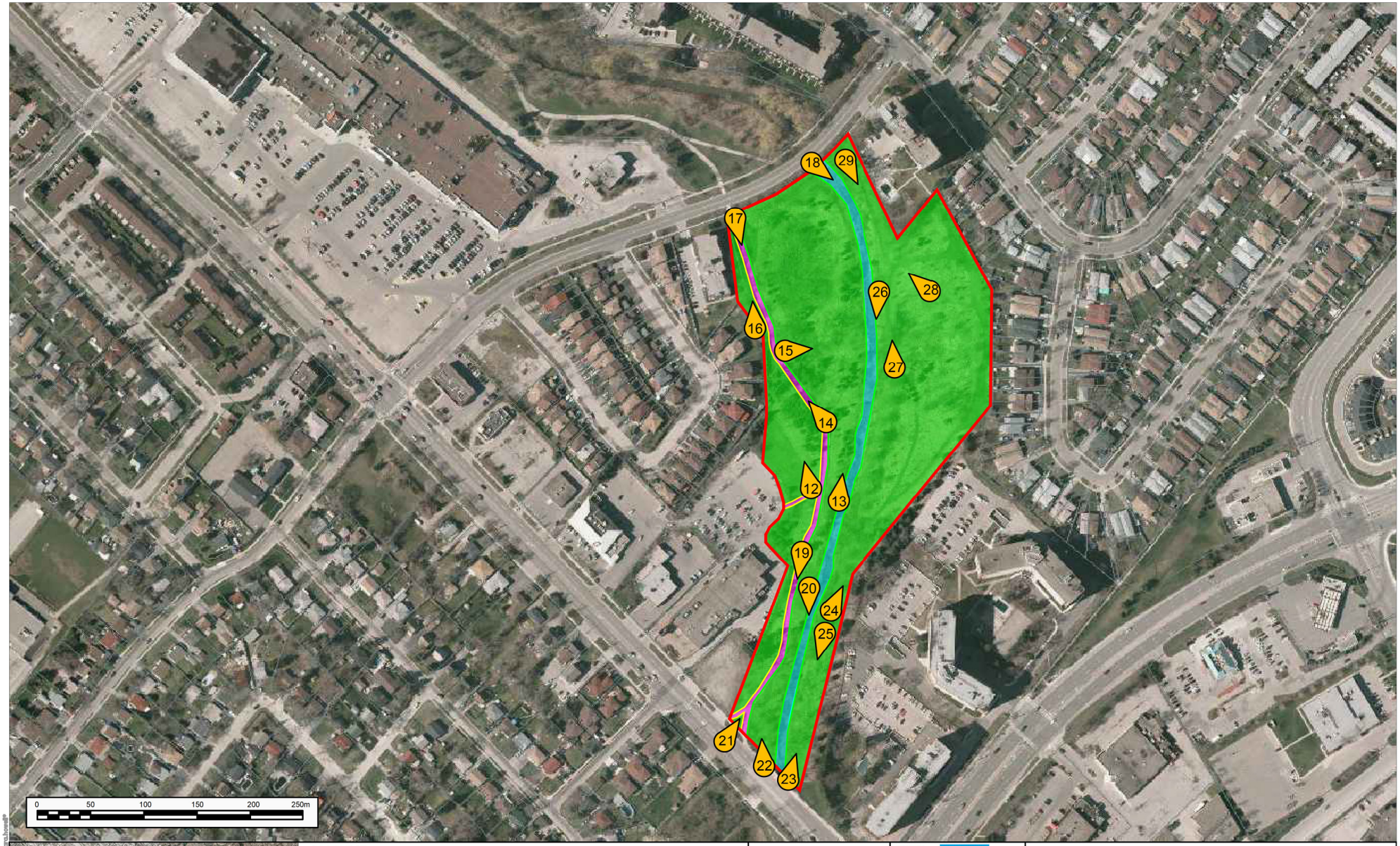
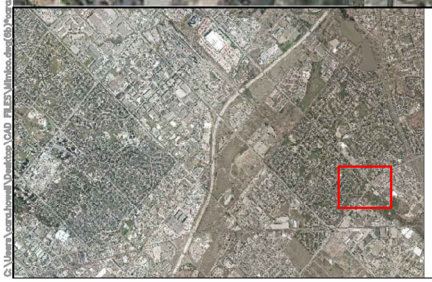
wood.





LEGEND

- Study area
- Area of archaeological potential, Stage 2 test pitting recommended
- Area of low archaeological potential due to paved walkway, no further assessment recommended
- Area of low archaeological potential due to excessive slope, no further assessment recommended
- Mimico Creek, standing water, no further work recommended
- 1 Photograph location, number and direction

NOTES:

THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS REPORT No.TPB1981091.

Conditions encountered in the field may be different from the interpreted information presented on this figure.

SOURCE:Canadina Topographic Maps

CLIENT: MISSISSAUGA

STAGE 1 ARCHAEOLOGICAL ASSESSMENT,
Mimico Creek, City of Mississauga, Ontario

Stage 1 Results for Area 2a with Photograph Locations, Numbers and Directions

Drawn By:	CH
Checked By:	SA
Revision N°:	01
Scale:	1: 5,000
PROJECT N°:	TPB1981091
DATE:	04 Feb 2020

FIGURE: 33

N W E S

Wood Environment and Infrastructure Solutions
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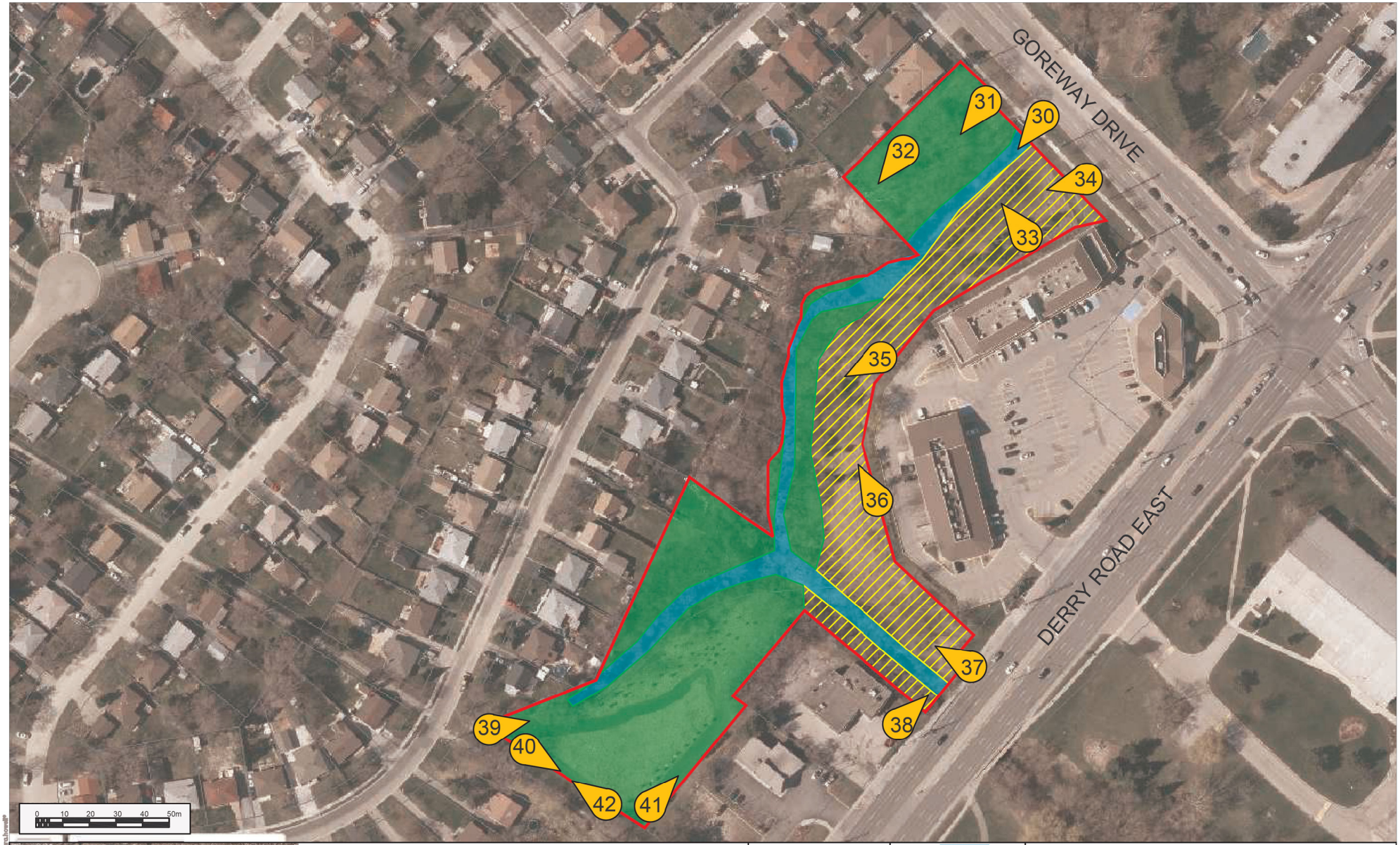

LEGEND

- Study area
- Area of archaeological potential, Stage 2 test pitting recommended
- Area of low archaeological potential due to road construction, no further assessment recommended
- Area of low archaeological potential due to excessive slope, no further assessment recommended
- Mimico Creek, standing water, no further work recommended
- 1 Photograph location, number and direction

NOTES:

THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS REPORT No.TPB1981091.

Conditions encountered in the field may be different from the interpreted information presented on this figure.

SOURCE: Canadian Topographic Maps

CLIENT: MISSISSAUGA

STAGE 1 ARCHAEOLOGICAL ASSESSMENT,
Mimico Creek, City of Mississauga, Ontario

Stage 1 Results for Area 2b with Photograph Locations, Numbers and Directions

Drawn By:	CH
Checked By:	SA
Revision N°:	01
Scale:	1: 2,000
PROJECT N°:	TPB1981091
DATE:	04 Feb 2020

FIGURE: 34

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wood.

3.0 Problem and Opportunity Statement

Further to intial meetings with the City, and considering the review of background information and results of the baseline inventory in Section 2, the following problem and opportunity statement was develoiped.

The Mimico Creek east branch between Derry Road East and Etude Drive, and the west branch between the CNR and downstream of Rena Road, has been experiencing erosion, related to historic urbanization in the City of Mississauga, and upstream in the watershed in the City of Brampton. The City of Mississauga, through its ongoing annual erosion inventory and assessment program, identified the two study reaches as a high prioroty for rehabilitation due to the risk to infrastructure and adjacent residential (east branch) and industrial (west branch) properties throughout the study area, and the risk to City trails in the park on the east brach between Goreway and Etude. In addition, erosion has led to localized bank instability, undermining of abutments, undermining of storm sewer outfalls, deteriorating gabion baskets and concrete grade control structures, imbalances in sediment transport, and degradadtin of both aquatic habitat and riparian vegetation.

The City, through the current Class EA and detailed design assignment , has the opportunity to address the areas with significant erosion , through design of erosion control works and appropriate mitigation. The City will be able to work on primaily City lands, and will be able to work adjacent to two recently completed Region of Peel and TRCA projects for channel works and bank stabilization on both the west and east branches. The City is also underaking a flood mitigation study in the contributing drainage area, which may also offer an opportunity for future works to be identified on the east branch.

4.0 Identification and Evaluation of Alternative Solutions

In order to assess and select the Preferred Alternative(s) to address the existing erosion problem in the Mimico Creek, a systematic and transparent approach must be developed to evaluate all identified alternatives. For the current study, this evaluation has been divided into a Long-List and Short-List Screening exercise.

4.1 Identification of Long-List of Alternative Solutions

The following provides an outline of potential alternatives to address the Problem Statement. Ten (10) alternatives have been considered for mitigating the identified problem:

A Do Nothing

B Stormwater Management

1. Online Facilities
2. End-of-pipe Facilities
3. Source Controls

C Diversion

D Creek Rehabilitation

1. Realignment
2. Protect-In-Place

E Infrastructure Improvements

1. Gabion-lined channel Upgrade
2. Road Bridges Upgrades

F Land Acquisition

4.1.1 Alternative A: Do Nothing

Under this alternative, no measures are proposed to mitigate the existing sedimentation erosion problem. This alternative represents baseline conditions and its evaluation is required by the Municipal Class EA process, however it is not considered as preferred since the erosion problem would not be addressed.

4.1.2 Alternative B: Stormwater Management

Various stormwater management alternatives are available to address the erosion problem. Stormwater management solutions would be designed to reduce the volume and/or rate of runoff from the higher frequency, lower magnitude storms that are associated with channel formative processes. The goal would be to reduce the runoff rate such that the frequency and duration of exceedance of the erosion thresholds of the Study Area reaches are reduced, thereby resulting in less erosion. Stormwater management options include retrofit end-of-pipe facilities and source controls.

End-of-pipe facilities would be located at the drainage outlet (storm sewer and/or overland system) for a neighbourhood area. Source controls are distributed throughout the neighbourhood and provide treatment typically at an individual lot scale.

New stormwater management opportunities within the existing urban areas would retroactively treat existing development and are referred to as 'retrofits'. Retrofits are required to be integrated into an existing urban fabric and as such they are commonly constrained by available land, resistance from private landowners and the general public, and impacts to the natural environment. Nevertheless, where an opportunity is available, retrofits are commonly applied to mitigate flood, erosion and water quality problems.

4.1.3 Alternative B1: End-of-Pipe Facilities

End-of-pipe stormwater management facilities are most often constructed as wet ponds or wetlands and can provide erosion control, as well as flood and water quality controls. These facilities require a significant dedicated land area and in this case the land would be required to be in municipal control and have municipal access. These facilities are generally located at storm sewer outfalls and most often adjacent to the receiving watercourse. However in all cases there is little or no available land proximate to the outfall. New facilities at these locations would require acquisition of private property. The majority of the drainage area is also in the City of Brampton. We note that the City of Brampton has proposed up to 28 end-of-pipe retrofits throughout the City as part of a City-wide study. Given the obvious constraints, a detailed analysis of the feasibility of additional end-of-pipe stormwater management retrofits is not considered to be warranted for the current study, and this alternative has been screened from further consideration.

4.1.4 Alternative B2: Source Controls

Source controls have become an important component in the recent shift towards Low Impact Development (LID) stormwater management planning and control. Where implemented, LID practices (e.g. bioswales, infiltration trenches, vegetated buffer strips,

rain barrels, etc.) are distributed throughout the development area and can be incorporated into the landscaping of individual lots and public right-of-ways and can provide water balance, stormwater quality and erosion control functions. LID practices, like traditional stormwater management, are typically applied to new greenfield development where they can be more readily incorporated into the urban planning fabric. Retrofitting LID practices in existing urban areas and neighbourhoods is possible but often challenging.

The objective of the current assessment is mitigating the erosion problem in the Mimico Creek, which limits the applicable LID practices to those that provide a measurable level of volume control, as reducing volume is one factor that can reduce erosion (versus practices that provide primarily a water quality function). The Low Impact Development Stormwater Management Planning and Design Guide (CVC & TRCA, 2010) provides guidance on the function, application, design and construction of various LID practices in Southern Ontario.

Given that existing urban land uses represent a substantial portion of the drainage area to the subject reaches of Mimico Creek, implementing source controls would likely be extremely effective in reducing erosion. While there is industrial, rail, hydro, and highway land use, a large portion of the contributing drainage area consists of private residential land uses, for which implementation and upkeep of source controls is at the discretion of the owner. Another issue is that roughly 85 % of the watershed is in the City of Brampton. It is considered highly unlikely that a majority of Study Area homeowners would elect to implement source controls, thereby rendering this alternative relatively ineffective as a stand-alone solution to the erosion problem.

4.1.5 Alternative C: Diversion

Diversions can be implemented to address erosion problems by transferring runoff to a neighbouring subcatchment and its associated conveyance system (presumed to have greater capacity), thereby reducing peak flows and runoff volume to the problem area. The common problem with diversion is that it has the potential to cause an impact on the receiving system (erosion or flooding), and therefore an assessment of the capacity and sensitivity of the receiving system must be completed and any predicted impact would require mitigation. Further, diversions can also impact the riparian zone of the watercourse from which runoff is diverted. For the reasons discussed, diversions are often not supported by Conservation Authorities.

4.1.6 Alternative D: Creek Rehabilitation

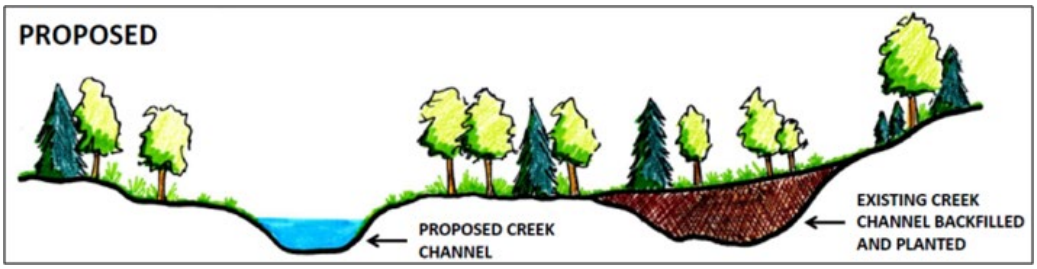
Natural channel design techniques can be used to establish a new plan form and cross-section that are appropriate for the local flow regime with due consideration for local

constraints, like valley wall contact points, trails, pedestrian bridges and storm outfalls. Creek rehabilitation could take the form of plan form realignment or protection-in-place, with a strategic combination of the two likely to produce the best solution considering for localized areas of risk and the overall reach-wide erosion processes. As noted in **Section 1.2**, Study Area, the scope of this study is limited to lands owned by the City, and as such, creek rehabilitation considered herein has only been considered on City land. The exception is where creek realignment on City land may require work on a Region easement to tie into the existing watercourse.

4.1.7 Alternative D1: Realignment

The channel realignment alternative employs a holistic approach to resolving channel issues and re-establishing a self-sustaining channel. Generally, this is employed when there are several issues of varying severity over a substantial length of channel. Realignment is also particularly beneficial when the issues are a result of the current planform alignment and there is sufficient area in the valley for relocation. When a channel is to be realigned, a new planform alignment is determined based on the surrounding conditions, existing channel conditions, and general principles of natural channel design. An entirely new channel is then constructed some distance away from the original channel with dimensions and characteristics based on those of the original channel (ref. **Figure 35**). By relocating the channel away from at-risk features, such as infrastructure or valley walls, the channel construction requires fewer hard structures and allows for the use of more natural techniques. Vegetation can be employed to establish the banks and new bed structures can be created to sustain channel morphology.

Figure 35: Schematic illustrating the typical process for channel realignment



The primary limitations of this alternative are the higher relative capital costs and the amount of disturbance to the surrounding terrestrial environment. However, it is often considered to provide the highest potential for long-term stability and, therefore, would require minimal long-term maintenance and associated costs.

Within the Study Area, the realignment alternative could be employed to remove areas where the channel contacts the toe of the valley wall. This would remove the existing risk to valley wall stability caused by fluvial erosion of the toe. The channel realignment would utilize the available area in the centre of the valley to relocate the channel away from these high-risk areas. One important consideration for this alternative would be the existing vegetation within the valley. The new alignment would need to minimize the loss of any high-quality forest communities and also accommodate any species-at-risk that may be sited within the area. The realigned channel reaches would also be required to provide no net loss in aquatic habitat productivity, maintain/improve fish passage, should target a realigned length within 5% of the original channel, and should maintain the hydrograph and existing channel slope, within reason, to preserve form as well as function.

4.1.8 Alternative D2: Protect In-Place

The protect-in-place alternative employs local or spot treatments to address channel issues which are small-scale or isolated. Generally, it is used for concerns such as bank erosion or issues related to infrastructure within the channel (sewer outfalls and bridges). Protect-in-place is preferable for areas where the channel is highly constrained by the surrounding area and therefore the channel footprint cannot be altered. Surrounding constraints could consist of development, infrastructure, topography, or sensitive habitat (trees, wetlands, etc). In these cases, protect-in-place is a preferred solution as it limits disturbance to the surrounding area and can address immediate concerns at the selected locations. The primary limitation of this alternative is that it may not fully address long-term stability issues and future repairs or maintenance may be required if issues persist.

For bank protection there are a number of different treatments that can be used that vary based on the severity of the issue and the risk to the surrounding area. Generally, the treatment is only needed for the eroding bank, which minimizes overall disturbance. For areas that are low risk, and/or low scour potential, a simple treatment which consists primarily of vegetation (e.g., brush mattress), or bioengineering can be used (**Figure 36**). When there is higher risk due to surrounding infrastructure or high scour potential, more rock is incorporated to provide added stability (**Figure 37** and **Figure 38**). Under all options, the objective to take the 'softest' (i.e., more natural, less hardening) should be employed, where it can also adequately reduce the risk of future erosion.

Figure 36: Schematic showing typical application of brush mattress treatment

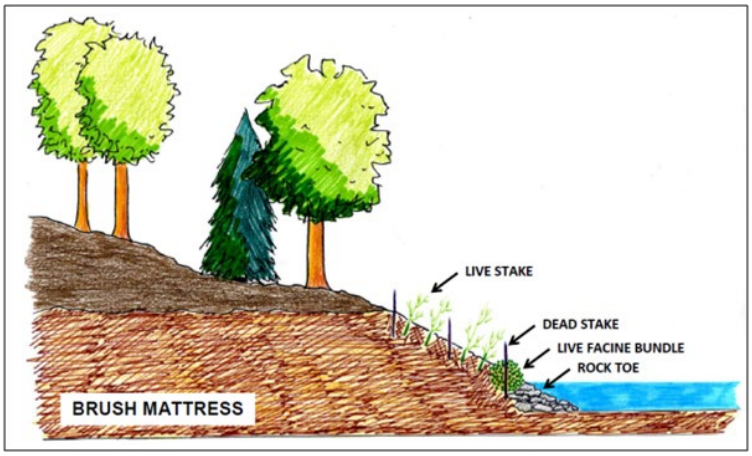


Figure 37: Schematic showing typical application of vegetated boulder revetment or buttress treatment

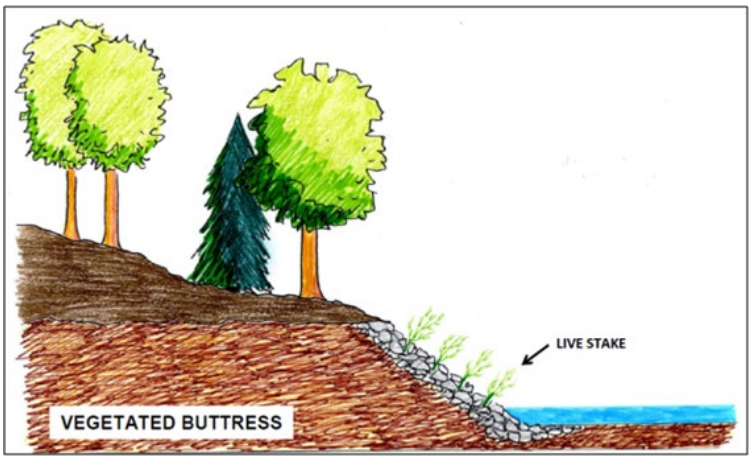
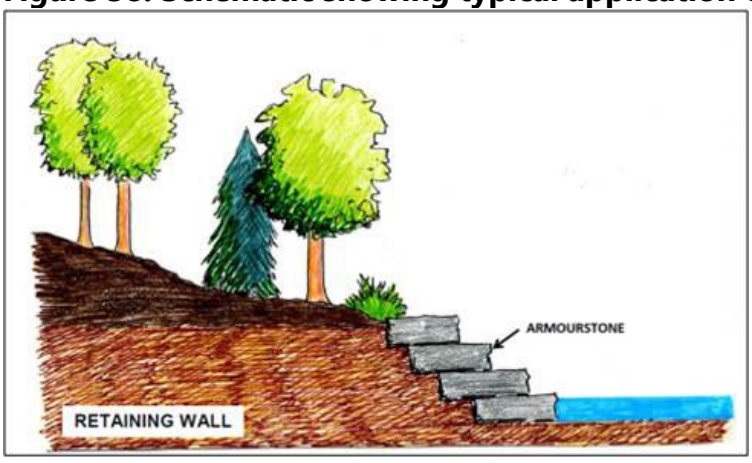


Figure 38: Schematic showing typical application of armour stone retaining wall



Within the Study Area, most of the issues are related to erosion at valley wall contacts. Applying the protect-in-place alternative would involve protecting the toe of the valley wall to reduce fluvial erosion. The existing bank and/or toe of slope would need to be protected using one of the more substantial treatments such as a vegetated boulder revetment or buttress

4.1.9 Alternative E: Infrastructure Improvements

The City recently upgraded the Rena Road crossing on the west branch. There are no plans to upgrade Derry Road East or Goreway Drive on the east branch. The City may widen the gabion-lined west tributary of the east branch upstream of Derry Road as part of a different study regarding conveyance and flooding on this tributary system.

4.1.10 Alternative F: Land Acquisition

Where erosion poses a risk to adjacent private property, the option to mitigate the risk by acquiring the property is available. Due to the high socioeconomic impacts of this type of solution, it is generally only considered when the subject valley corridor is very constrained and where the risk is critical/imminent and no other viable options exist; this is not considered to be the case for the current study.

4.2 Evaluation of Long-List of Alternative Solutions

4.2.1 Evaluation Criteria

As required by the Municipal Environmental Assessment process, the evaluation must consider relevant criteria beyond the functional efficacy of each alternative (i.e. ability to address the existing erosion problem). The various alternatives described in the previous sections have been assessed to determine their impact and opportunity related to four environments:

(i)	**Functional Environment**	This environment considers the ability of the alternative to address the problem and how it may impact existing physical systems
(ii)	**Natural Environment**	Impacts or opportunities that an alternative may have related to the natural environment (i.e. terrestrial and aquatic habitat, water quality, etc.)

(iii)	**Social Environment**	Impacts or opportunities relating to the interaction of the community/neighbourhood with the implementation of the proposed alternative
(iv)	**Economic Environment**	Capital and maintenance costs associated with an alternative, both in the short term and long term

Within each environment, relevant and representative criteria must be selected for the evaluation. Each evaluation criterion needs to be assigned a significance weighting and, based on the assessment, each alternative will then be screened or short-listed. Evaluation criteria are summarized by environment as follows:

Functional Environment

Erosion Mitigation: The ability of each alternative to address the existing erosion condition within the Study Area. Mitigation of erosion is considered positive. Erosion is the main problem in the Study Area and as such this criterion has been assigned a high significance.

Slope Stability: The stability of some valley walls within the Study Area is considered to be at risk due to the ongoing erosion. Reducing risk to slope stability is considered positive. Slope erosion or a slope failure could result in loss of table land, both private and municipal, however no structures are considered to be in immediate danger. Accordingly, this criterion has been assigned a moderate significance.

Mitigate Impact to Existing Infrastructure: The ability of each alternative to be implemented and simultaneously mitigate any impact to existing infrastructure in the creek reaches, specifically the Region of Peel channel stabilization and sanitary sewer on the east branch between Derry and Goreway, and the Region sanitary crossing and creek works at the south end of the west branch. Bridges, culverts and other crossing infrastructure are proposed to not be impacted.

Natural Environment

Terrestrial Environment: The terrestrial environment (wildlife, habitat, and vegetation) would be affected in the short-term through construction and in the long-term associated with the proposed restoration plan. Un-mitigatable habitat degradation is considered negative, whereas an increase in habitat quality is considered positive. Overall, the West Branch study area was comprised of meadows and thickets as the dominant communities, with smaller pockets of exotic woodlands, and the East Branch study area contained a larger forest land coverage. No SAR plants were observed

within the East and West Branch study areas during the botanical inventory. None of the ELC communities are of regional concern. Notwithstanding, the study area does contain numerous locations of moderate, and one high, potential habitat for species at risk, hence this criterion has been assigned a moderate-high significance.

Aquatic Environment: Aquatic habitat would be affected in the short-term through construction and in the long-term associated with any measures taken to stabilize the watercourse and riparian areas. Un-mitigatable habitat degradation is considered negative, whereas an increase in habitat quality is considered positive. The Study Area (both reaches) has reaches with good quality direct fish habitat, and the potential rehabilitation / restoration work along Mimico Creek involves identifying erosion and barrier issues along the channel, and potentially addressing select barriers, which may improve fish passage. Accordingly, this criterion has been assigned a high significance.

Social Environment

Construction Impacts to Private Property: The subject reach of East Mimico Creek is adjacent to private residential properties, and West Mimico Creek is adjacent to private industrial properties, and as such construction may result in associated temporary nuisances such as increased traffic, dust, noise, etc. Any impact to private property is considered negative. Given that impacts would be temporary, this criterion has been assigned a low significance.

Public Safety: The ongoing erosion can compromise the stability of creek banks and valley walls which are proximate to rear yards and pedestrian trails through the Study Area. Improved public safety would be considered positive. Public safety is considered paramount on any municipal lands and as such this criterion has thus been assigned a high significance.

Economic Environment

Capital Cost: Capital costs include all costs associated with the design, permitting and construction of the alternative, including any land costs. High costs are considered negative, low costs are considered positive. A high significance has been assigned due to the need for the City to be able to balance economic cost with functional benefit.

Maintenance Cost: Maintenance costs are associated with work required to maintain the design condition or function of the alternative. High costs are considered negative, low costs are considered positive. This criterion has been assigned a moderate significance.

4.2.2 Evaluation of Long-List of Alternative Solutions

In order to evaluate the long-list of alternatives, the 'impact' or 'benefit' of each alternative on a given criterion has been determined. Impact has been determined to be either Positive, Positive/Neutral, Neutral, Negative/Neutral or Negative relative to the existing (baseline) condition. For example, Alternative D1: Creek Rehabilitation - Realignment would have a positive impact on the Erosion Mitigation criterion, while it would have a negative impact on the Terrestrial Environment criterion. The impact is deemed to be neutral where the alternative does not change the existing condition.

Table 11 summarizes the evaluation of each alternative relative to the criteria discussed above and provides the impact score and associated justification. The Summary row indicates if the alternative has been Screened Out or Short-listed. Generally, if an alternative has been deemed to be either infeasible, ineffective with respect to the Problem Statement, or to have significant and unjustifiable impacts, it has been screened out. The Long-List Screening has screened out seven (7) alternatives and short-listed three (3) alternatives. Justification for the screened out alternatives is provided in the following paragraphs. Short-listed alternatives are discussed further in **Section 4.3**.

Alternative A: Do Nothing has been screened out as it does not address the problem statement.

Alternative B1: Stormwater Management - End-of-Pipe Facilities has been screened out due to the lack of suitable sites for new stormwater management facilities proximate to major existing storm sewer outfalls. New facilities at these locations would require acquisition of private property and/or result in significant impacts to mature forest lands. Given the obvious constraints this alternative is not considered feasible to implement as part of the current study.

Alternative B2: Stormwater Management – Source Controls has been screened out has been screened out. The City does not have the ability to implement source controls on a scale sufficient to significantly reduce the erosion problem in Mimico Creek. The City may still promote the use of source controls in general, but not specifically for this project.

Alternative C: Diversion has been screened out due to the potential to cause undesirable impact on Mimico Creek riparian habitat as well as on the receiving system (erosion or flooding). In addition, this alternative would likely not be supported by TRCA.

Alternative E2: Infrastructure Improvements – road bridge upgrades has been screened out unnecessary, as the capacity of the crossings is not a significant factor in the erosion in the creeks. The Rena Road culvert has also been recently upgraded.

Alternative F: Land Acquisition has been screened out since the social and economic impacts would not justify the benefits, especially in the context of the other alternatives available.

Table 11: Evaluation of Alternative Solutions

Evaluation Environment	Evaluation Criteria	Factor Significance	Alternative A:	Alternative B: Stormwater Management		Alternative C:	Alternative D: Creek Rehabilitation		Alternative E: Infrastructure Improvements		Alternative F:
			Do Nothing	B1: End-of-Pipe Facilities	B2: Source Controls	Diversion	D1: Realignment	D2: Protect-in-Place	E1: Gabion Outfall Channel Upgrade	E2: Road Bridge Upgrades	Land Acquisition
Functional	Erosion Mitigation	High	Existing erosion unmitigated	High degree of mitigation if implemented for all existing development without SWM	High degree of mitigation if implemented for all existing development without SWM	Theoretically high potential for erosion mitigation	A new channel would be designed to be stable within the existing flow regime	Isolated works would stabilize the existing channel in key locations	Isolated works would stabilize the existing channel in key locations	Minor reduction in erosive flows	Existing erosion unmitigated
	Slope Stability	Moderate	Existing risk to slope stability unmitigated	Mitigated erosion would reduce risk to slope stability	Mitigated erosion would reduce risk to slope stability	Mitigated erosion would reduce risk to slope stability	Channel realignment would remove the risk to slope stability	Toe armouring would mitigate the risk to slope stability	Design would address slope stability	Design would address adjacent slope stability	Slope stability would not be improved, but no longer a significant constraint
	Impact to Infrastructure	Moderate	Existing risk to infrastructure unmitigated	Mitigated erosion would reduce risk to infrastructure	Mitigated erosion would reduce risk to infrastructure	Mitigated erosion would reduce risk to infrastructure	Channel realignment would impact in-reach infrastructure such as sanitary sewer and bank works	Protect in place would mitigate the risk of impact to existing infrastructure	Design would improve infrastructure	Design would improve infrastructure	Infrastructure would not be improved, but not impacted either
Natural	Terrestrial Environment	Moderate-High	No direct impacts. Potential for continued loss of riparian and tableland habitat and species	Mitigated erosion would reduce risk of further loss of riparian and tableland habitat and species. Significant direct impacts at pond location.	Mitigated erosion would reduce risk of further loss of riparian and tableland habitat and species	Loss of baseflow would have a permanent negative impact on riparian habitat	Loss of mature trees. Short term impact to riparian species. Long term stabilization of riparian habitat.	Minor Loss of mature trees. Short term impact to riparian species. Long term stabilization of riparian habitat.	Continued negative impact on riparian habitat and species	Increased local impacts on riparian and tableland habitat and species	Potential for continued loss of riparian and tableland habitat and species
	Aquatic Environment	High	Continued degradation of habitat	Mitigated erosion and improved water quality would benefit aquatic habitat. Potential for thermal impacts	Mitigated erosion and improved water quality would potentially allow for recovery of aquatic habitat	Loss of baseflow would have a permanent negative impact on aquatic habitat	Opportunity for improved habitat in lower reaches. No water quality benefits.	Some opportunity for improved habitat in lower reaches. No water quality benefits	Continued degradation of habitat	Continued degradation of habitat	Continued degradation of habitat

Evaluation Environment	Evaluation Criteria	Factor Significance	Alternative A: Do Nothing	Alternative B: Stormwater Management – B1: End-of-Pipe Facilities	Alternative B: Stormwater Management – B2: Source Controls	Alternative C: Diversion	Alternative D: Creek Rehabilitation – D1: Realignment	Alternative D: Creek Rehabilitation – D2: Protect-in-Place	Alternative E: Infrastructure Improvements – E1: Gabion Outfall Channel Upgrade	Alternative E: Infrastructure Improvements – E2: Road Bridge Upgrades	Alternative F: Land Acquisition
Social	Construction	Low	No impact	High social impacts (Land Acquisition)	High social impacts (Construction on private property)	A feasible location has not been identified and as such this criteria cannot be assessed	Largest construction area/duration proximate to private property	Large construction area duration proximate to private property	Large construction area/duration proximate to private property	Minimal impact to private property – disruption to traffic.	Significant impact to affected land owners
	Public Safety	High	Existing risk associated with erosion adjacent to slopes and trails unmitigated	Mitigated erosion reduces risk	Mitigated erosion reduces risk	Mitigated erosion reduces risk	Creek moved away from slopes and trails, risk reduced	Erosion mitigated where creek is adjacent to slopes and trails	Mitigated erosion reduces risk	No impact on public safety.	Risk near slopes mitigated by property acquisition. Risk along trail persists
Economic	Capital Cost[1]	High	None	$3 M to $5 M	$3 M to $5 M	$1 M to $3 M	$500 K - $1 M	$500 K to $1 M	$500 K - $1 M	$1 M to $3 M	$5 M +
	Maintenance Cost	Moderate	Potential for maintenance related to ongoing erosion (e.g. fallen tree removal, sediment accumulation, etc.)	Regular maintenance required in perpetuity	Maintenance of source controls challenging, reconstruction would be required at end of design life	Minimal maintenance, replace at end of design life	Natural channel design requires minimal maintenance	Erosion related maintenance potential reduced significantly	Regular maintenance required in perpetuity	Regular maintenance required in perpetuity	Potential for maintenance related to ongoing erosion (e.g. fallen tree removal, sediment accumulation, etc)
Summary			Screened Out. Not effective.	Screened Out. Not feasible.	Screened Out. Not effective.	Screened Out. Not feasible.	Short-listed.	Short-listed.	Short-listed.	Screened Out. Not effective or necessary.	Screened Out.

Positive | Neutral/Positive | Neutral | Neutral/Negative | Negative

4.3 Short-List of Alternatives and Evaluation

Three (3) alternatives have been advanced to the short-list evaluation. The following provides additional information on opportunities and constraints related to each alternative and if or how the alternative is recommended to be included as part of the Preferred Alternative.

Alternative D1: Creek Rehabilitation - Realignment has been advanced as it presents the opportunity to construct a stable natural channel with an alignment and cross-section appropriate for the existing flow regime in Mimico Creek. However, as noted in the evaluation, there are multiple constraints to realignment in the study area, in particular the Region sanitary sewer infrastructure, and recent natural channel design and creek bank stabilization works on both branches. This is particularly the case at the site downstream of Goreway Drive on the East Branch, where the Peel Region has recently constructed the south bank and this cannot be altered.

Minor shifting of the creek to accommodate protection in place may be included as part of the preferred alternative, provided there are no constraints to the shifting of the opposite bank. Larger-scale realignment is not proposed to be required. Therefore, Alternative D1 is only recommended in support of Alternative D2, where feasible.

Alternative D2: Creek Rehabilitation – Protect-in-Place has been advanced as it presents the opportunity to stabilize the existing watercourse while minimizing the impact to the surrounding terrestrial environment. Protect-in-place is particularly applicable in space constrained areas within the valley (i.e. nearby constraints such as slopes, private property or infrastructure). It is noted that in locations where the watercourse is close to an at-risk slope, protection-in-place would require significant armouring. In these locations, moderate creek realignment may be an option in support of the protect-in-place, subject to not being constrained by infrastructure. Therefore, Alternative D2 is recommended as the preferred alternative, in combination with select support from Alternative D1 where feasible.

Note: while **Alternative E1: Infrastructure Improvements – Gabion Outfall Channel Upgrade** has initially been short-listed for this study. However, the City is concurrently working on a separate study related to the watershed and storm sewers upstream of the gabion outfall channel (Malton Flood Mitigation Study, 2020-ongoing) and will assess the gabion channel as part of that study. The Malton Flood Mitigation Study includes a recommendation that the gabion channel tributary to the East Branch will be modified to accommodate a widened storm sewer outlet. It is noted that there may be significant constraints to property and construction and these factors will be considered further in more detail during the other City study on this tributary. The erosion within this reach

will be addressed as part of the future channel work specified in the Malton Flood Mitigation Study. This alternative will therefore not be considered further in this study, as it is no longer applicable to this study area.

4.4 Preferred Solution

4.4.1 Description of Preferred Solution

In accordance with the discussion and evaluation in **Section 4.2** and **Section 4.3**, the preferred solution to the erosion problem is protecting the existing creek in-place (Alternative D2). **Figure 39** and **Figure 41** illustrate the Preferred Solution.

It is noted that the Preferred Solution will mitigate erosion within the Study Area by helping the watercourse to adapt to existing and future alterations to the flow regime cause by upstream urban development. As noted in the Problem Statement (**Section 3.0**), urbanization of the watershed without stormwater management controls has ultimately led to the current erosion problem. The proposed works will assist the channel in accommodating the resulting flow regime.

The preferred solution proposes several high priority erosion sites to be protected in the two (2) Study Area reaches. Minor erosion protection works are also recommended around medium priority sites at outfalls on the West Branch, and one outfall on the East Branch, to improve the connection with the channel and reduce risk of erosion.

The study team will incorporate the short-list of alternatives into the design at each of the high priority erosion sites that are identified on the figures. The leading alternative is protect-in-place, given that the entire study area is constrained in plan, such that creek realignment may not be feasible. This is particularly the case at the site downstream of Goreway Drive on the East Branch, where the Peel Region has recently constructed the south bank and this cannot be altered. The West Branch locations are constrained but there will be some opportunity to adjust the creek in the immediate location of the erosion repairs, by adjusting the opposite bank. The East Branch upstream of Goreway Drive is also constrained by the park and vegetation, so the leading alternative will involve local erosion repairs and minimal adjustment to the creek plan. Each location will also require details to be developed for the tree preservation, protection and planting plans, as well for the specific layout of the access routes, which are directly related to the tree preservation plans.

The following provides a detailed discussion on the works recommended for each Study Area reach.

East Branch

In the East Branch, there are three (3) high priority erosion sites where erosion stabilization works have been proposed: one at the downstream side of Etude Drive (which is actually a combination of two high priority sites), one at the upstream side of Goreway Drive, and one downstream of Goreway Drive on the north bank. This is to mitigate valley wall contacts, risk to property, and to rehabilitate failing protection.

A hard treatment such as vegetative rip-rap and boulder revetment will be used to provide stability to the bank treatment sites Gabion replacement or underpinning will be used for the site at the upstream side of Goreway Drive.

With one exception, medium priority sites are not proposed for treatment at this time due to the lack of any adverse threat to existing infrastructure or private property, and because the disturbance to mature forest area for access and construction would be significant, relative to the erosion protection benefit. The medium priority site identified as the outfall between Goreway Drive and Derry Road on the south side of the creek is proposed to be addressed given that the access to the high priority erosion site will cross the outfall channel and there will be an opportunity to address the outfall erosion without significant impact to the vegetation.

West Branch

In the West Branch, there are two (2) high priority sites where erosion stabilization works have been proposed. These locations currently have erosion failures and slope stability concerns at the toe of the valley wall. The existing gabion and concrete transverse grade control structures will be examined for structural stability. The City may consider removing them once they approach the end of their design lives.

It is also proposed to treat each of the five (5) medium priority sites in the West Branch, given the opportunity and lack of impact or adverse disturbance to mature vegetation along proposed access routes. As a result, two additional medium erosion sites and three outfalls will be addressed.

All Reaches

A natural heritage system preservation and restoration plan will be developed at detailed design to ensure the short-term stabilization and long-term health of the Study Area terrestrial ecosystem. The restoration plan will employ locally native, non-invasive species suitable to Study Area conditions. The plan will be designed to meet City tree compensation by-laws.

The proposed creek improvements are expected to adequately stabilize slopes at risk from erosion and reduce the potential for future slope instability. Geotechnical engineers will be involved in the detailed design.

4.4.2 Compliance with The Living City Policies (2014)

In response to the Notice of Study Commencement, the TRCA staff recommended the preferred solution for this project shall meet the policies of Section 7 of The Living City Policies (2014). Accordingly, the preferred solution was selected through an evaluation of alternative solutions that considered following impacts and/or opportunities:

- Opportunities for erosion mitigation and slope stability
- Opportunities for community and public realm benefits and public safety
- Impacts to aquatic and terrestrial habitat and functions

In addition to the above, the TRCA noted that the preferred solution shall also consider impacts to the TRCA property and heritage resources. Further, a section of the Mimico Creek from Etude Drive to Derry Road East contains sections of TRCA property under management agreement. Accordingly, the TRCA staff were engaged during this Class EA study to discuss erosion control works on the TRCA property.

With regards to the heritage/archaeological resources, a Stage 1 Archaeological Assessment, which identified the areas of archaeological potential. These areas shall be subject to a Stage 2 Archaeological Assessment prior to conducting any construction/land disturbance activities.

4.4.3 Preliminary Cost Estimate for Preferred Solution

The preliminary cost estimate to implement preferred solution is estimated to be approximately $900,000. A summary of the preliminary cost estimate is provided in the table on the following page, and a detailed breakdown is provided in Appendix E.

Table 12: Preliminary Cost Estimate for Preferred Solution

Item Description	Estimated Cost
East Branch mobilization, access, dewatering etc.	$77,000
East Branch bank revetment with boulders/vegetation	$150,000
East Branch armour stone walls, rip-rap spillways	$127,500
West Branch mobilization, access, dewatering etc.	$95,000
West Branch bank revetment with boulders/vegetation	$140,000
West Branch armour stone walls, rip-rap spillways	$39,000
Allowances: arbourist, landscaping, contingency	$272,850
Total	**$901,350**

Figure 39: Mimico Creek East Branch – Preferred Solution (Plan View)

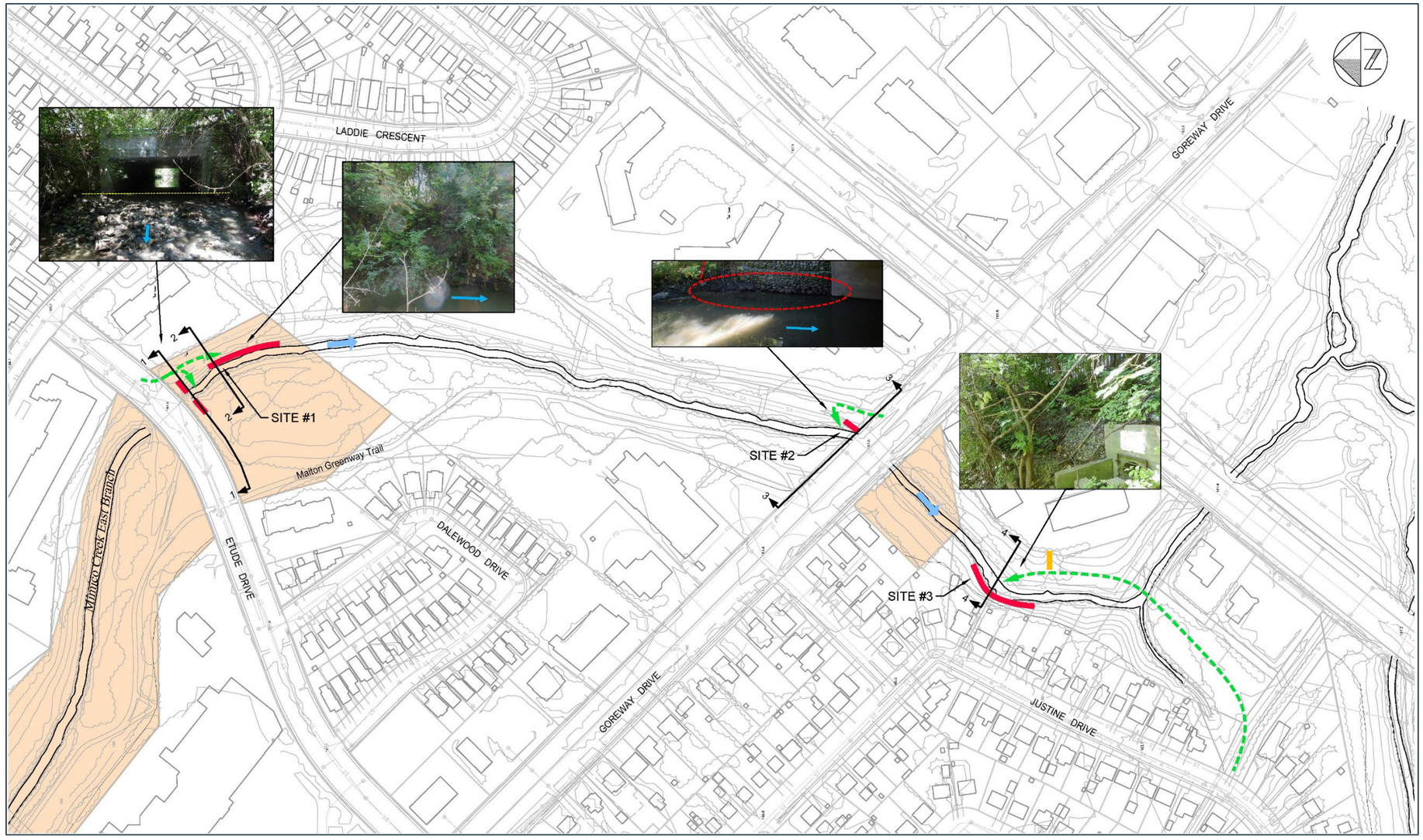


Figure 40: Mimico Creek East Branch – Sections (Existing)

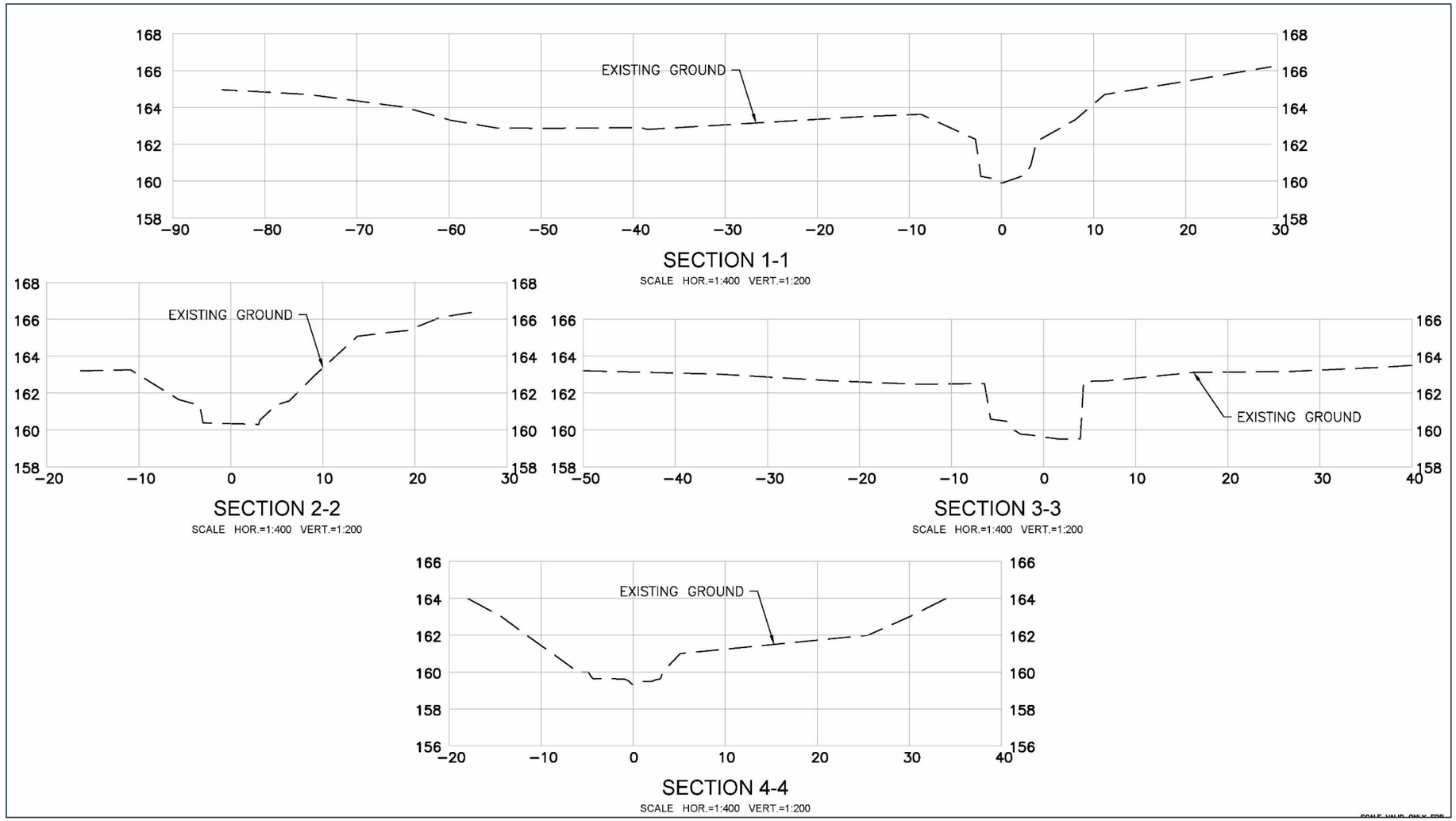
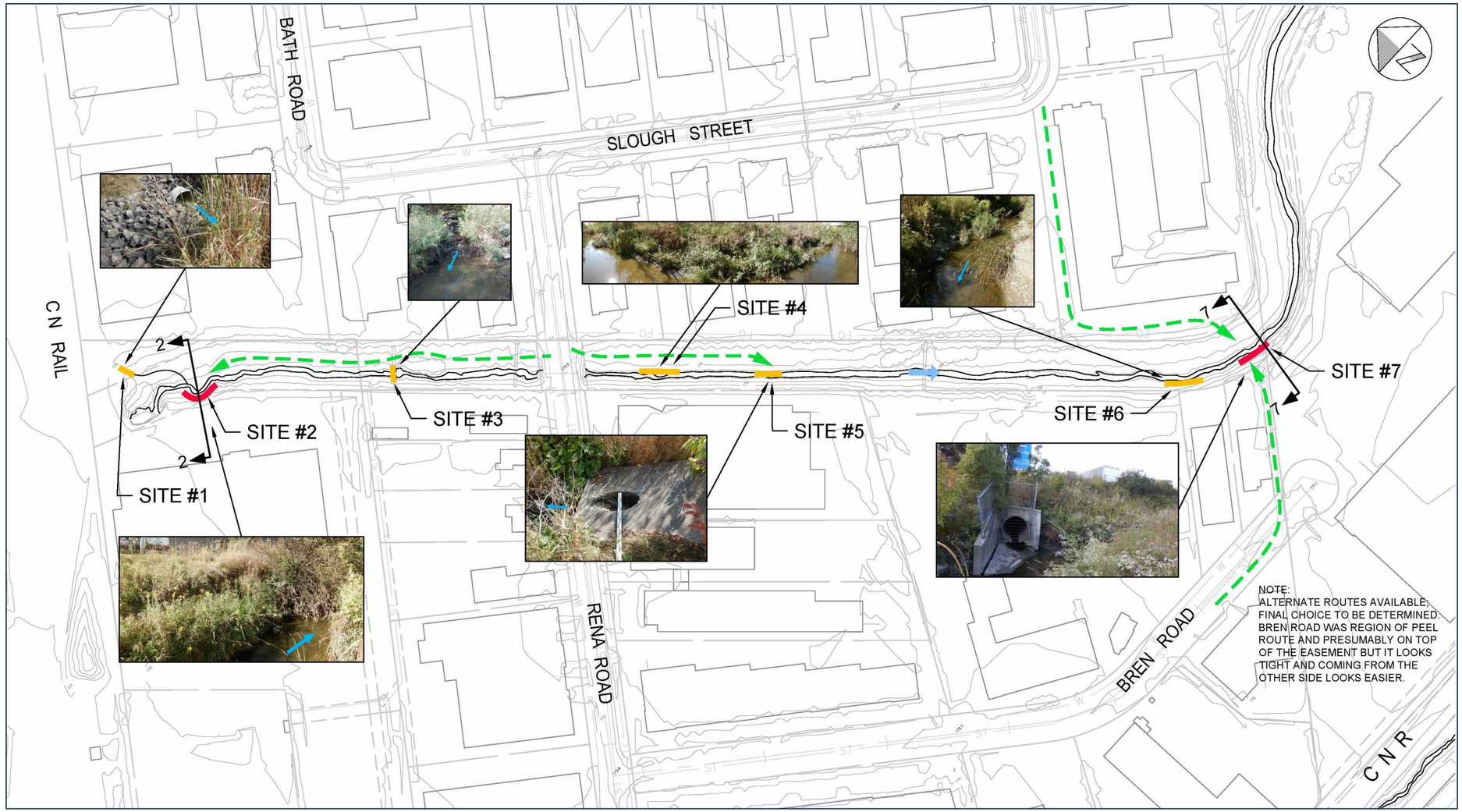


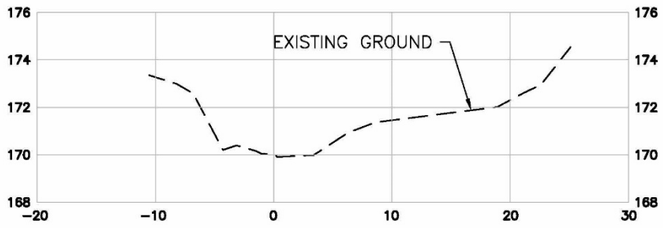
Figure 41: Mimico Creek West Branch – Preferred Solution (Plan View)



LEGEND

- POTENTIAL CREEK/TOE STABILIZATION WORKS – HIGH PRIORITY
- POTENTIAL CREEK/TOE STABILIZATION WORKS – MEDIUM PRIORITY
- POTENTIAL CONSTRUCTION ACCESS

Figure 42: Mimico Creek West Branch – Sections (Existing)



SECTION 2-2
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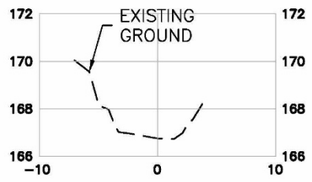


SECTION 7-7
SCALE HOR.=1:400 VERT.=1:200

5.0 Potential Impacts and Proposed Mitigation Measures

5.1 Slope Stabilization / Geotechnical

As discussed in **Section 2.3**, the following subsurface investigations are recommended to assess the slope stability and provide geotechnical recommendations regarding erosion control / slope stabilization:

Mimico Creek West Branch ~50 m south of the CN Rail CSP culvert at the north end of the study area

The subsurface investigation for this section will consist of a single borehole with a groundwater water monitoring well. Due to site access restrictions the borehole will have to be located at the 7615 Torbram Road industrial property.

Mimico Creek West Branch from the south limit of the study area to 50 m northwards

The subsurface investigation for this section will consist of a single borehole with a groundwater water monitoring well. Due to site access restrictions the borehole will have to be located at the 7385 Bren Road commercial property.

Mimico Creek East Branch from Etude Drive to ~ 70 m southwards

The subsurface investigation of this section will consist of a single borehole with a groundwater water monitoring well. Site access is available from Etude Drive along the Malton Greenway Park pedestrian trail.

Mimico Creek East Branch from ~135 to ~150 m west of Goreway Drive to the rear of the residence at 6938 Justine Drive

Site access for standard drilling equipment is not available. The subsurface investigation for this section will consist of hand excavated test pits.

5.2 Fisheries

5.2.1.1 General Assessment of Potential Impacts of the Project

The potential rehabilitation / restoration work along Mimico Creek involves addressing erosion and identifying barrier issues along the channel, which may improve fish passage. The proposed work may result in varying degrees of impact depending on numerous factors (e.g., fish species sensitivity). Potential negative impacts to the East and West Branch during project works may include the following:

- Introduction of sediments, concrete and other deleterious substances;
- Alteration of natural habitat features and flows due to the removal of in-water structures;
- Disruption of critical fish life stages;
- Erosion and sedimentation due to the operation of machinery; and
- Loss of vegetative cover over the creek.

Upon completion of project works, improvements to the West and Each Branch may include:

- Stabilization of watercourse banks; and
- Reduced future erosion and sedimentation due to improved bank stability.

In addition to above, the works may include improvement to fish passage.

5.2.1.2 General Mitigation Measures

The rehabilitation / restoration work which will be undertaken will improve the function of Mimico Creek and provide increased channel stability. Mitigation measures will be implemented during project works to protect fish and fish habitat within the creek. Mitigation measures include, but are not limited to:

- Project activities shall be scheduled to avoid wet and rainy periods and in-water works shall be conducted during low flow condition;
- In-water work will follow MNDMNRF timing windows, with no in-water work occurring March 15 to July 15 of any given year;
- All dewatering discharge, if required, shall be directed to a filter bag to remove sediments. The filter bag shall be located in an area that is sufficiently vegetated, stable and does not display any evidence of erosion or instability;
- The disturbance or removal of riparian vegetation should be minimized;
- Construction staging shall occur in a manner to prevent spills and/or leaks into the creek;
- Standard erosion and sediment control (ESC) measures (e.g. silt fence) shall be applied consistent with Ontario Provincial Standards and Specifications (OPSS) to ensure no negative effects to surface waters. The control measures shall be implanted prior to work and be maintained during project works and until disturbed areas will be reinstated to original or improved condition, upon completion of works;
- Any stockpiled materials shall be stored and stabilized away from water;

- Remove all construction materials from site upon project completion;
- Methods will follow applicable standard operating procedures (OPSS 180, 182, 804 and 805) to protect fish and fish habitat;
- Project works will comply with required permitting and authorizations, based on agency consultation including:
    - If isolation of any area(s) of the creek is required, a fish salvage operation will be undertaken to collect and remove any fish from the work area. The fish salvage(s) will be undertaken under a Licence to Collect Fish for Scientific Purposes (LCFSP) from the MNDMNRF. Conditions of the LCFSP will be followed; and
    - Upon determination of the project works, a project screening process following that outlined by the DFO will occur to determine whether or not further consultation with DFO will be required through a Request for Review.

5.2.1.3 Potential Enhancement and Compensation Measures

Potential enhancement / compensation measures for the West Branch include:

- Stabilizing areas where creek banks are slumping, and stormwater outfall structures are failing;
- Removing or rearranging the boulders downstream of the Rena Road culvert to facilitate fish passage;
- Removal of debris and structures within the creek to facilitate fish passage;
- Adjustment of structures within the creek to facilitate fish passage; and
- Common Reed management along the west branch of Mimico Creek.

Potential enhancement / compensation measures for the East Branch include:

- Stabilizing areas where creek banks are slumping, gabion baskets are failing and stormwater outfall structures are failing;
- Removal of debris within the creek to facilitate fish passage;
- Removal of woody debris accumulated on the west bank upstream of Etude Dr; and
- Removal of garbage accumulated on the riparian area upstream of Etude Dr.

5.3 Terrestrial

Vegetation

At present time, it is understood that high priority sites for erosion locations will be reviewed more closely for execution. As such, a general review of impacts and proposed mitigation have been prescribed herein. Further review of impacts and mitigation shall be identified during detailed design phase once exact locations of known works are better understood. As each of the East and West Branch study areas are located within the NHS measures to minimize negative impacts shall be considered, avoided and mitigated through restoration and enhancement to the extent possible. The primary vegetation communities observed within the West Branch study area are meadows and thickets, with smaller pockets of exotic woodlands. Each of these communities is already susceptible to disturbance activities associated with urban areas, including dumping, man-made trails, road salt and mowing. Similarly, the East Branch study area also contains larger pockets of exotic woodland communities, and displays evidence of disturbance. Given the nature of this Project is to remediate existing erosion issues associated with Mimico Creek a summary of some high-level impacts may include:

- Staging of equipment may encroach into adjacent natural areas beyond the proposed Project limits which may result in vegetation damage or loss;
- Disturbed areas and vegetation loss as a result of construction activities (e.g., trampling vegetation);
- Soil compaction from continuous access routes, or laydown and staging areas;
- Focal clearing and grubbing of vegetation to promote access and demolition;
- Introduction of invasive and/or non localized plant material from previous construction sites and disturbance activities. More specifically, there are pockets of the heavily invasive Common Reed (MAMM1-12), which should be avoided to the extent possible;
- Dust from work activities may settle on vegetation; and
- Contamination of vegetation communities due to the unplanned release or discharge of deleterious substances to the environment, including fuels (diesel and propane), lubricants (engine oil, transmission oil, etc.), and coolants (ethylene glycol).

Proposed Mitigation

In order to assist with the temporary impacts associated with construction, the following general mitigation measures are recommended:

- Staging, and access areas will be minimized as much as feasible to avoid disturbing the natural environment beyond the proposed disturbance limit.
- All work zones shall be clearly marked on detailed design drawings and the Erosion and Sediment Control (ESC) Plan prepared. The ESC Plan shall be developed prior to construction and conform to industry Best Management Practices (BMPs) and recognized standard specifications. The ESC Plan shall follow the Erosion and Sediment Control Guide for Urban Construction (2019).
- The ESC measures should be implemented prior to construction and maintained during the construction phase in accordance with the ESC Plan until all areas are stabilized and restored.
- To facilitate the demolition of the erosion prevention structures, measures should be taken to stage the demolition in such a manner to minimize impacts to the natural environment.
- Utilize existing roadways and access paths to the extent possible.
- Install tree protection fencing as directed by the City (City of Mississauga, 2008). The tree protection fencing shall be installed prior to construction or demolition activities.
- All tree removals shall be completed by a qualified tree care professional under the supervision of a certified arborist using best arboricultural practice.
- Operate, store, and maintain equipment, vehicles, and associated materials in a manner that prevents the entry of any deleterious substance from entering into the natural environment.
- Implement drip pans under equipment (i.e. generators, pumps, etc.) in operation within the work zones.
- Any re-fueling is to be undertaken at least 30 m from the watercourse greatest extent possible given the limitations imposed by the East and West Branch study areas.
- Ensure a Spill Management Plan (including spill kit materials, instructions regarding their use, education of staff, and emergency contact numbers) is present on-site at all times for implementation in the event of an accidental spill. All spills are to be reported to the MECP Spills Action Centre (SAC) at 1-800-268-6060.
- Ensure that machinery arrives on site in a clean condition and is maintained free of fluid leaks, invasive species and noxious weeds.

- Identify local regulatory authorities (TRCA) and have contact information available on site.
- All project related works are to be undertaken in compliance with OPSS 182 – General Specification for Environmental Protection for Construction In and Around Waterbodies and on Watercourse Banks. Ensure that machinery arrives on site in a clean condition and is maintained free of fluid leaks, invasive species and noxious weeds.
- A tree inventory will be completed to target those areas identified for proposed works.
- A Tree Protection Plan will be prepared to identify areas to be avoided, and those trees to be protected.
- Follow all permit and approval requirements (as required).
- Removal and/or management of existing invasive species patches, more specifically Common Reed, before it continues to spread through the NHS.

Wildlife

Based on a review of secondary source material, and review of habitat criteria through the botanical inventory, wildlife may utilize the East and West branch study areas at various times during any given year. Although the proposed works are expected to result in minimal impacts to wildlife, some expected impacts may include:

- Impacts to nesting birds within the East and West Branch study areas or in close proximity;
- Wildlife encounters during construction;
- Dust from work activities has the potential to settle on adjacent vegetation and may disrupt wildlife and their habitat; and
- Noise from construction may disrupt wildlife and their life cycle processes (e.g., predator calls).

Proposed Mitigation

Similar to the avoidance and mitigation identified for vegetation, additional measures to help avoid or mitigate impacts to wildlife as a result of the Project include:

- Removal of all vegetation shall occur outside of the general migratory bird nesting period (April 1 to August 31) and activities will occur in accordance with the *Migratory Birds Convention Act* (MBCA) and *Migratory Bird Regulations*. These timing constraints should not be perceived as absolutes. This period represents the core

breeding period, although some species may nest in March and September. Ultimately, the objective from a compliance perspective is to not circumvent the MBCA. As such, due diligence measures should be implemented and documented for any nest searching efforts, including record control, to ensure compliance with the MBCA.

- For activities (including vegetation removal) which must occur during bird nesting season, surveys to identify nesting activity should be completed by an experienced Avian Biologist within 24 hours of scheduled work activities. Due to the uncertainty that lies with nest sweeps during construction, especially during leaf-on conditions, it is, as noted, recommended that all vegetation clearing activities occur outside the above-noted bird nesting window. In the event that bird nests protected under the MBCA, FWCA or *ESA* are encountered during construction, work must stop in the vicinity of the sighting until further direction is provided. These species and their nests must not be disturbed, tormented, injured in any way, destroyed, and/or separated from young. A protective buffer area should be established around the nest and should be determined in consultation with a qualified avian biologist, as well as the MNDMNRF, MECP and/or Canadian Wildlife Service (CWS), as necessary.
- While it may not be known if wildlife encounters will occur, it may be best to obtain a permit to account for the safe removal and relocation of wildlife in the event they are encountered. More specifically, a Wildlife Scientific Collectors Authorization under the FWCA may be needed where there is intentional or anticipated incidental capture, handling and/or relocation of herpetofauna (e.g., frogs and turtles). The Wildlife Scientific Collector's Authorization is to be obtained from the MNDMNRF and must be obtained by the contractor hired to perform the work. All wildlife removal and relocation activities should be completed by a qualified professional.
- Wildlife exclusion fencing for turtles etc. could be implemented in addition to sediment control measures proposed for the Project. Wildlife exclusion fencing shall follow the Reptile and Amphibian Exclusion Fencing Best Practices, Version 1.0 Species at Risk Branch Technical Note, Prepared for the Ministry of Natural Resources (2013).

Summary and Next Steps

A summary of next steps as it pertains to the findings documented within the report are as follows:

- There may be potential for five (5) candidate SWH in the West Branch study area including: bat maternity, snake hibernaculum, marsh bird breeding, terrestrial crayfish, and that associated with special concern (SC) and rare (S1-S3, SH) wildlife

species. Within the East Branch study area three (3) candidate SWH are thought to possibly occur, including bat maternity colonies, snake hibernaculum, turtle nesting habitat, and special concern (SC) and rare (S1-S3, SH) wildlife species. Several special concern and rare species were noted during the secondary source review to have element occurrences that overlap the East and West Branch study areas. Although these element occurrences were documented, it is important to note that the exact locations of those records are not available. Respective mitigation measures identified herein, and those to be further refined during the next phase of the Project will help avoid and/or mitigate impacts to candidate SWH.

- No vegetative SAR were documented during the botanical review, and review of secondary source information indicates low to moderate potential for other known SAR that have habitat ranges encompassing the East and West Branch study areas based on existing habitat conditions and criteria. More specifically, suitable habitat is present for non-SAR and SAR bats, and as such a snag cavity search as well as cluster search is recommended during leaf-off and leaf-on conditions. It is suggested these searches be focused accordingly depending on actual areas of impact associated with the Project, inclusive of access areas.
- A tree inventory shall be completed to target those areas proposed for future erosion efforts once identified.
- All areas disturbed should be restored to equal or better condition using native seed mixes and native species selection known to the existing East and West Branch study areas.
- Although there is no way to identify exact timing of breeding birds protected under the MBCA, it is recommended that all tree and vegetation removal be completed outside of the core breeding time period for Southern Ontario which takes place from April 1 to August 31 in any given year. Special care should be made during all vegetation removals no matter the time of year to avoid impacts wildlife.
- As there is uncertainty that lies with wildlife inhabiting both the East and West Branch study areas that are connected with natural features, it is recommended that a Wildlife Scientific Collector's Authorization from the MNDMNRF be obtained by the contractor scheduled to perform the wildlife rescue and relocation during future work efforts.

As noted herein, species identified as endangered and threated are provided protection under the ESA. Those species, identified as special concern, are not afforded protection under Sections 9 and 10 of the ESA however, may be afforded protection as part of

SWH. As such, due diligence should be enforced if a special concern species or their habitat is determined present.

5.4 Archaeological Resources

- Prior to land alterations, Stage 2 archaeological assessment should be conducted in the areas of archaeological potential identified in **Figure 32**, **Figure 33** and **Figure** 34 (also provided in **Appendix D**). Since ploughing of these lands is not viable, Stage 2 assessment should be carried out by means of test-pit survey. Test pits should be excavated by hand at 5-m intervals in a grid-pattern to a depth of 5 cm into the subsoil. The stratigraphy of soils excavated during test pitting should be examined to detect cultural soil horizons. In addition, excavated soils are to be screened through 6-mm mesh to facilitate the recovery of artifacts. After examination, each test pit should be fully backfilled and any sod caps replaced and tamped down by foot.
- The pattern and intensity of test-pit placement may be altered due to changes in archaeological potential in different parts of the study area as a result of disturbed soils not visible during the Stage 1 property inspection. Any areas of deep and thorough disturbance should be evaluated and photo-documented.
- If archaeological resources are found, their exact distribution should be documented, and any diagnostic artifacts recovered and inventoried. Upon the discovery of cultural materials, the 5-m survey grid should be continued to determine whether there are enough contiguous archaeological resources to meet the criteria for making a recommendation to carry out Stage 3 assessment. In the event that insufficient archaeological resources are recovered, eight additional test pits are to be dug in a 2-m to 2.5-m radius around the isolated positive test pit, followed by the excavation of a 1-m x 1-m test unit at the positive test pit. Soils from each intensification test pit and from the test unit should be screened through 6-mm mesh to facilitate the recovery of artifacts by provenience. Recovered resources should be analyzed and catalogued in the Stage 2 assessment report.
- The remainder of the study area as identified in **Figure 32**, **Figure 33** and **Figure** 34 (also provided in **Appendix D**), does not require further archaeological assessment.

6.0 Future Work Commitments, Permit Requirements, and Monitoring Plan

6.1 Future Commitments

The specific location and extent of creek realignment and remnant channel backfilling, bank protection, valley toe protection and terrestrial rehabilitation would be determined at detailed design with consideration for all relevant objectives and constraints including fluvial geomorphology and hydraulics, geotechnical (slope stability), and aquatic and terrestrial resources. **Table 12** summarizes the commitments to be undertaken by the City during detailed design.

Table 13: Summary of Commitments for Detailed Design

Category	Future Commitment
Slope Stabilization / Geotechnical	**Mimico Creek West Branch ~50 m south of the CN Rail CSP culvert at the north end of the study area:** The subsurface investigation for this section will consist of a single hand-excavated test pit, due to site access restrictions. The test pit will be located in the creek block adjacent to the 7615 Torbram Road industrial property. **Mimico Creek West Branch From the south limit of the study area to 50 m northwards:** The subsurface investigation for this section will consist of a single hand-excavated test pit due to site access restrictions. The test pitwill be located in the creek block adjacent tothe 7385 Bren Road commercial property. **Mimico Creek East Branch from Etude Drive to ~ 70 m southwards:** The subsurface investigation of this section will consist of a single borehole complete with a groundwater water monitoring well. Site access is available from Etude Drive along the Malton Greenway Park pedestrian trail. **Mimico Creek East Branch from ~135 to ~150 m west of Goreway Drive to the rear of the residence at 6938 Justine Drive:** Site access for standard drilling equipment is not available. The subsurface investigation for this section will consist of hand excavated test pits.

Category	Future Commitment
Terrestrial Environment	Confirm potential impacts and mitigation measures.
	A tree inventory will be completed to target those areas identified for proposed works.
	A tree protection plan will be prepared that will identify areas to be avoided, and those trees to be protected.
	Suitable habitat is present for non-SAR and SAR bats, and as such a snag cavity search as well as cluster search is recommended during leaf-off and leaf-on conditions. It is suggested these searches be focused accordingly depending on actual areas of impact associated with the Project, inclusive of access areas.
Archaeological Resources	Stage 2 archaeological assessment should be conducted in the areas of archaeological potential identified in the Stage 1 Archaeological Assessment Report (**Appendix D**)

6.2 Permit Requirements

The following summarizes the permits/approvals that may be required, the administering agency and the relevant legislation:

- Alteration to Watercourses and Floodplains – TRCA (Ontario Regulation 166/06)
- Letter of Advice – Ministry of Environment Conservation and Parks (Endangered Species Act, 2007)
- Request for Review – Fisheries and Oceans (Fisheries Act, 1985)
- Approval/Authorization on Stage 2 Archaeological Assessment - Ministry of Heritage, Sport, Tourism and Culture Industries (Ontario Heritage Act, 1990)
- License to Collect Fish for Scientific Purposes (if fish salvage is required during construction) – MNDMNRF (Fish and Wildlife Conservation Act, 1997)
- Wildlife Scientific Collectors Authorization (for intentional or anticipated incidental capture, handling and/or relocation of herpetofauna (e.g., frogs and turtles)) - MNDMNRF (Fish and Wildlife Conservation Act, 1997)

6.3 Monitoring

In order to ensure proper functionality of the proposed channel works and successful rehabilitation of the aquatic and terrestrial environs it will be necessary to implement a post-construction monitoring program. Depending on the performance of the implemented works, adaptive management (i.e., additional or modified remedial works) may be required, as determined by the results of the monitoring program. Monitoring for most aspects of the proposed works is proposed for a period of three (3) years, with reporting submitted to the City and TRCA each year. The following monitoring program is recommended for the Preferred Alternative:

Stream Morphology

The program would be intended to provide quantification of channel processes, including lateral migration, vertical channel adjustments, changes in channel capacity, substrate adjustment and general channel performance. Quantitative measurements would be supported by detailed qualitative observations and photos. The monitoring program is designed to provide long-term insight into channel processes which would allow for the evaluation of channel performance. To measure the desired parameters a series of monitoring 'stations' will be installed. These are proposed to include:

- Benchmarked cross-sections throughout various sites of channel works. These will be installed in representative areas and will include at minimum one (1) cross-section at each of the geomorphic feature types (i.e. Riffle, pool, run);
- Pebble counts at each of the control sections;
- Erosion pins where possible (due to difficulties with exposed shale bedrock);
- A longitudinal profile which encompasses a minimum of two bedform sequences on each site. The survey will be tied into at least one control section which will act as a vertical control; and,
- A photographic inventory from known vantage points to assess general channel performance.

Additional detail with respect to number and location of stations will be provided at the detailed design stage. Once the detailed designs are completed, additional tasks which pertain specifically to the proposed works may also be added to the monitoring program.

The monitoring would be installed immediately after construction is completed and a report summarizing baseline conditions would be compiled. Monitoring would then be repeated annually, in the early fall, for a period of three (3) years. An annual report

would be prepared which would include any relevant recommendations relating to channel maintenance.

Groundwater

Considering the lack of baseline monitoring for post-construction comparison and lack of expectation for groundwater impacts, groundwater monitoring is not proposed.

Fisheries

Pre-construction fish collections were not undertaken for this project, and therefore there is little benefit to include fish collections as part of the post-construction monitoring. Furthermore, the fish community at this site would be expected to thrive in urban streams, and would be expected to increase in numbers wherever structural habitat and water depth is increased, which is proposed as part of the realigned sections. As such, no fish collections are considered to be required to monitor the proposed works, however monitoring should ensure that the constructed habitat is functioning as designed.

It is proposed that a fisheries biologist ensure that the designed habitat is appropriate for the endemic fish community, and that it is functioning as designed. The watercourse design will be reviewed by a qualified fisheries biologist prior to construction, followed by several post-construction field evaluations. The first aquatic habitat field evaluation is proposed to occur as soon as practically possible following construction, or during the first summer. The constructed channel sections, including a short distance upstream and downstream, are proposed to be photographed at key georeferenced locations and examined for general habitat quality, groundwater inputs, and potential barriers to upstream fish movement. A report detailing the qualities (positive and negative) of the constructed habitat, and identifying any repairs or alterations that may be needed, would then be produced. This field examination and report cycle would be repeated for two (2) additional seasons, during the second and fifth post-construction summers (i.e. 3 distinct years).

Terrestrial Ecology

Vegetation directly impacted by construction will be replaced as part of the landscape restoration plan and will be monitored for two (2) years post construction as an item under warranty. Vegetation adjacent to the construction may suffer from disturbances to soil, increased light and wind, exposure to colonization from exotic species and potential damage from encroachment. To monitor these potential effects communities within ten meters from any construction disturbances should be monitored for composition and abundance with an assessment of floristic quality and coefficient of conservativism to record potential changes in the health and resiliency of the native

community. Monitoring should begin prior to the initiation of construction, an assessment should be completed as soon as practically possible after construction, and continue for a minimum of three (3) years thereafter with reports submitted to the City and TRCA.

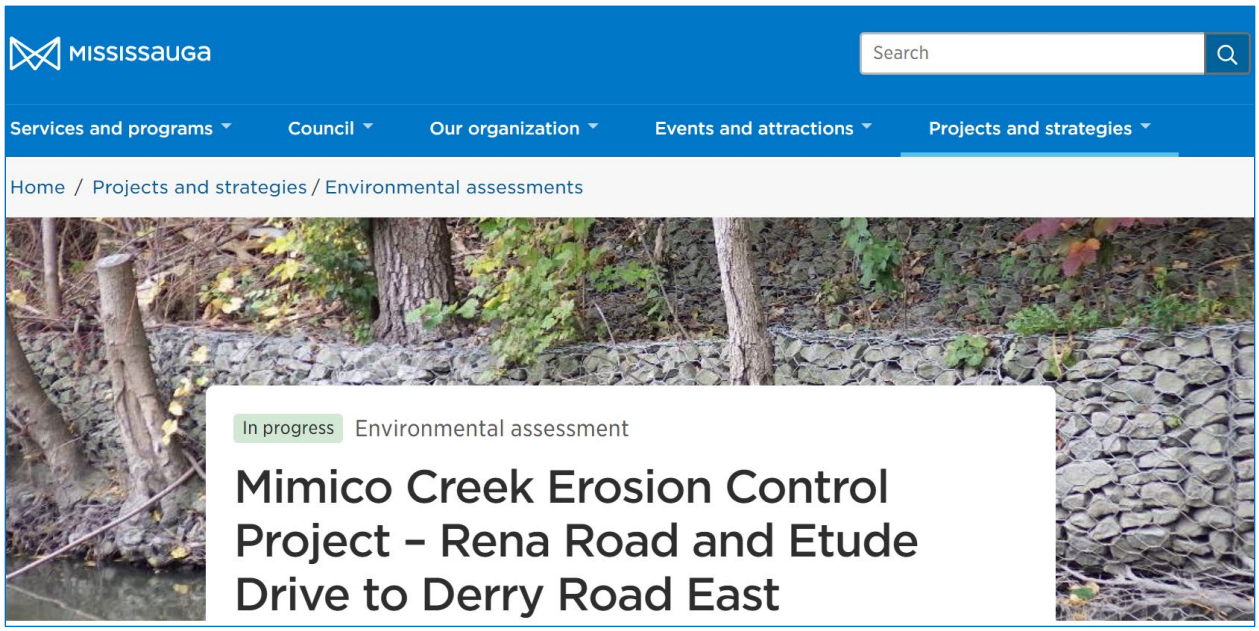
7.0 Consultation

7.1 Study Contact List

A Study Contact List was developed at the commencement of this study. This list included contacts from the federal and provincial government agencies, TRCA, Peel Region, Indigenous Nations, utility companies, and relevant area organizations. It was updated throughout the study upon request. The final Study Contact List is provided in **Appendix F**.

7.2 Study Webpage

A webpage was created for this project on the City of Mississauga's website. Information related to the study was posted on this webpage throughout the study, including study notices, Public Information Centre materials, and study reports. The study webpage can be accessed by clicking at: [Mimico Creek Erosion Control Project – Rena Road and Etude Drive to Derry Road East].



7.3 Study Notices

7.3.1 Notice of Study Commencement

The Notice of Study Commencement was issued to introduce the study. It was issued on October 24, 2019. The notice was posted on the Project webpage, and published in the Mississauga News, and issued to the contacts on the Study Contact List.

7.3.2 Notice of Online Public Engagement

The Notice of Online Public Engagement was hand delivered to the properties that back onto the subject branches of Mimico Creek on May 26, 2021. The notice was also issued to the contacts on the Study Contact List via email on May 27, 2021. This notice was also posted on the project webpage.

7.4 Agency Consultation

As previously noted, various level of government agencies identified on the Study Contact List were contacted as part of this study. Agency consultation is summarized below. Copies of agency correspondence are provided in **Appendix G**.

7.4.1 Toronto and Region Conservation Authority

7.4.1.1 Response to Notice of Study Commencement

On November 19, 2019, the TRCA response to the Notice of Study Commencement via a response letter. TRCA noted that the section of Mimico Creek from Etude Drive to Derry Road East contains sections of TRCA property under management agreement, and there are a number of ongoing projects in the overall study area (including TRCA restoration projects) that must be coordinated with TRCA or other municipalities/agencies. TRCA also outlined the following:

- TRCA's commenting role in the Class EA study,
- TRCA's areas of interest,
- Consideration of The Living City Policies in the development and evaluation of alternative solutions,
- Submission requirements, and
- Review fees

7.4.1.2 Meeting #1 (April 28, 2020)

A meeting was held with the TRCA on April 28, 2020. The purpose of this meeting was to discuss background data review and field investigations for the Study. It was discussed that the draft reports will be provided to the TRCA for review.

7.4.1.3 Meeting #2 (May 13, 2021)

The draft Project File Report was submitted to TRCA on April 22, 2021. A meeting was hosted on May 13, 2021, to share with the TRCA the preliminary preferred solution for erosion control for this project and to receive TRCA's endorsement of the preferred solution so it can be presented to the public.

The TRCA staff noted that since the last meeting in April 2020, the TRCA updated the hydraulic model and the floodplain mapping, based on newer LiDAR mapping. The TRCA staff also noted that the updates are not significant in this location, hence the results reported in the Class EA report do not need to be updated. The TRCA staff suggested doing a spot-check review of the updated model and mapping. Wood staff noted that the updated modelling will be reviewed during detailed design, and the proposed works checked for potential impacts to local flood levels, and mitigation.

The TRCA staff also noted that there is a parcel of TRCA property located at northeast of Goreway Drive and Derry Road under management agreement. On the TRCA owned lands, the Archaeology works should be completed by the TRCA archaeology staff. There will also be requirements to access the property based on the management agreement.

It was also discussed that the TRCA staff will review the draft Project File Report and provide comments.

7.4.1.4 Comments on the Draft Project File Report (June 29, 2021)

On June 29, 2021, the TRCA provided comments on the draft Project File Report. The comments were related to the following: ecology, water resources, geotechnical, the TRCA projects, and the TRCA property. The Study Team's responses to the TRCA comments are provided in a comment-response table provided in **Appendix G**.

7.4.2 Ministry of the Environment, Conservation and Parks

7.4.2.1 Response to Notice of Study Commencement

On November 26, 2019, the Ministry of the Environment, Conservation and Parks (MECP) provided response to the Notice of Study Commencement via a response letter. The Ministry shared "Areas of Interest" document that provides guidance regarding the Ministry's interests with respect to the Class EA process. In addition, the Ministry's letter noted that the City is required to consult with the following Indigenous Nations, who have been identified as potentially affected by the proposed project:

- Curve Lake First Nation;
- Alderville First Nation;
- Mississaugas of the Credit First Nation;
- Mississaugas of Scugog Island First Nation;
- Hiawatha First Nation; and
- Huron-Wendat Nation.

7.4.3 Ministry of Heritage, Sport, Tourism and Culture Industries

On November 27, 2021, the Ministry of Heritage, Sport, Tourism and Culture Industries provided a letter related to archaeological and cultural heritage resources. The Study Team shared the Ministry's letter with the City of Mississauga's Heritage Planning staff for review and advice.

The City's Heritage Planning staff noted that there are no previously registered archaeological sites within the project Study Area. The City's Heritage Planning staff also noted that there are no heritage properties within or adjacent to the project Study Area. Therefore, a Heritage Impact Assessment is not required.

7.4.4 Region of Peel

On June 2, 2021, the Region of Peel staff provided a response to the Notice of Online Public Engagement. The response noted that as part of the Region's retaining wall project, the Region will be removing the existing south-east and south-west gabion retaining walls on Derry Road East, west of Goreway Drive and replacing them with new PVC (polyvinyl chloride) gabion baskets. The Region staff shared project drawings and inquired if there is any conflict with the project plans. The Region staff also inquired about the proposed timelines for the Mimico Creek stabilization works.

On June 2, 2021, the Study Team responded to the Region staff that the stabilization works are not being proposed at Derry Road bridge in the Mimico Creek east branch study area. Further, the works will likely be completed in winter months. As such, there will be no conflicts with the Peel Region's retaining wall project.

The Region of Peel staff provided additional comments on June 29, 2021, noting that there is minimal Regional infrastructure located within the Mimico Creek West Branch Study Area and there is a wastewater main that runs directly under the Mimico Creek within the East Branch Study Area. The Region staff requested where the staging areas for the construction materials/machines will be, as weight of construction trucks can affect Region's assets. They also inquired about where gabions will be located and the depths that the construction equipment will be digging to. The Region staff also identified that the Region is currently undertaking a sanitary sewer lining project (PF-20055) in Malton. The project stretches southeastward from York Street (slightly south of the West Branch Study Area) along the Derry Greenway/Creek towards the west terminus of the East Branch Study Area.

On June 30, 2021, the Study Team provided a response that as the project proceed into the detailed design phase, the Study Team will be mindful of the Region's infrastructure

and any staging areas will be kept away from those locations. The Project Team will be in contact with the Peel Region for further review once the design is ready. The Study Team also requested the plan drawing for the Region's lining project to confirm there are no conflicts. The Region's staff provided the requested drawing on July 5, 2021.

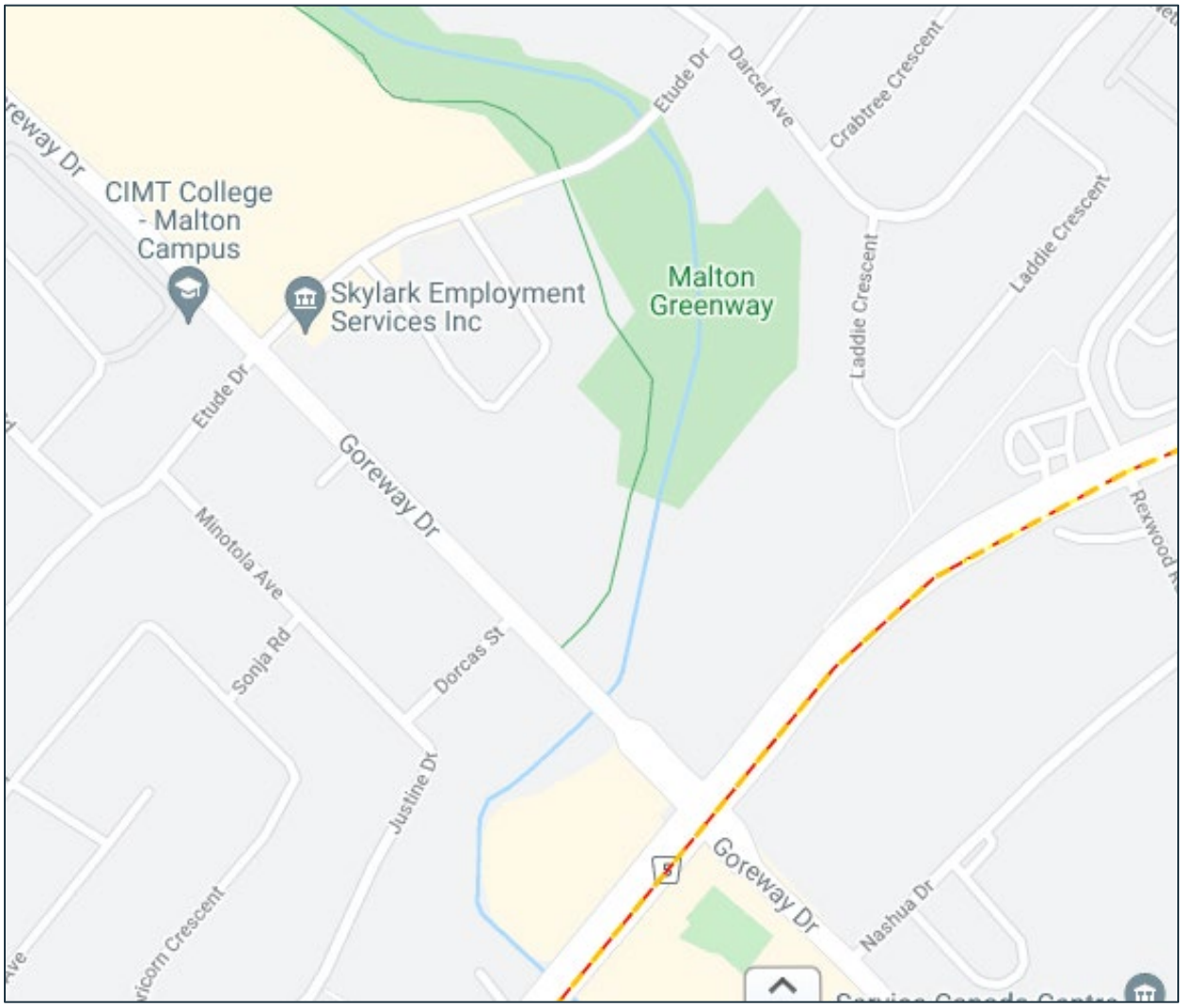
On July 8, 2021, the Peel Region's Stormwater Management team requested that they would like to be kept informed throughout the project.

7.5 Utility Consultation

Utility consultation is discussed below. Records of Utility Consultation are provided in **Appendix H**.

7.5.1 TELUS

On May 28, 2021, TELUS provided a response to the Notice of Online Public Engagement. TELUS staff noted that there is no TELUS owned infrastructure within the Mimico Creek West Branch Study Area, however, TELUS does have infrastructure within Mimico Creek East Branch Study Area. TELUS will need to be notified of any work requiring crossing of Derry Road East. TELUS Infrastructure in Mimico Creek East Branch Study Area is shown as a yellow-red-dotted line in the graphic below:



7.5.2 Zayo

On June 7, 2021, Zayo provided a response to the Notice of Online Public Engagement. Zayo staff noted that Zayo does not have any existing plants in the project Study Area.

7.5.3 Hydro One Inc.

On June 10, 2021, Hydro One provided a response to the Notice of Online Public Engagement. Hydro One staff confirmed there are no existing Hydro One Transmission assets within the project Study Area.

7.6 Public Consultation

7.6.1 Online Public Engagement

As part of the Online Public Engagement, an information package was posted on the project webpage: Mimico Creek Erosion Control Project – Rena Road and Etude Drive to Derry Road East. The information package provided information on the study background, results of various technical investigations, identification and evaluation of alternative solutions, and the preferred solution for addressing erosion problem. The public and other interested parties were invited to participate in this engagement by reviewing and commenting on the information package. Comments were invited from June 3, 2021 to July 8, 2021. No comments were received from the members of the public.

A copy of the information package is provided in **Appendix F**.

7.7 Indigenous Engagement

Indigenous engagement is a key component of the Class EA process. As discussed in Section 7.6.2, the MECP confirmed the Indigenous Nations that should be consulted for this project. An email including Notice of Online Public Engagement, a Project Summary document and the Stage 1 Archaeological Assessment Report were sent to the following Indigenous Nations on May 27 and 28, 2021:

- Curve Lake First Nation;
- Alderville First Nation;
- Mississaugas of the Credit First Nation;
- Mississaugas of Scugog Island First Nation;
- Hiawatha First Nation; and
- Huron-Wendat Nation.

Based on understood consultation protocols with these Indigenous groups, Wood sent a follow-up email on June 16, 2021. Due to the COVID-19 pandemic, many of the Nations prefer email contact and follow-ups only. A description of the further engagement expressed by certain Nations outlined below.

Copies of all Indigenous engagement documents can be found in **Appendix I**.

7.7.1 Curve Lake First Nation

No response was received from the Curve Lake First Nation at the time of completion of this report.

7.7.2 Alderville First Nation

No response was received from the Alderville First Nation at the time of completion of this report.

7.7.3 Mississaugas of the Credit First Nation

Following the initial contact and the follow-up email and phone call, Mississaugas of the Credit First Nation responded on June 16, 2021, and expressed their interest in participating in the archaeological and natural environment fieldwork. On July 5, 2021, Wood responded to Mississaugas of the Credit First Nation that the Stage 2 Archaeological Assessment work is planned to be undertaken in the fall of 2021, as part of the detailed design phase of the Project and requested the word version of the Mississaugas of the Credit First Nation's participation agreement for the City's review and signature. The Nation shared the agreement on July 6, 2021.

On August 11, 2021, the Mississaugas of the Credit First Nation confirmed that they have reviewed the Stage 1 Archaeological Assessment Report for this project and they do not have any comments or concerns.

On August 19, 2021, the agreement was signed by the City and the Mississaugas of the Credit First Nation. Accordingly, the City will invite the Nation to monitor the Stage 2 Archaeological Assessment fieldwork during detailed design phase of this project.

7.7.4 Mississaugas of Scugog Island First Nation

No response was received from the Mississaugas of Scugog Island First Nation at the time of completion of this report.

7.7.5 Hiawatha First Nation

Following the initial contact and the follow-up email, Hiawatha First Nation responded on June 16, 2021 and expressed that they had no questions or concerns at the time of the email.

7.7.6 Huron-Wendat Nation

Following the initial contact and the follow-up email, Huron-Wendat Nation responded on June 17, 2021 expressing interest in participating in all archaeological field work and inquired about funding support for participation in field work. Wood responded on July 5, 2021, stating that the City would provide funding to participate in the Study.

The City will invite the Huron-Wendat Nation to monitor the Stage 2 Archaeological Assessment fieldwork during detailed design phase of this project.

8.0 Summary and Next Steps

The foregoing report has summarized the baseline inventory and characterization of the Study Area erosion problem, identified and evaluated feasible alternative solutions to mitigate the erosion problem and advanced a Preferred Solution that best meets the requirements of all stakeholders. The study has satisfied the requirements of a 'Schedule B' undertaking as defined by the Municipal Class Environmental Assessment process (i.e., completion of Phases 1 and 2).

This report is available for a formal review period from Wednesday, March 16, 2022, to Monday, April 18, 2022. Interested persons may provide written comments to the following contact by April 18, 2022:

Greg Frew, P. Eng.
Stormwater Drainage Engineer
Infrastructure Planning and Engineering Services Division
City of Mississauga
Greg.Frew@mississauga.ca
300 City Centre Drive, Mississauga Ontario L5B 3C1

In addition, a request may be made to the Ministry of the Environment, Conservation and Parks for an order requiring a higher level of study (i.e. requiring an individual/comprehensive EA approval before being able to proceed), or that conditions be imposed (e.g. require further studies), only on the grounds that the requested order may prevent, mitigate or remedy adverse impacts on constitutionally protected Aboriginal and treaty rights. Requests on other grounds will not be considered. Requests should include the requester contact information and full name. Requests should specify what kind of order is being requested (request for conditions or a request for an individual/comprehensive environmental assessment), how an order may prevent, mitigate or remedy potential adverse impacts on Aboriginal and treaty rights, and any information in support of the statements in the request. This will ensure that the ministry is able to efficiently begin reviewing the request. The request should be sent in writing or by email to:

Minister of the Environment, Conservation and Parks
Ministry of Environment, Conservation and Parks
777 Bay Street, 5th Floor
Toronto ON M7A 2J3
minister.mecp@ontario.ca
Director, Environmental Assessment Branch

Ministry of Environment, Conservation and Parks
135 St. Clair Ave. W, 1st Floor
Toronto ON, M4V 1P5
EABDirector@ontario.ca

Requests should also be copied to the proponent contact identified above.

All personal information included in your request – such as name, address, telephone number and property location – is collected, under the authority of section 30 of the Environmental Assessment Act and is collected and maintained for the purpose of creating a record that is available to the general public. As this information is collected for the purpose of a public record, the protection of personal information provided in the Freedom of Information and Protection of Privacy Act (FIPPA) does not apply (s.37). Personal information you submit will become part of a public record that is available to the general public unless you request that your personal information remain confidential.

9.0 References

AECOM. 2010. Torbram Road Grade Separations Stormwater Management Design Brief, AECOM, January 2010.

AECOM. 2014. Rena Road Hydraulic Report and Updated Floodplain Mapping for Torbram Road Grade Separation Works. December 2014.

AECOM. 2017. Contract Drawings, Rena Road Culvert Replacement, P.N. 16-152.

Bat Conservation International, Inc . (2018). BCI Species Profiles. Retrieved from http://batcon.org.

Cadman, M., Sutherland, D., Beck, G., Lepage, D., & Couturier, A. (2007). Atlas of the Breeding Birds of Ontario, 2001-2005. Retrieved from http://www.birdsontario.org/atlas/datasummaries.jsp

Canadian National Railways. 2019. https://en.wikipedia.org/wiki/Canadian_National_Railway_facilities_in_Peel_Region

Chapman. L.J., and D.F. Putnam. 1984. The Physiography of Southern Ontario: Ontario Geological Survey, Special Volume 2.

Chapman. L.J., and D.F. Putnam. 1984. Physiography of Southern Ontario: Ontario Geological Survey, Map P.2715. Scale 1:600,000.

City of Mississauga. (2008, Jan). Development and Design Construction Hoarding.

City of Mississauga. (2012, December 12). Private Tree Protection By-law 254-12. City of Mississauga, Ontario.

City of Mississauga. (2015). City of Mississauga Official Plan: Chapter 6 Value the Environment. Mississauga.

City of Mississauga. (2018). 2018 Natural Areas Update. Mississauga.

Conservation Authorities Act. (1990).

COSEWIC . (2013). COSEWIC assessment and status report on the Bank Swallow Riparia riparia in Canada. Ottawa.

COSEWIC. (2007). COSEWIC assessment and status report on the Chimney Swift Chaetura pelagica in Canada. Ottawa.

COSEWIC. (2007). COSEWIC assessment and status report the Common Nighthawk Chordeiles minor in Canada. Ottawa: Committee on the Status of Endangered Wildlife in Canada.

COSEWIC. (2008). COSEWIC assessment and status report on the Snapping Turtle Chelydra serpentina in Canada. Ottawa: Committee on the Status of Endangered Wildlife in Canada.

COSEWIC. (2012). COSEWIC assessment and Status Report on the Eastern Wood-pewee Contopus Virens in Canada. Ottawa.

COSEWIC. (2012). COSEWIC assessment and status report on the Northern Map Turtle Graptemys geographica in Canada. Ottawa: Committee on the Status of Endangered Wildlife in Canada.

COSEWIC. (2012). COSEWIC assessment and status report on the Wood Thrush Hylocichla mustelina in Canada. Ottawa.

COSEWIC. (2013). COSEWIC assessment and status report on the Little Brown Myotis Myotis lucifugus, Northern Myotis Myotis septentrionalis and Tri-colored Bat Perimyotis subflavus in Canada. Ottawa.

COSEWIC. (2016). COSEWIC assessment and status report on the Blanding's Turtle Emydoidea blandingii, Nova Scotia population and Great Lakes/St. Lawrence population,in Canada. Ottawa.

COSEWIC. (2016). COSEWIC assessment and status report on the Monarch Danaus plexippus in Canada. Ottawa: Committee on the Status of Endangered Wildlife in Canada.

Dobbyn, J. (1994). Atlas of the Mammals of Ontario. Don Mills: Federation of Ontario Naturalists.

Endangered Species Act. (2007). Retrieved from https://www.ontario.ca/laws/statute/07e06#BK0

Environmental Systems Research Institute, Inc. 2019. ArcGIS Online. http://www.arcgis.com/home/webmap/viewer.html

Environment Canada and Climate Change. (2018). Species at Risk Public Registry database. Retrieved from www.sararegistry.gc.ca/species/schedules_e.cfm?id+1

Fischenich, C. 2001. Stability Thresholds for Stream Restoration Materials. EMRRP Technical Notes Collection (ERDC TN-EMRRP-SR-29), U.S. Army Engineer Research and Development Center, Vicksburg, MS

GHD. (2016). Malton Greenway Sanitary Infrastrucutre Protection Project - Natural Heritage Impact Study. Mississauga: TRCA.

GHD. (2017). Bren Road Sanitary Infrastrucute Protection Project - Natural Heritage Impact Study. Mississauga: TRCA.

Google Earth Pro 7.3.2.5491

Heagy, A., Badzinski, D., Bradley, D., Falconer, M., McCracken, J., Reid, R., & Richardson, a. K. (2014). Recovery Strategy for the Barn Swallow (Hirundo rustica) in Ontario. Peterborough, Ontario: Ontario Ministry of Natural Resources and Forestry.

iNaturalist. (2019, June). Retrieved from https://www.inaturalist.org/

Lee, H., Bakowsky, W., Riley, J., Bowles, J., Puddister, M., Uhlig, P., & McMurray, S. (1998). Ecological Land Classification for Southern Ontario: First Approximation and Its Application. Ontario Ministry of Natural Resources.

MacNaughton, A. R. (2019). Ontario Butterfly Atlas Online. Retrieved from http://www.ontarioinsects.org/atlas_online.htm

McCracken, J., Reid, R., Renfrew, R., Frei, B., Jalava, J., Cowie, A., & Couturier, a. A. (2013). Recovery Strategy for the Bobolink (Dolichonyx oryzivorus) and Eastern Meadowlark (Sturnella magna) in Ontario. Peterborough, Ontario: Ontario Ministry of Natural Resources.

Migratory Birds Convention Act. (1994).

Ministry of Energy, Northern Development and Mines. (2019). Physiography. Queen's Printer for Ontario.

Ministry of Environment, Conservation and Parks. (2019, July). Species at Risk in Ontario (SARO) List. Retrieved from https://www.ontario.ca/page/species-risk-ontario

Ministry of Municipal Affairs and Housing. (2014). Provincial Policy Satement.

Ministry of Natural Resources. (2010, March 18). Natural Heritgae Reference Manual for Natural Heritage Polices of the Provincial Policy Statement, 2005, Second Edition. Toronto, Ontario.

Ministry of Natural Resources. (2013). Reptile and Amphibain Exclusion Fencing Best Practices, Version 1.0.

Mississauga Maps - Interactive Online Mapping Service http://www6.mississauga.ca/missmaps/maps.aspx#map=12/-8864609.44/5404848.32/0.9075712110370514

MMM Group Ltd. 2009. Final Report, Hydrologic Modelling, Mimico Creek. Report for Toronto Region Conservation Authority, December 2009.

Ontario Ministry of Natural Resources (MNR), Water Resources Section. 2002. Technical Guide - River & Stream Systems: Erosion Hazard Limit.

Ontario Ministry of Transportation (MTO). 2008. Highway Drainage Design Standards.

Ontario Ministry of Transportation (MTO). 2009. Environmental Guide for Fish and Fish Habitat.

Ontairo Ministry of Natural Resources and Forestry. (2014). Butternut Assessment Guidelines- Assessment of Butternut Tree Health for the Purposes of the Endangered Species Act, 2007.

Ontario Ministry of Natural Resources. (2000). Significant Wildlife Habitat Technical Guide. Fish and Wildlife Branch, Wildlife Section, Science Development and Transfer Branch, South-central Sciences Section.

Ontario Ministry of Natural Resources. (2011). Bats and Bat Habitats: Guidelines for Wind Power Projects. Second Edition. Ontario.

Ontario Ministry of Natural Resources and Forestry. (2015). Significant Wildlife Habitat Criteria Schedules for Ecoregion 7E. Addendum to Significant Wildlife Habitat Technical Guide. Ontario Ministry of Natural Resources.

Ontario Ministry of Natural Resources and Forestry. (2019, June). Biodiversity Explorer: Ontario Natural Heritage Information Centre database. Retrieved from https://www.biodiversityexplorer.mnr.gov.on.ca/nhicWEB/mainSubmit

Ontario Ministry of Natural Resources and Forestry (MNRF). 2019. Ontario Flow Assessment Tool. http://www.gisapplication.lrc.gov.on.ca/OFAT/Index.html?site=OFAT&viewer=OFAT&loc

Ontario Ministry of Natural Resources and Forestry. (2019, June). Land Information Ontario. Retrieved from https://www.ontario.ca/page/land-information-ontario

Ontario Ministry of Natural Resources and Forestry. (2019, July). Species at Risk in Ontario (SARO) List. Retrieved from https://www.ontario.ca/page/species-risk-ontario

Ontario Nature. (2019, June). Ontario Reptile & Amphibian Atlas. Retrieved from https://www.ontarionature.org/protect/species/herpetofaunal_atlas.php

(2002). Species At Risk Act.

Sear, D.A., Newson, M.D., and C.R. Thorne. 2003. Guidebook of Applied Fluvial Geomorphology, R&D Technical Report FD1914. Defra/Environment Agency Flood and Coastal Defence R&D Programme. Defra Flood Management Division, London, ENG.

Toronto Region Conservation (TRC). 2007. Watercourse Crossing Design and Submission Requirements.

Toronto Region Conservation (TRC). 2010a. Etobicoke and Mimico Creeks Watersheds Technical Update Report, Aquatic System – Instream Barriers to Fish Passage.

Toronto Region Conservation (TRC). 2010b. Etobicoke and Mimico Creeks Watersheds Technical Update Report, Stormwater Management and Streamflow, Final Draft October 2010.

Toronto and Region Conservation Authority. (2010). Etobicoke and Mimico Creeks Watersheds: Technical Update Report, Exectuive Summary.

Toronto Region Conservation (TRC). 2014. The Living City Policies for Planning and Development in the Watersheds of the Toronto and Region Conservation Authority.

Toronto and Region Conservation Authority. (2019). Erosion and Sediment Control Guide for Urban Construction. Vaughan, Ontario.

Toronto and Region Conservation Authority. (2019, 11 15). Long-term Monitoring. Retrieved from https://trca.ca/conservation/environmental-monitoring/terrestrial-habitat-species/

Toronto and Region Conservation Authority. (2019). Regultated Area Search.

University of Toronto. 2019. 1954 Air Photos of Southern Ontario. https://mdl.library.utoronto.ca/collections/air-photos/1954-air-photos-southern-ontario/index

Water Survey of Canada. 2019. Historical Hydrometric Data Search.

https://wateroffice.ec.gc.ca/search/historical_e.html