



McKINLEY
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SOLUTIONS

Headwaters Drainage Assessment (HDA)
Kennedy Lands Development
3432 Greenbank Road, Ottawa, ON



September 2021
Prepared for Minto Communities

McKINLEY ENVIRONMENTAL SOLUTIONS
613-620-2255 | mckinleyenvironmental@gmail.com
www.mckinleyenvironmental.com

1.0	INTRODUCTION	1
1.1	Background and Site Overview.....	1
1.2	Regulatory Requirements	3
1.3	Description of Development	5
2.0	METHODOLOGY	7
3.0	EXISTING CONDITIONS	9
3.1	Drainage Feature Overview.....	9
3.2	Hydrological Characteristics.....	10
3.3	Channel and Riparian Characteristics.....	13
3.4	Amphibian Habitat.....	17
3.5	Fish Habitat	19
3.6	Summary of Habitat Quality	20
4.0	CLASSIFICATION AND MANAGEMENT RECOMMENDATIONS.....	21
4.1	Classification Criteria.....	21
4.2	Potential Development Impacts & Mitigation	22
5.0	GENERAL MITIGATION	23
5.1	Servicing and Stormwater Management.....	23
5.2	Sediment and Erosion Controls	23
5.3	Construction Stage Mitigation	24
6.0	SUMMARY	25
7.0	CLOSURE	26
8.0	REFERENCES	27

LIST OF FIGURES

Figure 1: Site Overview
Concept Plan – Kennedy Lands
Figure 2: HDA Survey Sites

LIST OF TABLES

Table A: Hydrological Measurements
Table B: Channel Measurements
Table C: Riparian Classification
Table D: Amphibian Survey Results

Appendix A – Site Photographs

1.0 INTRODUCTION

1.1 Background and Site Overview

The Site includes the property known as the Kennedy Lands, which is located at 3432 Greenbank Road, Ottawa, Ontario (Part of Lot 12, Concession 3, Nepean) (the Site) (Figure 1). The Site is approximately 23 hectares in size and is proposed to be developed as a residential subdivision. At the current time, the Site is mostly vacant and includes a mixture of Cultivated Fields, Cultural Meadows (Graminoid Dominated), and Deciduous Hedgerows. The Site also includes three (3) minor drainage features, which are identified as minor tributaries of the Clarke Drain. The three (3) minor drainage features are aligned in an approximately south-north direction. Six (6) existing agricultural structures are found within the Site. The area north of the Site consists of agricultural lands on an adjacent property, beyond which is the Jock River. The alignment of the Jock River is such that the river occurs within close proximity to both the northwest corner of the Site and the eastern part of the Site. The area south of the Site includes a recently constructed residential subdivision. The area southwest and west of the Site includes a residential subdivision that is currently under construction. The Site has a very gradual slope from the south towards the north (e.g. towards the Jock River). The Site elevation varies between approximately 93 m and 95 m Above Sea Level (ASL), sloping down to approximately 90 m ASL adjacent to the Jock River.

FIGURE 1: SITE OVERVIEW

Kennedy Lands (3432 Greenbank Road), Ottawa, Ontario
Headwaters Drainage Assessment (HDA)



Please Note: This is not a legal land survey. All dimensions and locations are shown as approximate.

 - Site Boundary

 - Agricultural Structures

1.2 Regulatory Requirements

This Headwaters Drainage Assessment (HDA) has been prepared to address the three (3) minor drainage features that overlap the Site. Regulatory requirements related to the three (3) minor drainage features are described below. It should be noted that additional natural heritage related regulatory requirements are discussed in the concurrently prepared *Combined Environmental Impact Statement & Tree Conservation Report – Kennedy Lands, 3432 Greenbank Road, Ottawa, Ontario* (MES 2021). Refer to MES (2021) for a detailed description of the natural heritage related regulatory requirements which pertain to the Jock River, the floodplain of the Jock River, the presence of Barn Swallow habitat (threatened), and the City of Ottawa’s Urban Tree Conservation By-law. Natural heritage related regulatory requirements which pertain to the three (3) minor drainage features include the following:

- **Ontario Regulation 153/06:** Ontario Regulation 153/06 regulates activities that would alter shorelines, watercourses, and wetlands. The Jock River and the three (3) minor drainage features (minor tributaries of the Clarke Drain) are regulated by the Rideau Valley Conservation Authority (RVCA) under O.Reg 153/06. The proposed decommissioning of Drainage Feature A and Drainage Feature B (described below) will require approval from the RVCA under O.Reg 153/06.
- **Fisheries Act:** A Fisheries Act Authorization (05-HCAA-CA4-01840) was obtained to support the construction of the adjacent subdivision (located south of the Site). The Fisheries Act Authorization was originally obtained in 2010, and then renewed in 2013 and 2015. The Fisheries Act Authorization authorized the removal of the upstream portions of the three (3) minor drainage features (minor tributaries of the Clarke Drain). The Fisheries Act review process requires proponents to assess downstream impacts associated with their proposed project. During the Fisheries Act review process for the adjacent subdivision, Fisheries and Oceans Canada would have been aware that the removal of the upstream portions of the three (3) minor drainage features would result in the degradation of the downstream portions of those features (e.g. the portions of the three (3) minor drainage features that occur within the current Site). Implementation of the Fisheries Act Authorization (e.g. the removal of the upstream portions of the three (3) minor drainage features) implies the removal of hydrological functionality for the immediately downstream area (e.g. the portions of the three (3) minor drainage features that occur within the Site). By extension, the implementation of the Fisheries Act Authorization also implies the removal of any potential fish habitat functions within immediately downstream areas (e.g. the portions of the three (3) minor drainage features within the Site). As such, it is reasonable to conclude that it was anticipated that the implementation of the Fisheries Act Authorization for the adjacent subdivision would remove any significant fish habitat functions which may otherwise have existed within the current Site. As described below

in Section 3.2, the three (3) minor drainage features currently provide negligible hydrological functions and hence they are unlikely to provide any significant fish habitat functions. As discussed below in Section 3.5 and Section 4.2, no significant impacts to fish habitat are anticipated to occur as a result of the proposed development. As such, a review and/or authorization under the Fisheries Act is unlikely to be required to support the proposed development.

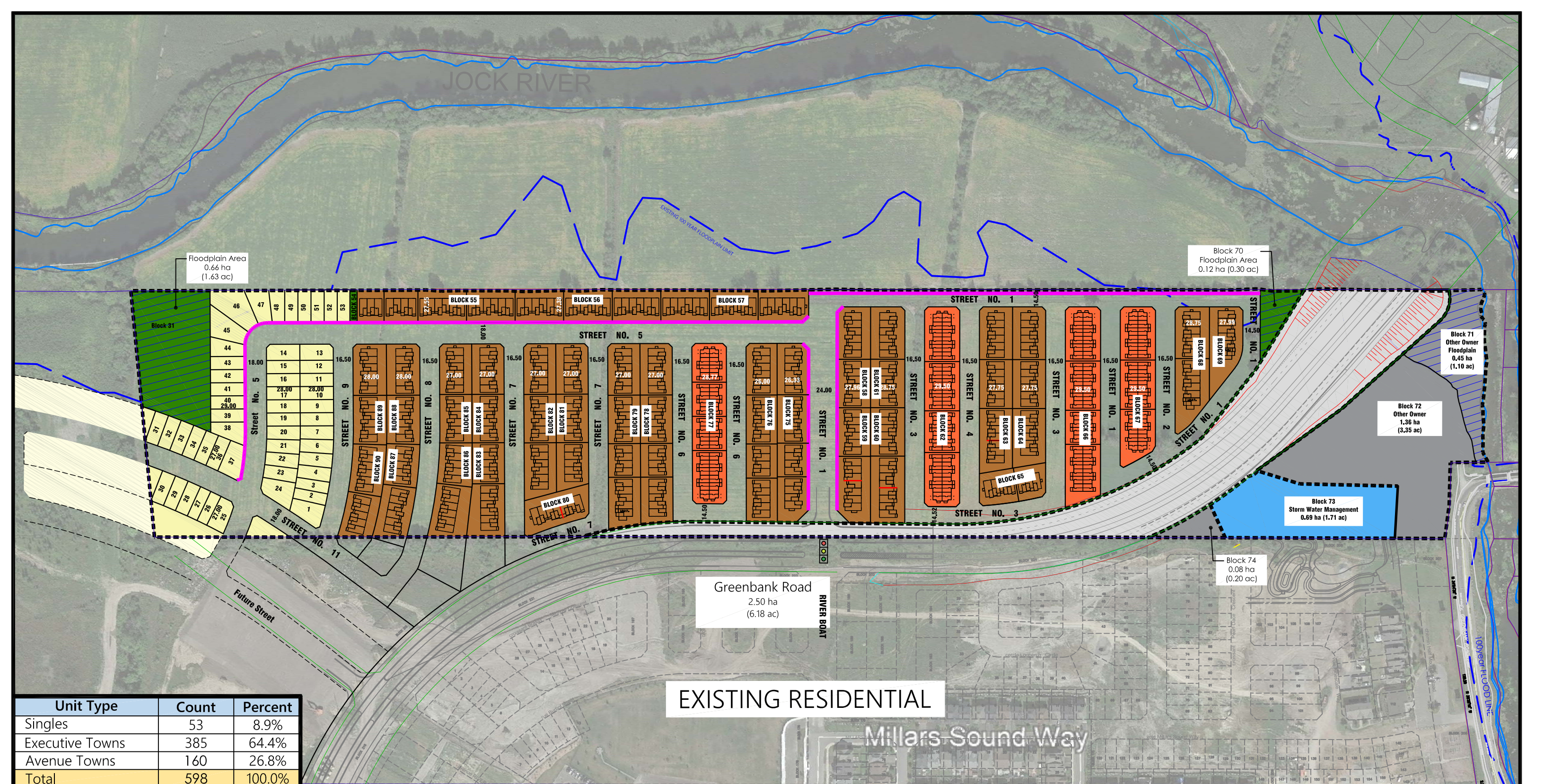
1.3 Description of Development

The Concept Plan for the Kennedy Lands development is included below. The Site is proposed to be developed to accommodate a mix of single detached homes, executive townhomes, and avenue townhomes. The Concept Plan also includes a 0.69 ha Stormwater Management Block. The Stormwater Management Block will accommodate a portion of a new Stormwater Management (SWM) Pond, with the remainder of the SWM Pond located within the adjacent residential subdivision. The new SWM Pond will provide SWM services for the Site. The Site will receive municipal sewer and water. As shown in the Concept Plan, the City of Ottawa plans to realign Greenbank Road through the Site.

Two (2) Natural Feature Blocks are shown in the Concept Plan. In order to address the presence of the 1:100 year floodplain of the Jock River, the Natural Feature Blocks have been positioned adjacent to the Jock River in the eastern and northwestern parts of the Site. Although the two (2) Natural Feature Blocks contain portions of the 1:100 year floodplain of the Jock River, portions of the floodplain also overlap the proposed development area. As such, a cut and fill operation will be required in order to address areas where the proposed development and the floodplain overlap. Refer to MES (2021) for additional detail with respect to the proposed cut and fill operation.

The two (2) Natural Feature Blocks also provide minimum 30 m wide setbacks from the Jock River. Existing trees and vegetation will be retained within the two (2) Natural Feature Blocks. Trees throughout the remainder of the Site will be removed in order to accommodate the planned development. Refer to MES (2021) for additional detail with respect to the setbacks from the Jock River and the proposed tree clearing.

As described below in Section 3.1, the three (3) minor drainage features are identified as minor tributaries of the Clarke Drain. Drainage Feature A and Drainage Feature B will be decommissioned during the development of the Site. The remnant portion of Drainage Feature C will be retained within the Natural Feature Block in the northwest corner of the Site.



Unit Type	Count	Percent
Singles	53	8.9%
Executive Towns	385	64.4%
Avenue Towns	160	26.8%
Total	598	100.0%

Legend

- Single Detached Homes
- Executive Towns
- Avenue Towns
- Storm Water Management (SWM) Pond
- Parkland
- Land Owned by Others
- Area within Floodplain
- Natural Feature | Area within Floodplain
- Open Space / Pathways
- Sidewalk Locations
- Property Boundary
- Proposed Extent of Greenbank Grading

EXISTING RESIDENTIAL

No.	Description	Date	By
0	Issued for Review	8/19/2021	K.G.

Revisions

Title: **Concept Plan 23**

Project: **Kennedy Lands**

North

Scale: **NTS**

Drawn By: MS
Checked By: CS

Minto Communities Inc
180 Kent Street,
Ottawa, ON
K1P 0B6

2.0 METHODOLOGY

Site visits to preliminarily assess the ecological functions of the three (3) minor drainage features (minor tributaries of the Clarke Drain) were completed on July 29th, 2020 and September 17th, 2020. Weather conditions during the July 29th, 2020 Site visit included temperatures of 22 °C and partly cloudy skies. Weather conditions during the September 17th, 2020 Site visit included temperatures of 14 °C and sunny skies. Following the preliminary assessment of the Headwaters Drainage Features in 2020, a full Headwaters Drainage Assessment (HDA) was undertaken in 2021. The field component of the HDA was undertaken following the *Evaluation, Classification and Management of Headwater Drainage Features Guideline* (TRCA 2014). The Survey Sites included 40 m upstream and 40 m downstream of each constriction or confluence. As shown in Figure 2, five (5) Survey Sites were required. Upstream and downstream drainage feature segments were measured at each of the five (5) Survey Sites. The Site surveys included the following:

- **OSAP Module S4.M10 – Assessing Headwaters Drainage Features (Stanfield et al. 2013):** This includes an assessment of hydrological and physical functions. The parameters measured are summarized in Tables A, B and C. The parameters measured included the watercourse type, flow regime, wetted width, water depth, hydraulic head, bankfull width, channel depth, substrate, and riparian corridor vegetation. Flow and water measurements were completed on March 24th (spring freshet), May 26th (late spring), and July 11th, 2021 (mid-summer). The channel measurements were completed during the March 24th, 2021 Site visit.
- **Marsh Monitoring Program – Amphibian Call Count Surveys (Konze and McLaren 1998):** Amphibian breeding habitat was identified according to the *Marsh Monitoring Program – Amphibian Call Count Surveys Method* (Konze and McLaren 1998). This method includes three (3) night time surveys in April, May, and June to survey for amphibian breeding activity by listening for frog calls. Surveys were conducted on April 19th, May 18th, and June 15th, 2021. Conditions on April 19th included clear skies and temperatures of 13 °C. Conditions on May 18th included temperatures of 22 °C and clear skies. Conditions on June 15th included clear skies and temperatures of 18 °C. The amphibian call counts were conducted in the upstream and downstream segments of each Survey Site. The amphibian survey results are included in Table D.

Due to the limited hydrological functions of the three (3) minor drainage features, targeted fish surveying was not required. Refer to Section 3.5 for additional detail.

FIGURE 2: HDA SURVEY SITES

Kennedy Lands (3432 Greenbank Road), Ottawa, Ontario
Headwaters Drainage Assessment (HDA)



Please Note: This is not a legal land survey. All dimensions and locations are shown as approximate.

3.0 EXISTING CONDITIONS

3.1 Drainage Feature Overview

There are three (3) minor drainage features within the Site, each of which is oriented in a south-north direction. As described below, the three (3) minor drainage features are each degraded channels which provide negligible ecological functions. Each of the three (3) minor drainage features is shown to be a minor tributary of the Clarke Drain (City of Ottawa 2021). Historically, the three (3) minor drainage features were each fed by surface runoff and overland flow coming from the south. However, the upstream portions of each of the three (3) minor drainage features have been decommissioned as part of the construction of the adjacent residential subdivision. The stormwater management system for the adjacent residential subdivision is likely to intercept the majority of overland stormwater flow coming from the south, which may otherwise have been conveyed to the three (3) minor drainage features. The construction of the adjacent residential subdivision has therefore significantly altered the hydrology of the three (3) minor drainage features, such that they no longer receive significant surface runoff and/or overland flow from upstream areas. At the current time, it is likely that hydrological inputs to the three (3) minor drainage features are limited to surface runoff from the adjacent agricultural fields (within the Site). Due to the relatively small size of the surrounding drainage area, it is unlikely that surface runoff from the adjacent fields (within the Site) is sufficient to maintain significant hydrological functions within the three (3) minor drainage features (the results of the hydrological measurements are described below in Section 3.2).

3.2 Hydrological Characteristics

The hydrological characteristics of the three (3) minor drainage features are summarized below in Table A. The hydrological characteristics of Drainage Feature A were assessed at Survey Site #1 and Survey Site #2. The upstream end of Drainage Feature A (Survey Site #2 upstream) was dry during each hydrological measurement. Survey Site #2 downstream, Survey Site #1 upstream, and Survey Site #1 downstream each had standing water depths of ≤ 10 cm during the March 24th (spring freshet) hydrological measurement, but were dry during the May 26th (late spring) and July 11th (mid-summer) hydrological measurements. No flow was observed within Drainage Feature A during any of the hydrological measurements. Drainage Feature A was observed to have extremely limited hydrological functionality, with no flow observed and the majority of the feature entirely dry following the spring freshet. The lack of water in the upstream end of Drainage Feature A (Survey Site #2 upstream), and the lack of flow throughout the feature, suggests that Drainage Feature A does not contribute significant water and/or nutrients to downstream areas.

The hydrological characteristics of Drainage Feature B were assessed at Survey Site #3 and Survey Site #4. No flow was observed within the upstream end of Drainage Feature B (Survey Site #4 upstream and downstream) throughout the survey period. Minimal flow volumes were observed at Survey Site #3 (both upstream and downstream) during the March 24th (spring freshet) hydrological measurement. No flow was observed within Survey Site #3 (both upstream and downstream) during the May 26th (late spring) and July 11th (mid-summer) hydrological measurements. Water depths throughout Drainage Feature B were ≤ 11 cm during the March 24th (spring freshet) hydrological measurement. During the May 26th (late spring) hydrological measurement, no flow was observed within Drainage Feature B and water depths ranged from dry to 6 cm of standing water. Drainage Feature B was entirely dry by July 11th (mid-summer). Drainage Feature B was observed to have extremely limited hydrological functionality, with minimal flow volumes observed in the downstream portion of the feature (Survey Site #3) only during the spring freshet. The negligible flow volume and duration within Drainage Feature B, and the limited standing water depths, suggest that Drainage Feature B does not contribute significant water and/or nutrients to downstream areas.

The hydrological characteristics of Drainage Feature C were assessed at Survey Site #5. It should be noted that the upstream portion of Drainage Feature C, which previously occurred west of the Site boundary, has been removed by the adjacent development. As a result, the upstream portion of Drainage Feature C no longer exists. No flow was observed within Drainage Feature C throughout the survey period. Standing water depths of 48 cm (downstream) and 26 cm (upstream) were observed within Drainage Feature C during the March 24th (spring freshet) hydrological measurement. The standing water observed within Drainage Feature C on March 24th was likely due

to water back-up from the adjacent Jock River, as no upstream connecting channel exists and no flow was observed. Standing water depths declined to ≤ 4 cm by May 26th (late spring), and Drainage Feature C was entirely dry by July 11th (mid-summer). The lack of flow within Drainage Feature C, and the limited standing water depths during late spring and mid-summer, suggest that Drainage Feature C does not contribute significant water and/or nutrients to downstream areas.

In summary, none of the three (3) minor drainage features showed significant hydrological functions. The lack of flow and the limited standing water depths within each of the three (3) minor drainage features suggest that the minor drainage features do not contribute significant water and/or nutrients to downstream areas.

TABLE A: HYDROLOGICAL MEASUREMENTS

SITE	SEGMENT	FEATURE TYPE	FLOW REGIME*			WETTED WIDTH (cm)			AVERAGE WATER DEPTH (mm)			AVERAGE HYDRAULIC HEAD (mm)		
			Mar.24	May 26	July 11	Mar.24	May 26	July 11	Mar.24	May 26	July 11	Mar.24	May 26	July 11
Site #1	Downstream	Channelized Farm Drain	No Flow	Dry	Dry	125	0	0	60	0	0	0	0	0
	Upstream	Channelized Farm Drain	No Flow	Dry	Dry	150	0	0	100	0	0	0	0	0
Site #2	Downstream	Channelized Farm Drain	No Flow	Dry	Dry	140	0	0	90	0	0	0	0	0
	Upstream	Channelized Farm Drain	Dry	Dry	Dry	0	0	0	0	0	0	0	0	0
Site #3	Downstream	Channelized Farm Drain	Minimal	No Flow	Dry	110	54	0	67	27	0	3	0	0
	Upstream	Channelized Farm Drain	Minimal	No Flow	Dry	130	81	0	80	40	0	1	0	0
Site #4	Downstream	Channelized Farm Drain	No Flow	Dry	Dry	120	0	0	37	0	0	0	0	0
	Upstream	Channelized Farm Drain	No Flow	No Flow	Dry	240	140	0	107	57	0	0	0	0
Site #5	Downstream	Defined Natural Channel	No Flow	No Flow	Dry	270	40	0	477	40	0	0	0	0
	Upstream	Defined Natural Channel	No Flow	No Flow	Dry	190	74	0	257	30	0	0	0	0

*Flow Regime categories are defined as Substantial = Surface Flow >0.5 L/sec; Minimal = Surface Flow <0.5 L/Sec

3.3 Channel and Riparian Characteristics

The channel morphology and riparian characteristics of the three (3) minor drainage features are summarized below in Table B and Table C (respectively). The three (3) minor drainage features are channelized into narrow corridors, which are oriented in an approximately south-north direction. The following is a description of each of the three (3) minor drainage features:

- **Drainage Feature A:** The channel morphology and riparian characteristics of Drainage Feature A were assessed at Survey Site #1 and Survey Site #2. Drainage Feature A has an average bankfull width of approximately 3.6 meters and an average channel depth of approximately 70 cm. Drainage Feature A flows through a narrow deciduous hedgerow. Beyond the narrow deciduous hedgerow, the riparian zone consists entirely of corn fields and/or the adjacent residential development (located to the south). Drainage Feature A is entirely overgrown with terrestrial vegetation, and there is no significant aquatic and/or wetland plant growth. Terrestrial plants growing within Drainage Feature A predominantly consist of deciduous shrubs including Common Buckthorn, Wild Red Raspberry, Staghorn Sumac, Tartarian Honeysuckle, Domestic Apple, and Hawthorn. Recent regrowth stems of White Ash, Manitoba Maple, and American Elm are also present. Groundcover includes Common Ragweed, Common Milkweed, Canada Goldenrod, Canada Thistle, Bull Thistle, Ox-eye Daisy, Common Burdock, Chickory, Wild Parsnip, Yellow Rocket, Red Clover, White Clover, Dandelion, Queen Anne's Lace, Daisy Fleabane, Common Buttercup, Sow Thistle, Virginia Creeper, Riverbank Grape, and Common Stinging Nettle.
- **Drainage Feature B:** The channel morphology and riparian characteristics of Drainage Feature B were assessed at Survey Site #3 and Survey Site #4. Drainage Feature B has an average bankfull width of approximately 6 meters and an average channel depth of approximately 115 cm. An 850 mm CSP culvert is present between the upstream and downstream segments of Survey Site #3. Drainage Feature B flows through a narrow deciduous hedgerow. Beyond the narrow deciduous hedgerow, the riparian zone consists entirely of corn fields and/or the adjacent residential development (located to the south). Drainage Feature B is entirely overgrown with terrestrial vegetation, and there is no significant aquatic and/or wetland plant growth. Drainage Feature B is predominantly overgrown with recent regrowth stems of Manitoba Maple, White Ash, and American Elm (<10 cm diameter at breast height (dbh) in size). Shrub and groundcover includes the same species as described above for Drainage Feature A.
- **Drainage Feature C:** The upstream portions of Drainage Feature C that occur west of the Site boundary have been decommissioned as part of the adjacent subdivision development. The remnant portion of Drainage Feature C within the Site is approximately 43 m in length. The channel morphology and riparian characteristics of Drainage Feature C were assessed at Survey

Site #5. Drainage Feature C has an average bankfull width of approximately 6.2 meters and an average channel depth of approximately 122 cm. The riparian zone surrounding the downstream segment of Drainage Feature C predominantly consists of meadow. The shrub and groundcover plants include the same species as described above for Drainage Feature A. However, Drainage Feature C is partially shaded by a small stand of Manitoba Maple, American Elm, White Ash, and Silver Maple, which are present within and/or adjacent to the riparian zone. The majority of the trees are relatively young and are <40 cm dbh in size. The riparian zone surrounding the upstream segment of Drainage Feature C includes a narrow hedgerow (the tree stand), meadow, and corn fields.



TABLE B: CHANNEL MEASUREMENTS

SITE	SEGMENT	FEATURE TYPE	BANKFULL WIDTH (m)	CHANNEL DEPTH (mm)	SUBSTRATE	FEATURE ROUGHNESS**	CONSTRICTIONS AND INPUTS
Site #1	Downstream	Channelized Farm Drain	3.2	600	Grass	Extreme	None
	Upstream	Channelized Farm Drain	4.6	960	Grass	Extreme	None
Site #2	Downstream	Channelized Farm Drain	3.3	600	Silt, Grass	High	None
	Upstream	Channelized Farm Drain	3.4	640	Silt, Detritus	Moderate	None
Site #3	Downstream	Channelized Farm Drain	6.4	1530	Silt, Detritus	Moderate	850 mm CSP culvert between upstream and downstream portions of Site #3
	Upstream	Channelized Farm Drain	5.2	1000	Silt, Detritus	Moderate	Tile Drain Outlets
Site #4	Downstream	Channelized Farm Drain	7.6	1460	Silt, Detritus	Moderate	None
	Upstream	Channelized Farm Drain	4.8	600	Silt, Detritus	Moderate	None
Site #5	Downstream	Defined Natural Channel	6.2	1260	Silt	Minimal	Tile Drain Outlets
	Upstream	Defined Natural Channel	6.2	1170	Silt, Detritus	Moderate	Tile Drain Outlets

**Feature Roughness categories are defined by OSAP Module 4.10 as; Minimal = Less than 10% of the areal coverage of the channel substrates contains materials that diffuse flows; Moderate = 10-40% of the areal coverage of the channel substrates contains materials that diffuse flows; High = 40-60% of the areal coverage of the channel substrates contains materials that diffuse flows; Extreme = More than 60% of the areal coverage of the channel substrates contains materials that diffuse flows.

TABLE C: RIPARIAN CLASSIFICATION

SITE	SEGMENT	FEATURE TYPE	LEFT BANK*			RIGHT BANK*		
			0 - 1.5 m	1.5 - 10 m	10 - 30 m	0 - 1.5 m	1.5 - 10 m	10 - 30 m
Site #1	Downstream	Channelized Farm Drain	Narrow Hedgerow	Corn Field	Corn Field	Narrow Hedgerow	Corn Field	Corn Field
	Upstream	Channelized Farm Drain	Narrow Hedgerow	Corn Field	Corn Field	Narrow Hedgerow	Corn Field	Corn Field
Site #2	Downstream	Channelized Farm Drain	Narrow Hedgerow	Corn Field	Corn Field	Narrow Hedgerow	Corn Field	Corn Field
	Upstream	Channelized Farm Drain	Narrow Hedgerow	Development Site	Development Site	Narrow Hedgerow	Corn Field	Corn Field
Site #3	Downstream	Channelized Farm Drain	Narrow Hedgerow	Corn Field	Corn Field	Narrow Hedgerow	Corn Field	Corn Field
	Upstream	Channelized Farm Drain	Narrow Hedgerow	Corn Field	Corn Field	Narrow Hedgerow	Corn Field	Corn Field
Site #4	Downstream	Channelized Farm Drain	Narrow Hedgerow	Corn Field	Corn Field	Narrow Hedgerow	Corn Field	Corn Field
	Upstream	Channelized Farm Drain	Narrow Hedgerow	Development Site	Development Site	Narrow Hedgerow	Corn Field	Corn Field
Site #5	Downstream	Defined Natural Channel	Meadow	Meadow	Meadow	Meadow	Meadow	Meadow
	Upstream	Defined Natural Channel	Narrow Hedgerow	Narrow Hedgerow	Corn Field	Meadow	Meadow	Meadow

*Left and right bank are relative to an observer facing upstream.

3.4 Amphibian Habitat

Table D summarizes the results of the amphibian call count surveys. No frogs were observed calling within the Site during the survey period. On April 19th and May 18th, Spring Peepers, American Toads, and Grey Treefrogs were heard calling from adjacent properties located west and northwest of Survey Site #5, including on the opposite side of the Jock River. The survey results indicate that the three (3) minor drainage features do not provide significant amphibian breeding habitat functions.

TABLE D: AMPHIBIAN SURVEY RESULTS

SITE	SEGMENT	FEATURE TYPE	AMPHIBIAN CALL ACTIVITY		
			April 19	May 18	June 15
Site #1	Downstream	Channelized Farm Drain	None	Killdeer	Killdeer
	Upstream	Channelized Farm Drain	None	Killdeer	Killdeer
Site #2	Downstream	Channelized Farm Drain	Killdeer	None	None
	Upstream	Channelized Farm Drain	Killdeer	None	None
Site #3	Downstream	Channelized Farm Drain	None	None	None
	Upstream	Channelized Farm Drain	None	None	None
Site #4	Downstream	Channelized Farm Drain	None	None	None
	Upstream	Channelized Farm Drain	None	None	None
Site #5	Downstream	Defined Natural Channel	Spring Peepers and American Toads calling to the northwest on the opposite side of the Jock River (beyond the Site)	Spring Peepers, American Toads, and Grey Treefrogs calling to the northwest on the opposite side of the Jock River (beyond the Site) and to the west (beyond the Site)	None
	Upstream	Defined Natural Channel			None

3.5 Fish Habitat

As described above in Section 3.2, standing water depths within Drainage Feature A and Drainage Feature B were ≤ 11 cm during the spring freshet. Standing water depths varied between 0 cm and 6 cm within Drainage Feature A and Drainage Feature B by late spring, and both features were entirely dry by mid-summer. Standing water depths of 48 cm (downstream) and 26 cm (upstream) were observed within Drainage Feature C during the March 24th (spring freshet) hydrological measurement. The standing water observed within Drainage Feature C on March 24th was likely due to water back-up from the adjacent Jock River, as no upstream connecting channel exists and no flow was observed. Standing water depths declined to ≤ 4 cm by May 26th (late spring), and Drainage Feature C was entirely dry by July 11th (mid-summer). The standing water depths throughout the Site were too shallow throughout the survey period for fish sampling to be completed using a backpack electrofisher. Fish sampling was instead undertaken with a dip net, however, no fish were found.

The hydrological functions of Drainage Feature A and Drainage Feature B are extremely limited, and therefore it is unlikely that either feature provides any significant fish habitat functions. Water backed up from the Jock River hydrated Drainage Feature C during the spring freshet, at which time fish could potentially migrate into the feature from the Jock River. However, standing water depths within Drainage Feature C declined to ≤ 4 cm by May 26th (late spring), and therefore the potential fish habitat functions provided by Drainage Feature C are likely to be limited to the very early season (e.g. the spring freshet). As described below in Section 4.2, the remnant portion of Drainage Feature C that occurs within the Site will be preserved within a Natural Feature Block in the northwest corner of the Site. The preservation of the remnant portion of Drainage Feature C within the Natural Feature Block is anticipated to be sufficient to protect the potential minor fish habitat functions provided by Drainage Feature C.

3.6 Summary of Habitat Quality

All three (3) of the minor drainage features are highly degraded channelized drains which provide negligible ecological functions. As described above, Drainage Feature A and Drainage Feature B both displayed extremely limited hydrological functions. Both Drainage Feature A and Drainage Feature B occur within narrow deciduous hedgerows, beyond which the riparian zone consists of corn fields and/or the adjacent residential subdivision (located to the south). Drainage Feature C was hydrated by water backed up from the Jock River in the early spring, but displayed very limited hydrological functions throughout the remainder of the survey period. The riparian vegetation surrounding Drainage Feature C consists of a mix of meadow, a narrow hedgerow, and corn fields. No evidence of amphibian breeding habitat was observed in relation to any of the three (3) minor drainage features. No evidence of fish habitat functions was observed in relation to Drainage Feature A and Drainage Feature B. Drainage Feature C may provide minor fish habitat functions during the spring freshet, at which time fish could potentially migrate into the feature from the adjacent Jock River. However, no fish were observed within Drainage Feature C throughout the survey period.

4.0 CLASSIFICATION AND MANAGEMENT RECOMMENDATIONS

4.1 Classification Criteria

The Classification Criteria for Headwaters Drainage Assessments is provided by the Toronto and Region Conservation Authority (TRCA) (2014). Refer to TRCA (2014) for further detail regarding the Classification Criteria. The Classification Criteria results for the three (3) minor drainage features are as follows:

- **Drainage Feature A and Drainage Feature B:**
 - Hydrological Classification: Limited Functions (Dry or Standing Water). TRCA definition: *No surface flow occurs.*
 - Riparian Classification: Limited Functions. TRCA definition: *The riparian zone is dominated by cropped land or no vegetation.*
 - Fish and Fish Habitat Classification: Limited Functions. TRCA definition: *No allochthonous transport through feature to downstream habitat.*
 - Terrestrial Habitat Classification: Limited Functions. TRCA definition: *No terrestrial habitat (amphibian habitat) and/or movement corridors present.*
 - Determination: No Management/Mitigation Requirements - Following TRCA (2014) guidelines, drainage features with limited hydrological functions and limited terrestrial habitat functions have no management and/or mitigation requirements.
- **Drainage Feature C:**
 - Hydrological Classification: Contributing Functions (Ephemeral). TRCA definition: *Provides ephemeral flow or water storage functions during and for a short time after the spring freshet and following large rain events.*
 - Riparian Classification: Valued Functions. TRCA definition: *The riparian corridor is dominated by meadow.*
 - Fish and Fish Habitat Classification: Contributing Functions. TRCA definition: *Allochthonous transport through feature to downstream habitat.*
 - Terrestrial Habitat Classification: Limited Functions. TRCA definition: *No terrestrial habitat (amphibian habitat) and/or movement corridors present.*
 - Determination: Mitigate Potential Impacts - Following TRCA (2014) guidelines, drainage features with contributing hydrological functions, no important or valued fish habitat functions, no valued terrestrial habitat (amphibian habitat) functions, and valued riparian functions require mitigation during development.

4.2 Potential Development Impacts & Mitigation

The Toronto and Region Conservation Authority (TRCA) (2014) guidelines do not specify any management and/or mitigation requirements for Drainage Feature A and Drainage Feature B. As shown in the Concept Plan, the development of the Site will require the decommissioning of Drainage Feature A and Drainage Feature B. Per the TRCA guidelines, no flow and/or hydrological mitigation requirements have been identified for Drainage Feature A and Drainage Feature B.

The alignment of the Jock River is such that the river occurs within close proximity to both the northwest corner of the Site and the eastern part of the Site. Two (2) Natural Feature Blocks are shown in the Concept Plan. In order to address the presence of the 1:100 Year Floodplain of the Jock River, the Natural Feature Blocks have been positioned adjacent to the Jock River in the eastern and northwestern parts of the Site. The two (2) Natural Feature Blocks provide minimum 30 m wide setbacks from the Jock River. Existing vegetation within the minimum 30 m wide setbacks from the Jock River will be retained during the development of the Site. The remnant portion of Drainage Feature C that occurs within the Site is contained entirely within the Natural Feature Block in the northwest corner of the Site. The Natural Feature Block will therefore preserve the remnant portion of Drainage Feature C that occurs within the Site, while also providing a minimum 30 m wide development setback from Drainage Feature C. The purpose of the minimum 30 m wide setback is to provide a buffer which will help to slow, filter, and absorb overland stormwater flow, while also providing habitat for wildlife and wildlife movement. Trees growing within the setback area help to protect the watercourse from edge effects including noise, pollution, and other forms of human disturbance. Trees also provide shade which helps to cool surface water temperatures, while they additionally help to prevent erosion, stabilize banks, and enhance the absorption and filtration of overland stormwater flows. The Natural Feature Block, and the associated minimum 30 m wide setback from Drainage Feature C, are anticipated to be sufficient to mitigate potential development impacts to Drainage Feature C.

5.0 GENERAL MITIGATION

5.1 Servicing and Stormwater Management

The Concept Plan includes a 0.69 ha Stormwater Management Block. The Stormwater Management Block will accommodate a portion of a new Stormwater Management (SWM) Pond, with the remainder of the SWM Pond located within the adjacent residential subdivision. The new SWM Pond will provide SWM services for the Site. The Site will receive municipal sewer and water.

5.2 Sediment and Erosion Controls

As described in greater detail in the Combined Environmental Impact Statement and Tree Conservation Report (MES 2021), temporary wildlife exclusion fencing (wire re-enforced silt fencing) will be required during the construction phase. The temporary wildlife exclusion fencing will be installed adjacent to the development area along the edges of the two (2) Natural Feature Blocks. In addition to preventing wildlife from entering the development area, the fencing will also serve to mitigate potential sediment and erosion impacts on the Jock River and Drainage Feature C.

During construction, existing conveyance systems along Greenbank Road and in the adjacent subdivisions could be exposed to significant sediment loading. Although construction is only a temporary situation, a sediment and erosion control plan will be required to ensure that the existing conveyance systems are not negatively impacted by sediment and erosion. The sediment and erosion control plan will include the following:

- Groundwater in trenches (if present) will be pumped into a filter mechanism, such as a trap made up of geotextile filters and straw, prior to release to the environment;
- Bulkhead barriers will be installed at the nearest downstream manhole in each sewer which connects to an existing downstream sewer (e.g. existing sewers along Greenbank Road, if required). These bulkheads will trap any sediment carrying flows, thus preventing any construction-related contamination of existing sewers;
- Seepage barriers will be constructed in any temporary drainage ditches;
- Construction vehicles will leave the Site at designated locations. Exits will consist of a bed of granular material, in order to minimize the tracking of mud off-site;
- Any stockpiled material will be properly managed to prevent those materials from entering the sewer systems; and
- Until landscaped areas are sodded or until streets are asphalted and curbed, all catch basins and manholes will be constructed with a geotextile filter sock located between the structure frame and cover.

5.3 Construction Stage Mitigation

Refer to the Combined Environmental Impact Statement and Tree Conservation Report (MES 2021) for a detailed description of the construction stage mitigation requirements for Species at Risk (SAR) and other wildlife, including mitigation measures during tree clearing. For brevity, only those mitigation requirements which pertain directly to the three (3) minor drainage features are presented in this HDA report. In addition to the mitigation measures outlined in MES (2021), the following requirements apply when decommissioning Drainage Feature A and Drainage Feature B:

- **Timing Windows:** The decommissioning of Drainage Feature A and Drainage Feature B should be undertaken outside of the sensitive in-water work timing window, which is March 15th to June 30th each year. As described above, Drainage Feature A and Drainage Feature B are likely to be predominantly dry by July 1st each year. If the decommissioning of Drainage Feature A and Drainage Feature B is completed in the late summer (e.g. after July 1st), in-water works, dewatering, and/or fish and wildlife relocation should not be required.

6.0 SUMMARY

As described above, all three (3) of the minor drainage features are highly degraded channelized drains which provide negligible ecological functions. As shown in the Concept Plan, the development of the Site will require the decommissioning of Drainage Feature A and Drainage Feature B. The Toronto and Region Conservation Authority (TRCA) (2014) guidelines do not specify any management and/or mitigation requirements for Drainage Feature A and Drainage Feature B. Potential development impacts to Drainage Feature C will be mitigated by preserving Drainage Feature C within the Natural Feature Block that is proposed in the northwest corner of the Site. The Natural Feature Block will provide a minimum 30 m wide development setback from Drainage Feature C. The Natural Feature Block, and the associated minimum 30 m wide setback from Drainage Feature C, are anticipated to be sufficient to mitigate potential development impacts to Drainage Feature C.

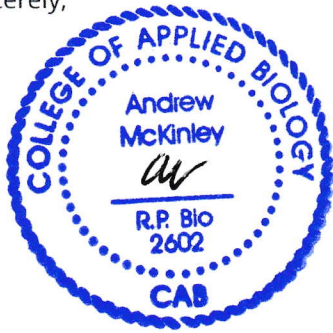
The proposed decommissioning of Drainage Feature A and Drainage Feature B will require approval from the Rideau Valley Conservation Authority (RVCA) under O.Reg 153/06. No significant impacts to fish habitat are anticipated to occur as a result of the proposed development. As such, a review and/or authorization under the Fisheries Act is unlikely to be required to support the proposed development.

Provided that the mitigation measures described above are implemented appropriately, the development of the Site is not anticipated to significantly negatively impact the natural features and functions.

7.0 CLOSURE

We trust that the above information is sufficient; should you have any questions or require further information, please do not hesitate to contact the undersigned, at your convenience.

Sincerely,



Dr. Andrew McKinley, EP, RP Bio.
Senior Biologist, McKinley Environmental Solutions



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ENVIRONMENTAL
SOLUTIONS

McKINLEY ENVIRONMENTAL SOLUTIONS

613-620-2255

mckinleyenvironmental@gmail.com

www.mckinleyenvironmental.com

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APPENDIX A – SITE PHOTOGRAPHS



McKINLEY
ENVIRONMENTAL
SOLUTIONS

McKINLEY ENVIRONMENTAL SOLUTIONS

613-620-2255

mckinleyenvironmental@gmail.com

www.mckinleyenvironmental.com



Photograph 1: Survey Site #1 downstream, facing upstream (March 24th, 2021).



Photograph 2: Survey Site #1 upstream, facing upstream (March 24th, 2021).





Photograph 3: Survey Site #2 downstream, facing upstream (March 24th, 2021).



Photograph 4: Survey Site #2 upstream, facing upstream (March 24th, 2021).





Photograph 5: Survey Site #3 downstream, facing upstream (March 24th, 2021).



Photograph 6: 850 mm CSP culvert between the upstream and downstream portions of Survey Site #3 (March 24th, 2021).





Photograph 7: Survey Site #3 upstream, facing upstream (March 24th, 2021).



Photograph 8: Survey Site #4 downstream, facing upstream (March 24th, 2021).





Photograph 9: Survey Site #4 upstream, facing upstream (March 24th, 2021).



Photograph 10: Survey Site #5 downstream, facing upstream (March 24th, 2021).





Photograph 11: Survey Site #5 upstream, facing upstream (March 24th, 2021).



Photograph 12: Survey Site #1 downstream, facing downstream (May 26th, 2021).



Photograph 13: Survey Site #1 upstream, facing downstream (May 26th, 2021).



Photograph 14: Survey Site #2 downstream, facing downstream (May 26th, 2021).



Photograph 15: Survey Site #2 upstream, facing downstream (May 26th, 2021).



Photograph 16: Survey Site #3 downstream, facing downstream (May 26th, 2021).





Photograph 17: Survey Site #3 upstream, facing downstream (May 26th, 2021).



Photograph 18: Survey Site #4 downstream, facing downstream (May 26th, 2021).





Photograph 19: Survey Site #4 upstream, facing downstream (May 26th, 2021).



Photograph 20: Survey Site #5 downstream, facing downstream (May 26th, 2021).





Photograph 21: Survey Site #5 upstream, facing downstream (May 26th, 2021).



Photograph 22: Survey Site #1 downstream, facing upstream (July 11th, 2021).





Photograph 23: Survey Site #1 upstream, facing upstream (July 11th, 2021).



Photograph 24: Survey Site #2 downstream, facing upstream (July 11th, 2021).





Photograph 25: Survey Site #2 upstream, facing upstream (July 11th, 2021).



Photograph 26: Survey Site #3 downstream, facing upstream (July 11th, 2021).





Photograph 27: Survey Site #3 upstream, facing upstream (July 11th, 2021).



Photograph 28: Survey Site #4 downstream, facing upstream (July 11th, 2021).





Photograph 29: Survey Site #4 upstream, facing upstream (July 11th, 2021).



Photograph 30: Survey Site #5 downstream, facing upstream (July 11th, 2021).





Photograph 31: Survey Site #5 upstream, facing upstream (July 11th, 2021).

