Headwater Drainage Feature Assessment
6150 Thunder Road, Ottawa

Updated Report

July 15, 2021

Submitted To:

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TABLE OF CONTENTS

List of Tables

List of Figures

List of Appendices

1.0 INTRODUCTION

This report is an updated Headwater Drainage Feature Assessment written by Kilgour & Associates Ltd. (KAL) on behalf of Avenue 31 in support of potential future development at 6150 Thunder Road in Ottawa, Ontario (the "Site").

2.0 HEADWATER DRAINAGE FEATURES

2.1 Overview

Seven headwater drainage features (HDFs) on the Site were initially reviewed in 2018 using field methodologies identified with the *Evaluation, Classification and Management of Headwater Drainage Features Guidelines* (CVC & TCRA, 2013) (the "HDF Guidelines"). Six HDFs (R1 through R6) all drain to a permanent watercourse identified within this report as channel R7. The features were studied during the spring and summer of 2018 as part of a due-diligence review of the site prior to the commencement of planning for the site, though the formal HDFA report was not completed at the time.

Much of the southern half of the Site was cleared of vegetation in 2019. The site was briefly revisited on October 8, 2020, to note where portions of the Site landcover had been cleared. As vegetation clearing was permissible on the site at the time under City bylaws, the descriptions and management recommendations provided in this report reflect current site conditions.

Two additional existing channels have been noted since that time along the western boundary of the Site (R8 and R9), which was not part of the initial review in 2018. Two further temporary drainage channels (R10 and R11) were added to the Site in 2021.

This updated report describes current site conditions.

2.2 Assessment Methodology

2.2.1 Channel Form and Fish

Headwater channels R1 through R7 on the Site were investigated three times in 2018 following *Evaluation, Classification and Management of Headwater Drainage Features Guidelines* (Toronto and Region Conservation Authority and Credit Valley Conservation, 2014) to document their hydrological and riparian and terrestrial habitat. On April 12, 2018 (i.e. during the spring freshet), KAL biologists Liza Hamilton and Tyler Peat identified and described seven channelized features on the Site (reaches R1 through R7; Figure 2), noting the channel dimensions, substrate, form, and riparian vegetation.

Channel R1 is the roadside ditch along Thunder Road. This feature is unlikely to be altered (realigned) in any meaningful way under future development plans. All other channels on site had been (i.e. in 2018) located within young, early successional wooded areas and coniferous plantation covering former agricultural fields. A single small wetland pocket was observed at the upstream end of Channel R4. Natural landcover along Channels R6, R5 and most of R2 was completely removed in 2019.

Channel R7, the permanent watercourse crossing the north end of the Site is highly linearized, U-shaped drainage channel, though it does not have status as a municipal or ward drain. All other channels are small, shallow, linear, U-shaped agricultural ditches or swales that ultimately connect to Channel R7.

Channels R3 and R4, and the north half of Channel R2 were all wet until mid-summer in 2017, but only so because of the presence of beaver dams along Channel R7, which prevented the site from draining normally. With the dams having been removed, Channels other than R7, can be expected to run dry shortly after the spring freshet. Channels R5, R6 and the upper half of Channel R2 are ephemeral and ran dry very quickly after the freshet, even when beaver dams were present. Small numbers of fish were observed in all areas below Channel R 7 is considered as a potential fish habitat.

On June 21, 2018, KAL biologists Rob Hallett and Tyler Peat conducted an electrofishing survey of R1, R3, R4, and a portion of R2 north of R4. These channels were deemed at the time to be sufficiently wet to potentially support fish, whereas R2, R5, and R6 were dry at the time of electrofishing surveys and therefore not able to support fish. R7, a permanent stream, was not fished as the project does not propose to alter or build within 30 m of that feature. As a permanently flowing channel connected to larger creeks downstream, R7 is considered to directly support fish regardless.

Several beaver dams were removed from R7 just west of the Site in late June 2018. The effect on Site water levels was observed on July 5, 2018, by KAL biologist Terry Hams while completing bird surveys, with flows R7 noted as being greatly reduced and all other channels having dried. On June 8, 2021, KAL biologist Anthony Francis noted channel R7 was hydrated but had no perceptible flow. Channels R1 through R6 were fully dry, except for the bottom ~25 m of R2, which held shallow (<10 cm) of backwater from R7.

Channel R8 was initially noted during the field visit of October 8, 2020, by KAL biologist Ed Malindzak. The channel was observed to wet at the time. Given its direct connection to R7, it is presumed to provide fish habitat. Given its location at the rear of the Site, however, the feature will not be subject to alteration and no development is proposed within 30 m of its top-of-bank. No further study is deemed to be required at this time.

Channel R9 was first noted on June 8, 2021, as a dry shallow ditch along the western property line leading northward to R7. KAL biologist Nick Moore returned the feature on June 22, 2021, to take measurements and photos. The feature is a shallow, linear, dirt swale, 1 - 1.5 m in width, with no obvious bank substructure. It was fully dry along its entire length. It likely conveys some runoff during the spring freshet but is unlikely to provide aquatic habitat beyond that.

Channel R10 was dug as an eastward-running, linear drainage channel sometime in either late fall 2020 or spring 2020. The 2 m wide swale was excavated in the bare sandy soil of the cleared portion at the south end of the site. City of Ottawa air photos from 2019 (Ottawa, 2021) suggest some natural surface drainage may have previously occurred along that route, though no headwater features were evident there during site surveys through the 2018 field season. Channel R11 is a similarly sized and formed feature at the north end of the cleared area, dug within the same time frame. City of Ottawa air photos (Ottawa, 2021) do not suggest any channel had existed there previously. Both R10 and R11 were fully dry on June 8, 2021.

Figure 1 HDF Reaches

Legend

Property Boundary

ELC

- Residential
- FOD7
- FOD8
- TAG
- SWT

Cleared Areas

- Formerly Treed
- Formerly Wetland
- Sand-filled pit

N

0 100 m

Project File: Thunder 5.map
MTM Zone 9
(NAD 83)
Printed on: 2021-07-14

KILGOUR & Associates

2.2.2 Vegetation

KAL Biologist, Terry Hams, completed an initial tree inventory and an ecological land classification (ELC) of the Site on June 20, 2018. Vegetation cover on the Site was described following standard ELC methods, including the collection of soil samples (Lee *et al*., 1998).

As the south half of the Site was cleared and partially regraded in 2019, the ELC for the Site and the tree information for the remaining stands were updated by Ed Malindzak (October 15, 2020) and Anthony Francis (on October 18, 2020). The updated tree survey identified the size and species distributions of trees within forested areas of the Site.

2.2.3 Anurans

Site amphibian (anuran) surveys were conducted and lead by KAL biologists, Rob Hallett and Liza Hamilton, following protocols set forth by the Marsh Monitoring Program (Bird Studies Canada *et al.*, 2008). Three surveys are completed to identify early, mid, and, late-season breeding amphibian species generally in April, May, and June, respectfully, though survey dates are temperature dependent. Surveys are completed on nights of calm weather with temperatures above 5 degrees Celsius (°C), 10°C, and 17°C for each of the three respective survey periods. Surveys begin a half-hour after sunset and are finished by midnight with a five-minute recording period at each survey station. Amphibian species are recorded at each point along with the estimated distance from observers, calling code, an estimate of the number of individuals, and estimated directions of calling anurans.

Amphibian surveys were performed on April 23, May 30, and June 21, 2018 (Table 2). Three stations were surveyed in wetland and aquatic habitats (F1 through F3; Figure 2). Station F3 was located at the north end of the Site with the observers facing south. Stations F1 and F2 were the same point located near the southwestern corner of the Site, but with one observer facing south (F1) and one facing north (F2).

Table 1 Summary of frog survey times and weather conditions

Survey Date	Temperature (°C)	Weather conditions	Wind speed (km/hour)
23-Apr-18	10*	Clear	4
30-May-18	21*	Mostly Cloudy	11-14
21-Jun-18	17**	Clear	7 - 10

* Temperatures on these nights were warmer than the preceding nights, with evening temperatures just above 5°C and 10°C, respectively, within a few days of the surveys. Frogs for the period would still be expected to be calling regardless.
** Temperatures on this night just reached the minimum required temperature but had been were warmer the preceding nights, with evening temperatures above 17°C. Frogs for the period would still be expected to be calling regardless.

2.3 Component Classifications

The following tables summarize the functions provided by the Site channels.

Table 2. Hydrology Classification

Drainage Feature	Hydrology Classification					
	Assessment Period	Flow Conditions		Flow Classification	Modifiers	Hydrological Function
		Description	(OSAP Code)			
R1	April 12, 2018 June 21, 2018 July 5, 2018	Standing water Standing water Dry	4	Ephemeral	Road sided ditch. Water remained in this reach for a longer period of time than usual due to beaver dams in R7.	**Contributing**
R2	April 12, 2018 June 21, 2018 July 5, 2018	Standing water Upper channel: Dry Lower channel: standing water Dry	3	Intermittent (lower half) Ephemeral (upper half)	Water remained in lower portion of this reach for a longer period of time than usual due to beaver dams in R7.	**Valued (lower half)** **Contributing (upper half)**
R3	April 12, 2018 June 21, 2018 July 5, 2018	Standing water Standing water Dry	4	Intermittent	Water remained in this reach for a longer period of time than usual due to beaver dams in R7.	**Valued**
R4	April 12, 2018 June 21, 2018 July 5, 2018	Standing water Standing water Dry	4	Intermittent	Water remained in this reach for a longer period of time than usual due to beaver dams in R7.	**Valued**
R5	April 12, 2018 June 21, 2018 July 5, 2018	Standing water Dry Dry	1	Ephemeral		**Contributing**
R6	April 12, 2018 June 21, 2018 July 5, 2018	Standing water Dry Dry	3	Ephemeral		**Contributing**
R7	April 12, 2018 June 21, 2018 July 5, 2018	Surface flow Surface flow Surface flow	1	Perennial	Conducts flows from the east across the Site and on to neighbouring properties to the west. As a permanent perennial feature, this channel is not considered an HDF.	**Important**
R8	October 8, 2020 June 22, 2021	Standing Water Standing Water, bottom end, otherwise dry	1	Potentailly perennial	May contain water late into the season.	**Important**
R9	June 22, 2021	Dry	3	Ephemeral		**Contributing**
R10	June 8, 2021	Dry	3	Ephemeral		**Contributing**
R11	June 8, 2021	Dry	3	Ephemeral		**Contributing**

Table 3. Riparian Classification (Updated 2020)

Drainage Feature	Riparian Classification			
	OSAP Descriptions	**OSAP Riparian Codes**	**ELC Codes**	**Riparian Conditions**
R1	RUB – Cleared LUB – Road shoulder	RUB – 1 LUB – 1	- -	**Limited Functions**
R2	RUB – Cleared/Forest LUB – Cleared	RUB – 2 LUB – 4	- -	**Limited Functions (Upper half)** **Important Functions (Lower half)**
R3	RUB – Forest LUB – Forest	RUB – 6/2 LUB – 6/2	CUF CUF	**Important Functions**
R4	RUB – Forest LUB – Forest	RUB – 6/2 LUB – 6/2	CUW CUW	**Important Functions**
R5	RUB – Cleared LUB – Cleared	RUB – 6 LUB – 6	- -	**Limited Functions**
R6	RUB - Cleared LUB - Cleared	RUB – 2 LUB – 6	- -	**Limited Functions**
R7	RUB - Forest LUB – Meadow	RUB – 6 LUB – 4/6	CUW FOD	**Important Functions***
R8	RUB – Forest LUB – Forest	RUB – 6/2 LUB – 6/2	CUF CUF	**Important Functions**
R9	RUB – Forest LUB – Forest	RUB – 6/2 LUB – 6/2	CUF CUF	**Important Functions**
R10	RUB – Cleared LUB – Cleared	RUB – 6 LUB – 6	- -	**Limited Functions**
R11	RUB – Cleared LUB – Cleared	RUB – 6 LUB – 6	- -	**Limited Functions**

RUB – right upstream bank
LUB – left upstream bank
* "Important Function" level is discussed further in Section 3.1

Table 4. Fish and Fish Habitat Classification, June 21, 2018

Drainage Feature	Riparian Classification		
	Fish Observation • **Fishing effort**	**Fish & Fish Habitat Designation***	**Modifiers/Notes**
R1	Incidental fish present, no SAR present. • 630 SS = ~5.3s/m^2	Contributing Functions	20 fish (13 Central Mudminnows, 3 Brassy Minnows, 1 Brook Stickleback, and 3 Northern Redbelly Dace. These species are very common and highly tolerant. Only present as beaver dam backed up water into to this feature. Feature dried as soon as the dam was removed. Shallow feature is considered unlikely to support fish without the dams being present.
R2	Fish present lower half only, no SAR present. • 721 SS = 2.7 s/m2	Valued Functions (lower half) Contributing Functions (upper half)	155 fish (60 Central Mudminnows, 52 Brook Stickleback, 15 Northern Redbelly Dace, 8 Pumpkinseeds, 1 Fathead Minnow, and 1 Creek Chub). These species are very common and highly tolerant. Only present as beaver dam backed up water into to this feature. Feature dried as soon as the dam was removed. Bottom most end may provide some habitat in wet years regardless.
R3	Incidental fish, no SAR present. • 339 SS = 4.8 s/m2	Contributing Functions	130 fish (73 Central Mudminnows, 52 Brook Stickleback, and 3 Fathead Minnows, and 2 Pumpkinseeds). These species are very common and highly tolerant. Only present as beaver dam backed up water into to this feature. Feature dried as soon as the dam was removed. Shallow feature is considered unlikely to support fish without the dams being present.
R4	Incidental fish, no SAR present. • 327 SS = 2.7 s/m^2	Contributing Functions	32 Brook Stickleback were observed. This species is very common and highly tolerant. Only present as beaver dam backed up water into to this feature. Feature dried as soon as the dam was removed. Shallow feature is considered unlikely to support fish without the dams being present.
R5	No fish present, no SAR present. • Dry	Contributing Functions	
R6	No fish present, no SAR present. • Dry	Contributing Functions	
R7	Fish assumed present.	Valued Functions	Permanent channel assumed to have fish at all times of the year.
R8	Fish assumed present.	Valued Functions	Permanent channel assumed to have fish at all times of the year.
R9	No fish present, no SAR present. • Dry	Contributing Functions	
R10	No fish present, no SAR present. • Dry	Contributing Functions	
R11	No fish present, no SAR present. • Dry	Contributing Functions	

*Fish and Fish Habitat Designation is constrained by the HDF Guidelines definitions. “Modifiers” provides significant caveats to those designations.
SS = shocking seconds

Table 5. Terrestrial Habitat Classification (Updated 2020)

Drainage Feature	Description	Amphibians	Terrestrial Classification
R1	Roadside ditch.	No frogs were observed in the feature.	**Limited Functions**
R2	Lower half includes some portions within plantation forest. Upper half was located within moist forest/plantation (no adjacent wetland evident during surveys), but surrounding area has now been fully cleared.	No frogs were observed in the feature.	**Contributing Functions (lower half)** **Limited Functions (upper half)**
R3	Flows through plantation forest.	No frogs were observed in the feature.	**Contributing Functions**
R4	Upstream end is a small wetland pocket. Flows through plantation forest very near the clearing edge.	No frogs were observed in the feature.	**Valued Functions**
R5	All surrounding vegetation has been cleared.	No frogs were observed in the feature.	**Limited Functions**
R6	All surrounding vegetation has been cleared.	No frogs were observed in the feature.	**Limited Functions**
R7	Permanent stream within a forested area.	No frogs were observed in the feature.	**Valued Functions**
R8	Permanent stream within a forested area.	As no frogs were observed in R7, frog presence here is considered unlikely.	**Valued Functions**
R9	Ephemeral channel within a forested area with no adjacent wetlands features.	Frog presence here is considered unlikely.	**Contributing Functions**
R10	Newly dug ephemeral channel within a cleared area.	Frog presence here is considered unlikely.	**Limited Functions**
R11	Newly dug ephemeral channel within a cleared area.	Frog presence here is considered unlikely.	**Limited Functions**

2.4 Reach Summary

Dimensions of the HDF reaches are summarized in Table 5.

Table 6. Reach Dimensions During Spring Freshet (April 12, 2018)

Drainage Feature	Length (m)	Mean Bankfull Width (m)	Mean Wetted Width (m)	Mean Depth (m)
R1	401 (along the Site edge)	4.0	1.6	0.19
R2	485	3.0	90	0.90
R3	144	2.0	2.0	0.18
R4	145	3.0	3.0	-
R5	54	2.0	1.4	0.26
R6	55	2.5	1.2	0.32
R7	218 (on the Site)	5.1	3.2	-
R8	175	2		
R9	265	1.5		
R10	242	2.5		
R11	95	2.5		

3.0 MANAGEMENT RECOMMENDATIONS

The classification categories identified in Section 2 provide the basis of the management recommendations provided here. The following flow chart (Figure 2) combines and translates the classification results to management recommendations.

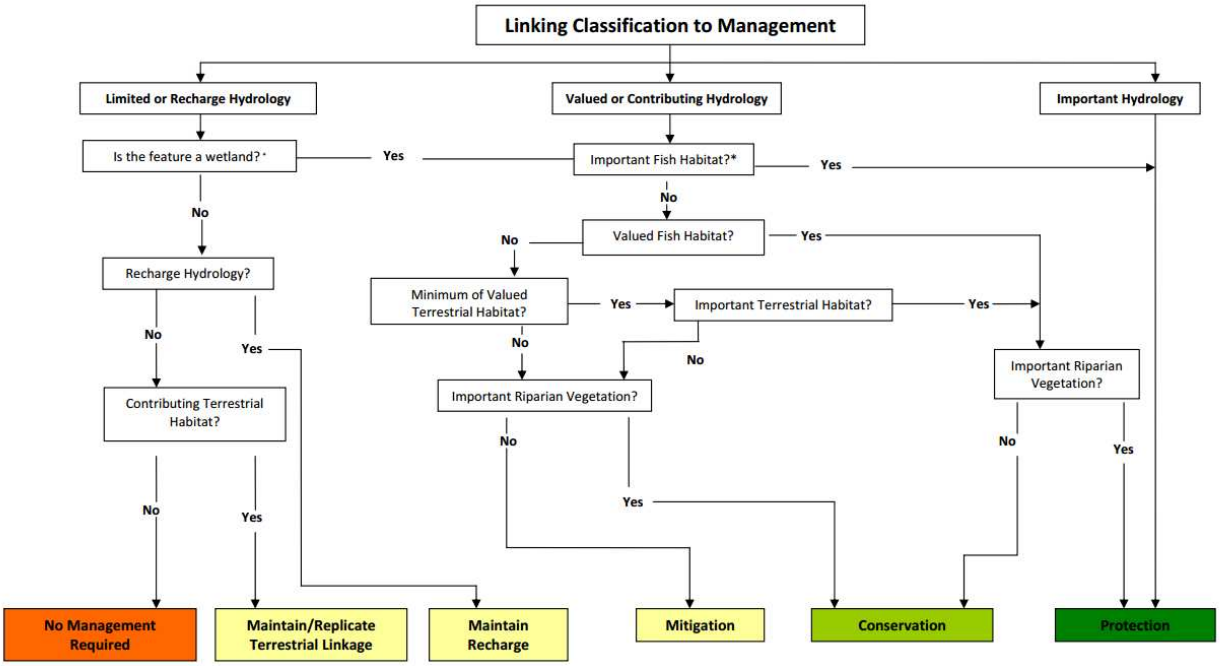


Figure 2. Headwater Drainage Feature Assessment (HDFA) flow chart providing direction on management options

3.1 Management Recommendations for Reaches

Channels R1, R5, R6, R10, R11 and the upper half of R2

These features are fully within the cleared area. They are ephemeral channels that do not provide fish habitat. Following the HDFA Guide flow chart linking component classification to management directives (Figure 2), these reaches:

1. Provide Contributing Hydrology.
2. Do not provide Important Fish Habitat;
3. Do not provide Valued Fish Habitat;
4. Do not provide Valued Terrestrial Habitat;
5. Do not provide Important Riparian Vegetation.

This chain of classification descriptors leads to a management directive of **Mitigation**. These features are not required to be maintained per se, but their functionality must be replicated or enhanced through lot level conveyance measures as part of the site stormwater management system. As the features convey runoff to more ecologically important reaches, replacement features/systems, should be vegetated to mimic online wet vegetation pockets to the extent possible, and should convey water to the same final receiver (i.e. R7). Lot level conveyance features would form part of the Site's future stormwater management system. As such, the replacement features would not require either setbacks or a natural channel design, nor would they need to be comparable dimensions so long as they function to provide the required conveyance and opportunity for allochthonous input.

Channels R3, R4 and R9

These reaches are small, ephemeral to intermittent drainage features located entirely within a treed area. While some fish were observed when beaver dams backed up water into them (R2 and R4), they are not considered valued fish habitat as the features now dry too quickly in the spring to support fish. The HDFA Guide flow chart linking component classification to management directives (Figure 2) progresses as follows:

1. Provides Contributing/Valued Hydrology;
2. Does not provide Important Fish Habitat;
3. Does provide Valued Fish Habitat;
4. Does not provide Valued Terrestrial Habitat; and
4. Provides Important Riparian Vegetation.

This chain of classification descriptors leads to a management directive of **Conservation** for this reach. The feature may be maintained or be realigned using natural channel design techniques to enhance their overall productivity. If realigned, the features may be relocated on or off the Site. In either case, the riparian corridors must be maintained or enhanced. If catchment drainage will be removed due to diversion of stormwater flows, lost functions should be restored through enhanced lot level controls (e.g. restore original catchment using clean roof drainage).

Channels R2 (lower half)

This reach, with its direct connection to R7 likely retains some water well into summer providing some potential fish habitat for tolerant forage fish. The HDFA Guide flow chart linking component classification to management directives (Figure 2) progresses as follows:

1. Provides Contributing/Valued Hydrology;
2. Does not provide Important Fish Habitat;
3. Provides Valued Fish Habitat;
4. Provides Important Riparian Vegetation.

This chain of classification descriptors would typically lead to a management directive of **Protection** for this reach, based in part on the assessment of "Important Riparian Vegetation". Under a management directive of **Protection,** the feature should not generally be relocated. For this feature, however, the

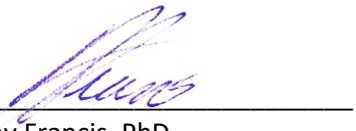
assessment of "Important Riparian Vegetation" comes from only the west side. The east side of the channel has limited vegetation and is generally located within <30 m of the Thunder Road (it connects with R7 within 3 m of the roadway), thus preventing options for an undisturbed, naturalized buffer on that side. The management recommendation for this feature is thus **Conservation** to allow its relocation. The feature should be realigned westward to allow for an improved, naturalized setback with an enhancement of the riparian corridors. Drainage must still be conveyed to R7 and stormwater management systems on the site must be designed to avoid impacts (i.e. sediment, temperature) to this headwater channel.

Channel R7 and R8

This perennial channel conveys off-site flows across the property. As a permanent stream, it does not qualify as headwater feature. As feature with important hydrology, it automatically receives a management directive of **Protection**. As such, this reach may be maintained and/or enhanced, but should not generally be relocated. Improvements, however, could be possible to its overall channel form and thus some minor realignment may be considered within that context. The riparian zone should be protected and enhanced where feasible. The hydro-period must be maintained. Use natural channel design techniques or wetland design to restore and enhance existing habitat features if and where needed. Stormwater management systems must be designed to avoid impacts (i.e. sediment, temperature) to this headwater channel.

4.0 CLOSURE

This report provides detailed descriptions of the HDFs on the Thunder Road site, as well as management recommendations to direct future development near those features. Points of clarification can be addressed to the undersigned.



Anthony Francis, PhD
KILGOUR & ASSOCIATES LTD.

5.0 REFERENCES

Bird Studies Canada, United States Environmental Protection Agency, and Environment Canada. 2008. Marsh Monitoring Program Participant's Handbook for Surveying Amphibians (Revised). Available online at: https://www.birdscanada.org/bird-science/marsh-monitoring-program/

Credit Valley Conservation and Toronto Region Conservation Authority. 20147. Evaluation, Classification and Management of Headwater Drainage Features.

Lee, H.R., W. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig, and S. McMurray. 1998. Ecological Land Classification for Southern Ontario: First Approximation and its Application. Ontario Ministry of Natural Resources, North Bay.

Appendix A: Site Photos

Note: Reach numbers located within the comment lines directly on photos indicate the order in which they were originally photographed and do not necessarily reflect the final assigned reach numbers used throughout this report.

Reach 1

Upstream view

Downstream view

Reach 2

Upstream view

Downstream view

Reach 3

Upstream view

Downstream view

Reach 4

Upstream view

Downstream view

Reach 5

Upstream view

Downstream view

Reach 6

Upstream view

Downstream view

Reach 7

Upstream view

Downstream view

Appendix B: Field Notes

KILGOUR & Associates

Daily Work Plan for Field Work

Client/Project #: SIMP 773

Date: 2018/04/12

Personnel Data: LH, TP

Staff Name	Date of Birth YYYY/MM/DD	Emergency contact and number	Staff hazard review initials@
L. Hamilton	1983/05/02	M. Vegiard 613-993-5683	LH.
T. Peat.	1988/07/19	Miranda Miller 613-985-6611	TP

If there are more than four crew, use a second sheet; *indicates person responsible for check in / check out; @ initial if staff has had the opportunity to review the hazard assessment and mitigations for this project, is aware of risks, and agrees the work can be done safely.

Vehicle (circle those that apply)	Owner	Licence
KAL Truck (Chev Silverado), Grey	Bruce Kilgour	685 7JZ (Ontario)
QUAD	Bruce Kilgour	2CK47 (Ontario)
QUAD Trailer	2317833 Ontario	M7807M (Ontario)
Tracker	2317833 Ontario	C23182ON (Transport Canada)
Tracker Trailer	2317833 Ontario	J3161S (Ontario)
Red Inflatable	2317833 Ontario	C23183ON (Transport Canada)
Inflatable Trailer	Bruce Kilgour	J7553K (Ontario)
White inflatable	Kilgour & Associates Ltd.	unmarked
LIZA'S HONDA FIT	L. HAMILTON.	NE9 H2W

Describe Anticipated Daily Activities Including Location(s), Route(s) and Access Points and approx. schedule

HJFA visit #1 @ 9150 Thunder Rd., Carlsruhe, ON.

Map is attached? Y☒ N☐

Check in / Check out Procedure

KAL Contact Person and cell number:	Charles Hatsy
Hotel Details	N/A
Client Contact Person and cell number:	N/A.
Check in method and frequency:	upon arrival / departure.

Both injured, out of reach of cell phones.

Anticipated Worst Outcome/ Catastrophic Failure (describe):

If CH hasn't heard from us in over 4 hrs, he calls both. If no one answers, he calls 911

Emergency Response Procedure (describe):

FINAL FIELD PACKAGE: P ____ OF ____

Home Base:	Field Location:
Time leaving 8:30	Time arriving 8:50
Time returning 11:15	Time Leaving 11:00

Person	Pre-Field Condition	Post-Field Condition
LIZA	GOOD	GOOD
TYLER	GOOD.	GOOD
Vehicle	**Pre-Field Condition**	**Post-Field Condition**
LIZA'S HONDA FIT	GOOD. Start km: 82125	GOOD. End km: 82155

Calibration										
Unit	Serial No.	Pre / Post	pH			Cond.	Turbidity			DO
			4	7	10	1413	0			100% Sat.
pH pen		Pre								
		Post								
YSI Pro Plus		Pre								
		Post								
HI Turb. Meter		Pre								
		Post								
Lamotte Turb. Meter		Pre								
		Post								
		Pre								
		Post								

Rules of thumb (when to flag your result):

- DO (mg/L): < 5 mg/L, check that YSI is calibrated to 100% saturation, if yes, then use HACH kit to confirm low DO
- pH: If < 6.5 or > 9, check pH meter vs buffer solutions
- If unit cannot calibrate, it must be serviced, so notify Bruce Kilgour

Issues with field equipment

Do not forget to mention all equipment issues to Rob Hallett as soon as possible

Datasheet Log

KILGOUR & Associates

Field Map

Client/Project #: SIMP773

Crew: LH, TP

Date: 2018/04/12

Location: 6150 Thunder Rd.

HDFA Visit #1

Notes

CREW INITIALS:

FINAL FIELD PACKAGE: P___ OF ___

KILGOUR & Associates

General Notes Sheet

Client/Project #: SIMPTT3

Crew: CH, TP

Date: 2018/04/12

Location: 1650 Thunder Rd.

Time (hh:mm)	Map Pin	Easting	Northing	Description/Note
9:30	3			- defined channel
	start	465023	5021492	- frozen over
	end	464905	5021419	- depth 18cm
				- substrate frozen.
				~ 9.0 m approx. wetted & estimated since cent measure.
				- forest on either side of channel
				- Moderate birch forest on (B). Moderate to dense mixed birch and coniferous on (U)
				- 2°C water temp.
				- 2°C air temp.
9:50	4			
	start	465056	5021398	- defined channel
	end	464980	5021348	- frozen over
				- wetted ~ 3m (best guess)
				- coniferous forest on either side (dense)
				- air temp 2°C
				- beaver dam on channel 2 (D) confluence w channel 4.
				- deep
				- very dense forest on either side of length of channel
				- scrubby brush then planted coniferous forest
				- ends in wetland area lots of tree and scrubby brush
				- difficult to see perimeter.

CREW INITIALS:

FINAL FIELD PACKAGE: P ____ OF ____

Headwater Drainage Features - Up- and Down- Stream

Stream Code	Site Code	Zone	Easting	Northing	Date (YYYY)	(MM)	(DD)	Time (24hr)
	1	10N	465007	5621564	2021	06	12	0900

Stream Name: Roadside Ditch

Discharge Approximates Baseflow? ○ Baseflow ⊗ Freshet ○ Spate

Upstream Site Length (m):

Access Route: Thunder Rd.

Site Description: Roadside Ditch along Thunder Rd.

Optional Features

Water Temp (C)	Air Temp (C)	pH	Conductivity (Ns)	Turbidity (NTV)	Dissolved O_2 (ppm)
2	2				

Number of upstream features:

Upstream Roughness:

Photo #	Photo Name

Upstream Feature(s)

Feature Number	Distance (m)	Bearing	Type	Flow	Sediment Transport: Adjacent Feature	Sediment Deposition	Width MT	~~Feature~~ Wetted Width (m)	~~BF~~ Wetted Depth (mm)	~~Entrenchment~~ Bankfull Width (m)	Feat. Veg	Riparian Vegetation 0-1.5 m Left	0-1.5 m Right	1.5-10 m Left	1.5-10 m Right	10-30 m Left	10-30 m Right
1			3	2		2		1.57	190	4.0	6	4	4	5	1	7	4
2																	
3																	
4																	

Upstream Longitudinal Gradient

Method Used	Distance (m)	Elevation Rise (cm)

Upstream Flow Measure(s) — Record EITHER Hydraulic Head OR Volume OR Distance

Feature Number	Wetted Width (m)	Depth (mm) 1	2	3	Hydraulic Head (mm) 1	2	3	Volume (lt) 1	2	3	Distance (m) 1	2	3	Time (sec) 1	2	3

Comments

- C2 tails in ditch (80% cover)
- Substrate is mud, silt, organic matter.
- SIMP773

Unconstrained Headwater Drainage Feature Assessment

Date: _____ Project #: _____ Recorder/Crew: _____

Stream Name: _____ Stream Code: _____ Site Code: _____

Site Limits: Upstream WP# _____ Field Assessment: ☐ Sample 1 Unconnected HDF:

Downstream WP# _____ ☐ Sample 2 ☐ Not connected

Direction of Assessment: ☐ Upstream ☐ Downstream ☐ Sample 3 to downstream network

Flow Influence ☐ Freshet (1) ☐ Spate (2) ☐ Baseflow (3)

Flow Condition ☐ Dry (1) ☐ Interstitial Flow (3) ☐ Substantial Flow (5)
☐ Standing Water (2) ☐ Minimal Flow (4)

Feature Type ☐ Defined Natural Channel (1) ☐ No Defined Feature (4) ☐ Swale (7)
☐ Channelized or Constrained (2) ☐ Tiled Feature (5) ☐ Roadside Ditch (8)
☐ Multi-thread (3) ☐ Wetland (6) ☐ Pond (9)

Feature Vegetation ☐ None (1) ☐ Lawn (2) ☐ Cropped (3) ☐ Meadow (4) ☐ Scrubland (5) ☐ Wetland(6) ☐ Forest (7)

Riparian Vegetation

0 - 1.5 m	Left Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)
	Right Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)
1.5 - 10 m	Left Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)
	Right Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)
10 - 30 m	Left Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)
	Right Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)

Channel Gradient (S4.M7) ☐ Visual (1) ☐ Clinometer (2) ☐ Laser Level (3) ☐ Survey Level (4) ☐ Other (5) ☐ LiDAR (6)

Distance (m): _____ _____ _____ Elevation (cm) : _____ _____ _____ Gradient (°): _____

	Clay (Hard Pan)	Silt	Sand (0.06-2 mm)	Gravel (22-66 mm)	Cobble (67-249 mm)	Boulder (250 mm)	Bedrock
Dominant Substrate (S2.M3)	☐	☐	☐	☐	☐	☐	☐
Sub-Dominant Substrate (S2.M3)	☐	☐	☐	☐	☐	☐	☐

Feature Roughness ☐ < 10% Minimal (1) ☐ 10 - 40% Moderate (2) ☐ 40 - 60% High (3) ☐ > 60% Extreme (4)

Width Measurement ☐ Can't Measure (1) ☐ Bankfull (2) ☐ Mean Width (3) ☐ Estimated (4) ☐ GIS (5) ☐ Measure/GIS (6)

Channel Dimensions Feature Width (m): _____ Bankfull Depth (mm) _____

Entrenchment Total: ☐ > 40 m ☐ < 40 m Left Bank _____ m Right Bank _____ m Total width _____ m

Surface Flow Method ☐ Perched Culvert (1) ☐ Hydraulic Head (2) ☐ Distance by Time (3) ☐ Estimated (4)

Wetted Width (m)	**Wetted Depth (mm)**			**Hydraulic head (mm)**			**Volume (L)**			**Distance (m)**			**Time (s)**		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3

Sediment Transport

Adjacent ☐ None (1) ☐ Rill (2) ☐ Rill and Gully (3) ☐ Gully (4) ☐ Outlet Scour (5)
☐ Sheet Erosion (6) ☐ Instream Bank Erosion (7) ☐ Other (8)

Feature ☐ None (1) ☐ Rill (2) ☐ Rill and Gully (3) ☐ Gully (4) ☐ Outlet Scour (5)
☐ Sheet Erosion (6) ☐ Instream Bank Erosion (7) ☐ Other (8)

Sediment Deposition Measures (mm): _____ _____ _____ _____ _____

☐ None (1) ☐ Minimal: < 5 mm (2) ☐ Moderate: 5-30 mm (3) ☐ Substantial: 31-80 mm (4) ☐ Extensive: > 80 mm (5)

Headwater Drainage Features - Up- and Down- Stream

Stream Code	Site Code	Zone	Easting	Northing	Date (YYYY)	(MM)	(DD)	Time (24hr)
	2	19	464999	5021573	2018	04	12	09:15

Stream Name: Ditch #1

Discharge Approximates Baseflow? ○ Baseflow ◉ Freshet ○ Spate

Upstream Site Length (m):

Access Route: Thurber Rd.

Site Description: Ditch running along length of property parallel to Thurber Rd.

Optional Features

Water Temp (C)	Air Temp (C)	pH	Conductivity (Ns)	Turbidity (NTV)	Dissolved O_2 (ppm)
2	2				

Number of upstream features:

Upstream Roughness: **Photo #:** **Photo Name:**

Upstream Feature(s)

Feature Number	Distance (m)	Bearing	Type	Flow	Sediment Transport: Adjacent	Sediment Transport: Feature	Sediment Deposition	Width MT	Wetted Feature Width (m)	Wetted ~~BF~~ Depth (mm)	Bankfull ~~Entrenchment~~ Width (m)	Feat. Veg	Riparian Vegetation 0-1.5 m Left	0-1.5 m Right	1.5-10 m Left	1.5-10 m Right	10-30 m Left	10-30 m Right
1			1	2			3		0.90	90	3.0	1	4	4	4	4	7	4
2																		
3																		
4																		

Upstream Longitudinal Gradient: Method Used | Distance (m) | Elevation Rise (cm)

Upstream Flow Measure(s)

Record EITHER Hydraulic Head OR Volume OR Distance

Feature Number	Wetted Width (m)	Depth (mm) 1	2	3	Hydraulic Head (mm) 1	2	3	Volume (lt) 1	2	3	Distance (m) 1	2	3	Time (sec) 1	2	3

Comments

Substrate - muddy, silt
SIMP773

Unconstrained Headwater Drainage Feature Assessment

Date: _____ Project #: _____ Recorder/Crew: _____

Stream Name: _____ Stream Code: _____ Site Code: _____

Site Limits: Upstream WP# _____ Field Assessment: ☐ Sample 1 Unconnected HDF:

Downstream WP# _____ ☐ Sample 2 ☐ Not connected

Direction of Assessment: ☐ Upstream ☐ Downstream ☐ Sample 3 to downstream network

Flow Influence ☐ Freshet (1) ☐ Spate (2) ☐ Baseflow (3)

Flow Condition ☐ Dry (1) ☐ Interstitial Flow (3) ☐ Substantial Flow (5)
☐ Standing Water (2) ☐ Minimal Flow (4)

Feature Type ☐ Defined Natural Channel (1) ☐ No Defined Feature (4) ☐ Swale (7)
☐ Channelized or Constrained (2) ☐ Tiled Feature (5) ☐ Roadside Ditch (8)
☐ Multi-thread (3) ☐ Wetland (6) ☐ Pond (9)

Feature Vegetation ☐ None (1) ☐ Lawn (2) ☐ Cropped (3) ☐ Meadow (4) ☐ Scrubland (5) ☐ Wetland(6) ☐ Forest (7)

Riparian Vegetation

0 - 1.5 m	Left Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)
	Right Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)
1.5 - 10 m	Left Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)
	Right Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)
10 - 30 m	Left Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)
	Right Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)

Channel Gradient (S4.M7) ☐ Visual (1) ☐ Clinometer (2) ☐ Laser Level (3) ☐ Survey Level (4) ☐ Other (5) ☐ LiDAR (6)

Distance (m): _____ _____ _____ Elevation (cm) : _____ _____ _____ Gradient (°): _____

	Clay (Hard Pan)	Silt	Sand (0.06-2 mm)	Gravel (22-66 mm)	Cobble (67-249 mm)	Boulder (250 mm)	Bedrock
Dominant Substrate (S2.M3)	☐	☐	☐	☐	☐	☐	☐
Sub-Dominant Substrate (S2.M3)	☐	☐	☐	☐	☐	☐	☐

Feature Roughness ☐ < 10% Minimal (1) ☐ 10 - 40% Moderate (2) ☐ 40 - 60% High (3) ☐ > 60% Extreme (4)

Width Measurement ☐ Can't Measure (1) ☐ Bankfull (2) ☐ Mean Width (3) ☐ Estimated (4) ☐ GIS (5) ☐ Measure/GIS (6)

Channel Dimensions Feature Width (m): _____ Bankfull Depth (mm) _____

Entrenchment Total: ☐ > 40 m ☐ < 40 m Left Bank _____ m Right Bank _____ m Total width _____ m

Surface Flow Method ☐ Perched Culvert (1) ☐ Hydraulic Head (2) ☐ Distance by Time (3) ☐ Estimated (4)

Wetted Width (m)	Wetted Depth (mm)			Hydraulic head (mm)			Volume (L)			Distance (m)			Time (s)		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3

Sediment Transport

Adjacent ☐ None (1) ☐ Rill (2) ☐ Rill and Gully (3) ☐ Gully (4) ☐ Outlet Scour (5)
☐ Sheet Erosion (6) ☐ Instream Bank Erosion (7) ☐ Other (8)

Feature ☐ None (1) ☐ Rill (2) ☐ Rill and Gully (3) ☐ Gully (4) ☐ Outlet Scour (5)
☐ Sheet Erosion (6) ☐ Instream Bank Erosion (7) ☐ Other (8)

Sediment Deposition Measures (mm): _____ _____ _____ _____ _____

☐ None (1) ☐ Minimal: < 5 mm (2) ☐ Moderate: 5-30 mm (3) ☐ Substantial: 31-80 mm (4) ☐ Extensive: > 80 mm (5)

Headwater Drainage Features - Up- and Down- Stream

Stream Code	Site Code	Zone	Easting	Northing	Date (YYYY)	(MM)	(DD)	Time (24hr)
	5	18	465102	5021327	2018	04	12	10:15

Stream Name: ditch

Discharge Approximates Baseflow? ○ Baseflow ⊗ Freshet ○ Spate

Upstream Site Length (m):

Access Route:
start - 465094 5021327.
end - 465102 5021327

Site Description:
- perpendicular to main ditch
- behind petro-C2.

Optional Features

Water Temp (C)	Air Temp (C)	pH	Conductivity (Ns)	Turbidity (NTV)	Dissolved O_2 (ppm)
2	2				

Number of upstream features:

Upstream Roughness:

Photo #	Photo Name

Upstream Feature(s)

Feature Number	Distance (m)	Bearing	Type	Flow	Sediment Transport: Adjacent	Sediment Transport: Feature	Sediment Deposition	Width MT	~~Feature~~ Wetted Width (m)	~~BF~~ Wetted Depth (mm)	~~Entrenchment~~ Bankfull Width (m)	Feat Veg	Riparian Vegetation 0-1.5 m Left	Riparian Vegetation 0-1.5 m Right	Riparian Vegetation 1.5-10 m Left	Riparian Vegetation 1.5-10 m Right	Riparian Vegetation 10-30 m Left	Riparian Vegetation 10-30 m Right
1			1	2			3		1.4	260	2.0M	1	5	5	5	5	5	5
2																		
3																		
4																		

Upstream Longitudinal Gradient

Method Used	Distance (m)	Elevation Rise (cm)

Upstream Flow Measure(s)

Record EITHER Hydraulic Head OR Volume OR Distance

Feature Number	Wetted Width (m)	Depth (mm) 1	Depth (mm) 2	Depth (mm) 3	Hydraulic Head (mm) 1	Hydraulic Head (mm) 2	Hydraulic Head (mm) 3	Volume (lt) 1	Volume (lt) 2	Volume (lt) 3	Distance (m) 1	Distance (m) 2	Distance (m) 3	Time (sec) 1	Time (sec) 2	Time (sec) 3

Comments

- substrate - mud, sand.
- SIMP773

Unconstrained Headwater Drainage Feature Assessment

Date: _____ Project #: _____ Recorder/Crew: _____

Stream Name: _____ Stream Code: _____ Site Code: _____

Site Limits: Upstream WP# _____ Field Assessment: ☐ Sample 1 Unconnected HDF:

Downstream WP# _____ ☐ Sample 2 ☐ Not connected

Direction of Assessment: ☐ Upstream ☐ Downstream ☐ Sample 3 to downstream network

Flow Influence ☐ Freshet (1) ☐ Spate (2) ☐ Baseflow (3)

Flow Condition ☐ Dry (1) ☐ Interstitial Flow (3) ☐ Substantial Flow (5)
☐ Standing Water (2) ☐ Minimal Flow (4)

Feature Type ☐ Defined Natural Channel (1) ☐ No Defined Feature (4) ☐ Swale (7)
☐ Channelized or Constrained (2) ☐ Tiled Feature (5) ☐ Roadside Ditch (8)
☐ Multi-thread (3) ☐ Wetland (6) ☐ Pond (9)

Feature Vegetation ☐ None (1) ☐ Lawn (2) ☐ Cropped (3) ☐ Meadow (4) ☐ Scrubland (5) ☐ Wetland(6) ☐ Forest (7)

Riparian Vegetation

0 - 1.5 m	Left Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)
	Right Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)
1.5 - 10 m	Left Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)
	Right Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)
10 - 30 m	Left Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)
	Right Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)

Channel Gradient (S4.M7) ☐ Visual (1) ☐ Clinometer (2) ☐ Laser Level (3) ☐ Survey Level (4) ☐ Other (5) ☐ LiDAR (6)

Distance (m): _____ _____ _____ Elevation (cm) : _____ _____ _____ Gradient (°): _____

	Clay (Hard Pan)	Silt	Sand (0.06-2 mm)	Gravel (22-66 mm)	Cobble (67-249 mm)	Boulder (250 mm)	Bedrock
Dominant Substrate (S2.M3)	☐	☐	☐	☐	☐	☐	☐
Sub-Dominant Substrate (S2.M3)	☐	☐	☐	☐	☐	☐	☐

Feature Roughness ☐ < 10% Minimal (1) ☐ 10 - 40% Moderate (2) ☐ 40 - 60% High (3) ☐ > 60% Extreme (4)

Width Measurement ☐ Can't Measure (1) ☐ Bankfull (2) ☐ Mean Width (3) ☐ Estimated (4) ☐ GIS (5) ☐ Measure/GIS (6)

Channel Dimensions Feature Width (m): _____ Bankfull Depth (mm) _____

Entrenchment Total: ☐ > 40 m ☐ < 40 m Left Bank _____ m Right Bank _____ m Total width _____ m

Surface Flow Method ☐ Perched Culvert (1) ☐ Hydraulic Head (2) ☐ Distance by Time (3) ☐ Estimated (4)

Wetted Width (m)	Wetted Depth (mm)			Hydraulic head (mm)			Volume (L)			Distance (m)			Time (s)		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3

Sediment Transport

Adjacent ☐ None (1) ☐ Rill (2) ☐ Rill and Gully (3) ☐ Gully (4) ☐ Outlet Scour (5)
☐ Sheet Erosion (6) ☐ Instream Bank Erosion (7) ☐ Other (8)

Feature ☐ None (1) ☐ Rill (2) ☐ Rill and Gully (3) ☐ Gully (4) ☐ Outlet Scour (5)
☐ Sheet Erosion (6) ☐ Instream Bank Erosion (7) ☐ Other (8)

Sediment Deposition Measures (mm): _____ _____ _____ _____ _____

☐ None (1) ☐ Minimal: < 5 mm (2) ☐ Moderate: 5-30 mm (3) ☐ Substantial: 31-80 mm (4) ☐ Extensive: > 80 mm (5)

Headwater Drainage Features - Up- and Down- Stream

Stream Code	Site Code	Zone	Easting	Northing	Date (YYYY)	(MM)	(DD)	Time (24hr)
	6	18	465135	5021245	2018	04	12	

Stream Name

Discharge Approximates Baseflow? ○ Baseflow ⊗ Freshet ○ Spate

Upstream Site Length (m)

Access Route

Site Description

ditch runs perpendicular to MDN ditch runs along property.

Optional Features

Water Temp (C)	Air Temp (C)	pH	Conductivity (Ns)	Turbidity (NTV)	Dissolved O_2 (ppm)
1	20C	✓	✓	✓	✓

Number of upstream features

Upstream Roughness

Photo #	Photo Name

Upstream Feature(s)

Feature Number	Distance (m)	Bearing	Type	Flow	Sediment Transport Adjacent	Sediment Transport Feature	Sediment Deposition	Width MT	~~Wetted~~ Feature Width (m)	~~Wetted~~ ~~Bf~~ Depth (mm)	B-Full Entrenchment Width (m)	Feat Veg	Riparian Vegetation 0-1.5 m Left	0-1.5 m Right	1.5-10 m Left	1.5-10 m Right	10-30 m Left	10-30 m Right
1			1	2			2		1.15	320	2.50	1	5	5	5	5	5	5
2																		
3																		
4																		

Upstream Longitudinal Gradient

Method Used	Distance (m)	Elevation Rise (cm)

Upstream Flow Measure(s)

Record EITHER Hydraulic Head OR Volume OR Distance

Feature Number	Wetted Width (m)	Depth (mm) 1	Depth (mm) 2	Depth (mm) 3	Hydraulic Head (mm) 1	Hydraulic Head (mm) 2	Hydraulic Head (mm) 3	Volume (lt) 1	Volume (lt) 2	Volume (lt) 3	Distance (m) 1	Distance (m) 2	Distance (m) 3	Time (sec) 1	Time (sec) 2	Time (sec) 3

Comments

substrate - mud, silt, partially frozen still.
SIMP773

Unconstrained Headwater Drainage Feature Assessment

Date: _____ Project #: _____ Recorder/Crew: _____

Stream Name: _____ Stream Code: _____ Site Code: _____

Site Limits: Upstream WP# _____ Field Assessment: ☐ Sample 1 Unconnected HDF:

Downstream WP# _____ ☐ Sample 2 ☐ Not connected

Direction of Assessment: ☐ Upstream ☐ Downstream ☐ Sample 3 to downstream network

Flow Influence ☐ Freshet (1) ☐ Spate (2) ☐ Baseflow (3)

Flow Condition ☐ Dry (1) ☐ Interstitial Flow (3) ☐ Substantial Flow (5)
☐ Standing Water (2) ☐ Minimal Flow (4)

Feature Type ☐ Defined Natural Channel (1) ☐ No Defined Feature (4) ☐ Swale (7)
☐ Channelized or Constrained (2) ☐ Tiled Feature (5) ☐ Roadside Ditch (8)
☐ Multi-thread (3) ☐ Wetland (6) ☐ Pond (9)

Feature Vegetation ☐ None (1) ☐ Lawn (2) ☐ Cropped (3) ☐ Meadow (4) ☐ Scrubland (5) ☐ Wetland(6) ☐ Forest (7)

Riparian Vegetation

0 - 1.5 m	Left Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)
	Right Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)
1.5 - 10 m	Left Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)
	Right Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)
10 - 30 m	Left Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)
	Right Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)

Channel Gradient (S4.M7) ☐ Visual (1) ☐ Clinometer (2) ☐ Laser Level (3) ☐ Survey Level (4) ☐ Other (5) ☐ LiDAR (6)

Distance (m): _____ _____ _____ Elevation (cm) : _____ _____ _____ Gradient (°): _____

	Clay (Hard Pan)	Silt	Sand (0.06-2 mm)	Gravel (22-66 mm)	Cobble (67-249 mm)	Boulder (250 mm)	Bedrock
Dominant Substrate (S2.M3)	☐	☐	☐	☐	☐	☐	☐
Sub-Dominant Substrate (S2.M3)	☐	☐	☐	☐	☐	☐	☐

Feature Roughness ☐ < 10% Minimal (1) ☐ 10 - 40% Moderate (2) ☐ 40 - 60% High (3) ☐ > 60% Extreme (4)

Width Measurement ☐ Can't Measure (1) ☐ Bankfull (2) ☐ Mean Width (3) ☐ Estimated (4) ☐ GIS (5) ☐ Measure/GIS (6)

Channel Dimensions Feature Width (m): _____ Bankfull Depth (mm) _____

Entrenchment Total: ☐ > 40 m ☐ < 40 m Left Bank _____ m Right Bank _____ m Total width _____ m

Surface Flow Method ☐ Perched Culvert (1) ☐ Hydraulic Head (2) ☐ Distance by Time (3) ☐ Estimated (4)

Wetted Width (m)	Wetted Depth (mm)			Hydraulic head (mm)			Volume (L)			Distance (m)			Time (s)		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3

Sediment Transport

Adjacent ☐ None (1) ☐ Rill (2) ☐ Rill and Gully (3) ☐ Gully (4) ☐ Outlet Scour (5)
☐ Sheet Erosion (6) ☐ Instream Bank Erosion (7) ☐ Other (8)

Feature ☐ None (1) ☐ Rill (2) ☐ Rill and Gully (3) ☐ Gully (4) ☐ Outlet Scour (5)
☐ Sheet Erosion (6) ☐ Instream Bank Erosion (7) ☐ Other (8)

Sediment Deposition Measures (mm): _____ _____ _____ _____ _____

☐ None (1) ☐ Minimal: < 5 mm (2) ☐ Moderate: 5-30 mm (3) ☐ Substantial: 31-80 mm (4) ☐ Extensive: > 80 mm (5)

Headwater Drainage Features - Up- and Down- Stream

Stream Code: | Site Code: 7 | Zone: 12 | Easting: 469981 | Northing: 5921600 | Date (YYYY): 2018 | (MM): 04 | (DD): 12 | Time (24hr): 1040

Stream Name:

Discharge Approximates Baseflow? ○ Baseflow ⊗ Freshet ○ Spate

Upstream Site Length (m):

Access Route:

Site Description: Main channel runs perpendicular to Thunder Rd.

Optional Features: Water Temp (C): 2 | Air Temp (C): 2°C | pH: / | Conductivity (Ns): / | Turbidity (NTV): / | Dissolved O_2 (ppm): /

Number of upstream features:

Upstream Roughness:

Photo #:

Photo Name:

Upstream Feature(s)

Feature Number	Distance (m)	Bearing	Type	Flow	Sediment Transport: Adjacent	Sediment Transport: Feature	Sediment Deposition	Width MT	~~Wetted~~ Feature Width (m)	Wetted ~~BF~~ Depth (mm)	B-Full ~~Entrenchment~~ Width (m)	Feat. Veg	Riparian Vegetation 0-1.5 m Left	0-1.5 m Right	1.5-10 m Left	1.5-10 m Right	10-30 m Left	10-30 m Right	Upstream Longitudinal Gradient: Method Used	Distance (m)	Elevation Rise (cm)
1			1	4			3		3.20	150	5.1	6	5	2	5	2	7	2			0
2																					
3																					
4																					

Upstream Flow Measure(s)

Record EITHER Hydraulic Head OR Volume OR Distance

Feature Number	Wetted Width (m)	Depth (mm) 1	Depth (mm) 2	Depth (mm) 3	Hydraulic Head (mm) 1	Hydraulic Head (mm) 2	Hydraulic Head (mm) 3	Volume (lt) 1	Volume (lt) 2	Volume (lt) 3	Distance (m) 1	Distance (m) 2	Distance (m) 3	Time (sec) 1	Time (sec) 2	Time (sec) 3

Comments:

Flow = 0.13 M/S. pockets of sediment > 40cm.
Substrate - Muck
- channel choked in wetland very close to road, thin patchy as you go downstream.

- SIMP773

Unconstrained Headwater Drainage Feature Assessment

Date: _____ Project #: _____ Recorder/Crew: _____

Stream Name: _____ Stream Code: _____ Site Code: _____

Site Limits: Upstream WP# _____ Field Assessment: ☐ Sample 1 Unconnected HDF:

Downstream WP# _____ ☐ Sample 2 ☐ Not connected

Direction of Assessment: ☐ Upstream ☐ Downstream ☐ Sample 3 to downstream network

Flow Influence ☐ Freshet (1) ☐ Spate (2) ☐ Baseflow (3)

Flow Condition ☐ Dry (1) ☐ Interstitial Flow (3) ☐ Substantial Flow (5)
☐ Standing Water (2) ☐ Minimal Flow (4)

Feature Type ☐ Defined Natural Channel (1) ☐ No Defined Feature (4) ☐ Swale (7)
☐ Channelized or Constrained (2) ☐ Tiled Feature (5) ☐ Roadside Ditch (8)
☐ Multi-thread (3) ☐ Wetland (6) ☐ Pond (9)

Feature Vegetation ☐ None (1) ☐ Lawn (2) ☐ Cropped (3) ☐ Meadow (4) ☐ Scrubland (5) ☐ Wetland(6) ☐ Forest (7)

Riparian Vegetation

0 - 1.5 m	Left Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)
	Right Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)
1.5 - 10 m	Left Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)
	Right Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)
10 - 30 m	Left Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)
	Right Bank	☐ None (1)	☐ Lawn (2)	☐ Cropped (3)	☐ Meadow (4)	☐ Scrubland (5)	☐ Wetland (6)	☐ Forest (7)

Channel Gradient (S4.M7) ☐ Visual (1) ☐ Clinometer (2) ☐ Laser Level (3) ☐ Survey Level (4) ☐ Other (5) ☐ LiDAR (6)

Distance (m): _____ _____ _____ Elevation (cm) : _____ _____ _____ Gradient (°): _____

	Clay (Hard Pan)	Silt	Sand (0.06-2 mm)	Gravel (22-66 mm)	Cobble (67-249 mm)	Boulder (250 mm)	Bedrock
Dominant Substrate (S2.M3)	☐	☐	☐	☐	☐	☐	☐
Sub-Dominant Substrate (S2.M3)	☐	☐	☐	☐	☐	☐	☐

Feature Roughness ☐ < 10% Minimal (1) ☐ 10 - 40% Moderate (2) ☐ 40 - 60% High (3) ☐ > 60% Extreme (4)

Width Measurement ☐ Can't Measure (1) ☐ Bankfull (2) ☐ Mean Width (3) ☐ Estimated (4) ☐ GIS (5) ☐ Measure/GIS (6)

Channel Dimensions Feature Width (m): _____ Bankfull Depth (mm) _____

Entrenchment Total: ☐ > 40 m ☐ < 40 m Left Bank _____ m Right Bank _____ m Total width _____ m

Surface Flow Method ☐ Perched Culvert (1) ☐ Hydraulic Head (2) ☐ Distance by Time (3) ☐ Estimated (4)

Wetted Width (m)	**Wetted Depth (mm)**			**Hydraulic head (mm)**			**Volume (L)**			**Distance (m)**			**Time (s)**		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3

Sediment Transport

Adjacent ☐ None (1) ☐ Rill (2) ☐ Rill and Gully (3) ☐ Gully (4) ☐ Outlet Scour (5)
☐ Sheet Erosion (6) ☐ Instream Bank Erosion (7) ☐ Other (8)

Feature ☐ None (1) ☐ Rill (2) ☐ Rill and Gully (3) ☐ Gully (4) ☐ Outlet Scour (5)
☐ Sheet Erosion (6) ☐ Instream Bank Erosion (7) ☐ Other (8)

Sediment Deposition Measures (mm): _____ _____ _____ _____ _____

☐ None (1) ☐ Minimal: < 5 mm (2) ☐ Moderate: 5-30 mm (3) ☐ Substantial: 31-80 mm (4) ☐ Extensive: > 80 mm (5)

KILGOUR & Associates

Daily Work Plan for Field Work

Client/Project #: 773

Date: 2018/06/12

Personnel Data:

Staff Name	Date of Birth YYYY/MM/DD	Emergency contact and number	Staff hazard review initials@
R. HOLLETT	1990/11/25	KATIE 613 851 5951	RH
T. POAT	1985/07/19	MICHELLE 613 436 6611	TP

If there are more than four crew, use a second sheet; *indicates person responsible for check in / check out; @ initial if staff has had the opportunity to review the hazard assessment and mitigations for this project, is aware of risks, and agrees the work can be done safely.

~~Vehicle (circle those that apply)~~	Owner	Licence
KAL Truck (Chev Silverado), Grey	Bruce Kilgour	685 7JZ (Ontario)
QUAD	Bruce Kilgour	2CK47 (Ontario)
QUAD Trailer	2317833 Ontario	M7807M (Ontario)
Tracker	2317833 Ontario	C23182ON (Transport Canada)
Tracker Trailer	2317833 Ontario	J3161S (Ontario)
Red Inflatable	2317833 Ontario	C23183ON (Transport Canada)
Inflatable Trailer	Bruce Kilgour	J7553K (Ontario)
White inflatable	Kilgour & Associates Ltd.	unmarked

Describe Anticipated Daily Activities Including Location(s), Route(s) and Access Points and approx. schedule

complete HOFA Fishing @ Thrasher Road

Map is attached? Y☑ N☐

Check in / Check out Procedure

KAL Contact Person and cell number:	A Francis
Hotel Details	
Client Contact Person and cell number:	
Check in method and frequency:	

Traffic encounter

Anticipated Worst Outcome/ Catastrophic Failure (describe):

911

Emergency Response Procedure (describe):

FINAL FIELD PACKAGE: P ____ OF ____

Home Base: KAC Time leaving 1206 Time returning 1730	**Field Location:** Thunder road Time arriving 1245 Time Leaving 1700

Person	Pre-Field Condition	Post-Field Condition
AM TP C	good	good
Vehicle	**Pre-Field Condition**	**Post-Field Condition**
	Start km:	End km:

Calibration									
Unit	Serial No.	Pre / Post	pH			Cond.	Turbidity			DO
			4	7	10	1413	0			100% Sat.
pH pen		Pre								
		Post								
YSI Pro Plus	unit 2	Pre	4.00	7.03	—	1410	—			—
		Post	4.03	7.00	—	1396	—			—
HI Turb. Meter		Pre								
		Post								
Lamotte Turb. Meter		Pre								
		Post								
		Pre								
		Post								

Rules of thumb (when to flag your result):

- DO (mg/L): < 5 mg/L, check that YSI is calibrated to 100% saturation, if yes, then use HACH kit to confirm low DO
- pH: If < 6.5 or > 9, check pH meter vs buffer solutions
- If unit cannot calibrate, it must be serviced, so notify Bruce Kilgour

Issues with field equipment

Do not forget to mention all equipment issues to Rob Hallett as soon as possible

none

Datasheet Log

DWP, map, fish x 4, notes

KILGOUR & Associates

Field Map

Client/Project #: SIMP773

Crew: ~~[illegible]~~

Date: 2018/06/21

Location: 6150 Thunder Rd.

HDFA Visit #1

Notes

New notes are in red.

CREW INITIALS:

FINAL FIELD PACKAGE: P___ OF ___

KILGOUR & Associates

Fish Collection Record

Client/Project #:

Date: 2018/06/21 Start Time: ~~—~~

Location: Thurcler Road	**Stream type:** Ditch	**Crew:** RH TP
(UTM NAD 83): 18	**Reach Classification:** unk	**Task:** I/DFA
Watercourse: unk	**Temperature:** 26.0°C	**Gear type:** E-
Reach/Station: Reach 1	**Conductivity:** 365 2 uS/cm	**Seconds/ Set + Pull Time:** 630
W-Depth: 0.45m	**pH:** 6.49	**Length fished:** 260m
W-Width: 3.0m	**DO:** 1.65mg/L / 20.8%	

Fishing Details/Other Comments:

START : 465078 5021483

END : 465032 5021542 Fish were barely being shocked. no major issues

Species	Number	Total	Notes/Stage + Health Observations
CNMD	⊠ ::	13	
BRMN	::	3	
BRST	•	1	
NRDC	::	3	

FINAL FIELD PACKAGE: P ____ OF ____

KILGOUR & Associates

Fish Collection Record

Client/Project #:

Date: 2018/06 /21 Start Time:

Location: Thunder Road	**Stream type:** Perm.	**Crew:** RA
(UTM NAD 83): 18	**Reach Classification:** Unk	**Task:** TD
Watercourse: Unk	**Temperature:** 22.5°C	**Gear type:**
Reach/Station: 2A.	**Conductivity:** 4036	**Seconds/ Set + Pull Time:** 721
W-Depth: ~~3.5m~~ 0.40m	**pH:** 7.61.	**Length fished:**
W-Width: 3.5m	**DO:** 51.9% 4.4 mg/L	

Fishing Details/Other Comments:
Start ; 465 001 502 1575
End ; 465 028 501 1494

very high spCond, not much fish response.
Catch was netted not shocked

Species	Number	Total	Notes/Stage + Health Observations
CNMN	☒ ☒ ☒ ☒ ☒ ☒	60	
BRST	☒ ☒ ☒ ☒ ☒ ··	52	
NRDC	☒ ∴	15	
PMSD	◻	8	
FTMN	·	1.	
CRCH	·	1	

FINAL FIELD PACKAGE: P ____ OF ____

KILGOUR & Associates

Fish Collection Record

Client/Project #:

Date: 2016/06 / Start Time:

Location: Thunder Road	**Stream type:** perm.	**Crew:**
(UTM NAD 83): 18	**Reach Classification:** cnk	**Task:** HOFA
Watercourse: cnk	**Temperature:** 25°C	**Gear type:** /
Reach/Station: Reach 3	**Conductivity:** 3083	**Seconds/ Set + Pull Time:** 338.7
W-Depth: 30cm	**pH:** 7.62	**Length fished:** 70m
W-Width: 1m	**DO:** <8% 4.75mg/L	

Fishing Details/Other Comments:

START 465028 5021496

END 464977 5021475

Species	Number	Total	Notes/Stage + Health Observations
CHMP	⊠⊠⊠⊠⊠⊠⊠ ∴	73	
BRST	⊠⊠⊠⊠ ⊠ ∴	52	
FTHN	∴	3	
PNSD	∴	2	

FINAL FIELD PACKAGE: P ____ OF ____

KILGOUR & Associates

Fish Collection Record

Client/Project #:

Date: 2018/06/21 Start Time:

Location: Thunder Road	**Stream type:** Perm.	**Crew:** RH - TD
(UTM NAD 83): 18	**Reach Classification:** —	**Task:** HDFA
Watercourse: onK	**Temperature:** 17.8	**Gear type:** Back Pack
Reach/Station: Reach 4	**Conductivity:** 123.9	**Seconds/ Set + Pull Time:** 327
W-Depth: 40-45cm	**pH:** 6.98	**Length fished:** 66m
W-Width: 3m	**DO:** 13.6% 1.28mg/L	

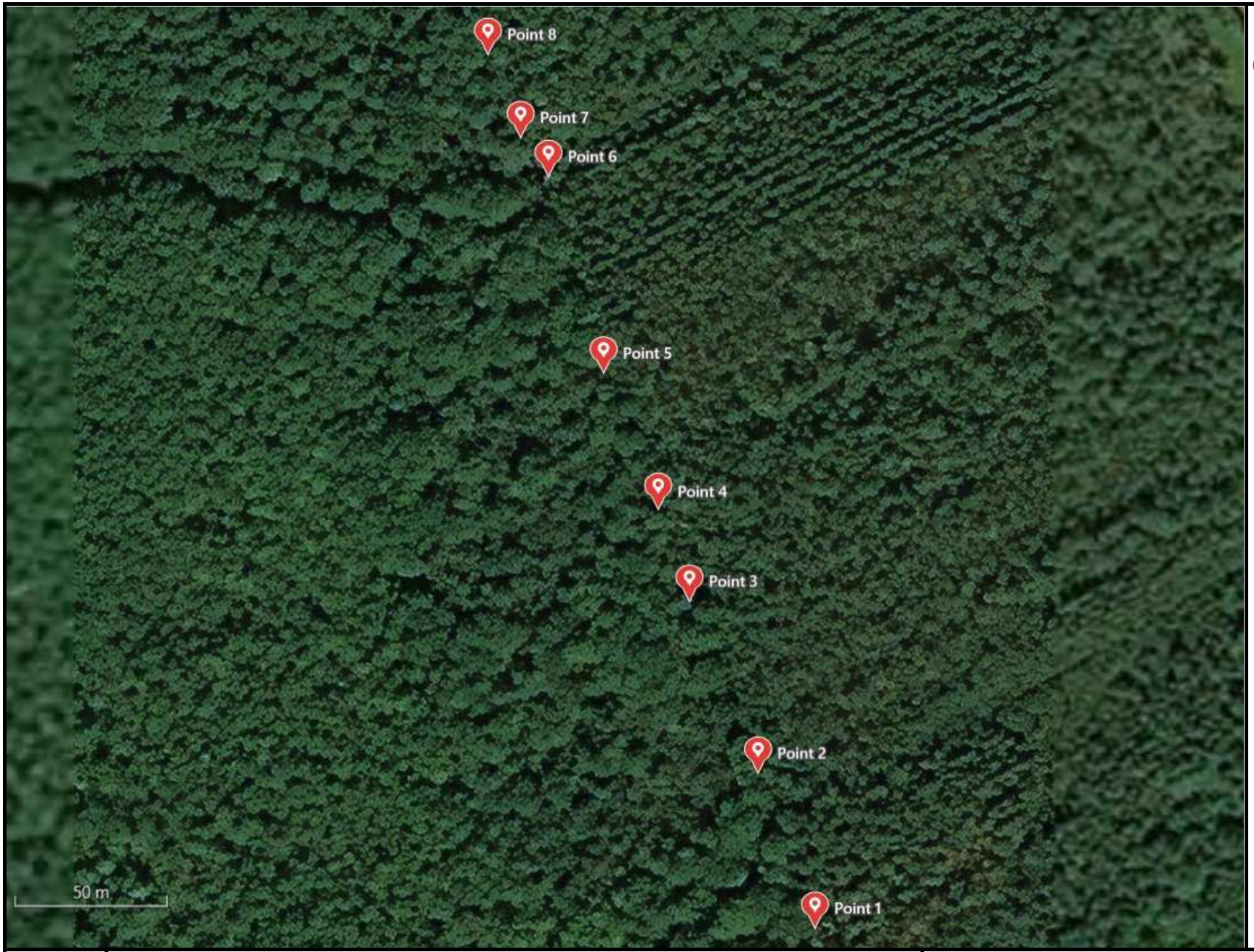
Fishing Details/Other Comments:

START 465065 5021389

END 465039 5021373

Species	Number	Total	Notes/Stage + Health Observations
BRST	⊠ ⊠ ∴	23	

FINAL FIELD PACKAGE: P ____ OF ____



Legend

Point

N

AVE1227 pdf

Date 2021-06-22

Point

Name	Description	Attachment	Latitude	Longitude	Altitude (m)	Date/Time
Point 8	North point	WIN_20210622_12_57_33_Pr WIN_20210622_12_57_39_Pr	45.34647400	-75.44961367	77.40	2021-06-22 12:57
Point 7	norh end	WIN_20210622_12_56_17_Pr WIN_20210622_12_56_22_Pr	45.34622833	-75.44947617	79.90	2021-06-22 12:56
Point 6	water starts at confluence	WIN_20210622_12_51_55_Pr WIN_20210622_12_52_12_Pr	45.34611350	-75.44935950	83.50	2021-06-22 12:51
Point 5	North of confluence		45.34553250	-75.44912767	86.90	2021-06-22 12:48
Point 4	cross of swLE going east	WIN_20210622_12_46_38_Pr WIN_20210622_12_46_45_Pr WIN_20210622_12_46_51_Pr	45.34513000	-75.44889800	84.30	2021-06-22 12:46
Point 3	North mid point	WIN_20210622_12_44_18_Pr WIN_20210622_12_44_24_Pr	45.34485850	-75.44876683	76.90	2021-06-22 12:43
Point 2	South mid swale	WIN_20210622_12_41_50_Pr WIN_20210622_12_41_56_Pr	45.34435100	-75.44847867	78.80	2021-06-22 12:41
Point 1	Start of swale	WIN_20210622_12_39_18_Pr WIN_20210622_12_39_37_Pr	45.34389283	-75.44823917	79.10	2021-06-22 12:38

Point 8 images (2)

WIN_20210622_12_57_39_Pro.jpg

WIN_20210622_12_57_33_Pro.jpg

Point 7 images (2)

WIN_20210622_12_56_22_Pro.jpg

WIN_20210622_12_56_17_Pro.jpg

Point 6 images (2)

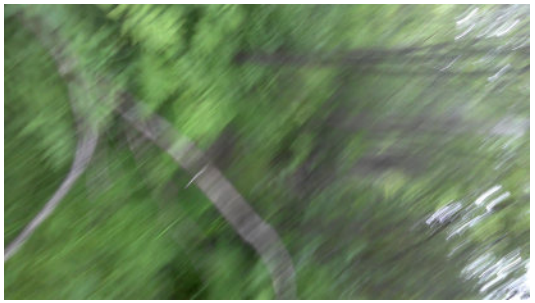
WIN_20210622_12_52_12_Pro.jpg

WIN_20210622_12_51_55_Pro.jpg

Point 4 images (3)

WIN_20210622_12_46_51_Pro.jpg

WIN_20210622_12_46_45_Pro.jpg



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Point 3 images (2)

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WIN_20210622_12_44_18_Pro.jpg

Point 2 images (2)

WIN_20210622_12_41_56_Pro.jpg

WIN_20210622_12_41_50_Pro.jpg

Point 1 images (2)

WIN_20210622_12_39_37_Pro.jpg

WIN_20210622_12_39_18_Pro.jpg