RURAL RESIDENTIAL DEVELOPMENT

2727 CARP ROAD
CITY of OTTAWA

Headwaters Report

Prepared for:

1384341 ONTARIO LTD
9094 Cavanagh Road
Ashton ON K0A 1B0

Prepared by:
Bowfin Environmental Consulting Inc.
168 Montreal Road
Cornwall, Ontario
K6H 1B3

and

Muncaster Environmental Planning Inc.
491 Buchanan Cres.
Ottawa, Ontario
K1J 7V2

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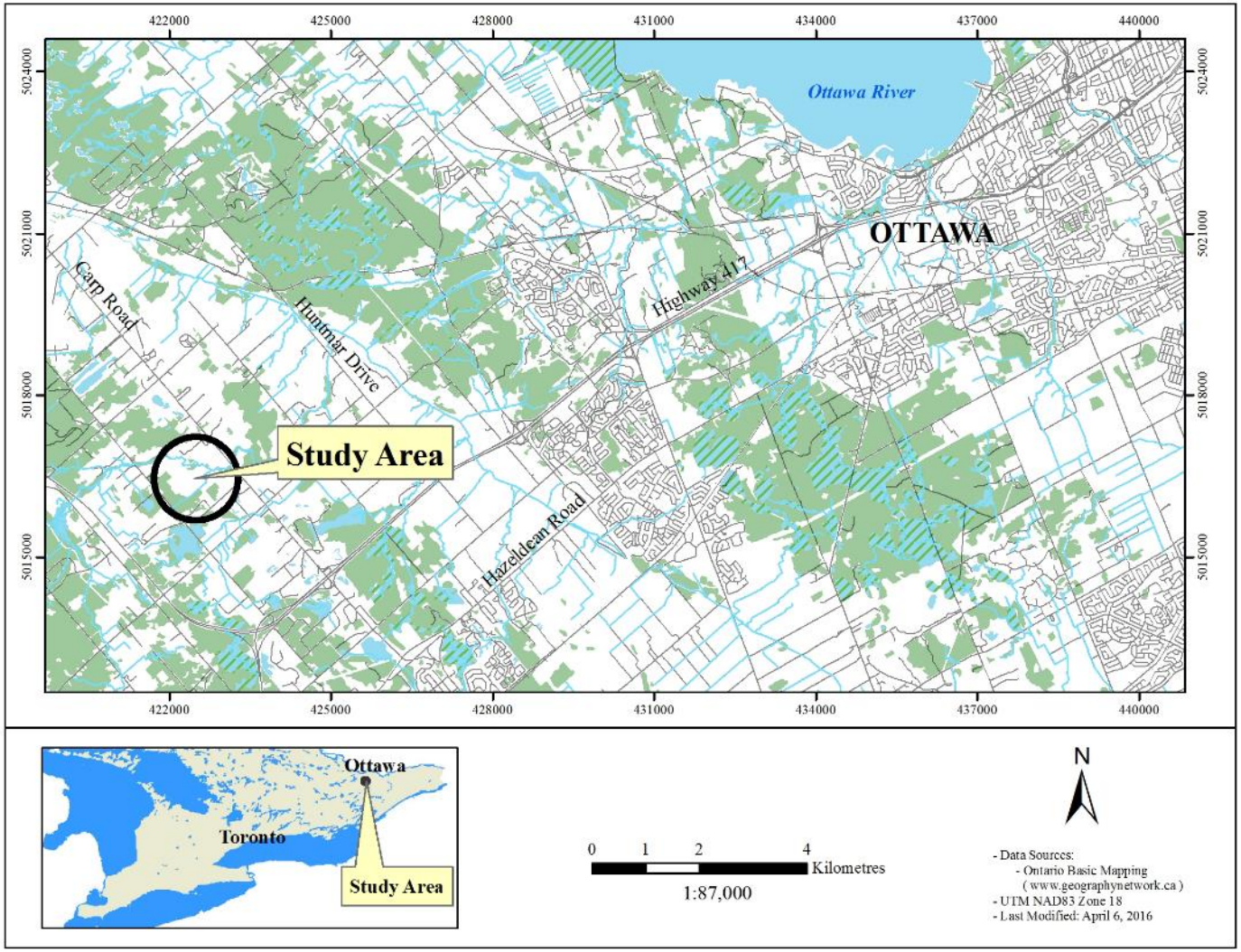
1.0 INTRODUCTION

The following report has been prepared by Bowfin Environmental Consulting (Bowfin) on behalf of the proponent and Muncaster Environmental Planning Inc. The approximately 77.6 hectares site is north of Cavanmore Drive, between William Mooney Drive and Carp Road in the Rural Area of the City of Ottawa in parts of Lot 7 and 8 Concession 3 of the Geographic Township of Huntley, Ottawa, Ontario (Figure 1 and Figure 2). Seventy-eight rural residential lots are proposed for the site, with three commercial blocks on the west side of Carp Road. The existing land use is dominated by agricultural lands (crops), with mixed and coniferous forests in the west portion. The adjacent lands include low density residential areas to the south, east and north, with forested area in between and some commercial areas to the west. A trailer storage yard was developed in the east portion of the site to the west of Carp Road in 2016.

This report provides a summary of the findings along with an evaluation of the headwaters as per the *Evaluation, Classification and Management of Headwater Drainage Features Guidelines* created by Credit Valley Conservation and Toronto Region Conservation (July 2013, updated January 2014).

Figure 1 Location of Study Area



2.0 METHODOLOGY

The field work included habitat assessment, fish community sampling, amphibian surveys and headwater assessments completed from April 2016 to August 2016.

2.1 Review of Background Information

The review of background information was conducted to identify potential environmental concerns and to augment the data collected during the site visit. Background information regarding fish species was searched for using the Natural Heritage Information Centre (NHIC) databases.

2.2 Habitat Description

The fish habitat features within the study area was described based on the *Ontario Stream Assessment Protocol*. Information on the channel morphology was collected (channel width, wetted width, bankfull and wetted depths, cover type and abundance, and substrate type). The location of specific features mentioned in the text is shown on Figure 2.

2.3 Fish Community Sampling

Fish community sampling was performed to document the use of the site by fish during the spring. The community was sampled by electrofishing and dip netting where appropriate.

2.4 Headwater Drainage Features

The headwater drainage features within the study area were assessed based on the *Evaluation, Classification and Management of Headwater Drainage Features* (hereafter referred to as the Guidelines) (prepared by Credit Valley Conservation Authority and Toronto and Region Conservation, revised January 2014). The Guideline is divided into three parts. Part 1 is the Evaluation and discusses various suggested study designs/methods. Part 2 determines the appropriate Classification following the outcome of Part 1. Finally, Part 3 outlines the Management Recommendations.

2.5 Amphibian Surveys

Nighttime amphibian calling surveys are being completed as per the *Environment Canada Marsh Monitoring Program* (MMP) guide. The protocol is summarized below:

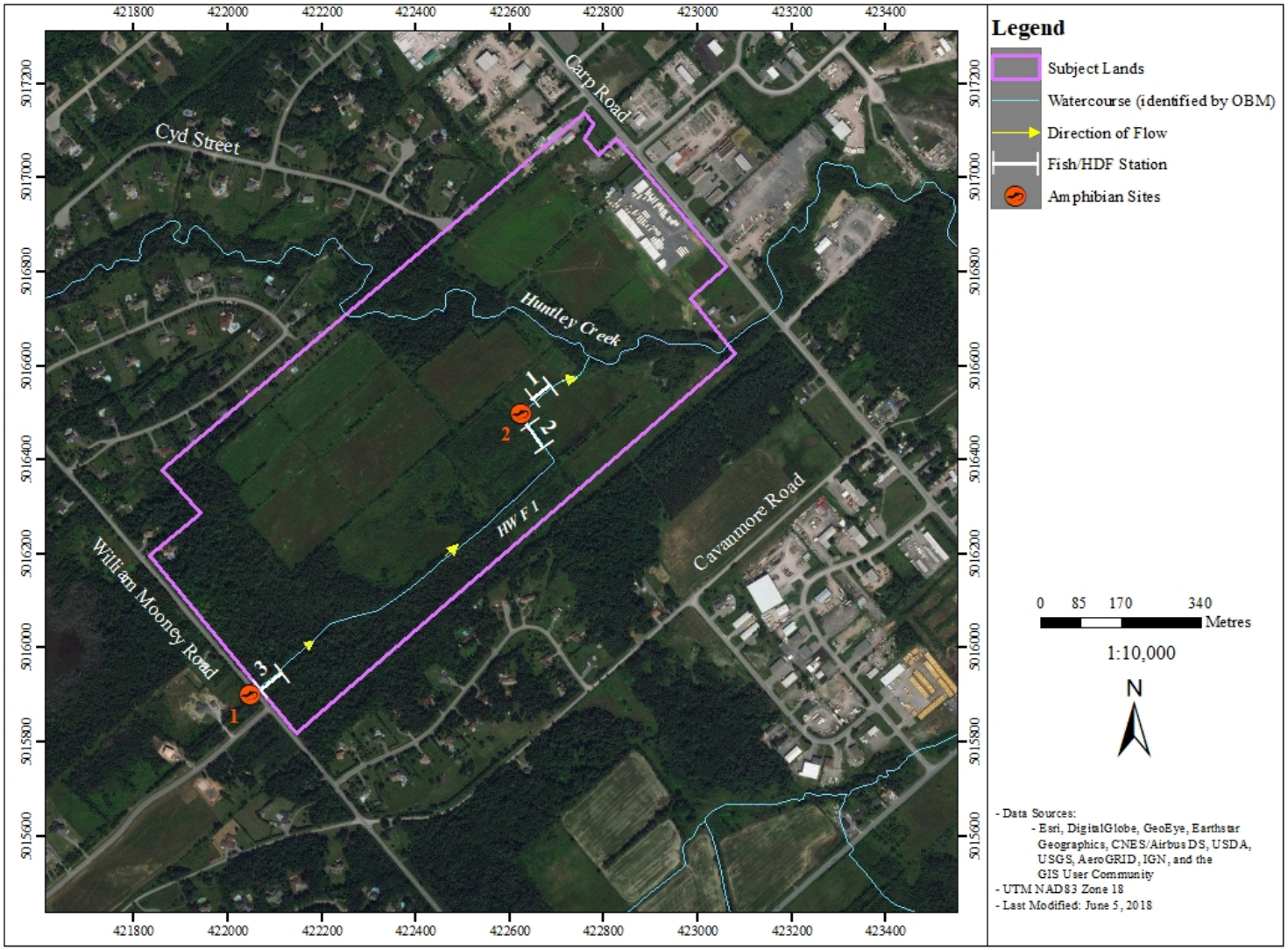
- The surveys were completed 3 times during the spring and early summer (once during each of the three survey periods to collect data on all species)
- Observations began 30 minutes after sunset and ended before midnight;

- Each station was surveyed for 3 minutes during which time the species and the calling code were recorded for each of the following distances: 0-50m, 50-100m, and >100m. Additional notes were taken on whether amphibians were in the feature being assessed. The calling codes were recorded as one of:
    - Code 1: Calls not simultaneous, number of individuals can be accurately counted
    - Code 2: Some calls simultaneous, number of individuals can be reliably estimated
    - Code 3: Full chorus, calls continuous and overlapping, number of individuals cannot be reliably estimated
- Surveys were only conducted if the wind strength was Code 0, 1, 2 or 3 on the Beaufort Wind Scale.
- Amphibian survey stations were separated by at least 500 m.

All surveys include the recording of the following information:

- Date
- Name of observer(s) conducting field work
- Time (start and end time, duration)
- Weather conditions (temperature, % cloud cover, wind)
- GPS location
- Species presence and abundance information

Figure 2 Location of Headwater Features and Survey Stations



3.0 RESULTS

3.1 Site Investigations

3.1.1 Summary of Visits and Sampling Site Locations

Several visits were completed between April 2016 and August 2016. Fish community sampling was completed during the spring (May 4, 2016). No fish sampling was completed in the summer of 2016 due to a lack of water. Amphibian surveys were completed during the spring of 2016. Environmental conditions for each visit are described in Table 1 below.

Table 1 Summary of Dates, Times of Site Investigations

Date	Time (h)	Staff	Air Temperature (Min-Max) °C	Weather	Purpose
April 15, 2016	1315-1500	S. St. Pierre C. Fontaine	15.0 (-2.1-14.6)	Clear skies, light air	-Headwater Assessment
April 21, 2016	2115-2215	M. Lavictoire B. Pierson	17.0 (-0.6-22.8)	Clear skies, light air	-Amphibian Survey
May 2, 2016	0945-1200	B. Pierson C. Fontaine	8.0-9.0 (2.4-9.3)	Clear skies, light air	- Headwater Assessment
May 4, 2016	1015-1130	M. Lavictoire S. St. Pierre	10.0-12.0 (3.3-15.1)	95% cloud cover, light breeze	- Fish Sampling
May 18, 2016	2215-2300	S. St. Pierre C. Fontaine	12.0-13.0 (5.2-17.4)	35% cloud coverage, light air	- Amphibian Survey
June 16, 2016	2245-2330	S. St. Pierre C. Fontaine	18.0-19.0 (11.9-28.8)	Clear skies, light air	-Amphibian Survey
August 11, 2016	0730-0845	S. St. Pierre C. Fontaine	24.0-25.0 (19.0-34.4)	10% cloud cover, light breeze changing to 10% cloud cover, light air	- Headwater Assessment - Fish Habitat and Community Assessment

M. Lavictoire – Michelle (Nunas) Lavictoire – B.Sc. Wildlife Biology, M.Sc. Natural Resources
S. St. Pierre – Shaun St. Pierre – B. Sc. Biology and Fisheries and Wildlife Technologist
B. Pierson—Brittney Pierson—Honours B.Sc. Biology and Environmental Science
C. Fontaine - Cody Fontaine - Fisheries and Wildlife Technologist

*Min-Max Temp Taken From: Environment Canada. National Climate Data and Information Archive. Ottawa INTL, Ontario. Moon Visibility Taken From: Time and Date. Moonrise, Moonset, and Phase Calendar. Ottawa. Available http://climate.weatheroffice.gc.ca/ [May 31, 2018]

3.2.2 Habitat and Fish Community Descriptions

The following sections provide information on the aquatic habitat and fish communities collected in 2016. A total of one headwater feature (HWF) with three individual stations are described herein. The headwater feature was walked in its entirety. Three stations were established within HWF 1 in a representative area.

Aquatic Habitat and Fish Community Sampling Results

Note that the aquatic habitat descriptions were completed in August 2016. Additional information on the presence of flow is provided with the spring notes and in the hydrological assessment of this report further below.

Headwater Feature 1 (HDF 1)

This feature enters Huntley Creek, approximately 5 km upstream of the confluence with the Carp River. The total length of HDF 1 is estimated at approximately 2.3 km, with 1.1 km within the subject lands. The feature generally flows in a southwest to northeast direction. The adjacent habitats consisted of a mixture of meadow, scrubland and forested areas. The channel was straight at the time of the visits. Three stations were established within this headwater feature.

Station 1

Station 1, flowing southwest to northeast, started 108 m upstream from confluence of Tributary 1 and was 50 m in length. The average channel width was 4.8 m and the headwater feature was dry during the August visit. The average wetted widths during the two spring flow visits were: 5.7 m and 3.6 m. The average water depths during these same visits were: 6.7 cm and 7.8 cm.

The substrate consisted of fines. In-water cover was provided by aquatic vegetation. These species included: purple loosestrife, grass-leaved goldenrod and scouring rush. A few areas containing large woody debris were noted. This station had no canopy cover. No signs of erosion were noted.

The top of the banks were fully vegetated with herbaceous vegetation and woody species. The most common species were: Canada goldenrod, bird's-foot trefoil, wild carrot, Bebb's willow, pussy willow, silver willow, white ash and eastern cottonwood.

During the spring fish sampling completed on May 4, the station was shocked for 265 seconds over an area of approximately 100 m^2. The average wetted width and water depth obtained were 2.0 m and 10 cm (range 3-24 cm), respectively. One brook stickleback was captured (size: 52 mm).

No sampling was completed during the summer of 2016 due to lack of water.

Photo 1 Station 1 looking downstream from the upstream end (April 15, 2016)

Photo 2 Station 1 looking downstream from the upstream end (August 11, 2016)

Station 2

Station 2, flowing southeast to northwest, started 47 m upstream of Station 1 and was 63 m in length. The average channel width was 2.5 m and the headwater feature was dry during the summer. The average wetted widths during the two spring flow visits were: 1.1 m and 0.8 m. The average water depths during these same visits were: 9.6 cm and 8.3 cm.

The substrate consisted of fines. In-water cover was provided by aquatic vegetation. These species included: purple loosestrife, grass-leaved goldenrod and scouring rush. This station had poor canopy cover. No signs of erosion were noted.

The top of the banks were fully vegetated with herbaceous vegetation and woody species. The most common species were: Canada goldenrod, bird's-foot trefoil, wild carrot, Bebb's willow, pussy willow, silver willow, white ash and eastern cottonwood.

During the spring fish sampling visit on May 4th, the station was shocked for 169 seconds over an area of approximately 42 m^2. The average wetted width and water depth obtained were 0.7 m and 6 cm (range 4-12 cm), respectively. No fish were observed or captured.

No sampling was completed during the summer of 2016 due to lack of water.

Photo 3 Station 2 looking upstream from the downstream end (April 15, 2016)

Photo 4 Station 2 looking upstream from the downstream end (August 11, 2016)

Station 3

Station 3, flowing southwest to northeast, started 17 m from William Mooney Road and was 55 m in length. The average channel width was 2.5 m and the headwater feature was dry during the summer visit. The average wetted widths during the two spring flow visits were: 2.0 m and 1.7 m. The average water depths during these same visits were: 6.3 cm and 5.0 cm.

The substrate consisted of fines. The in-water cover consisted of aquatic vegetation with a section containing no in-water cover. These species included: spotted joe-pye weed, bittersweet nightshade and common water plantain. Areas of large and small woody debris were noted. This station had moderate to full canopy cover. There were no signs of erosion.

The top of the banks were partially vegetated with herbaceous vegetation and the occasional woody species. The most common species were: grasses, ostrich fern, spotted jewelweed, common buckthorn, prickly ash, sugar maple, American elm and white birch.

During the spring fish sampling visit on May 4, the station was shocked for 309 seconds over an area of approximately 83 m^2. The average wetted width and water depth obtained were 1.5 m and 5 cm (range 4-14 cm), respectively. No fish were observed or captured.

No sampling was completed during the summer of 2016 due to lack of water.

Photo 5 Station 3 looking downstream from upstream end (April 15, 2016)

Photo 6 Station 3 looking upstream from the downstream end (August 11, 2016)

4.0 HEADWATER DRAINAGE FEATURES ASSESSMENT

4.1 Classification

4.1.1 Step 1: Hydrology Classification

In Step 1 the flow is classified based on the amounts recorded during the three visits. The amount of rainfall in the seven days prior to each field visit is provided in Table 3. The flow analysis is summarized in Table 4 (as per OSAP S4.M10).

A summary of the water temperatures and other parameters collected at the stations during 2016 is provided in Table 2. To put the water levels witnessed in 2016 into context, a review of the snow melt, flood and drought status during the field season is provided. The snow pack of winter 2015-2016 melted prior to ice off resulting in low peak flows in 2016. This was followed by a heavy snow storm at the start of April and cold air temperatures through to mid-April. Thin layers of ice were present on slow flowing channels in the mornings until after April 15th.

Mississippi Valley Conservation Authority issued a water safety statement during the spring (March 11). The water level conditions returned to normal by March 18, 2016. A flood watch was issued on April 18th and continued until May 17th.

Air temperatures returned to nearer normal but there was little rainfall in May.

Table 2 Features and Sampling Parameters

Station No.	Date	Purpose	Time (h)	Air Temp (°C)	Water Temp (°C)	pH	TDS (ppm)	Conductivity (µs)	Ave. Depth (cm)	Ave. Wetted Width (m)	Ave. Channel Width (m)
Station 1											
1	April 15, 2016	Flow	1401	15.0	11.0	8.06	416	620	6.7	5.66	4.82
	May 2, 2016	Flow	1024	9.0	8.8	8.56	477	694	7.8	3.60	
	May 4, 2016	Fish	1105	12.0	12.2	8.25	490	680	9.9	2.0	
	August 11, 2016	Flow/Habitat	0812	25.0			**				
Station 2											
2	April 15, 2016	Flow	1407	15.0	9.0	8.37	421	560	9.6	1.1	2.5
	May 2, 2016	Flow	1031	9.0	8.8	N/A	N/A	N/A	8.3	0.8	
	May 4, 2016	Fish	1117	12.0	10.4	8.52	497	712	6.0	0.7	
	August 11, 2016	Flow/Habitat	0825	25.0			**				
Station 3											
3	April 15, 2016	Flow	1420	15.0	13.5	8.19	383	558	6.3	2.0	2.45
	May 2, 2016	Flow	1007	8.0	8.4	8.06	483	636	5.0	1.7	
	May 4, 2016	Fish	1032	10.0	10.3	7.80	433	632	4.8	1.5	
	August 11, 2016	Flow/Habitat	0750	24.0			**				

**dry

Table 3 Summary of Rainfall for the 7 Days Preceding the Flow Surveys

Dates	Total Rainfall (mm)
April 8, 2016 to April 14, 2016	11.8
April 25, 2016 to May 1, 2016	6.4
August 4, 2014 to August 10, 2016	0.0

Total Rainfall taken from: Environment Canada. 2014. National Climate Data and Information Archive – Ottawa INTL. On-line (http://climate.weatheroffice.gc.ca) accessed April 9, 2018.

The HWF contained substantial surface water flow during the spring freshet visit and the second spring visit but were dry by the summer visit. The third visit was delayed until August, as there was a drought in 2016. The intent was to wait for a rain event in July-early August to mitigate the dry conditions. No rain events occurred.

Based on the flows, hydrology classification options were Valued or Contributing. Valued was chosen as all continued to have substantial flows during the second spring visit.

Table 4 Hydrology classification features using data from OSAP S4.M10.

HWF	Definitions of Flow Influence	Flow Conditions	Feature Type Code	Hydrology Classification
HWF 1/ Station 1	Spring Freshet or rainfall events Late April-May	Surface flow substantial (5)	Channelized or Constrained (2)	Valued
	July-August	No surface water (1)	Channel banks are visible and there is evidence that the stream has been historically dredged/straightened.	
HWF 1/ Station 2	Spring Freshet or rainfall events Late April-May	Surface flow substantial (5)	Channelized or Constrained (2)	Valued
	July-August	No surface water (1)	Channel banks are visible and there is evidence that the stream has been historically dredged/straightened.	
HWF 1/ Station 3	Spring Freshet or rainfall events Late April-May	Surface flow substantial (5)	Channelized or Constrained (2)	Valued
	July-August	No surface water (1)	Channel banks are visible and there is evidence that the stream has been historically dredged/straightened.	

4.1.2 Step 2: Riparian Classification

In Step 2 the riparian habitat is classified based on the width and type of vegetation on the banks. These are summarized in Table 5.

Table 5 Riparian Classification

HWF	OSAP S4.M10 Code	Riparian Classification	Comments
HWF 1/ Station 1	4 (Meadow)	Valued	The riparian habitat along the banks consisted entirely of meadow.
HWF 1/ Station 2	-West Side 6 (Forest) 5 (Scrubland) -East Side 4 (Meadow) 5 (Scrubland)	Important	The west bank contained forest for the first 0-1.5m then changed to scrubland. The east bank contained meadow for the first 0-1.5m then changed to scrubland.
HWF 1/ Station 3	6 (Forest)	Important	In the subject lands the feature is surrounded by forest

4.1.3 Step 3: Fish and Fish Habitat Classification

The fish habitat is classified based on fish observations during the spring and summer. Features that provide habitat for species at risk or critical (spawning) habitat would be considered the most significant.

The downstream section of HDF 1 (station 1), contained a single brook stickleback during the spring sampling. Based on the Guidelines, this would result in a Valued Function. Though with the chocked habitat and only a single specimen this ranking is questionable.

No Species at Risk (SAR) were present or anticipated.

Table 6 Fish and Fish Habitat Classification

HWF	Spring Results	Summer Results	Classification
HWF 1/ Station 1	1 brook stickleback	Dry	Valued
HWF 1/ Station 2	No fish	Dry	Contributing
HWF 1/ Station 3	No fish	Dry	Contributing

4.1.4 Step 4: Terrestrial Habitat Classification

This step is more of a classification of amphibian habitat than of the terrestrial habitat. According to the guidelines, only those features associated with wetland habitats can be considered Important or Valued. Features classed as Contributing are those that may or do provide a linkage between habitat for wildlife movement and Limited is given to those that do not meet any of the above criteria.

The MMP amphibian monitoring protocol was followed with the extra step of identifying whether amphibians were calling from the specific feature or not. Details are provided in Appendix A.

Table 7 Terrestrial Habitat Classification

HWF	OSAP S4.M10 Code	Marsh Monitoring Protocol Calling Code	Comments	Classification
HWF 1	Station 1- 4 (meadow) Station 2- -West Side 6 (Forest) 5 (Scrubland) -East Side 4 (Meadow) 5 (Scrubland)	3	During the first visit, there were many frogs calling in the feature, and in second visit there were a few frogs calling in the feature.	Limited
	Station 3- 6 (Forest)	0	No calls within the feature.	Limited

4.3 Part 3 – Management Recommendations

The management recommendations are grouped into six categories: protection, conservation, mitigation, maintain recharge, maintain/ replicate terrestrial linkage, and no management required.

The presence of important riparian habitat and valued fish habitat at the downstream section of HDF 1 results in a management recommendation of Conservation. The lack of fish and amphibians at the other stations but the presence of important riparian habitat leads to Conservation.

Table 8 Evaluation, Classification and Management Summary

Drainage Feature Segment	Hydrology Classification	Fish and Fish Habitat Classification	Riparian Classification	Terrestrial Habitat Classification	Management Recommendation
HWF 1/ Station 1	Valued	Valued	Valued	Limited	Conservation
HWF 1/ Station 2	Valued	Contributing	Important	Limited	Conservation
HWF 1/ Station 3	Valued	Contributing	Important	Limited	Conservation

5.0 SUMMARY

One headwater feature was observed on the site, flowing west to east to Huntley Creek. The feature was visited multiple times. Information collected on the feature is summarized below:

- Feature was channelized.
- There was substantial flow during the first two visits and dry in the summer.
- One brook stickleback was captured at Station 1. No fish upstream.
- No wetlands were along the channel.
- Upstream of station one the riparian included scrubland and forest.

Based on these outcomes, the conditions were classed as:

- Hydrology: Valued
- Riparian: Valued to Important
- Fish: Valued (one brook stickleback in spring) (no fish captured upstream of Station 1 but no barriers to fish noted)
- Terrestrial: Limited

Using these conditions, the feature is found to have a management recommendation of Conservation. The management implications of Conversation signify that the following options are available (as described in the guideline):

1. The channel may be maintained, relocated or enhanced. It is noted that should the channel be relocated then it is to be done using natural channel design.
2. The groundwater or wetland contribution is to be maintained or replicated. If the catchment drainage will be removed as part of the development then the function should be restored through enhancement of lot level control (i.e. restore original catchment using clean roof drainage), as feasible
3. Maintain or replace on-site flows using mitigation measures and/or wetland creation, if necessary.
4. Maintain or replace external flows
5. Drainage feature must connect to downstream

Appendix A - Summary of Channel Form

Watercourse	Average Bank Height (cm)	Bank Width (m)	Channel Stability	Morphology	Channel Slope	Bank Material	Substrate Material	Discharge points, seeps, tile drain outlet, etc.	Width and Depth of Associated Storage
HWF 1/ Station 1	18	4.82	No signs of erosion	Dry	1°	Fines	Fines	No evidence	No wetlands are located along this channel.
HWF 1/ Station 2	24	2.52	No signs of erosion	Dry	0.5°	Fines	Fines	No evidence	No wetlands are located along this channel.
HWF 1/ Station 3	24	2.45	No signs of erosion	Dry	0.5°	Fines	Fines	No evidence	No wetlands are located along this channel.

Appendix B - Amphibian Survey Results

HWF	Site	Visit 1 (Species, #) April 21, 2016			Visit 2 (Species, #) May 18, 2016			Visit 3 (Species, #) June 16, 2016		
		Distance from Site								
		50m	50-100m	>100m	50m	50-100m	>100m	50m	50-100m	>100m
HWF 1	**A2**	WOFR 4 SPPE 5	none	SPPE -FC	none	AMTO 1	SPPE 2	none	none	GRTR 3
HWF 1	**A1**	none	none	WOFR -FC SPPE -FC	none	none	AMTO 1 SPPE -FC	none	none	none

Green - In Feature
Red - Out of Feature
FC – Full Chorus

AMTO - American Toad
GRTR – Gray Treefrog
SPPE - Spring Peeper
WOFR - Wood Frog

Figure 3 Amphibian Results