Appendix F - Coldstream Creek

Associated Environmental

APPENDIX F

Okanagan Basin Water Board
Okanagan Nation Alliance
B.C. Ministry of Forests, Lands and Natural Resource Operations

Coldstream Creek

May 2016

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APPENDIX F

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APPENDIX F

1 Introduction

The purpose of this appendix is to provide information to support the application of recommended environmental flow needs (EFN)-setting methods for Coldstream Creek following the methods outlined in the accompanying report[1]. This document contains information obtained and collated by Associated Environmental Consultants Inc. (Associated) and will be revised following additional input from Okanagan Nation Alliance. A summary of current available information for Coldstream Creek is provided in Table 6-1 in the accompanying report and Table F-1 at the end of this appendix.

Section 5 in the accompanying report provides an overview of two recommended EFN-setting methods for tributaries within the Okanagan Basin, while Section 6 lists the key steps to implement each of the two methods, in both flowchart and text form.

Environmental flows have been previously recommended for Coldstream Creek by Koshinsky (1972) (Table 6-1 in the accompanying report); however, environmental flows have received minimal attention since that study.

2 Relevant Information for Setting Environmental Flow Needs

This section summarizes the information available to support EFN-setting in Coldstream Creek. Available information sources for Coldstream Creek are included within Table F-1 at the end of this appendix.

2.1 OVERVIEW OF THE WATERSHED

Coldstream Creek has a watershed area of approximately 206 km^2. Flowing south from Silver Star Provincial Park, Coldstream Creek discharges into Kalamalka Lake within the District of Coldstream. Coldstream Creek is characterised by steep headwaters, flowing onto a broad valley floor near the community of Lavington. Typical land use within the watershed includes agriculture and urban development in the lower watershed, and forestry and recreation in the upper portions of the watershed.

The Coldstream Creek watershed is shown in Figure 1-1 in the accompanying report.

2.2 STREAMFLOWS

2.2.1 Hydrometric Data

There is currently one active Water Survey of Canada (WSC) hydrometric station within the Coldstream Creek watershed:

[1] Associated Environmental Consultants Inc. (Associated). 2016. Collaborative Development of Methods to Set Environmental Flow Needs in Okanagan Streams. Working document, Current Version. Prepared for the Okanagan Basin Water Board, Okanagan Nation Alliance, and B.C. Ministry of Forests, Lands and Natural Resource Operations. May 2016.

- **Coldstream Creek above Municipal Intake** (WSC 08NM142; Drainage area: 60.6 km^2; Natural; Period of record: 1967-Present)

In addition, historic records are available from the following hydrometric stations within the watershed:

- **Coldstream Creek near Lavington** (WSC 08NM124; Drainage area: 61.9 km^2; Regulated; Period of record: 1959-1979)
- **Coldstream Creek at the Mouth** (WSC 08NM154; Drainage area: 205 km^2; Regulated; Period of record: 1969-1970)
- **Coldstream Creek above Kalavista Diversion** (WSC 08NM179; Drainage area: 207 km^2; Regulated; Period of record: 1970-1982)

2.2.2 Naturalized Streamflows

Figure 6-1 in the accompanying report highlights the necessity of producing hydrographs under natural conditions and under actual, licensed, and future proposed water use conditions. As part of the Okanagan Water Supply and Demand Project, net and naturalized flows were modelled for the majority of Okanagan tributaries (Summit 2010). Within the Okanagan Water Supply and Demand Project, Coldstream Creek is included within the Vernon Creek watershed (Node 12). Therefore, modelled net and naturalized flows are not available for Coldstream Creek. However, natural streamflows are recorded at Coldstream Creek above Municipal Intake (WSC 08NM142).

Phases 2 and 3 of the Okanagan Water Supply and Demand Project included modeling of multiple future scenarios for the Okanagan Basin, which considered projected climate change, population growth, change to irrigation efficiencies, and other factors. Net and naturalized streamflow outputs for Node 12 are available for each future scenario.

2.3 FISH AND AQUATIC HABITAT

Coldstream Creek contains both spawning and rearing habitat for rainbow trout and is one of the most prolific kokanee salmon spawning streams in the Okanagan (Aqua Resource Management Inc. 2001). The section of creek below the dam and settling pond at Coldstream Ranch serves as an extremely important area for spawning fish, especially for kokanee salmon migrating upstream from Kalamalka Lake (MOE 1982).

Ecoscape (2010) completed sensitive habitat inventory and mapping (SHIM) for Coldstream Creek. Fish habitat features were mapped throughout Coldstream Creek, as well as obstructions and barriers to fish migration.

Aqua Resource Management Inc. (2001) also documented a number of barriers to fish passage within Coldstream Creek. The most significant barriers included a spillway on Coldstream Ranch and culverts beneath Highway 6 and the CN railway

Since current (and potentially historic) aquatic habitat information is important for developing an EFN flow regime, it is recommended that up-to-date aquatic habitat information be obtained from publically available databases at the time of investigation.[2]

2.3.1 Current and Historical Fish Species Presence

Fish species found in Coldstream Creek include rainbow trout and kokanee salmon, as well as coarse fish (i.e., freshwater fish that are not salmonids) in the lower reaches (MOE 1982). MOE (1982) reported that rainbow trout inhabit the mainstem of Coldstream Creek at least as far upstream as 21.4 km from the mouth. The rainbow trout population is resident year-round in the stream, while below the settling pond at Coldstream Ranch, rainbow trout and kokanee salmon migrate upstream from Kalamalka Lake.

Since current (and potentially historic) fish presence information is important for developing an EFN flow regime, it is recommended that up-to-date fish presence information be obtained from publically available databases at the time of investigation.[3]

2.3.2 Fish Periodicity and Habitat Suitability

No stream-specific fish periodicity or habitat suitability indices have been determined for Coldstream Creek (Table 6-1 in the accompanying main report). However, Appendix E of the accompanying report provides information on salmonid species-specific life stage periodicities for the Okanagan Basin, as well as habitat suitability index (HSI) curves for select species. The information within Appendix E can be used at a minimum to support EFN-setting for Coldstream Creek.

2.4 WATER USE AND STORAGE

Greater Vernon Water (GVW) is the main water supplier in the Coldstream Creek watershed and obtains water from Deer Creek, a tributary to Coldstream Creek (Dobson 2008 [included in Summit 2010]). The North Okanagan Water Authority Master Water Plan provides information on water use and water storage within the Coldstream Creek watershed (AECOM et al. 2012).

Around the year 1900, streamflows within the upper watershed were diverted to supplement irrigation within the Coldstream / Lavington area. This diversion of the upper headwaters from east to west flows along the valley bottom for a few kilometers before joining with the existing creek bed at the junction of Brewer and Craster Creeks (Aqua Resource Management Inc. 2000).

2.4.1 Storage Reservoirs

GVW operates King Edward Lake Reservoir (1,356 ML), which is the only storage reservoir within the Coldstream Creek watershed (Dobson 2008).

[2] Aquatic habitat information, including fish barriers can be obtained from the Government of B.C. Habitat Wizard: http://www.env.gov.bc.ca/habwiz/.
[3] Fish presence information can be obtained from the Government of B.C. Fish Inventory Summary System Database Query: http://www.env.gov.bc.ca/fish/fiss/.

2.4.2 Water Licences and Major Points of Diversion

At present, there are 42 current water extraction licences within the Coldstream Creek watershed. Since knowledge of current water licences is critical in developing EFN flow regimes, it is recommended that up-to-date water licence information be obtained at the time of investigation.[4]

2.4.3 Interbasin Transfers

There are no direct diversions of water to or from the Coldstream Creek watershed.

2.5 GROUNDWATER AND SURFACE WATER INTERACTION

MOE (1982) reported that surface water and groundwater interactions within the Coldstream valley are locally significant to the streamflow and sediment regimes of lower Coldstream Creek. MOE (1982) also reported that there is no surface flow from late summer to early spring on the alluvial fans, which lead into the Coldstream valley from each of the upland basins. However, downstream of these fans, the mainstem of Coldstream Creek is reported to essentially be a groundwater-fed stream during the same period (MOE 1982).

2.6 TRADITIONAL KNOWLEDGE

The current version of this document does not include presentation of any Okanagan Nation Traditional Knowledge. However it is anticipated that a future revision will include such information, as well as potentially other technical information held by the Okanagan Nation Alliance Fisheries Department.

[4] Water Licence Information can be obtained from the Government of B.C. Water Licences Query: http://a100.gov.bc.ca/pub/wtrwhse/water_licences.input.

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Summit Environmental Consultants Inc. 2010. Okanagan Water Supply and Demand Project: Phase 2 Summary Report. Prepared for the Okanagan Basin Water Board, July 2010.

Table F-1 Summary of relevant information for setting environmental flow needs within the Coldstream Creek watershed

Information Source	Fish and Aquatic Habitat											Streamflow				Water Management																
	Current Fish Species Presence	Historic Fish Species Presence	Fish Periodicity Tables	Aquatic Habitat	Channel Characteristics	Channel Cross-Sections	Channel Velocity/Depth Measurements	Habitat Suitability Index	Fish Barriers (Natural/Man-made)	EFN Investigations / Recommended Fish Flows	Other Relevant Information	Streamflow Measurements	Water Quality / Temperature	Streamflow Estimates	Other Relevant Information	History of Water Management	Water License Points-of-Diversion Mapping	Water License Information	Water License – Conservation Storage/Flows	Water Purveyor Intakes	Groundwater Wells Mapping	Groundwater Information	Water Use Information (Actual/Estimated)	Return Flow Information	Land Use and Associated Water Supply Source	Interbasin/Intrabasin Transfers	Flow Regulation	Reservoir Flow Release Patterns	Reservoir Minimum Flow Releases	Other Relevant Information
Online Resources																																
B.C. Habitat Wizard (http://www.env.gov.bc.ca/habwiz/)	✓								✓																							
B.C. Ministry of Forests, Lands, and Natural Resource Operations – Dam Safety Program (http://www.env.gov.bc.ca/wsd/public_safety/dam_safety/). Contact: Mike Noseworthy, Dam Safety Officer (Penticton).																											✓				
B.C. Water Licences Query (http://a100.gov.bc.ca/pub/wtrwhse/water_licences.input)																		✓													
B.C. Water Resources Atlas (http://www.env.gov.bc.ca/wsd/data_searches/wrbc/)												✓	✓				✓			✓	✓	✓					✓				
B.C. Water Use Reporting Center (http://www.obwb.ca/tools/bc-water-use-reporting-centre/)												✓											✓								
B.C. Water Well Application (https://a100.gov.bc.ca/pub/wells/public/)																						✓									
DataBC (http://www.data.gov.bc.ca/)												✓	✓				✓	✓		✓	✓	✓					✓				
Fisheries Inventory Summary System (http://www.env.gov.bc.ca/fish/fiss/)	✓			✓																											
Okanagan Historical Society Reports (https://open.library.ubc.ca/#/collections/ohs)																✓															
Regional District of North Okanagan (http://www.rdno.ca/index.php/services/engineering/water/greater-vernon-water). Contact: Manager – Greater Vernon Water													✓	✓									✓		✓		✓	✓	✓	✓
Vernon Museum (http://vernonmuseum.ca/ex_history_of_coldstream_and_lavington.html)																✓															✓
Water Survey of Canada (https://www.ec.gc.ca/rhc-wsc/)												✓																			
Literature Resources																																
Western Water Associates Ltd., Polar Geoscience Ltd., and ESSA Technologies Ltd. 2014. Okanagan Water Allocation Tool Plan. Prepared for the Okanagan Basin Water Board, May 2014.										✓																					
Summit Environmental Consultants Inc. 2013. Okanagan Hydrologic Connectivity Model: Summary Report. Prepared for the Okanagan Basin Water Board, May 2013.														✓	✓			✓													

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Ecoscape Environmental Consultants Ltd. 2012. Kalamalka Lake Aquatic Habitat Index. Prepared for the Okanagan Collaborative Conservation Program, December 2012.	✓			✓							✓														✓						
Epp, P. 2012. HSI tables in Microsoft Excel Files: Glide Habitat Template and Riffle Habitat Template.								✓																							
Larrat Aquatic Consulting Ltd. 2011. Source Assessment of the Regional District of North Okanagan – Greater Vernon Water Utility: North Kalamalka Lake Intake. Prepared for Greater Vernon Water Utility, September 2011.												✓	✓																		
DHI Water and Environment. 2010. Okanagan Basin Water Accounting Model. Prepared for the Okanagan Basin Water Board, November 2010.															✓																
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TRUE Consulting Group. 2009. Coldstream Agriculture Plan – Planning Strategy. July 2009.																									✓						✓
B.C. Ministry of Environment. 2009. Okanagan Stream Trend Monitoring Program – Coldstream Creek Summary Report 2009. Environmental Protection Division.													✓																		

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Anonymous. 1969. Coldstream Creek – Fish Habitat Survey. August 1969.				✓		✓																										