Appendix J - McLean Creek

Associated Environmental

APPENDIX J

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

McLean Creek

May 2016

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APPENDIX J

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APPENDIX J

1 Introduction

The purpose of this appendix is to provide information to support the application of recommended environmental flow needs (EFN)-setting methods for McLean 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 McLean Creek is provided in Table 6-1 in the accompanying report and Table J-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.

No environmental flows have been recommended for McLean Creek to date.

2 Relevant Information for Setting Environmental Flow Needs

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

2.1 OVERVIEW OF THE WATERSHED

McLean Creek has a watershed area of 63 km^2. McLean Creek is approximately 15.0 km long and is located in the south eastern portion of the Okanagan Valley (ONA 2006). The headwaters of McLean Creek originate on a steep valley side neighbouring the Shuttleworth Creek watershed. From the headwaters, McLean Creek flows through an agricultural plateau for approximately 2 km before discharging into Skaha Lake. Mclean Creek is the only significant tributary into Skaha Lake (other than the Okanagan River) (Matthews and Bull 2003).

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

2.2 STREAMFLOWS

2.2.1 Hydrometric Data

There are currently no active Water Survey of Canada (WSC) hydrometric stations within the McLean Creek watershed; however, historic records are available from the following hydrometric station:

[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

- **Mclean Creek near Okanagan Falls** (WSC 08NM005; Drainage area: 20.7 km^2; Natural; Period of record: 1921-1926).

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 Phase 2 of the Okanagan Water Supply and Demand Project, net and naturalized flows were modelled for the majority of Okanagan tributaries (Summit 2010). However, within the Okanagan Water Supply and Demand Project, the McLean Creek watershed was included within residual area E-11 (Node 54).[2] Modelled net and naturalized streamflows were estimated for the entire residual area E-11 for 1996-2006 (i.e., model calibration period), but not specifically McLean Creek (Summit 2010).

Natural streamflows were recorded at McLean Creek near Okanagan Falls (WSC 08NM005) for the period between 1921 and 1926. In addition, Phase 2 and 3 of the Okanagan Water Supply and Demand Project also included modeling of multiple future scenarios for the Okanagan Basin, which considered projected climate change, population growth, changes to irrigation efficiencies, and other factors. Net and naturalized streamflow outputs for residual area E-11 are available for each future scenario.

2.3 FISH AND AQUATIC HABITAT

Okanagan Nation Alliance (ONA) assessed fish barriers along McLean Creek, finding eight partial barriers, which included six beaver dams and two culverts (ONA 2006). In addition, ONA (2006) identified quality spawning habitat for salmon throughout McLean Creek. An overview of spawning habitat and spawning escapements for rainbow trout and kokanee salmon is provided in Technical Supplement IX: Fisheries and Wildlife in the Okanagan (Canada-British Columbia Okanagan Basin Agreement 1974).

No sensitive habitat inventory and mapping (SHIM) has been completed for McLean Creek (Table 6-1 in the accompanying main report).

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.[3]

2.3.1 Current and Historical Fish Species Presence

Matthews and Bull (2003) found both fluvial and adfluvial rainbow trout within McLean Creek, while ONA (2006) reported that 10,000 rainbow trout were transplanted into McLean Creek from the Summerland hatchery in 1948.

[2] The geographic location of residual areas and water use areas can be found on Figure 1.1 in Dobson (2008 [included in Summit 2010]), and Maps 1 and 3 of Summit (2010).
[3] Aquatic habitat information, including fish barriers can be obtained from the Government of B.C. Habitat Wizard: http://www.env.gov.bc.ca/habwiz/.

ESSA and Solander (2009) also reported that fish species within residual area E-11 (Section 2.2.1) include rainbow trout and kokanee salmon (ESSA and Solander 2009). Therefore, it would seem reasonable to assume that these fish species are present within McLean Creek.

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.[4]

2.3.2 Fish Periodicity and Habitat Suitability

No stream-specific fish periodicity or habitat suitability indices have been determined for McLean 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 should be used at a minimum to support EFN-setting for McLean Creek.

2.4 WATER USE AND STORAGE

No water use information specific to McLean Creek is available.

2.4.1 Storage Reservoirs

There are no storage reservoirs within the McLean Creek watershed.

2.4.2 Water Licenses and Major Points of Diversion

At present, there are 56 current water extraction licences within the McLean 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.[5]

2.4.3 Interbasin Transfers

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

2.5 GROUNDWATER AND SURFACE WATER INTERACTION

There is no information relevant to groundwater and surface water interaction within McLean Creek.

[4] 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/.
[5] 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.

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.

References

Canada-British Columbia Okanagan Basin Agreement. 1974. Technical Supplement IX: Fisheries and Wildlife in the Okanagan. Office of the Study Director, Penticton, B.C., March 1974.

ESSA Technologies Ltd. and Solander Ecological Research (ESSA and Solander). 2009. Instream Flow Analysis for the Okanagan Water Supply & Demand Project. Prepared for the Okanagan Basin Water Board.

Matthews, S., and C. J. Bull. 2003. Selection of a Focal Watershed for the Protection and Restoration of Fish Stocks and Fish Habitat in the Okanagan Region.

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Summit Environmental Consultants Inc. (Summit). 2009. Surface Water Hydrology and Hydrologic Modelling Study “State of the Basin” Report. Prepared for the Okanagan Basin Water Board as part of the Phase 2 Okanagan Water Supply and Demand Project.

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

Table J-1 Summary of relevant information for setting environmental flow needs within McLean 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. Orchard Museum (https://kelownamuseums.ca/museums/the-bc-orchard-industry-museum/)																✓																
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)																✓																
Water Survey of Canada (https://www.ec.gc.ca/rhc-wsc/)												✓																				
Literature Resources																																
Epp, P. 2012. HSI tables in Microsoft Excel Files: Glide Habitat Template and Riffle Habitat Template.								✓																								
Polar Geoscience Ltd. 2012. Projected Water Supply and Use in the Okanagan Basin (2011-2040) – Okanagan Basin Water Accounting Model Results. Prepared for the Okanagan Basin Water Board. March 2012. *Note: Several Excel spreadsheets (not attached to the report) are available from the author describing monthly water extraction, water use, and net and natural streamflow for all major tributaries in the Okanagan Basin.*															✓																	
Rayne, S., and K. Forest. 2010. Historical trends in annual water yields for the Okanagan Basin, British															✓																	

Information Source	Fish and Aquatic Habitat											Streamflow				Water Management															
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Columbia, Canada. Nature Proceedings: doi: 10.1038/npre.2010.4946.1																															
van der Gulik, T., Neilsen, D., and R. Fretwell. 2010. Agriculture Water Demand Model – Report for the Okanagan Basin. February 2010.																							✓		✓						
ESSA Technologies Ltd. and Solander Ecological Research. 2009. Instream Flow Needs Analysis for the Okanagan Water Supply and Demand Project. Prepared for the Okanagan Basin Water Board, November 2009.	✓		✓							✓																					
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.											✓																				
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Okanagan Nation Alliance. 2006. Survey of Barriers to Anadromous Fish Migration in the Canadian Okanagan Sub Basin. Prepared for Colville Confederated Tribes, March 2006.	✓			✓	✓				✓																						
Ptolemy, R. 2005. HSI Charts and Tables in Microsoft Excel File: WUP-HIS.								✓																							
Matthews, S., and C. J. Bull. 2003. Selection of a Focal Watershed for the Protection and Restoration of Fish Stocks and Fish Habitat in the Okanagan Region.	✓	✓																													
Northwest Hydraulic Consultants. 2001. Hydrology, Water Use, and Conservation Flows for Kokanee Salmon and Rainbow Trout in the Okanagan Lake Basin, B.C. Prepared for B.C. Fisheries, Fisheries Management Branch, August 2001.			✓							✓																					
Obedkoff, W. 2000. Interior Community Watershed Streamflow Inventory. Water Inventory Section, Resources Inventory Branch, March 2000.												✓		✓	✓																
Snowy River Resources Ltd. 2000. Fish Collection Permit Reports for 2000. Prepared for the B.C.	✓			✓	✓				✓																						

Information Source	Fish and Aquatic Habitat											Streamflow				Water Management															
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Ministry of Environment, Lands, and Parks, December 2000.																															
Barr, L.J. 1988. Okanagan Region Low Flow Estimates. Memorandum dated May 20, 1988. Ministry of Environment and Parks, Water Management Branch.												✓			✓																
Canada-British Columbia Okanagan Basin Agreement. 1974. Technical Supplement IX: Fisheries and Wildlife in the Okanagan. Office of the Study Director, Penticton, B.C., March 1974.		✓		✓							✓																				
Anonymous. 1969. Fish Habitat Surveys – Okanagan Lake Tributary Streams. December 1969.		✓		✓	✓							✓																			