WORKING DOCUMENT VERSION 1

Appendix O - Penticton Creek





APPENDIX O

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

Penticton Creek









May 2016



APPENDIX O

Table of Contents

SEC	TION		PAGE NO.
Tabl	e of Cor	ntents	i
1	Intro	duction	0-1
2	Rele	vant Information for Setting Environmental Flow Needs	0-1
	2.1	Overview of the Watershed	O-1
	2.2	Streamflows	O-1
	2.3	Fish and Aquatic Habitat	O-3
	2.4	Water Use and Storage	O-4
	2.5	Groundwater and Surface Water Interaction	O-5
	2.6	Traditional Knowledge	O-5
Refe	rences		



1 Introduction

The purpose of this appendix is to provide information to support the application of recommended environmental flow needs (EFN)-setting methods for Penticton Creek following the methods outlined in the accompanying report¹. 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 Penticton Creek is provided in Table 6-1 in the accompanying report and Table O-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 Penticton Creek by Koshinsky (1972), nhc (2001), and ESSA and Solander (2009) (Table 6-1 in accompanying report).

2 Relevant Information for Setting Environmental Flow Needs

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

2.1 OVERVIEW OF THE WATERSHED

Penticton Creek has a watershed area of approximately 180 km². The Penticton Creek watershed lies to the northeast of the City of Penticton and drains into Okanagan Lake at Penticton. The main tributaries to Penticton Creek include James, Reed, Municipal, Harris, and Steward Creeks. Land use activities in the lower watershed include agriculture and urban development, while forestry occurs in the upper portions of the watershed.

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

2.2 STREAMFLOWS

2.2.1 Hydrometric Data

There are currently three active Water Survey of Canada (WSC) hydrometric stations within the Penticton 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



- Two Forty Creek near Penticton (WSC 08NM240; Drainage area: 4.94 km²; Natural; Period of record: 1983-Present)
- Two Forty-One Creek near Penticton (WSC 08NM241; Drainage area: 4.5 km²; Natural; Period of record: 1983-Present)
- **Dennis Creek near 1780 Metre Contour** (WSC 08NM242; Drainage area: 3.73 km²; Natural; Period of record: 1985-Present)

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

- Greyback Lake at the Outlet (WSC 08NM169; Regulated; Period of record: 1970-1987)
- Penticton Creek Above Dennis Creek (WSC 08NM168; Drainage area: 35.5 km²; Regulated; Period of record: 1970-1999)
- Howard Creek near Penticton (WSC 08NM068; Regulated; Period of record: 1930-1930)
- Reed Creek near Penticton (WSC 08NM069; Regulated; Period of record: 1930-1930)
- Penticton Creek Below Harris Creek (WSC 08NM170; Drainage area: 153 km²; Regulated; Period of record: 1970-1981)
- Penticton Creek Lot 19 Diversion (WSC 08NM063; Regulated; Period of record: 1926-1954)
- Penticton Creek Above Diversion (WSC 08NM076; Natural; Period of record: 1936-1941)
- Penticton Creek main Diversion (WSC 08NM032; Regulated; Period of record: 1919-1966)
- Penticton Creek Below Diversion (WSC 08NM031; Regulated; Period of record: 1919-1921)
- Penticton Creek at the Mouth (WSC 08NM118; Drainage area: 177 km²; Regulated; Period of record: 1950-1972)

In addition, the City of Penticton operated two hydrometric stations within the watershed during 2007:

- Penticton Creek at Van Horne (Period of record: 2007-2007)
- Ellis Creek near the Mouth (Period of record: 2007-2007)

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. nhc (2001) and Summit (2009) provided naturalized streamflow estimates for Penticton Creek at the mouth. In addition, as part of the Okanagan Water Supply and Demand Project, net and naturalized flows were modelled for the majority of Okanagan tributaries, including Penticton Creek (Summit 2010). Figure 2-1 provides a summary of the modelled mean weekly net and naturalized streamflows for Penticton Creek at the mouth for 1996-2006 (i.e., the model calibration period).

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 Penticton Creek at the mouth are available for each future scenario.

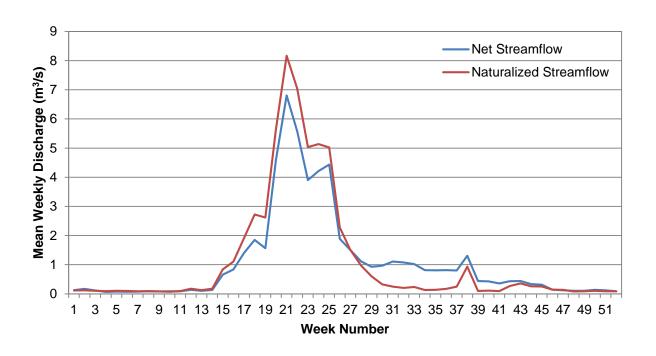


Figure 2-1

Mean weekly net and naturalized flows for Penticton Creek at the mouth, 1996-2006 (Summit 2010)

2.3 FISH AND AQUATIC HABITAT

There is limited information available on fish and aquatic habitat within Penticton Creek. Dobson (1998) completed a watershed assessment of the Penticton Creek watershed and provided an overview of channel characteristics for select reaches of Penticton Creek and its tributaries.

No sensitive habitat inventory and mapping (SHIM) has been completed for Penticton Creek (Table 6-1 in the accompanying main report). However, the City of Penticton is currently completing channel restoration along select sections of the creek (through the city) to improve flood protection and aquatic habitat.²

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

Aquatic habitat information, including fish barriers can be obtained from the Government of B.C. Habitat Wizard http://www.env.gov.bc.ca/habwiz/.



O-3

² More information on the Penticton Creek restoration project can be found at: http://www.penticton.ca/EN/main/community/vibrant-penticton/our-downtown/penticton-creek.html.
³ Aquatic habitat information, including fish barriers can be obtained from the Government of B.C. Habitat Wizard:

2.3.1 Current and Historical Fish Species Presence

Fish species found in Penticton Creek include rainbow trout, kokanee salmon, eastern brook trout, and longnose dace (ESSA and Solander 2009).

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 Penticton Creek (Table 6-1 in the accompanying main report). However, Appendix E of the accompanying report provides information on 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 Penticton Creek.

2.4 WATER USE AND STORAGE

The City of Penticton (CoP) is the main water supplier within the Penticton Creek watershed (Dobson 2008).

Summit (2010) provides an estimate of actual surface water use within the Penticton Creek watershed for 1996-2006 in Appendix C of the Okanagan Water Supply and Demand Project – Phase 2. The actual mean annual surface water use over 1996-2006 was estimated to be 2,893 ML. These water use estimates were subsequently included in the Okanagan Hydrologic Connectivity Model that was used to investigate 'first-intime, first-in-right' water licence legislation within the Okanagan Basin (Summit 2013).

2.4.1 Storage Reservoirs

CoP hold water licences from the province to store approximately 12,330 ML of water in Grayback Reservoir (DHI 2010).

2.4.2 Water Licences and Major Points of Diversion

The CoP has an intake on Penticton Creek approximately 3 km upstream from the mouth (Dobson 2008). In addition, the CoP also extracts water from Okanagan Lake (Dobson 2008).

At present, there are 29 current water extraction licences within the Penticton 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

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/.

2.4.3 **Interbasin Transfers**

There are no direct diversions of water into or out of the Penticton Creek watershed; however, stored and extracted water is distributed for domestic and irrigation purposes by the CoP between the Penticton Creek and Ellis Creek watersheds, as well as neighbouring land parcels (i.e., Residual areas E-9, E-10, and E-11) (Dobson 2008).6

2.5 **GROUNDWATER AND SURFACE WATER INTERACTION**

Summit (2009) identified that Penticton Creek likely loses water to groundwater and estimated that streamflow is lost to groundwater at a rate of 0.014 m³/s per km of channel on the alluvial fan (Section 3.6 of Summit 2009).

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.

http://a100.gov.bc.ca/pub/wtrwhse/water_licences.input.

The geographic location of the residual areas and water use areas can be found on Figure 1.1 in Dobson (2008), and Maps 1 and 3 in Summit (2010).



⁵ Water Licence Information can be obtained from the Government of B.C. Water Licences Query:

References

- DHI Water and Environment (Canada) (DHI). 2010. Okanagan Basin Water Accounting Model. Prepared for the Okanagan Basin Water Board. May 2010.
- Dobson Engineering Ltd (Dobson). 2008. Water Management and Use Study. Prepared for Okanagan Basin Water Board as part of the Phase 2 Okanagan Water Supply and Demand Project.
- Dobson Engineering Ltd. (Dobson). 1998. Watershed Assessment Report for the Penticton Creek Watershed. Prepared for Weyerhaeuser Canada Limited. October 1998.
- 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.
- Koshinsky, G. D. 1972. Estimates of Minimum Flow Requirements for Okanagan Tributary Streams for the Propagation of Salmonid Fish Species Endemic to the Main Lakes. March, 1972.
- Northwest Hydraulic Consultants (nhc). 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 Management Branch, Victoria, B.C.
- 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.
- Summit Environmental Consultants Inc. (Summit). 2013. Okanagan Hydrologic Connectivity Model: Summary Report. Prepared for the Okanagan Basin Water Board.

Table O-1 Summary of relevant information for setting environmental flow needs within Penticton Creek watershed

				Fis	sh and	l Aqua	tic Ha	bitat					Stream	mflow							W	ater M	lanage	ement						
Information Source	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/)																						✓								
City of Penticton (http://www.penticton.ca/). Contact: Public Works Director																✓				✓			✓				✓	✓	✓	✓
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																														
Grainger and Associates Consulting Ltd. and Streamworks Unlimited. 2010. Penticton Creek Hydrological Risk Assessment. Prepared for BC Ministry of Environment. November 2010.	✓				✓						✓		✓																	
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.										✓				✓	✓								✓				✓			

				Fis	sh and	Aquat	tic Ha	abitat					Strea	mflow							V	Vater N	/lanager	ment						
Information Source	Current Fish Species Presence	Historic Fish Species Presence	Fish Periodicity Tables	Aquatic Habitat	Channel Characteristics	Channel Cross-Sections	Channel Velocity/Depth Measurements	5	Fish Barriers (Natural/Man-made)	EFN Investigations / Recommended Fish Flows	Other Relevant Information	Ceromofilm Money on the	Streamnow 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
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.														√	✓															
Grainger, L. 2011. 2010 Fish Passage Culvert Assessments within Weyerhaeuser Operating Areas in the Okanagan Shuswap and Arrow Boundary Forest Districts: TSA 22, TSA 02, and TFL 59. Prepared for Weyerhaeuser Company Ltd., January 2011.				✓	✓				✓																					
Rayne, S., and K. Forest. 2010. Historical trends in annual water yields for the Okanagan Basin, British 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.																							✓		✓					
DHI Water and Environment. 2010. Okanagan Basin Water Accounting Model. Prepared for the Okanagan Basin Water Board, November 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.	✓		✓							✓																				
Polar Geoscience Ltd. 2009. Okanagan Basin Water Supplier Sources. Excel spreadsheet identifying water use areas in the Okanagan and the associated source(s) and water supplier. Digital file: Water supplier sources ver 15.xls.																✓				✓		✓	✓		✓					✓
Summit Environmental Consultants Ltd. 2009. Surface Water Hydrology and Hydrologic Modeling Study – "State of the Basin" Report. Prepared for the Okanagan Basin Water Board, September 2009. <i>Note: detailed spreadsheets supporting the findings of the report are available from the author.</i>											✓	√		✓	✓															
Golder Associates Ltd. and Summit Environmental Consultants Ltd. 2009. Groundwater Objectives 2 and 3 – Phase 2 Okanagan Water Supply and Demand Project. Prepared for the Okanagan Basin Water Board, July 2009.																						✓								
Dobson Engineering Ltd. 2008. Water Management and Use Study. Prepared for Okanagan Basin Water Board, December 2008.																✓	✓	✓	✓	✓			✓		✓	✓	✓	✓	✓	✓
Neilsen-Welch, L., and D. Allen. 2007. Groundwater and Hydrogeological Conditions in the Okanagan Basin, B.C. A State of the Basin Report. Prepared for the Okanagan Basin Water Board, December 2007.																						✓								

				Fis	sh and	d Aqua	ntic Ha	bitat					Strea	mflow							V	Vater N	<i>l</i> lanag	ement						
Information Source	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	ty /	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
Cohen, S., and T. Neale. 2006. Participatory Integrated Assessment of Water Management and Climate Change in the Okanagan Basin, British Columbia. Environment Canada and University of British Columbia, Vancouver.														√	√								✓							✓
Ptolemy, R. 2005. HSI Charts and Tables in Microsoft Excel File: WUP-HSI.								✓																						
City of Penticton. 2005. Water supply and distribution system information provided to L. Uunila of Summit Environmental Consultants Inc. by Brent Edge, Water Supervisor.																		✓					✓							
Schnorbus, M., Winkler, R., and Y. Alila. 2004. Modelling Forest Harvest Effects on Maximum Daily Peak Flow at Upper Penticton Creek. Extension Note 67.															✓															
Thyer, M., , Beckers, J., Spittlehouse, D., Alila, Y., and R. Winkler. 2004. Diagnosing a distributed hydrologic model for two high-elevation forested catchments based on detailed stand- and basin-scale data. Water Resources Research, Vol. 40, 1-20.														✓	✓															
Cohen, S., Neilsen, D., and R. Welbourn (eds.). 2004. Expanding the Dialogue on Climate Change & Waste Management in the Okanagan Basin, British Columbia. Final Report (January 1, 2002 to June 30, 2004). Environment Canada, Agriculture and Agri-Food Canada.														✓									✓							✓
Chara Consulting. 2004. Kokanee Stream Spawner Enumeration of the Okanagan Valley's Main Lakes, 2004.	✓																													
Winkler, R., Spittlehouse, D., Heise, D. A., Giles, T. R., and Y. Alila. 2003. The Upper Penticton Creek Watershed Experiment: A Review at Year 20. Water Stewardship: How Are We Managing? Annual Conference of the Canadian Water Resources Association, Vancouver, B.C., June 2003.												✓	✓	✓	✓															
Matthews, S., and C. J. Bull. 2003. Selection of Focal Watersheds for the Protection and Restoration of Fish Stocks and Fish Habitat in the Okanagan Region.	✓	✓																												
Mould Engineering. 2002. Lower Penticton Creek Strategic Restoration Plan. Prepared for Penticton Flyfishers, March 2002.					✓	✓				✓	✓			✓																
Dobson Engineering Ltd. 2001. Interim Restoration Plan for the Penticton Creek Watershed. Prepared for Weyerhauser Company Limited. February 2001.					✓						✓																			
Newbury, R. 2001. Letter report: Reconnaissance of Lower Penticton Creek for Restoration Potential, March 2001.					✓	✓					✓			✓																
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			✓							✓	✓	✓		✓																

				Fi	sh an	d Aqı	uatic I	Habita	at					Strear	nflow							V	Vater N	/ lanage	ement						
Information Source	Current Fish Species Presence	Historic Fish Species Presence	Fish Periodicity Tables	Aquatic Habitat	Channel Characteristics			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
Management Branch, August 2001.																															
Talayco, N. (ed.). 2001. Okanogan/Similkameen Subbasin Summary. Prepared for the Northwest Power Planning Council. Golder Associates Ltd. September 2001.												✓																			
Wildstone Engineering Ltd. 2001. Reconnaissance (1:20,000) Fish and Fish Habitat Inventory for Winters Creek Watershed, Wolfcub Creek Watershed, Shatford Creek Watershed, Selected Sub-Basins of Penticton Creek Watershed, Campin Creek Watershed, and Two-John Creek Watershed. Prepared for Weyerhaeuser Company Limited, Okanagan Falls, B.C., January 2001.	✓			√																											
Obedkoff, W. 2000. Interior Community Watershed Streamflow Inventory. Water Inventory Section, Resources Inventory Branch, March 2000.													✓		✓	✓															
Shepherd, B.G., and R. Ptolemy. 1999. Flows for Fish: Requirements for Okanagan Lake Tributaries (Draft). B.C. Ministry of Environment, Lands and Parks, Penticton, B.C. Note: there are several incomplete drafts of this document available on EcoCat. One should refer to most recent.										✓	✓			✓																	
Coulson, C. H., and W. Obedkoff. 1998. British Columbia Streamflow Inventory. B.C. Ministry of Environment, Lands, and Parks. March 1998.													✓			✓															
Dobson Engineering Ltd. 1998. Watershed Assessment Report for the Penticton Creek Watershed. Prepared for Weyerhaeuser Canada Limited. October 1998.					✓																										
Shepherd, B.G. 1993. Letter re: estimates of fisheries flow requirements for Penticton Creek for migration, spawning and incubation in 1993. Ecocat report ID 44475.											✓																				
McDougall, B., and Westbank Indian Band. 1992. Stream Enhancement and Habitat Inventory of Okanagan Lake Tributaries. Prepared for Westbank Indian Bank, B.C. Ministry of Environment, Lands and Parks, and B.C. Ministry of Aboriginal Affairs, October 1992												✓																			
B.C. Ministry of Environment and Ministry of Forests. 1991. Penticton Creek Integrated Watershed Management Plan.	✓				✓									✓	✓																
Barr, L.J. 1988. Okanagan Region Low Flow Estimates. Memorandum dated May 20, 1988. Ministry of Environment and Parks, Water Management Branch.													✓			✓															
Cheng, J.D. 1979. Low Flow Characteristics of Tributary Streams in the Okanagan Basin. Cohen, S. (ed.) and Kulkarni, T. (ed.). 2001. Water Management & Climate Change in the Okanagan Basin. Environment Canada & University of British Columbia.													✓			✓															
Wightman, J.C., and G.D. Taylor. 1978. Overview and rating of production capabilities and		✓								✓		✓																			

	Fish and Aquatic Habitat													Strear	nflow							٧	Vater N	/lanage	ement						
Information Source	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
enhancement opportunities for rainbow trout and kokanee in tributaries to upper Okanagan basin lakes. Fish Habitat improvement Section, Fish and Wildlife Branch, Ministry of Recreation and Conservation, Victoria, B.C.																															
Pinsent, M. E., Koshinsky, G. D., Willcocks, T. J., and J. O'Riordan. 1974. Fisheries and Sport Fish Potentials of the Okanagan Basin. Technical Supplement IX(A). Office of the Study Director, Penticton, BC.		✓										✓																			
Canada-British Columbia Okanagan Basin Agreement. 1974. Technical Supplement I: Water Quantity in the Okanagan Basin. Office of the Study Director, Penticton, B.C., March 1974.											✓					✓	✓				✓			✓		✓		✓			
Canada-British Columbia Okanagan Basin Agreement. 1974. Technical Supplement II: Water Quantity Computer Models. Office of the Study Director, Penticton, B.C., March 1974.															✓									✓							
Canada-British Columbia Okanagan Basin Agreement. 1974. Technical Supplement III: Water Quantity Alternatives and Supporting Water Quantity Data. Office of the Study Director, Penticton, B.C., March 1974.													✓				✓				✓										
Canada-British Columbia Okanagan Basin Agreement. 1974. Technical Supplement IV: Water Quality and Waste Loadings in the Okanagan Basin. Office of the Study Director, Penticton, B.C., March 1974.														✓																	
Canada-British Columbia Okanagan Basin Agreement. 1974. Technical Supplement VII: Value and Demand for Consumptive Use of Water in the Okanagan Valley. Office of the Study Director, Penticton, B.C., March 1974.																								✓							✓
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.		✓		✓								✓																			
Koshinsky, G. D. 1972. Estimates of Minimum Flow Requirements for Okanagan Tributary Streams for the Propagation of Salmonid Fish Species Endemic to the Main Lakes.												✓																			
Anonymous. 1969. Fish Habitat Surveys – Okanagan Lake Tributary Streams. December 1969.		✓		✓	✓								✓																		
Anonymous. 1969. Fisheries Habitat Survey for Penticton Creek, 24 July 1969 Ecocat Report 44039.		✓			✓									✓																	
Rodgers, R.R., and W.L. Kreuder. 1963. Water Supply and Water Use on Penticton and Ellis Creeks. Canada Department of Agriculture, Prairie Farm Rehabilitation Adminstration, Engineering Branch.															✓																
Anonymous. Undated. Okanagan Watershed Dscriptions for Chute Creek, Eneas Creek, Equesis Creek, Kelowna (Mill) Creek, Lambly Creek, Mission Creek, Naramata Creek, Naswhito Creek, Okanagan lake, Peachland Creek, Penticton Creek, Powers Creek, Robinson Creek, Shingle Creek, Similkameen River,	✓			✓	✓							✓		✓	✓																

				Fis	sh and	Aquat	ic Hab	itat					Stream	nflow							V	Vater N	/lanage	ement						
Information Source	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
Trepanier Creek, Trout Creek, Vaseux Creek, Vernon Creek. Ecocat Report ID 32362.																														