WORKING DOCUMENT VERSION 1

Appendix G - Equesis Creek





APPENDIX G

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

Equesis Creek









May 2016



APPENDIX G

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1 Introduction

The purpose of this appendix is to provide information to support the application of recommended environmental flow needs (EFN)-setting methods for Equesis 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 Equesis Creek is provided in Table 6-1 in the accompanying report and Table G-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 Equesis Creek by Koshinsky (1972), Shepherd and Ptolemy (1999), nhc (2001), and ESSA and Solander (2009) (Table 6-1 in the accompanying report).

2 Relevant Information for Setting Environmental Flow Needs

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

2.1 OVERVIEW OF THE WATERSHED

Equesis Creek has a watershed area of approximately 204 km². Equesis Creek flows from its headwaters at Pinaus Lake to the northwest arm of Okanagan Lake. There are several lakes in the watershed, including Lady King Lake, Pinaus Lake, Little Pinaus Lake, and Square Lake (Dobson 2001). Due to the steep topography of the watershed, land use is predominately forestry and there is a small amount of agricultural land present. Equesis Creek flows through Okanagan Indian Reserve No. 1 in the lower reaches.

The Equesis 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 Equesis Creek watershed; however, historic records are available from the following hydrometric stations:

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



- Ewer Creek near the Mouth (WSC 08NM176, Drainage area: 52.8 km², Natural; Period of record: 1971-1986)
- Equesis Creek near Vernon (WSC 08NM024; Drainage area: 179 km²; Regulated; Period of record: 1921-1926)
- Equesis Creek near the Mouth (WSC 08NM161; Drainage area: 199 km²; Regulated; Period of record: 1969-1982)

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. nhc (2001) and Summit (2009) provided naturalized streamflow estimates for Equesis 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 Equesis Creek (Summit 2010). Figure 2-1 provides a summary of the modelled mean weekly net and naturalized streamflows for Equesis 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 Equesis Creek at the mouth are available for each future scenario.

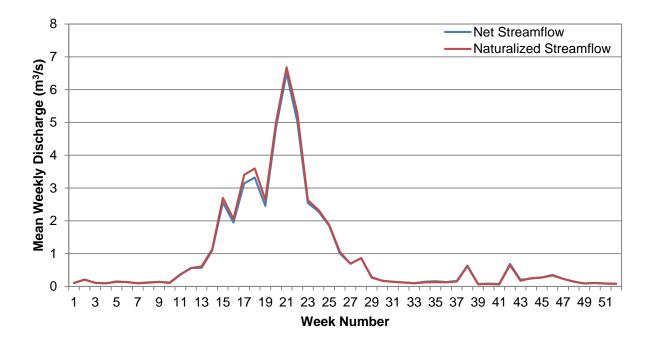


Figure 2-1
Mean weekly net and naturalized flows for Equesis Creek at the mouth, 1996-2006 (Summit 2010)

2.3 FISH AND AQUATIC HABITAT

Fisheries values within Equesis Creek are considered moderate (Swain 1994). Dobson (2001) completed an Interior Watershed Assessment for Equesis Creek watershed, providing information on channel conditions, fish barriers, and aquatic habitat. In addition, Dobson (2005) provided information on riparian vegetation and function along portions of the Equesis Creek channel and Wildstone Resources Ltd. (1997) provided information on fish habitat throughout portions of Equesis Creek.

Rainbow trout have been reported throughout the mainstem of Equesis Creek and have been identified to spawn in the lower reaches of the creek (Wildstone Resources Ltd. 1997). Kokanee salmon from Okanagan Lake have also been reported to spawn within the lower reaches of Equesis Creek (Wildstone Resources Ltd. 1997).

Summit (2000) identified four weirs on the lower mainstem of Equesis Creek that act as barriers to fish migration. In addition, Wildstone Resources Ltd. (1997) identified that the presence of beaver dams in the lower reaches of the creek limit kokanee salmon access to spawning habitat.

No sensitive habitat inventory and mapping (SHIM) has been completed for Equesis 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.²

2.3.1 Current and Historical Fish Species Presence

Fish species found in Equesis Creek include rainbow trout, kokanee salmon, prickly sculpin, and yellow perch (ESSA and Solander 2009). Pinaus Lake has been stocked with rainbow trout since 1949 and the stocked trout have been reported to spawn within two small tributaries to the lake, as well as within the outlet stream between Pinaus and Little Pinaus Lakes (Wildstone Resources Ltd. 1997).

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 Equesis 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

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/.



G-3

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/.

suitability index (HSI) curves for select species. The information within Appendix E should be used at a minimum to support EFN-setting for Equesis Creek.

2.4 WATER USE AND STORAGE

Summit (2010) provides an estimate of actual surface water use within the Equesis 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 5 ML.

2.4.1 Storage Reservoirs

The Okanagan Indian Band and the B.C. Ministry of Environment jointly manage Pinaus Lake to supplement streamflows downstream of the lake when required (Dobson 2008).

2.4.2 Water Licences and Major Points of Diversion

At present, there are 57 current water extraction licences within the Equesis Creek watershed. Since knowledge of current water licences is critical in developing EFN flow regimes, it is recommended that upto-date water licence information be obtained at the time of investigation.⁴

2.4.3 Interbasin Transfers

Although there are no direct diversions of water into or out of the watershed, the Okanagan Indian Band extracts water from Equesis Creek and distributes it not only in the Equesis Creek watershed, but also in Residual Area E-1 (Node 7) and Residual Area W-3 (Node 9) (Dobson 2008 [included in Summit 2010])⁵.

2.5 GROUNDWATER AND SURFACE WATER INTERACTION

nhc (2001) reports that Equesis Creek is potentially groundwater influent. However, Summit (2009) reports that there is likely no net loss or gain of streamflow to or from groundwater (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.

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.

⁵ 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).

References

- 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. 2001. Interior Watershed Assessment for Equesis Creek Watershed. Prepared for Tolko Industries Ltd., 2001.
- Dobson Engineering. 2005. Equesis Creek and Irish Creek Watersheds Hydrologic Assessment and ECA Evaluation. Prepared for Tolko Industries Ltd., March 2005.
- 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 Ltd. (nhc). 2001. Hydrology, Water Use and Conservation Flows for Kokanee Salmon and Rainbow Trout in the Okanagan Lake Basin, BC. Prepared for BC Fisheries, Fisheries Management Branch.
- 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.
- Summit Environmental Consultants. (Summit) 2000. Fish habitat and Passage Assessment for Six-mile Creek, Nashwhito and Whiteman Creeks. Prepared for the Okanagan Indian Band.
- Summit Environmental Consultants. (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. 2010. Okanagan Water Supply and Demand Project: Phase 2 Summary Report. Prepared for the Okanagan Basin Water Board, July 2010.
- Swain, L.G. 1994. Water Quality Assessment and Objectives for Tributaries to Okanagan Lake in the Vernon area. (Lower Vernon, Equesis, and Deep Creeks). B.C. Ministry of Environment, Lands and Parks.
- Wildstone Resources Ltd. 1997. Overview Fish Habitat Assessment Procedure Equesis, Nashwito, Whiteman and Shorts Creeks. Prepared for Okanagan Indian Band, April 1997.



Table G-1 Summary of relevant information for setting environmental flow needs within Equesis Creek watershed

				F	ish an	d Aqu	uatic I	Habita	ıt					Strear	nflow							٧	Vater I	Manage	ement						
Information Source	Current Fish Species Presence	Historic Fish Species Presence	Fish Periodicity Tables	Aquatic Habitat	Channel Characteristics	Channel Cross-Sactions	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)																	✓														
Okanagan Indian Band (https://okib.ca). Contact: OKIB – Public Works Director																	✓				✓			✓		✓		✓	✓	✓	✓
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.											✓																				
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															✓	✓															

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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)	7		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
the Okanagan Basin.																															
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															٧																
van der Gulik, T., Neilsen, D., and R. Fretwell. 2010. Agriculture Water Demand Model – Report for the Okanagan Basin. February 2010.																								✓		✓					
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>											~		✓	٧	/ v	/															
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.	✓		✓							✓																					
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.																							✓								
Trumbley Environmental Consulting Ltd. 2009. Fish Passage Culvert Inspection (FPCI) – Equesis Creek (EC1), Pinaus Site P1. Prepared for Tolko Industries Ltd., December 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.																							✓								
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.														٧	/ v	/								✓							✓
Louis, K. 2006. Kokanee Enumeration 2006: Whiteman Creek, Nashwito Creek and Equesis Creek. Prepared for Okanagan Nation Alliance Fisheries Department.	✓				✓																										

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Okanagan Indian Band. 2006. Kokanee Enumeration 2006 – Whiteman Creek, Equesis Creek, and Nashwito Creek. Okanagan Nation Alliance Fisheries Department.				√					√																					
Ptolemy, R. 2005. HSI Charts and Tables in Microsoft Excel File: WUP-HSI.								✓																						
Rae, R. 2005. The State of Fish and Fish Habitat in the Okanagan and Similkameen Basins. Prepared for the Canadian Okanagan Basin Technical Working Group, Westbank, B.C.	✓			✓							✓																			
Dobson Engineering. 2005. Equesis Creek and Irish Creek Watersheds Hydrologic Assessment and ECA Evaluation. Prepared for Tolko Industries Ltd., March 2005.					✓						✓																			
B.C. Ministry of Environment, Lands and Parks (MELP). 2004. Water Rights Information System Demand Report #2 for the Okanagan Basin. December 23, 2004.																		✓	✓											
Chara Consulting. 2004. Kokanee Stream Spawner Enumeration of the Okanagan Valley's Main Lakes, 2004.	✓																													
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.														✓									✓							✓
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.	✓	✓																												
B.C. Ministry of Environment. 2002. 2002 Kokanee Enumerations of Nashwito, Equesis, and Whiteman Creeks. December 1996.	✓												✓																	
Dobson Engineering. 2001. Interior Watershed Assessment for Equesis Creek Watershed. Prepared for Tolko Industries Ltd., 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 Management Branch, August 2001.			✓							√	✓			✓																
Talayco, N. (ed.). 2001. Okanogan/Similkameen Subbasin Summary. Prepared for the Northwest Power Planning Council. Golder Associates. September, 2001.											✓																			
Obedkoff, W. 2000. Interior Community Watershed Streamflow Inventory. Water Inventory Section, Resources Inventory Branch, March 2000.												✓		✓	✓															
Okanagan Nation Fisheries Commission. 2000. Kokanee Spawner Enumeration and Kokanee Habitat				✓					✓																					

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Characteristics of Equesis, Nashwito, and Whiteman Creeks of Okanagan Lake. 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.										✓	✓			✓																	
Wildstone Resources Ltd. 1997. Overview Fish Habitat Assessment Procedure Equesis, Nashwito, Whiteman and Shorts Creeks. Prepared for Okanagan Indian Band, April 1997.	✓	✓		✓								✓																			
Wildstone Resources Ltd. 1996. 1996 Kokanee Enumerations of Nashwito, Equesis, and Whiteman Creeks. October 1996.	✓													✓																	
Agrodev Canada Inc. 1996. Stream Assessment and Fishway Feasibility Study. Prepared for the Okanagan Indian Band. January 1996.										✓																					
Swain, L.G. 1994. Water Quality Assessment and Objectives for Tributaries to Okanagan Lake in the Vernon area. (Lower Vernon, Equesis, and Deep Creeks). B.C. Ministry of Environment, Lands and Parks.														✓																	
Letvak, D.B. 1994. Equesis Creek Water Supply Hydrology - 1994.											✓		✓		✓									✓							
Young, D., and G. Inkster. 1992. Enumeration Results and Management Concerns on: Whiteman, Nashwito (Siwash), and Equesis (Six-Mile) Creeks. Prepared for the Okanagan Indian Band, Heartland Economics Ltd., and the Okanagan Heritage Society, October 1992.	✓													✓																	
Reksten, D.E. 1991. North Okanagan Low Flows (Vernon Creek, Deep Creek, and Equesis Creek). B.C. Ministry of Environment, Water Management Branch, File S2108-3P, Study #350																✓															
Dobson Engineering Ltd. 1990. Equesis Creek: Assessment of Alternatives to Enhance Okanagan Lake Fishery. September 1990.	✓				✓						✓	✓																			
Barr, L.J. 1988. Okanagan Region Low Flow Estimates. Memorandum dated May 20, 1988. Ministry of Environment and Parks, Water Management Branch.													✓		✓																
Letvak, D.B. 1980. Annual Runoff Estimates for West Side of Okanagan Valley. B.C. Ministry of Environment. January, 1980.																✓															
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		✓								✓		✓																			

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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.											✓				✓					✓			✓		✓					
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. 1973. General notes on stream spawning kokanee in the Okanagan Basin.				✓	✓				✓		✓																			
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. Equesis (6 Mile) Creek – Fish Habitat Survey. August 1969.				✓		✓																								
Anonymous. Undated. Okanagan Watershed Descriptions 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, Trepanier Creek, Trout Creek, Vaseux Creek, Vernon Creek. Ecocat Report ID 32362.	✓			✓	✓						✓		✓	√																

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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
Anonymous. Undated. Cross section data for Mission, Powers and Equesis Creeks Ecocat Report ID 38406					✓									✓																