

**Residential, Commercial, Industrial, and
Institutional Actual Water Use in
Vernon and Kelowna**

A Report Prepared for the OBWB

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Introduction

The purpose of this report is to provide detailed water use estimates for the residential (indoor) and ICI (Institutional, Commercial, Industrial) water use sectors based on actual water use where it has been recorded through water meters in the Okanagan Basin.

This report builds on previous work completed as part of the Okanagan Water Supply and Demand Project (OWSDP). As agricultural, golf course, and similar outdoor water uses have already been examined through the OWSDP, more detailed water use values for the indoor use sectors are required to support the Okanagan Basin Water Balance Model being developed concurrently through the OWSDP. Previous reports have provided estimates of actual water use for these two key sectors based on assumptions provided by experts. This report attempts to verify those assumptions and improve data reliability by reporting actual water use where it has been recorded by water purveyors.

Methods

The key goals of this project were to:

- Collect actual water use (meter) data for residential and ICI water users within the Okanagan Basin;
- Define major residential and ICI sub-sectors based on that data to support improved estimates of water use where metered use data is unavailable; and
- Estimate an average water use value (cubic meters per day) for each indoor water use sub-sector based on the actual water consumption data.

The initial work plan for this project focused on collecting metered water use data from several Okanagan municipal water suppliers: Kelowna, Penticton, Summerland, and Oliver. The call for data was expanded to include other Basin municipalities when it was determined that metered use data may be unavailable or limited. This was due to both the limited time allotted to collect the data, as several municipalities didn't have the staff resources available to provide data, and that many local governments didn't collect meter data in a format easily transferred or in a format suited to Basin-wide analysis. Metered use data was received from the Regional District of North Okanagan (City of Vernon), City of Kelowna, and Town of Osoyoos.

Data needs, in terms of the format of the metered use data, were assessed based on previous work to determine the relationship between land use and water use. Work completed by UBC students broke down land use activity by eight zoning classes that incorporated all local government zoning types within the Okanagan Basin. Based on previous work completed by the author, it was determined that local government land use zoning categories are too broadly defined to indicate actual land use activities affecting water use. Therefore, BC Assessment (BCA) "Actual Use Codes", that specifically define land use activity

on a per parcel basis for taxation purposes, were chosen over zoning categories. In addition to providing a specific land use definition, these codes are applied province wide, simplifying their application across the multiple local government jurisdictions within the Okanagan Basin.

To ensure the water meter data met the needs of the OWSDP, to incorporate actual metered use data into the existing water model GIS and allow actual use to be assessed spatially, suppliers were asked to provide water use data in the following format:

Folio	Jurisdiction ID	Actual Use Code	Water Use per Parcel	Other Land Use ID
(Parcel Identifier)	(GIS code used by local government)	(BC Assessment 3 digit land use code)	(preferred m ³ /day/parcel, averaged over multiple years)	(e.g. business/organization name to help further define land use activity)
23306180078	25899	200	8.790	ABC Laundromat

While the Vernon data set followed this format, the data was incomplete as strata properties were not included and some errors in the linking of folio data to account/customer were found. However, the data did provide an excellent starting point for developing average use estimates for each of the BC Assessment Actual Use Codes (BCAAUC). Vernon's water use was recorded from 2006-2008 on a quarterly basis, as part of the utility billing cycle, and the use was averaged over those years to define an average daily use for each account. It was assumed that most parcels had only one meter and one billing account to allow the data to be transformed from water use per account to use per parcel. This assumption was checked using the jurisdiction ID that defines each parcel and this code allowed multiple accounts on a single parcel to be combined, as was the case when multiple business activities occurred within a single building but received separate utility bills. The average daily water use per parcel was then averaged over all parcels linked to the same BCAAUC to create an estimate of actual water use for each code type. These averages were then grouped based on broader land use types and water use to reduce the number of BCAAUC from 192 to 44 Water Use Categories.

As the other municipalities tended to record their water use data in other ways, variations on the data format were accepted to develop the estimated water use values for each sub-sector category. While Kelowna provided a substantial data set, the water use accounts were not identified based on land use beyond 3 broad categories: residential (meaning single family dwellings), multi-family (all other residential accounts), and commercial. These estimates along with the data for 11 meters received from Osoyoos were then compared with the categories developed from the Vernon data to create sub-sector estimates of water use that could be applied across the Basin.

Results

Tables 1 and 2 summarize the Water Use Categories developed from the BCAAUC for residential and ICI water users. The estimated average water use in cubic metres per parcel per day is also included for each BCAAUC to indicate the reasoning behind how the BCAAUC were grouped to create the Water Use Categories. Descriptions of the land use types associated with each BCAAUC are included in the tables, but the descriptions are fragmented in some cases (e.g. 660-Land Classified Recreational Used For). The author sought more complete descriptions from BC Assessment but these weren't provided. The BCAAUC follow the following format:

BCA Code Group	Land Use Type
000 – 099	Residential
100 – 199	Farm (not assessed for this report)
200 – 300	Commercial
400 – 499	Industrial
500 – 599	Transportation, Communication & Utility
600 – 699	Civic, Institutional & Recreational

Table 1 – Residential Water Use Categories and Average Use Estimates

Water Use Category	BCAAUC	BCA Description	Average Water Use (m³/day/parcel)	Category Average (m³/day/parcel)
Residential-Vacant	001	Vacant Residential Less Than 2 Acres	0.024	0.020
Residential-Vacant	051	Multi-Family (Vacant)	0.035	
Residential-Vacant	061	2 Acres Or More (Vacant)	0.000	
Residential Seasonal Dwelling or Residential Outbuilding	040	Seasonal Dwelling	0.013	0.029
Residential Seasonal Dwelling or Residential Outbuilding	020	Residential Outbuilding Only	0.133	
Residential Seasonal Dwelling or Residential Outbuilding	042	Strata-Lot Seasonal Dwelling (Condominium)	0.000	
Residential Seasonal Dwelling or Residential Outbuilding	062	2 Acres Or More (Seasonal Dwelling)	0.000	
Residential Seasonal Dwelling or Residential Outbuilding	070	2 Acres Or More (Outbuilding)	0.000	
Residential-Manufactured Home Park*	234	Manufactured Home Park	17.100	17.100
Residential-Low Density	037	Manufactured Home (Within Manufactured Home Park)	0.186	0.457
Residential-Low Density	002	Property Subject To Section 19(8)	0.228	
Residential-Low Density	063	2 Acres Or More (Manufactured Home)	0.238	
Residential-Low Density	038	Manufactured Home (Not In Manufactured Home Park)	0.253	
Residential-Low Density	060	2 Acres Or More (Single Family Dwelling, Duplex)	0.522	
Residential-Low Density	034	Duplex Up & Down (/Suo Bottom)	0.567	
Residential-Low Density	035	Duplex Single Unit Ownership (Side)	0.625	
Residential-Low Density	032	Residential Dwelling with Suite	0.642	
Residential-Low Density	041	Duplex Single Unit Ownership (Top)	0.656	
Residential-Low Density*	000	Single Family Dwelling	0.654	
Residential-Low Density	036	Duplex Single Unit Ownership (Back)	no record in Vernon	

Table 1 Continued

Water Use Category	BCAAUC	BCA Description	Average Water Use (m³/day/parcel)	Category Average (m³/day/parcel)
Residential-Medium Density	030	Strata-Lot Residence (Condominium)	1.318	1.600
Residential-Medium Density	033	Duplex (/Suo Front)	1.495	
Residential-Medium Density	047	Triplex	1.669	
Residential-Medium Density	049	Fourplex	1.691	
Residential-Medium Density	053	Multi-Family (Conversion)	1.829	
Residential-Medium Density	039	Row Housing (Single Unit Ownership)	no record in Vernon	
Residential-High Density	050	Multi-Family (Apartment Block)	9.270	9.280
Residential-High Density	052	Multi-Family (Garden Apartment & Row Housing)	9.289	
Residential-High Density	054	Multi-Family (High-Rise)	no record in Vernon	
Residential-High Density	055	Multi-Family (Minimal Commercial)	no record in Vernon	
Residential-High Density	056	Multi-Family (Residential Hotel)	no record in Vernon	
Residential-High Density	057	Stratified Rental Townhouse	no record in Vernon	
Residential-High Density	058	Stratified Rental Apartment (Frame Construction)	no record in Vernon	
Residential-High Density	059	Stratified Rental Apartment (Hi-Rise Construction)	no record in Vernon	
Residential-Parking Lot	029	Strata Lot (Parking Residential)	no record in Vernon	no record in Vernon
Residential-Parking Lot	043	Parking (Lot Only, Paved Or Gravel)	no record in Vernon	
Notes:				
* indicies estimate includes data from Kelowna				
Residential density refers to the number of people living on a parcel				

Table 2 - ICI Water Use Categories and Average Use Estimates

Water Use Category	BCAAUC	BCA Description	Average Water Use (m³/day/parcel)	Category Average (m³/day/parcel)
Commercial-Retail Low Water User	206	Neighbourhood Store	0.689	0.689
Commercial-Retail Medium Water User	200	Store(S) And Service Commercial	1.129	1.170
Commercial-Retail Medium Water User	202	Store(S) And Living Quarters	1.068	
Commercial-Retail Medium Water User	204	Store(S) And Offices	1.203	
Commercial-Retail Medium Water User	208	Office Building (Primary Use)	1.280	
Commercial-Retail High Water User	210*	Bank	3.322	3.509
Commercial-Retail High Water User	216	Commercial Strata-Lot	3.190	
Commercial-Retail High Water User	203*	Stores And/Or Offices With Apartments	3.748	
Commercial-Retail High Water User	212*	Department Store - Stand Alone	3.222	
Commercial-Retail High Water User	214	Retail Strip	4.063	
Commercial-Retail Large Format Low Water User	205	Big Box	10.136	10.021
Commercial-Retail Large Format Low Water User	215*	Food Market	9.906	
Commercial-Retail Large Format Medium Water User	209	Shopping Centre (Neighbourhood)	28.710	28.710
Commercial-Retail Large Format High Water User	211*	Shopping Centre (Community)	94.826	94.947
Commercial-Retail Large Format High Water User	213*	Shopping Centre (Regional)	95.067	
Commercial-Storage Low Water User	031	Strata-Lot Self Storage-Res Use	0.501	0.309

Table 2 Continued

Water Use Category	BCAAUC	BCA Description	Average Water Use (m³/day/parcel)	Category Average (m³/day/parcel)
Commercial-Storage Low Water User	218	Strata-Lot Self Storage-Business Use	0.501	
Commercial-Storage Low Water User	260*	Parking (Lot Only, Paved Or Gravel)	0.200	
Commercial-Storage Low Water User	272*	Storage & Warehousing (Open)	0.350	
Commercial-Storage Low Water User	488	Strata-Lot Self Storage-Industrial Use	no record in Vernon-Kelowna	
Commercial-Storage Low Water User	219	Strata Lot (Parking Commercial)	no record in Vernon-Kelowna	
Commercial-Storage Low Water User	275	Self Storage	no record in Vernon-Kelowna	
Commercial-Storage Low Water User	262	Parking Garage	no record in Vernon-Kelowna	
Commercial-Storage Low Water User	490	Parking Lot Only (Paved Or Gravel)	0	
Commercial-Storage Low Water User	274*	Storage & Warehousing (Cold)	0.302	
Commercial-Storage High Water User	273*	Storage & Warehousing (Closed)	1.974	
Industrial-Low Water Use	201*	Vacant IC&I	0.516	0.395
Industrial-Low Water Use	421	Vacant	no record in Vernon-Kelowna	
Industrial-Low Water Use	276*	Lumber Yard Or Building Supplies	0.541	
Industrial-Low Water Use	300*	Stratified Operational Facility Areas	0.217	
Industrial-Low Water Use	401*	Industrial (Vacant)	0.117	
Industrial-Low Water Use	428	Improved	0	

Table 2 Continued

Water Use Category	BCAAUC	BCA Description	Average Water Use (m³/day/parcel)	Category Average (m³/day/parcel)
Industrial-Low Water Use	445	Sand & Gravel (Vacant and Improved)	0.448	
Industrial-Low Water Use	464	Metal Fabricating Industries	0.513	
Industrial-Low Water Use	460	Printing & Publishing Industry	0.811	
Industrial-Medium Water Use	456	Clothing Industry	2.910	4.911
Industrial-Medium Water Use	458*	Furniture & Fixtures Industry	5.567	
Industrial-Medium Water Use	466*	Machinery Manufacturing (Excluding Electrical)	4.267	
Industrial-Medium Water Use	448	Concrete Mixing Plants	6.901	
Industrial-High Water Use	474*	Miscellaneous & (Industrial Other)	14.972	
Industrial-High Water Use	420*	Lumber Remanufacturing (When Separate From Sawmill)	10.467	29.223
Industrial-High Water Use	425*	Paper Box, Paper Bag, And Other Paper Remanufacturing.	35.633	
Industrial-High Water Use	240*	Greenhouses And Nurseries (Not Farm Class)	30.500	
Industrial-High Water Use	415*	Sawmills	52.767	
Industrial-High Water Use	450*	Rubber & Plastics Products	31	
Infrastructure-Low Water Use	560	Water Distribution Systems	0	
Infrastructure-Low Water Use	515	Airports, Heliports, Etc.	0.574	
Infrastructure-Low Water Use	530*	Telecommunications (Other Than Telephone)	1.133	
Infrastructure-Low Water Use	280	Marine Facilities (Marina)	1.128	
Infrastructure-Medium Water Use	520*	Telephone	2.429	4.986

Table 2 Continued

Water Use Category	BCAAUC	BCA Description	Average Water Use (m³/day/parcel)	Category Average (m³/day/parcel)
Infrastructure-Medium Water Use	580*	Electrical Power Systems (Including Non-Utility)	7.544	
Infrastructure-High Water Use	510*	Bus Company, Including Street Railway	30.133	33.479
Infrastructure-High Water Use	550*	Gas Distribution Systems	34.067	
Infrastructure-High Water Use	570*	Irrigation Systems	31.117	
Infrastructure-High Water Use	590*	Miscellaneous (Transportation & Communication)	38.600	
Infrastructure-Water Use Unknown	525	Fiberoptic Conduit	no record in Vernon-Kelowna	no record in Vernon-Kelowna
Infrastructure-Water Use Unknown	540	Community Antenna Television (Cablevision)	no record in Vernon-Kelowna	
Infrastructure-Water Use Unknown	476	Grain Elevators	no record in Vernon-Kelowna	
Infrastructure-Water Use Unknown	478	Docks & Wharves	no record in Vernon-Kelowna	
Infrastructure-Water Use Unknown	480	Shipyards	no record in Vernon-Kelowna	
Infrastructure-Water Use Unknown	500	Railway	no record in Vernon-Kelowna	
Infrastructure-Water Use Unknown	505	Marine & Navigational Facilities (Includes Ferry)	no record in Vernon-Kelowna	
Commercial-Automobile Oriented Low Water Use	224	Self-Serve Service Station	0.596	0.846
Commercial-Automobile Oriented Low Water Use	227*	Automobile Sales (Lot)	0.533	

Table 2 Continued

Water Use Category	BCAAUC	BCA Description	Average Water Use (m³/day/parcel)	Category Average (m³/day/parcel)
Commercial-Automobile Oriented Low Water Use	228*	Automobile Paint Shop, Garages, Etc.	1.409	
Commercial-Automobile Oriented Medium Water Use	220*	Automobile Dealership	5.997	5.773
Commercial-Automobile Oriented Medium Water Use	225	Convenience Store/Service Station	5.549	
Commercial-Automobile Oriented High Water Use	222	Service Station	14.433	18.031
Commercial-Automobile Oriented High Water Use	226*	Car Wash	21.629	
Hospitality-Accommodation Low Water Use	239	Bed & Breakfast Operation Less Than 4 Units	1.733	1.733
Hospitality-Accommodation Low Water Use	237	Bed & Breakfast Operation 4 Or More Units	no record in Vernon-Kelowna	
Hospitality-Accommodation Medium Water Use	232	Motel & Auto Court	6.967	10.950
Hospitality-Accommodation Medium Water Use	236*	Campground (Commercial)	14.933	
Hospitality-Accommodation High Water Use	238	Seasonal Resort	no record in Vernon-Kelowna	38.189
Hospitality-Accommodation High Water Use	230	Hotel	35.211	
Hospitality-Accommodation High Water Use	233*	Individual Strata Lot (Hotel/Motel)	41.167	

Table 2 Continued

Water Use Category	BCAAUC	BCA Description	Average Water Use (m³/day/parcel)	Category Average (m³/day/parcel)
Hospitality-Food Service or Entertainment Low Water Use	258*	Drive-In Restaurant	0.233	0.233
Hospitality-Food Service or Entertainment Low Water Use	252	Drive-In Theatres	no record in Vernon-Kelowna	
Hospitality-Food Service or Entertainment Medium Water Use	266	Bowling Alley	2.243	3.081
Hospitality-Food Service or Entertainment Medium Water Use	270*	Hall (Community, Lodge, Club, Etc.)	3.919	
Hospitality-Food Service or Entertainment Low Water Use	256*	Restaurant Only	7.355	10.248
Hospitality-Food Service or Entertainment Low Water Use	257*	Fast Food Restaurants	9.809	
Hospitality-Food Service or Entertainment Low Water Use	250	Theatre Buildings	10.705	
Hospitality-Food Service or Entertainment Low Water Use	254*	Neighbourhood Pub	13.122	
Commercial-Assisted Living Facilities Low Water Use	284	Seniors Strata - Care, Independent or Assisted Living	0	1.537
Commercial-Assisted Living Facilities Low Water Use	287*	Group Home	3.074	

Table 2 Continued

Water Use Category	BCAAUC	BCA Description	Average Water Use (m³/day/parcel)	Category Average (m³/day/parcel)
Commercial-Assisted Living Facilities Medium Water Use	286	Seniors Independent & Assisted Living	12.965	12.965
Commercial-Assisted Living Facilities High Water Use	285	Seniors Licensed Care	24.919	24.919
Industrial-Food Production Low Water Use	407*	Soft Drink Bottling	4.667	4.667
Industrial-Food Production High Water Use	400*	Fruit & Vegetable	503.040	537.788
Industrial-Food Production High Water Use	409*	Winery	393.067	no record in Vernon-Kelowna
Industrial-Food Production High Water Use	410	Distillery	no record in Vernon-Kelowna	
Industrial-Food Production High Water Use	408	Brewery	717.257	
Industrial-Food Production Water Use Unknown	412	Feed Manufacturing	no record in Vernon-Kelowna	
Industrial-Food Production Water Use Unknown	413	Flour Mills & Breakfast Cereal Products	no record in Vernon-Kelowna	no record in Vernon-Kelowna
Industrial-Food Production Water Use Unknown	414	Miscellaneous (Food Processing)	no record in Vernon-Kelowna	
Industrial-Food Production Water Use Unknown	402	Meat & Poultry	no record in Vernon-Kelowna	
Industrial-Food Production Water Use Unknown	403	Sea Food	no record in Vernon-Kelowna	
Industrial-Food Production Water Use Unknown	404	Dairy Products	no record in Vernon-Kelowna	
Industrial-Food Production Water Use Unknown	405	Bakery & Biscuit Manufacturing	no record in Vernon-Kelowna	
Industrial-Food Production Water Use Unknown				

Table 2 Continued

Water Use Category	BCAAUC	BCA Description	Average Water Use (m³/day/parcel)	Category Average (m³/day/parcel)
Industrial-Food Production Water Use Unknown	406	Confectionery Manufacturing & Sugar Processing	no record in Vernon-Kelowna	
Industrial-Water Use Unknown	416	Planer Mills (When Separate From Sawmill)	no record in Vernon-Kelowna	no record in Vernon-Kelowna
Industrial-Water Use Unknown	417	Plywood Mills	no record in Vernon-Kelowna	
Industrial-Water Use Unknown	418	Shingle Mills	no record in Vernon-Kelowna	
Industrial-Water Use Unknown	419	Sash & Door	no record in Vernon-Kelowna	
Industrial-Water Use Unknown	424	Pulp & Paper Mills (Including Fine Paper,	no record in Vernon-Kelowna	
Industrial-Water Use Unknown	426	Logging Operations, Incl Log Storage	no record in Vernon-Kelowna	
Industrial-Water Use Unknown	427	Logging Roads & Bridges	no record in Vernon-Kelowna	
Industrial-Water Use Unknown	446	Cement Plants	no record in Vernon-Kelowna	
Industrial-Water Use Unknown	429	Miscellaneous (Forest And Allied Industry)	no record in Vernon-Kelowna	
Industrial-Water Use Unknown	430	Petroleum And Gas Exploration (Including Oil And Gas	no record in Vernon-Kelowna	
Industrial-Water Use Unknown	431	Production Pipelines	no record in Vernon-Kelowna	
Industrial-Water Use Unknown	432	Oil Refining Plants	no record in Vernon-Kelowna	
Industrial-Water Use Unknown	433	Gas Scrubbing Plants	no record in Vernon-Kelowna	
Industrial-Water Use Unknown	434	Petroleum Bulk Plants	no record in Vernon-Kelowna	
Industrial-Water Use Unknown	435	Liquid Gas Storage Plants	no record in Vernon-Kelowna	
Industrial-Water Use Unknown	436	Oil & Gas Transportation Pipelines	no record in Vernon-Kelowna	
Industrial-Water Use Unknown	437	Oil & Gas Pumping & Compressor Stations	no record in Vernon-Kelowna	

Table 2 Continued

Water Use Category	BCAAUC	BCA Description	Average Water Use (m³/day/parcel)	Category Average (m³/day/parcel)
Industrial-Water Use Unknown	438	Miscellaneous (Petroleum Industry)	no record in Vernon-Kelowna	
Industrial-Water Use Unknown	440	Mining (Coal)	no record in Vernon-Kelowna	
Industrial-Water Use Unknown	442	Mining & Milling (Metallic)	no record in Vernon-Kelowna	
Industrial-Water Use Unknown	443	Mining & Milling Non-Metallic (Including Asbestos,	no record in Vernon-Kelowna	
Industrial-Water Use Unknown	444	Smelting & Refining	no record in Vernon-Kelowna	
Industrial-Water Use Unknown	447	Asphalt Plants	no record in Vernon-Kelowna	
Industrial-Water Use Unknown	449	Miscellaneous (Mining And Allied Industries)	no record in Vernon-Kelowna	
Industrial-Water Use Unknown	452	Leather Industry	no record in Vernon-Kelowna	
Industrial-Water Use Unknown	454	Textiles & Knitting Mills	no record in Vernon-Kelowna	
Industrial-Water Use Unknown	462	Primary Metal Industries (Iron & Steel Mills,	no record in Vernon-Kelowna	
Industrial-Water Use Unknown	468	Transportation Equipment Industry (Including Aircraft,	no record in Vernon-Kelowna	
Industrial-Water Use Unknown	470	Electrical & Electronics Products Industry	no record in Vernon-Kelowna	
Industrial-Water Use Unknown	472	Chemical & Chemical Products Industries	no record in Vernon-Kelowna	
Institutional-Low Water Users	614	Campgrounds (Includes Government Campgrounds, Ymca &	0	
Institutional-Low Water Users	615	Government Reserves (Includes Greenbelts (Not In Farm	0	

Table 2 Continued

Water Use Category	BCAAUC	BCA Description	Average Water Use (m³/day/parcel)	Category Average (m³/day/parcel)
Institutional-Low Water Users	642	Cemeteries (Includes Public Or Private).	0	
Institutional-Low Water Users	660	Land Classified Recreational Used For	0	
Institutional-Low Water Users	625	Garbage Dumps, Sanitary Fills, Sewer Lagoons, Etc.	0.131	
Institutional-Low Water Users	630	Works Yards	0.318	
Institutional-Low Water Users	601	Civic, Institutional & Recreational (Vacant)	1.039	
Institutional-Low Water Users	652	Churches & Bible Schools	1.813	
Institutional-Medium Water Users	600	Recreational & Cultural Buildings (Includes Curling	9.521	
Institutional-Medium Water Users	650	Schools & Universities, College Or Technical Schools	10.944	16.409
Institutional-High Water Users	654*	Recreational Clubs, Ski Hills	14.033	
Institutional-High Water Users	620*	Government Buildings (Includes Courthouse, Post Office	18.785	
Institutional-Hospitals	640*	Hospitals (Nursing Homes Refer To Commercial Section).	427.259	427.259
Institutional-Unknown Water Users	622	Alrt	no record in Vernon-Kelowna	no record in Vernon-Kelowna
Institutional-Unknown Water Users	623	Alrt/Mixed Use	no record in Vernon-Kelowna	
Institutional-Unknown Water Users	632	Ranger Station	no record in Vernon-Kelowna	

Table 2 Continued

Water Use Category	BCAAUC	BCA Description	Average Water Use (m³/day/parcel)	Category Average (m³/day/parcel)
Institutional-Unknown Water Users	634	Government Research Centres (Includes Nurseries &	no record in Vernon-Kelowna	
Institutional-Excluded Outdoor Water Users	612	Golf Courses (Includes Public & Private)	not included	Excluded Outdoor Water Users
	610	Parks & Playing Fields	not included	
Note: * indicates category includes Kelowna data or was sourced only from Kelowna if no records were found in Vernon.				

To provide some perspective, Table 3 compares the water use estimates provided in the Phase 2 Okanagan Water Supply and Demand Project Water Management and Use Study (Dobson 2008) with the actual use amounts recorded in Vernon and Kelowna for single family dwellings and an aggregate average for all ICI use in each city. The water use averages calculated for single family homes in Vernon and Kelowna is significantly lower than the estimate used within the Phase 2 study while the ICI estimates are much higher.

Table 3 – Water Use Estimate Comparison

	Residential (Single Family)	Commercial / ICI
Phase 2 Study Water Use Estimate	250 l/day/person (indoor use)	0.75 ML per connection/year
City of Kelowna Average Actual Use	217 l/day/person (indoor use)	3.9 ML per connection/year
City of Vernon Average Actual Use	222 l/day/person (indoor + outdoor annual average)	7.55 ML per connection/year

Restrictions on Estimate Utility

These estimates were derived from data collected on various time scales and to varying degrees of accuracy by each municipality. While indoor use was of greatest interest, particularly residential indoor use, the City of Vernon’s data was calculated on an annual basis and couldn’t be disaggregated to estimate indoor vs. outdoor use. The City of Kelowna’s monthly data was used to define an indoor use estimate for single family residential, but couldn’t be linked to specific parcels. Moreover, the parcel sizes are not uniform within each land use category, indicating that a better estimate would require use to be assessed on a per square meter basis instead of per parcel.

Another drawback to relying on average use estimates was the discrepancy between ICI activities in Kelowna – larger businesses tend to locate in Kelowna and these few skewed the average use higher than Vernon’s average for some categories. Several individual Kelowna businesses were similar to the Vernon average, which indicates the value of using the Vernon average over a combined Kelowna-Vernon estimate. This approach will better estimate use in the smaller municipalities that are more likely to have businesses and other ICI uses on a similar scale to Vernon. The City of Kelowna did provide a table of land use identifiers in the last few days of the contract, allowing one month of multifamily and one month of ICI water use to be assessed on a per parcel basis. An average overall use month (November) within an average use year (2006) were chosen for this analysis, due to the limited time available. It was found that only a small percentage of multi-family water use records could be linked to a specific parcel and land use code (34%) but a similar situation to the commercial uses was found – some individual parcels matched Vernon’s average but Kelowna

generally showed a higher average use. For example, multi-family apartment blocks (actual use code 050) had an average use of 9.8 m³/day/parcel in Vernon while Kelowna averaged 553.3 m³/day/parcel for the same category. This discrepancy suggests that further research into the water use measurement methods employed by each water purveyor would be beneficial, to ensure that the amounts recorded reflect use activities at the same scale.

Discussion

The goals set forth for this project - to collect, analyze, and develop estimates of actual water use based on certain land use activities - were achieved for a small portion of the Okanagan Basin. Sufficient data was collected from the City of Vernon to provide a good estimate of water use averaged over 3 years including 2006, the benchmark year used in the OWSDP Water Management and Use Study (Dobson 2008). It is likely that these estimates for Vernon will be applicable to other municipalities of a similar population or smaller, but this assumption would be better supported by analysis of water use in other Basin communities. The BCAUC provided a good description of actual land use activities in Vernon, based on selective comparisons of the data with recent orthophotos. The aggregated Water Use Categories created from those codes should be applicable Basin-wide to help to reduce the size of the data set needed to assess actual water use.

Recommendations

1. For the purposes of the Water Balance Model, apply the water use estimates contained in Tables 1 and 2 to the majority of the Okanagan Basin, except Kelowna. Where data has been provided by the City of Kelowna, use those actual use estimates or the aggregated estimates contained in Table 3 (data archived on CD accompanying this report). The Water Use Categories can be applied Basin-wide once BC Assessment Actual Use Codes have been linked to the existing cadastre data (GIS) maintained at the Summerland Pacific Agri-food Research Centre.
2. Investigate current water data collection methods in detail, specifically assessing how quantities measured on a per meter basis are aggregated to a property owner scale. This work could begin with the City of Kelowna to determine why there was such a large discrepancy in averages between it and the City of Vernon. This analysis should also investigate duplicate parcel identifiers resultant from leasing or strata ownership and their effect on estimating per parcel water use (e.g. multiple roll or billing account numbers linked to one parcel with multiple water meters). Use this information to develop a program for improved water use monitoring, as per recommendation 2.
3. Encourage water purveyors to develop water use monitoring databases and include BCA coding with parcel identifiers to allow for a spatial analysis of

water use based on land use and parcel area. The water purveyors should also be encouraged to provide water use data, based on the format described above, for direct inclusion in the Water Balance Model to allow a spatial analysis of actual water use, reducing the error introduced through averaged estimates.

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