DISCUSSION PAPER

Arrowsmith Water Service
Englishman River Water Intake Study

Phase 1 – Conceptual Planning

Discussion Paper 3-2 – Water Demands

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1 HISTORICAL WATER DEMAND – MUNICIPAL SYSTEMS

Max Day Per Capita (m^3/day/cap)					
Year	Parksville Population	Avg. Day Demand	Max Day Demand	Max Day/Cap	Max Day/ Max Month
2005	10,831	5,437	11,388	1.05	1.21
2006	11,090	6,515	13,396	1.21	1.23
2007	11,234	5,162	11,746	1.05	1.34
2008	11,378	5,775	10,814	0.95	1.17
2009	11,500		13,990	1.22	1.22
	Qualicum Beach Population	Avg. Day Demand	Max Day Demand	Max Day/Cap	Max Day/ Max Month
2005	8,430	4,707	12,351	1.47	1.25
2006	8,516	5,591	14,342	1.68	1.28
2007	8,644	4,589	11,755	1.36	1.41
2008	8,773	4,772	13,241	1.51	1.30
2009	8,905		11,665	1.31	1.47

The municipal systems keep daily water production records, allowing the determination of maximum day system demand. Maximum day demands need to be supplied from source, whereas peak hour demand is supplemented from distribution system storage. The ratio of maximum day to average day in the maximum month is determined to assist in estimating the maximum day demands for the systems below. Average annual daily demands are listed for later use in annual watershed yield determinations.

The average ratio of maximum day to average day in the maximum month for Parksville and Qualicum Beach is 1.3 over the past 5 year record.

2 HISTORICAL PER CAPITA MAXIMUM DAY WATER DEMAND - RDN SYSTEMS (M^3/DAY)

Year	Nanoose Bay Population	Avg Day for Year	Avg Day in Max Month	Avg Day in Max Month/Cap	Est. 130% Max Day/Cap
2005	4,513	2,183	5,479	1.21	1.58
2006	4,586	2,431	5,007	1.09	1.42
2007	4,671	2,138	4,430	0.95	1.23
2008	4,735	2,098	4,639	0.98	1.27
2009	4,803		5,053	1.05	1.37
Year	French Creek Population	Avg Day for Year	Avg Day in Max Month	Avg Day in Max Month/Cap	Est. 130% Max Day/Cap
2005	603	289	346	0.57	0.75
2006	603	207	414	0.69	0.89
2007	606	172	285	0.47	0.61
2008	606	178	352	0.58	0.76
2009	606		336	0.55	0.72

The regional district keeps only monthly records of source production from manual meter readings of all the groundwater wells. Thus the maximum per capita demand over the maximum month can be calculated. The per capita maximum day demand is then estimated using a factor 1.3 based on the average ratio determined for the municipal systems.

Population estimates are based on residential service connection records supplied by the RDN, multiplied by 2.5 for Nanoose and 2.6 for French Creek.

3 HISTORICAL PER CAPITA MAXIMUM DAY WATER DEMAND – EPCOR SYSTEM

Year	EPCOR System Population	Avg Day for Year	Avg Day in Max Month	Avg Day in Max Month/Cap	Est. 130% Max Day/Cap
2005	-	-	-	-	-
2006	4,129	1,403	3,681	0.89	1.16
2007	4,129	1,403	3,771	0.91	1.18
2008	4,129	1,403	3,863	0.94	1.22
2009	4,129		3,958	0.96	1.25

EPCOR keeps only monthly records of source production from manual meter readings of all its groundwater sources and the French Creek intake. Since it obtained ownership of the system from

Breakwater, no service connections have been added. As for the RDN systems, the per capita maximum day demand have been estimated using a factor 1.3 based on the average ratio determined for the municipal systems.

4 DESIGN VALUES FOR MAXIMUM DAY PER CAPITA DEMAND

From the historical data presented above, it would appear that the current per capita maximum day demands in the municipal systems and the Nanoose and EPCOR systems are fairly similar, and indicating a slightly downward trend. The average weighted per capita value for these four systems in 2009 is 1.29 m^3/day. Year-to-year variations occur due to climatic factors, ie. drier and wetter summers, affecting outdoor water use.

The low values for French Creek can be attributed to the fact that this system has suffered from limited supply and heavy water use restrictions for many years. As this is a small part of the overall system, these values have been disregarded in any projections. These values may have some use in determining achievable conservation targets.

The design per capita maximum day demand that was established for the AWS system when first conceived was 1.375 m^3/day.

The reduction in per capita water use, encouraged through demand side management, will need to play a major role in supporting responsible stewardship of our water resources. Water use in our part of the world is considerably higher than that in other developed regions, and we believe that there is still a considerable way to go before a practical minimum is reached. The opportunities for further reductions in per capita water use are considerable. Serious water conservation efforts must be built into the development of any modern water supply system, if for no other reason than to stay abreast of potentially dwindling fresh water resources due to the effects of global warming. Initiatives like the B.C. Living Water Smart Program and the University of Victoria Water Sustainability Project under the Polis Project on Ecological Governance indicate that major efforts are building in this province towards water conservation.

It is recommended that a conservation target is established for purposes of major supply infrastructure planning for the AWS. A conservatively achievable target may be set at 1.1 m^3/day per capita (about a 10% reduction over current average values). A more aggressive target may be achievable (with French Creek as a possibly extreme local example). Universal water metering has been implemented in all AWS member systems, but the most significant opportunity for related water use reduction (through increasing block water rates) has not been fully implemented, and where it has been it has probably not had sufficient time to show the full results. Thus, it may be possible to realistically target a larger reduction. A discussion on what will be a realistically achievable target should take place before the intake design capacity is finalized.

The establishment of a lower conservation water use target fits within the objectives of the B.C. Living Water Smart Program, designed to reduce water use and achieve more sustainable water consumption habits in communities across the province.

For purposes of establishing a range of design demands for the supply infrastructure, for discussion, the following calculations are based on a high per capita value of 1.375 and a low value of 1.100 m^3/day.

5 PROJECTED WATER DEMANDS 2015 – 2050

A high-low range of maximum day water demand projections is presented using the range of projected populations from Discussion Paper 3-1 and the above mentioned range of per capita maximum day water demands, respectively:

Year 2015

Population	Per Capita Demand (m^3/day)	Design Demand (m^3/day)
33,380 (high)	1.375 (high)	45,898
33,380	1.100 (low)	36,718
32,087 (low)	1.375 (high)	44,120
32,087	1.100 (low)	35,296

Year 2050

Population	Per Capita Demand (m^3/day)	Design Demand (m^3/day)
63,512(high)	1.375 (high)	87,329
63,512	1.100 (low)	69,863
47,561 (low)	1.375 (high)	65,397
47,561	1.100 (low)	52,317

These estimates include all water use from residential, seasonal, commercial, industrial and institutional development, as well as any unaccounted for water, such as unmetered public use and system leakage.

6 SURFACE WATER SOURCE CAPACITY

To arrive at the required surface water intake capacity, the total capacity of reliable groundwater wells that will contribute to the AWS supply system needs to be deducted.

The estimated reliable yield of existing groundwater supplies among the AWS jurisdictions is 39,000 m^3/day, including the TQB wells rated at 20,000 m^3/day. **This does not include COP additional well capacity developed during 2009. It also does not include the Fairwinds wells being developed along Northwest Bay Road, some of which are in the process of being turned over to the RDN, and all of which will likely form part of the AWS groundwater supply in the future.**

It should be noted that, even for the high population projection for TQB of 16,000, TQB will be self-sufficient from existing groundwater sources if it can reduce its maximum day per capita demand to less than 1.25 m^3/day.

To-date, TQB has participated in AWS on the basis of "insurance" against failure or depletion of some of its wells. If existing groundwater sources continue to produce at the presently estimated capacities, TQB may not require a surface water source from AWS.

To cover all scenarios, we have determined the 2015 and 2050 requirements for AWS surface water supply with and without the water demands from TQB, or contribution from its groundwater supply.

<u>2015:</u>

The 2015 design demand **with full participation by TQB** for the surface water intake would be determined as follows:

High Total Demand 2015 (m^3/day)	Groundwater Capacity (incl TQB)	**Surface Source Capacity (m^3/day)**
45,898	39,000	**6,898 (high)**

Low Total Demand 2015 (m^3/day)	Groundwater Capacity (incl TQB)	**Surface Source Capacity (m^3/day)**
35,296	39,000	**none (low)**

Without TQB participation, the 2015 design values would be as follows:

High Total Demand 2015 (m^3/day)	2015 TQB Demand (m^3/day)	Groundwater Capacity (excl TQB)	**Surface Source Capacity (m^3/day)**
45,898	13,310 (high)	19,000	**13,588 (high)**

Low Total Demand 2015 (m^3/day)	2015 TQB Demand (m^3/day)	Groundwater Capacity (excl TQB)	**Surface Source Capacity (m^3/day)**
35,296	10,153 (low)	19,000	**6,143 (low)**

2050:

The 2050 design demand **with full participation by TQB** for the surface water intake would be determined as follows:

High Total Demand 2050 (m^3/day)	Groundwater Capacity (incl TQB)	**Surface Source Capacity (m^3/day)**
87,329	39,000	**48,329 (high)**

Low Total Demand 2050 (m^3/day)	Groundwater Capacity (incl TQB)	**Surface Source Capacity (m^3/day)**
52,318	39,000	**13,318 (low)**

Without TQB participation, the 2050 design values would be as follows:

High Total Demand 2050 (m^3/day)	2050 TQB Demand (m^3/day)	Groundwater Capacity (excl TQB)	**Surface Source Capacity (m^3/day)**
87,329	22,000 (high)	19,000	**46,329 (high)**

Low Total Demand 2050 (m^3/day)	2050 TQB Demand (m^3/day)	Groundwater Capacity (excl TQB)	**Surface Source Capacity (m^3/day)**
52,318	12,100 (low)	19,000	**21,218 (low)**

The current Englishman River water licence in the name of AWS is for a maximum withdrawal of 47,888 m^3/day.

Note:

These calculations will need to be adjusted based on updating of currently available reliable groundwater capacity for the AWS supply system, to be completed under work plan task series 5.