

Water Plans for the Future - 4-3-2-1 Treatment

In June 2008 The Vancouver Island Health Authority issued a request for Union Bay Improvement District to advise of its plan to comply with the 4-3-2-1 Treatment requirement as part of the Safe Drinking Water Act. Union Bay had originally planned to install a water treatment system in 2006. This timeline was put on hold until it was known the amount of development that may take place in the Union Bay Improvement District. Now that the 4-3-2-1 Treatment is mandatory Union Bay has engaged in reviewing its 20-year Planning Study. The Board of Trustees has based the update of the study on servicing 1000 residents.

	2003	2007	2008
Water Usage	511,000 m ³	137,000 m ³	147,000m ³

1. CURRENT USAGE

Since universal metering was implemented, the per capita water demand has dropped considerably. Average daily flow was cited in the 2003 report as 16.3 l/s, or roughly 1,400 cubic metres per day. Based on 620 active connections at the time, this translates to just under 2.3 cubic metres per household per day, average day.

Present day average annual aggregate of individual metered flows appears to be roughly 300 cubic metres per day. This translates to only about 0.5 cubic metres per household, or just over 20% of the 2003 pre-metered demand. This does not account for leakage in the system which could be considerable.

The present day average annual usage is in the order of 500 cubic metres per day, inclusive of some system losses, translating to 780 liters per connection per day [at 640 active connections]. This is roughly 350 liters per capita, based on 2.25 persons per dwelling unit, on average. This seems a reasonable estimate, noting it to be roughly 60% of the per capita usage in the Comox Valley system, wherein no metering takes place, other than at larger and newer multifamily and commercial project sites. This said, 500 cubic metres per day is only about 35% of the overall average annual usage cited in the 2003 report, not even accounting for the fact that there are now an additional 20 connections [now 640, was 620]. Thus, this represents a dramatic reduction in overall usage.

2. EXPECTED GROWTH AND RESULTING SYSTEM DEMAND

It was agreed that 1,000 dwelling units would be used as the long term overall equivalent residential population. Further, it was agreed that for the purposes of this update, the impacts of Kensington would be limited to inclusion of service provision within this 1,000 unit total service population.

In other words, total water system demand, inclusive of residential, institutional, commercial [and industrial - were this to occur] users would equate to an equivalent

residential demand of 1,000 units. Based on a growth rate of 3% per annum, the difference between present day 640 units and future 1000 units would carry the UBID for 14 years, or to approximately the year 2023. This of course could be significantly altered through the supply to Kensington, were this to materialize.

Thus, the longer term average day annual demand is proposed [pending rationalization of system metering issues] to be 780 cubic metres per day. Based on a 1,000 dwelling unit service area, peak day demand would therefore be roughly 2.8 times this value, or about 2,200 cubic metres per day.

Fire flows have therefore been modeled and checked, based on a design (1,000 unit demand) peak day background flow of 2,200 cubic metres per day, or 25.5 liters per second. This is only about 40% of the peak day demand modeled in the 2003 study, for a 10 year planning horizon (in the unmetered condition and 875 connections assumed at the time to be possible by the year 2013 +/-).

Thus, assuming the present day demand estimates adopted for this study, on an interim basis, bear out to be reasonably accurate, then the additional available fire flow, formerly set aside for peak day demand, would be in the order of 40 liters per second, with 1,000 unit serviced. If a new upper pressure zone is created, as outlined this could quite dramatically improve the resulting fire flow availability, and defer some required network upgrades, this being a clear benefiting outcome of the universal metering program.

3. TREATMENT OPTIONS

The 2003 report outlines water quality issues in considerable detail. A number of treatment options were discussed, along with recommendations for bench testing and pilot studies to be undertaken in advance of selecting a system and commissioning the designed.

The UBID has solicited a rough budget price from "Corix" for the supply of a dissolved air filtration (DAF) system. This system would consist of a treatment train roughly as follows:

- Addition of a flocculent chemical and rapid mixing.
- Separation of particulate material through the DAF process, whereby particles are floated to the top of the fluid via small air bubbles, introduced from a pressurized source in which air is saturated in solution.
- Filtration, via either sand or membrane media.
- Disinfection, via chlorine, ozone, UV, etc.

The system is typically smaller than conventional settlement/sedimentation treatment process, as the DAF system instead forces coagulated particulate to float to the top of the fluid column, requiring a smaller containment vessel and less overall surface area.

DAF is reported to be very effective in reducing very small particulate and dissolved organics, (colour) very effectively. DAF systems are noted to be of higher capacity and efficiency than conventional settlement technologies, allowing the final stage filtration media to run longer between backwash cycles, etc.

The \$1.75 million Corix quotation does not indicate if the costs cited are intended to represent the cost of design, construction, commissioning and training of the UBID operations staff.

If we simply pro-rate the estimated cost in the same proportions as year 2023 peak day flows the resulting estimated cost would be approximately \$2.56 million. For the purposes of this initial analysis, we have indicated treatment costs in the order of \$2.5 million.

4. STORAGE REQUIREMENTS

A new storage reservoir will be required. Location will be determined when location of plant is settled.

For the assumed metered demands, we arrive at the following storage requirements, based on 60l/s fire fighting requirement (single family residential, 90 l/s multi-family residential and 120 /s commercial, a for 2 hours duration:

Reservoir Storage Requirements (Per MMCD)

	At fire flow 60 l/s (m3)	At fire flow 90 l/s (m3)	At fire flow 120 /s (m3)
Present Day	978	1,278	1,518
Future (1,000 units)	1,228	1,498	1,768

We believe providing for a fire flow of 120 /s for 2 hours to be appropriate. Thus the overall storage requirement to the year 2023 is calculated to be roughly 1,800 cubic meters.

Current storage capacities are 573 cubic meters at McLeod Road and 300 cubic meters at McKay Road. However, the McLeod Road storage is too low to effectively service the old town site area, is likely not designed to current seismic standards and is thought to be nearing the end of its service life. Thus, we will assume here that the McLeod Road reservoir is to be decommissioned at such time as the new reservoir is constructed higher up along the raw water feed line. Therefore, new storage in the order of 1,500 cubic meters, or 330,000 imperial gallons, is required.

Given the recent reductions in potable water demand, there remains now more water in the UBID's two water storage reservoirs for firefighting purposes. This said, 60 l/s for 2 hours equates to 432 cubic meters. The total existing storage in the two reservoirs is roughly 873 cubic meters, while the required storage under present day conditions, by MMCD standards is roughly 980 cubic metres. Thus some form of reservoir upgrading is needed relatively soon.

5. NEXT STEPS

The Union Bay Improvement District Trustees propose to implement the 4-3-2-1 Treatment Plan as soon as approval and funding can be determined for the project. Landowner Approval is required to borrow funds. The Comox Valley Regional District is currently mandated to provide information regarding a Regional Water Commission and the provision of water to the entire Comox Valley area.

Part of the updating of the 20 year Planning Study is to determine capital expenditure charges required to implement the proposed treatment system. In this regard the UBID Trustees have revised the Capital Expenditure Charges according to the information provided by McElhanney Engineering. The Capital Expenditure Charges will form part of the funding for the water treatment project. The balance of funds would be charged to the users of the system in the form of a parcel tax. The exact amount of the parcel tax would be determined at the time of implementation of the process.