

# Potable Water Supply Sources & Design Options

Your synopsis of water supply options and implementation costs for the Village of Belcarra



November 2005



## **BACKGROUND**

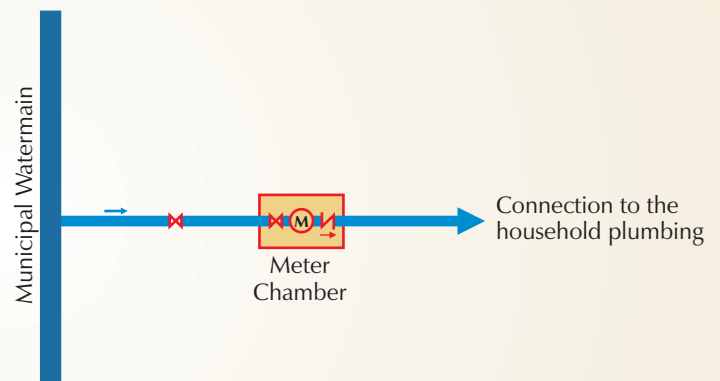
In 1990, the *Village of Belcarra* and *Dayton & Knight Ltd.* completed a *Water Supply Study* which identified options for a community potable water system. Recently, *Dayton & Knight Ltd.* has been retained to update this study and the costs based on recent changes in water treatment regulations. The options considered most feasible are captured in this summary, which includes, local groundwater, surface water and a connection to the *Greater Vancouver Water District* through either the *District of North Vancouver*, the *City of Port Moody* or the *Village of Anmore*. Once a water supply is developed, additional municipal infrastructure would be required to connect each house to a watermain. The typical connection detail is discussed below.

The information in this study would be used to apply for Provincial and Federal grants if the community intends to carry forward with this work.

On the back cover are the preliminary estimates of the construction and operating costs for each option. These costs are based on the requirements to develop a water supply or treatment system, which would meet the minimum Municipal and Government requirements.

## **HOUSEHOLD CONNECTIONS**

Once a potable water supply is developed for the *Village of Belcarra*, additional infrastructure is required to allow each home owner to access the water. At each lot a minimum 19 mm diameter copper pipe would connect the water main under the roadway to a water meter located at the property line. From the water meter, the service water pipe would be connected to the existing building plumbing. Impact mitigation methods would be incorporated into the design of each household connection.



**TYPICAL DOMESTIC SERVICE CONNECTION**

## **SURFACE WATER**

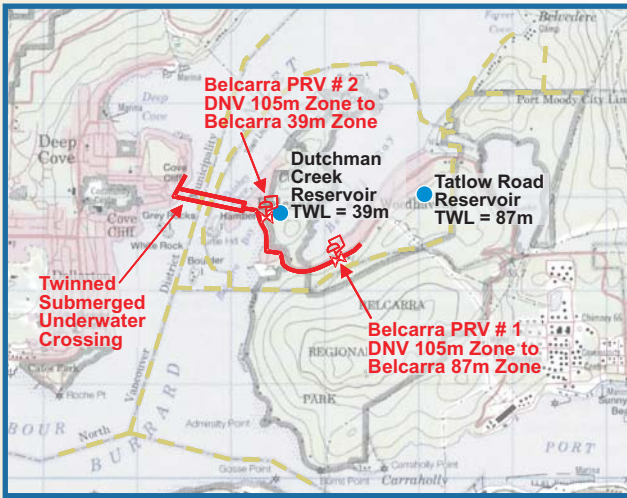
Due to the proximity and volume, the most viable surface water source near Belcarra is Sasamat Lake. The lake is protected from most watershed activities considered detrimental to water quality, including mining and forestry. A complete water treatment facility, including filtration and multiple levels of disinfection, would be required to make Sasamat Lake safe for consumption. Water sharing agreements would have to be developed between *Esso Canada* (the primary water licence holder) and the *Greater Vancouver Regional District* parks division. The use of Sasamat Lake would require the *Village of Belcarra* to own and operate a water filtration plant.

## **GROUNDWATER**

Belcarra is underlain by both a fractured rock aquifer and areas of till material. Till materials are present around Ray Creek and Windemere Creek. Extracting sufficient water for a community system from the fractured rock is technically challenging due to the variability in the nature of the fractures and maximum flow capacity of individual wells. The probability of extracting sufficient water from the till materials around the local creeks is higher than from the fractured rock. To determine the potential of groundwater supplies from the till materials a hydrogeotechnical investigation, involving test wells, pump tests and water quality monitoring, would be necessary. The use of groundwater would require the *Village of Belcarra* to own and operate a water disinfection facility.

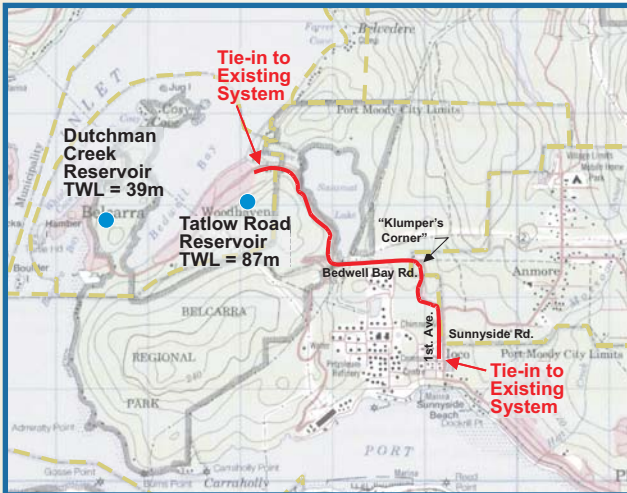
**GREATER VANCOUVER WATER DISTRICT -  
DISTRICT OF NORTH VANCOUVER**

The closest connection for the *Village of Belcarra* to the *Greater Vancouver Water District* is located in the *District of North Vancouver*. Technically, this is a feasible option. A 700 metre twinned underwater crossing is recommended to provide redundancy. In addition to the crossing, upgrades to the *District of North Vancouver's* water distribution system would be required. Due to the higher pressures from the *District of North Vancouver*, pressure reduction would be required to supply the existing *Village of Belcarra* reservoirs. This option would not require the *Village of Belcarra* to own or operate a water treatment facility.



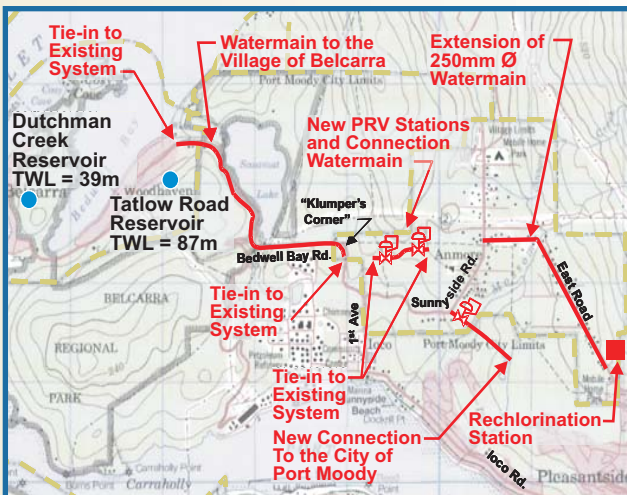
**GREATER VANCOUVER WATER DISTRICT -  
CITY OF PORT MOODY**

The most economical land route is to connect to the *City of Port Moody's* system at the old loco townsite. A 4.0 kilometer watermain would be installed along Bedwell Bay Road where it would connect to the *Village of Belcarra's* water distribution system. Due to the higher elevations along Bedwell Bay Road, a pump station near loco Road may at sometime be required. This option would not require the *Village of Belcarra* to own or operate a water treatment facility.



**GREATER VANCOUVER WATER DISTRICT -  
VILLAGE OF ANMORE**

A connection to the *Village of Anmore's* water supply system at "Klumper's Corner" would result in the *Village of Anmore* exceeding the design capacity of the existing connection to the *City of Port Moody*. To make this option feasible, a number of upgrades to the neighbouring municipalities' supply and distribution systems would be required. Although many of the upgrades are likely to be completed in the future, the additional demands of the *Village of Belcarra* would require immediate upgrades. This option would not require the *Village of Belcarra* to own or operate a water treatment facility.



As part of the *Water Supply Study*, order of magnitude costs are being developed for each option. These capital costs include provisions for constructing the major infrastructure, as required for each option, including watermains, intakes, and if required, water treatment facilities, hydraulic controls and contingency factors. These costs are used for comparing the level of effort and long term costs of each water supply.

A preliminary cost summary is outlined below, which includes capital costs necessary to construct a water supply system and a distribution system. Typically, a community such as the *Village of Belcarra* would qualify for infrastructure funding grants from the Provincial or Federal Government. The remaining construction cost would be paid by the *Village of Belcarra* specified area property owners.

Following construction of a water supply system, annual costs are necessary to operate and maintain all water treatment facilities or to purchase bulk water from a member municipality of the *Greater Vancouver Water District*. These annual operating and maintenance costs would be paid by the *Village of Belcarra* specified area property owners.

	Potable Water Supply Source				
	Local Supplies		Greater Vancouver Water District		
	Groundwater Range*	Surface Water	District of North Vancouver	City of Port Moody	Village of Anmore
<b>Construction Costs (in 2005 Million dollars)</b>					
<b>Water Supply System</b>	\$ 1.4 to \$ 3.0	\$ 2.9	\$ 1.9	\$ 1.4	\$ 3.2
<b>Distribution System</b>	\$ 2.5 to \$ 2.5	\$ 2.5	\$ 2.5	\$ 2.5	\$ 2.5
<b>Total Construction Costs</b>	\$ 3.9 to \$ 5.5	\$ 5.4	\$ 4.4	\$ 3.9	\$ 5.7
<b>Amount Covered by Government Grants (67%)</b>	(\$ 2.6) to (\$ 3.7)	(\$ 3.6)	(\$ 2.9)	(\$ 2.6)	(\$ 3.8)
<b>Cost to the Village of Belcarra</b>	\$ 1.3 to \$ 1.8	\$ 1.8	\$ 1.5	\$ 1.3	\$ 1.9
<b>Annual Costs to the Village of Belcarra (in 2005 dollars)</b>					
<b>Debt Servicing Cost (at 7% ann. interest)**</b>	\$ 123,000 to \$ 170,000	\$ 170,000	\$ 142,000	\$ 123,000	\$ 180,000
<b>O &amp; M Cost</b>	\$ 50,000 to \$ 101,000	\$ 95,000	\$ 126,000	\$ 126,000	\$ 143,000
<b>Total</b>	\$ 173,000 to \$ 271,000	\$ 265,000	\$ 273,000	\$ 244,000	\$ 328,000
<b>Annual Costs per Lot (in 2005 dollars)***</b>					
<b>Cost per Lot for Debt Payment over 20 years</b>	\$ 410 to \$ 570	\$ 570	\$ 480	\$ 410	\$ 590
<b>Operating Costs Per Lot</b>	\$ 170 to \$ 340	\$ 320	\$ 420	\$ 420	\$ 480
<b>Total Cost per Lot</b>	<b>\$ 580 to \$ 910</b>	<b>\$ 890</b>	<b>\$ 900</b>	<b>\$ 830</b>	<b>\$ 1070</b>
* To account for uncertainties in the quality and quantity of groundwater a lower and higher estimate are provided					
** Assumes 7% annual interest rate compounded annually (debt servicing factor = 0.0944)					
*** Assumes 300 lots					