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Water System Capacity for Fire Protection Committee – Technical Brief #1

Information Letter to Attention of Mayor and Council

Council needs to be aware of issues that are of upmost concern to the Water Committee from the recently tabled 2019 Annual Belcarra Water Report. This report included information that the Water Committee feels they must flag to the attention of Belcarra Council and the residents:

1) Two critically important valves that are designed to maintain the safety of our water supply have been altered significantly in function. There does not appear to be any documentation, who made the decision to change valve setting or to disable the seismic valve at Tatlow tank AND there is no documentation as to the date that these changes were implemented.
2) A review of data included in the Annual Drinking Water Reports from 2013 to 2019 has been completed and appears to indicate excessive leakage somewhere in Village of Belcarra distribution pipes.

This information illustrates why a Village of Belcarra Water System Manual along with a SCADA Operational Manual are so important. The manual needs to describe what these valves do for the safety of the water system and include information on the authorization procedures for making ANY changes to the settings or installation of the valves.

1) **Actuated altitude valve at the Tatlow Reservoir**

The information in the 2019 report indicates:

> *Installation of an actuated altitude valve at the Tatlow Reservoir was completed and put in service in November of 2017. The ability to start filling the reservoir remotely or manually on demand, improves water availability for firefighting with the ability to quickly adjust water levels. The mechanically actuated altitude valve settings were adjusted in 2019 to better balance the water quality and quantity. The current high setting is 95%, the current low setting is at 55% which is below the nonadjustable altitude valve setting of 60%. During firefighting conditions, the low setting of the actuated valve gets moved to 80% in order to help prevent the water tank from running too low.*

The information that the Water Committee received after the fire at Turtlehead was that the low setting was raised to 80% (reference: Belcarra Barnacle, Volume 39 Issue 6, page 6, Fire and Water, Bruce Drake) to ensure that the tank had sufficient volume of water for fire fighting. The resulting risk from lowering the low water setting on the Tatlow Tank may be a good idea for domestic water supply but critical failure volume of water available for fire fighting.

Changing the actuated valve to full open upon a fire callout will add water to the Tatlow tank but the tank will lose water capacity once the fire department starts to use the water on the fire. Thus, it is especially important to maintain the minimum valve setting as high as practical so that maximum volume of water will be available in the Tatlow tank during a fire event. This minimum valve setting is difficult due to the potable system needing to maintain minimum chlorination levels (low setting) and the large volumes for fire fighting not providing proper mixing (high setting as possible).

The reason for wanting a higher low water setting is illustrated in the following table.

Measured maximum capacity of Tatllow resevoir = **244,600 litres** (91.5% of usable volume of 267, 310 litres).

Tank at 55% of usable volume = 147,021 litres.

Tank at 65% of usable volume = 173,752 Litres

Tank at 75% of usable volume = 200,483 Litres

Tank at 80% of usable volume = 213,848 Litres

This table indicates the usable volume of water at various low water settings of the value. The Water Committee wanted the Fire Department to have as close to a full tank as possible when they started to fight any fire.

How much time is required to fill the tank based on various water flows from District of North Vancouver water supply?

	Litres	Fill time rate (litres/sec)	20	30	40	60
Measured Maximum tank level:	244,600	Fill time rate (litres/min)	1200	1800	2400	3600
55% level:	147,021	Fill Time(mins)	**81**	54	41	27
Litres to fill to Meas. Max level:	97,580					

	Litres	Fill time rate (litres/sec)	20	30	40	60
Measured Maximum tank level:	244,600	Fill time rate (litres/min)	1200	1800	2400	3600
65% level:	173,752	Fill Time(mins)	59	39	30	20
Litres to fill to Meas. Max level:	70,849					

	Litres	Fill time rate (litres/sec)	20	30	40	60
Measured Maximum tank level:	244,600	Fill time rate (litres/min)	1200	1800	2400	3600
75% level:	200,483	Fill Time(mins)	**37**	25	18	12
Litres to fill to Meas. Max level:	44,118					

	Litres	Fill time rate (litres/sec)	20	30	40	60
Measured Maximum tank level:	244,600	Fill time rate (litres/min)	1200	1800	2400	3600
80% level:	213,848	Fill Time(mins)	**26**	17	13	9
Litres to fill to M.Max level:	30,752					

The table above illustrates that at the current rate of water flow from DNV it will take 81 minutes to replenish the water in the Tatlow tank when the low water setting is at 55%. This time is significantly shorter (26 minutes) when the low water setting is at 80%. Not the optimum situation but the best compromise for balancing the domestic water supply requirements and the fire fighting water requirements.

2) **Seismic valve at the Tatlow Reservoir**

The Annual 2019 Water Report indicates:

" Seismic valve at the Tatlow reservoir has been disabled. The sensitivity could not be adjusted to a satisfactory setting and potential damage could occur to the pumping system if the valve got triggered inadvertently."

The seismic valve has been turned off so that the Village will no longer retain a source of water in the reservoir that could be used for fires, which is commonly associated with seismic events. It is alarming to find out this information as this displays a lack of understanding on the critical importance of those valves.

This adjustment occurred after 2-3 years of reporting how sensitive the valve was during operation. A decision was made to decommission this valve in spite of previous years reports indicating how critical this valve was to the operation of the water system from premature emptying of all the water during any seismic event.

2018 Water Report reported that "*Installation and monitoring of the Seismic Valve at the Tatlow Reservoir was in full service during 2018. The valve is very sensitive and needed to be cautiously calibrated so that it functions only during a seismic event, thereby closing the reservoir should there be a main failure, to prevent premature emptying. This allows the Public Works to assess any damage and to isolate and/or repair the area, so the water system can be put back into service. This would retain a source of water in the reservoir that could be used for fires, which is commonly associated with seismic events.*"

2017 Water Report. Reported "*Installation and monitoring of the Seismic valve at the Tatlow Reservoir was initiated and went into full service in 2017. The valve is very sensitive and needed to be cautiously calibrated so that it functions only during a seismic event, thereby closing the reservoir, should there be a main failure, to prevent premature emptying. This allows the Public Works Crew to assess the damage and isolate or repair the area so the system can be put back into service with water still in the reservoir. This would also retain a source of water in the reservoir that could be used for firefighting, which is commonly associated with seismic events.*"

3) The Drinking Water Annual Reports appears to indicate excessive leakage in distribution pipes

The 2019 Drinking Water Annual Report indicated that *"From January to December 2019, there was 2,554,030 cubic Feet of water consumed (19,105,471 gallons) in Belcarra, this is up from 2018 by 233,145 cu/ft."*

This volume increase in consumption needs to be viewed in the context of increases over previous years consumption and the analysis is pointing towards a leak in the Belcarra distribution pipes.

a. Typically, the number of residences connected to the water supply increases by approximately 5 or less per year.
b. With a total of 179 residences connected in 2019, this can explain a 2 to 3% yearly water consumption increase which is far less than the recorded average yearly consumption increases of +10%.

			DAYS	M3	LITERS	L/D	L/H	L/M	L/S	% over previous year
2019			365	72322	72,322,000	198142.50	8255.94	137.60	2.29	10.00
2018			365	65748	65,748,000	180131.50	7505.48	125.09	2.08	17.14
DISREGARD 2017	2 FIRES + LEAK		365	89970	89,970,000	246493.20	10270.55	171.18	2.85	
2016			365	56127	56,127,000	153772.60	6407.19	106.79	1.78	17.75
2015	5/1/2015	29/12/2015	359	46881	46,881,000	130587.70	5441.16	90.69	1.51	10.84
2014			358	42179	42,179,000	117818.40	4909.10	81.82	1.36	11.16
2013			345	36567	36,567,000	105991.30	4416.30	73.61	1.23	

Since 2013 there has been a year over year increase in water consumption of about 10% that cannot be simply explained as being increased number of hook-up to the system. This increase in water consumption needs to be investigated.