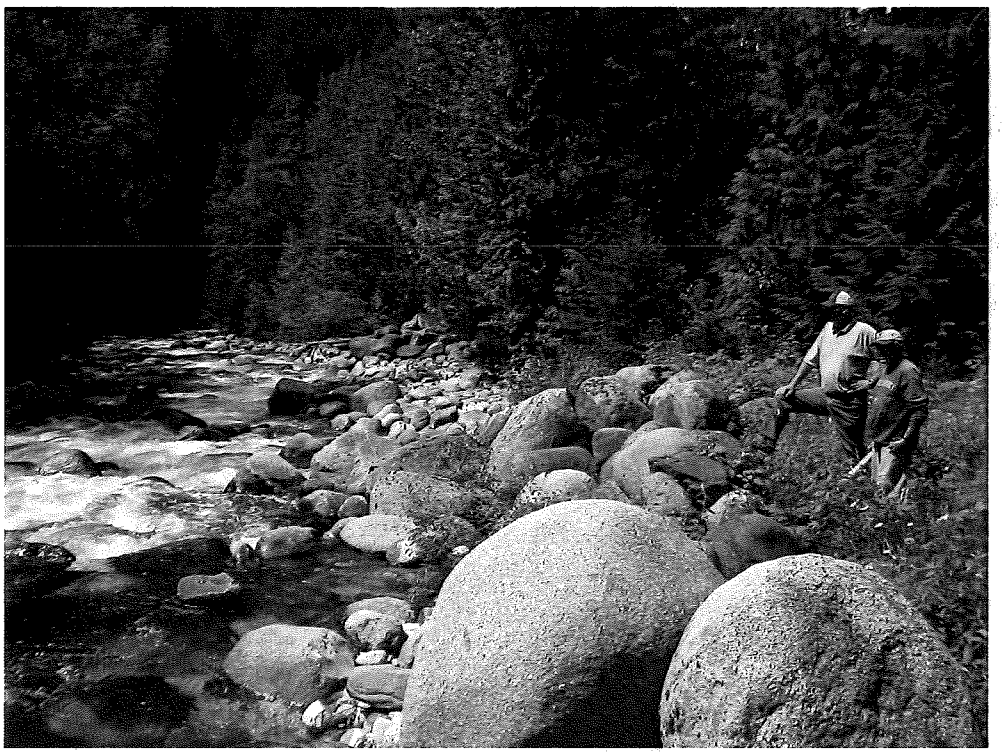
Sanca Park Water System

Water System Upgrade Options



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Introduction

The Regional District of Central Kootenay is excited to explore a unique opportunity for the Provincial Government, the Regional District of Central Kootenay (RDCK) and the Interior Health Authority (IHA). Since 2003 there have been a number of changes in the water industry in British Columbia. These changes include:

- ✓ New water legislation and regulation has been enacted;
- ✓ Point of Entry and Point of Use technology has been included in Provincial legislation;
- ✓ Awareness around climate change has increased and its impact on water resources;
- ✓ 174 local governments have signed the Provincial Climate Action Charter agreeing to be carbon neutral by 2012.

These changes have created a number of challenges for small water systems and generated a lot of interest in Point of Entry (POE) technology as a potential solution for bringing small water systems up to standard.

Background

The RDCK has spent a considerable amount of time and money in partnership with the Provincial Government studying the pros and cons of POE technology and how this technology could be employed on a full scale in a community. The Interior Health Authority has stated that they are not opposed to using this technology on a community scale and would like to see a project move forward in partnership.

The following proposal outlines a Point of Entry concept that incorporates best water management practices as well as renewable energy. This project could be employed on a community scale and evaluated over a one year period to gather data and demonstrate under what water quality conditions, or better, the proposal could be employed provincially or even nationally. This community scale exercise will add significant value to understanding POE technology, its benefits, and where and when this technology is applicable.

The Community Selection Process

The RDCK has three study grants to evaluate POE technology and communities where this equipment might be applicable.

South Slocan

South Slocan was opposed to chlorine in their community and the concept of using carbon filters at the point of entry to remove chlorine was evaluated. This worked well in the community of Ymir in conjunction with centralized treatment and it was determined that this was a better approach for a community with 60 connections.

Denver Siding

Denver Siding was small enough to consider for POE technology; however, a potable water source is available from the Village of New Denver. Best management practices dictate that the two systems should be amalgamated. After several community meetings with Denver Siding and meeting with the Village Council for New Denver it was agreed to consider amalgamating the communities. A result of a poll that was taken within the Denver Siding community indicates that the community is in favour of moving this process forward.

Sanca Park

Sanca Park has approximately 30 connections but only 6 full time residents with the other 24 being seasonal residents. Water quality is typical for a creek source in the Kootenays. Sanca Creek in particular is subject to seasonal fluctuations in turbidity and has deposited substantial amounts of sand and gravel in the distribution system thus making it mandatory that some form of sedimentation/filtration be incorporated in the treatment regime. Sanca Park's proximity to the District of Erickson where the RDCK has certified staff to monitor the system makes this an ideal community for doing a full scale pilot study.

Previous Study

In 2007 the RDCK installed a POE system in a private residence in Sanca utilizing a bag filter and a Hallet UV unit. The unit was monitored for a period of one year and the results indicated that this would not be a suitable form of treatment for this community. Some challenges that have been identified are highlighted in the next section.

POE Challenges

Although the water quality is good in Sanca, during freshet it is subject to excessive sand and gravel infiltration in the distribution system. This causes problems for the filters in the POE unit as they require daily cleaning. As well the suspended solids that

manage to penetrate the bag filter will reduce the efficiency of the UV unit. It is clear that POE technology will work best on systems that have consistently high quality raw water.

Volume of Water Use

UV Reactors need to be appropriately sized for the residential connections. It has been found that occasionally homeowners excessively water their gardens and this causes the UV Reactor to alarm and shut down the system. There is a need to incorporate best water use practices to split the potable water stream and water used for gardens and washing cars.

Water Temperature

Cold water temperatures can also have an impact on the UV Reactors at high flows. Occasionally they will alarm at high flows with cold water and shut down.

Power Surges, Brown Outs and Outages

Power was discovered to be a significant issue. Power outages happen several times per year shutting down UV Reactors and requiring restarts. Power surges and brown outs can have the same effect.

Conclusions

The following conclusions were drawn:

- Consistent water quality is important for POE systems;
- Passive pressure membrane filters that require minimal power and provide certified log credits for removal of viruses, (Giardia & Cryptosporidium) and bacteria would reduce operational issues;
- Splitting raw water supply from potable water supply would prove beneficial and extend the life span of POE equipment;
- Access to equipment 24/7 is important and therefore must be contained in a vault at the property line;
- It will likely be necessary to inject chlorine at source in order to maintain the integrity of the distribution system and as well provide a second barrier for disinfection. The chlorine could then be removed using a carbon block filter at the property line.

Current Proposal

Headwork's Facility

To make this project successful and relevant beyond the community of Sanca Park it is extremely important to have a consistent water quality feeding the POE treatment equipment. Presently there is a need to upgrade the infiltration gallery that is currently servicing the community. It is constructed of 6 inch perforated PVC pipe and has no backwash capability. As a result it is prone to clogging with sand, gravel and tree roots.

Now would be an appropriate time to investigate other options to improve raw water quality so that the seasonal fluctuations currently experienced are avoided. Two options are currently being evaluated.

The first option would be diverting a portion of the creek into a sedimentation pond. The water would then pass through a mechanical screen and be piped to the Town simply by the use of gravity. The excess water would be returned to the creek and the sediment would be dredged from the pond as required. There are however a couple of issues with this approach:

- In order to divert the creek we would require the assent of the Department of Fisheries and Oceans (DFO) and the Ministry of Environment (MOE) and retain the services of an engineering firm to design the intake structure.

- The second and more difficult issue is that the RDCK does not own the land that the structure would be sitting upon and because of the large footprint of the facility we would need the cooperation of the property owner to expand the existing right-of-way agreement.

The second option to improve raw water quality would be to dig or drill a well immediately adjacent to Sanca Creek. Although a small (30,000 impg) reservoir and a power line are required it would still be a much smaller footprint than the first option of diverting the creek. Another factor influencing this decision is that we would likely get a turbidity reading of less than 5 NTU from the sedimentation pond but would get an NTU[1] reading of less than 1 from the well. Although IHA would likely classify the well as a Guidi[2] well, the enhanced raw water quality would make the downstream treatment that much more effective.

[1] NTU means nephelometric turbidity unit (a measure of cloudiness)
[2] Guidi well means groundwater under the direct influence of surface water

Purple Pipe System and Roof Water Collection

In order to extend the life of the POE equipment and to size it correctly to meet the maximum daily demand of each household it is recommended that where possible water used for irrigation not be treated. This could be accomplished by installing a second connection to the main or splicing into the service line prior to the line entering the POE vault. As well rain barrels or handy tanks could be used to supplement irrigation water. The advantage of using this technology cannot be overstated as it could reduce the summer volumes of treated water by as much as 70%.

Point of Entry Treatment Equipment

As stated earlier the results of a pilot study utilizing a bag filter and UV Reactor performed on one home in Sanca proved to be unsuccessful. The amount of service calls required to keep the unit operational would make it uneconomical if applied to the entire community. In order to avoid most of the issues connected to our previous pilot study a membrane filtration system would be better suited to this application.

Two options are currently being investigated:

- a Homespring unit by Zenon
- a Freshpoint unit by Pentek

Although one is an inside-out unit and the other is an outside-in unit both are capable of meeting IHA's requirement of a 4-3-2-1-0[3] treatment regime. (See Appendix A and B for further information on each unit's performance specifications.)

As previously discussed in order to allow access to the POE units 24/7 they should be housed in a vault or kiosk located on the property line. In order to save money the two units could live in one vault which could be located on the line separating the two properties but remain in the utility corridor. As these units require electricity to activate their backwash cycle it is anticipated that this power could be supplied from a solar panel which would service both units.

Due to the sandy gravel soil conditions found in the Sanca Park area it is anticipated that both units could share a common drain without any difficulties as the backwash rates would typically be about 10 - 12 liters per day per unit. (See performance specifications in Appendix A and B.)

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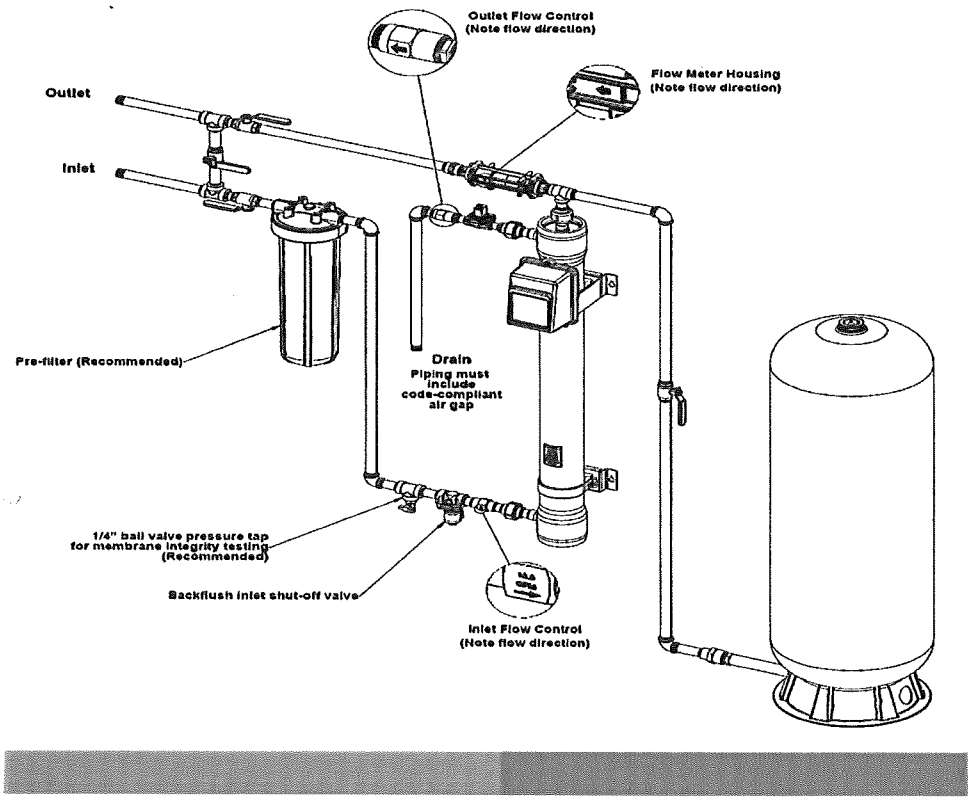
[3]BC Interior Health has identified five objectives (4-3-2-1-0) for providing water that is safe for consumption. The 4-3-2-1-0 objectives represent the following: 4 log (99.99%) reduction in viruses; 3 log (99.9%) reduction in pathogens; 2 methods of treatment; 1 nephelometric turbidity unit (NTU)(a measure of cloudiness); 0 coliforms.

A schematic for a typical unit is shown below:



Membrane filtration, how does it work?

- Water enters the system from the bottom port, flowing into the straw-like hollow fibers inside the vessel. As water passes through the walls of the fiber, particles as small as 0.025 microns, including sediment, turbidity, and cysts, are trapped in the pores of the membrane, removing them from your water supply.

- After passing through the membrane, clean water flows up through the large perforated center channel. From there the clean water enters your existing plumbing system, reaching every point of use throughout your house.

- The system will periodically run through a self cleaning cycle to flush trapped particles from the porous fibers. This serves to maximize the system's filter capacity and extend the life of the membranes.

Electrical Requirements

Each unit requires a small amount of electricity to operate the controller which triggers the backwash cycle. Rather than supplying this power from the individual residences, a better option would be to supply the power using solar panels with a battery bank. This would eliminate any problems associated with power outages and avoid the cost running an underground cable from the house.

Cost Estimates

As a result of the information gathered to date, the RDCK would like to put forward two proposals at this time to address the issue of water quality in the Sanca Park water system. These options are contingent on getting widespread support from within the community. Without that support no work can proceed.

Option#1: Apply for an Infrastructure Grant and treat the Sanca Park system as a POE study. The folks in Victoria have indicated that they would look favorably on such a proposal. Although the cost of putting the infrastructure in place would be borne by the grant, the cost of maintaining it would be borne by the residents of Sanca Park.

Option#2: Borrow sufficient funds through the Municipal Financing Authority (MFA) to drill a well; build a small reservoir; and install a puck chlorinator. The reason for drilling a well as opposed to diverting water from the creek is primarily cost and land use issues as previously indicated. By the use of a reservoir we would still be able to gravity feed the system and the chlorinator would satisfy IHA's requirements for a Guidi well should that be the case. If it was determined that it was necessary to use chlorine then the members of the community that have an aversion to chlorine could be outfitted with a carbon block filter at the point of use.

Both of these options have merit; however, the key component is determining the long term costs. Option #1 would require the creation of a sinking fund to replace the components of the POE units. For the property owners who are residing in the community primarily in the summer months only, the life expectancy of the units would be extended proportionately. For the year-round residents it would be anticipated that some replacement would be required within ten years with full replacement required within twenty years. All maintenance on the POE units would be performed by the RDCK's Erickson water system operators who are trained and certified for these units. They would only be used on an as-needed basis with the exception of the annual integrity tests. It is important to note that with this option the grant money has to be secured. Without it this project would be unaffordable for the community. Option#2 would require a borrowing bylaw which would trigger a poll of the local taxpayers. There are a variety of options for doing this but all require majority assent.

Option #1 - Capital Costs (POE unit costs)

Vault	- material	$2000		
	- labor	$2000		
	- cont.	$ 600		
	Total	$4600 @16	=	$ 76,000
POE unit		$5000		
Solar Power		$ 750		
	Total	$ 5750 @ 30	=	$172,500
Well		$ 8000		
Building		$18,000		
Chlorinator		$ 4000		
Reservoir		$60,000		
	Total	$90,000	=	$ 90,000
Pipeline		$40,000	=	$ 40,000
Sub-total			=	$378,500
15% eng			=	$ 57,000
15% contingency			=	$ 57,000
TOTAL CAPITAL COSTS OPTION #1			**=**	**$492,500**

Option#1 - Annual Operation and Maintenance (O&M) Costs

Administration	=	$ 4200
Integrity Test	=	$ 3000
Materials	=	$ 2500
Sinking Fund	=	$ 7500
Maintenance Contract	=	$ 2500
Total	**=**	**$19,700**
Annual O&M Cost per Connection (30)	**=**	**$ 656***

*Parcel Tax included

Option #2 - Capital Costs

Well	=	$ 10,000
Building	=	$ 15,000
Chlorinator	=	$ 4,500
SCADA	=	$ 2,500
Power	=	$ 15,000
Reservoir	=	$ 60,000
Sub-total	=	$107,000
15% eng.	=	$ 16,000
15% contingency	=	$ 16,000
TOTAL CAPITAL COSTS OPTION #2	**=**	**$139,000**

Option#2 - Annual Operation and Maintenance (O&M) Costs

Please note that in order to complete this section borrowing $110,000 over a term of 25 years @ 5% interest is assumed. The balance of the funds would be withdrawn from reserves. As well the cost of replacing the pipeline that currently goes through the resort is not included.

Administration	=	$ 4200
Maintenance Contract	=	$ 2500
Materials	=	$ 2500
Cost of Borrowing	=	$ 8200
Total	**=**	**$17,400**
Annual O&M Cost per Connection (30)	=	**$ 580***

*Parcel Tax included

Summary

The RDCK Board of Directors has mandated that all water systems that are currently on boil water advisories be removed as soon as possible. This is now a matter of some urgency as effective September 1st the moratorium will be lifted that allows the RDCK to take on new water systems that may also be on a boil advisory so any back log needs to be addressed.

Both options presented in this report have merit and although the residents of Sanca Park would be facing a increase in water rates, once the infrastructure is installed rate increases after that point would likely match the rate of inflation. It should be noted that these rates are about average on a provincial scale for potable water.

Option #1

- Infrastructure upgrades would be fully funded by the Federal and Provincial governments

- Membrane filtration delivers a consistently high quality of water without the addition of coagulants and other chemicals.

- Treating only the water that is used domestically will extend the life of the POE technology.

- For the seasonal residents the POE units can be decommissioned during the winter months. A telephone call is all that is required to have a technician reactivate the system again in the spring.

- The purple pipe system may require the property owner to make some changes to the portion of the plumbing system that is devoted to irrigation.

- The use of solar power is carbon neutral and demonstrates good environmental stewardship.

- This option would allow for expansion of the system thereby potentially reducing costs to the current users.

Option #2

- Infrastructure upgrades would be borne by the residents of Sanca through a combination of borrowing and contributions from reserves.

- Drilling a well comes with no guarantees but if sufficient volumes can be developed at a suitable depth then the requirement for the addition of chlorine may be waved. The alternative would be periodic flushing of the distribution system.
- If in fact chlorine is required, it can be removed at the residences by the use of a Point of Use carbon block filter. This has been used successfully in other communities in the RDCK.

- It will extend the life of the system dramatically by not annually introducing large amounts of sand and gravel into the distribution system.

- The use of a well and a reservoir only would insure operation and maintenance costs would remain reasonable in the years to come requiring only Cost-of-Living increases.

- This option would allow for expansion of the system thereby reducing costs for the current users.

In conclusion, the Sanca Park Water system needs to get off the Boil Water Advisory. There may be other options available for treatment but none of these are likely going to be any cheaper than the ones proposed herein. Regardless, the community needs to decide what their long range goals are so that the RDCK can put the planning in place to realize those goals. Even if a decision was made this fall it would take 6 - 12 months before construction could begin. Support from the majority of the community is needed before we can move ahead with any of these initiatives.

For further information or clarification on the above Options please contact the under signed.

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APPENDIX A – Homespring Unit

Specifications for the Homespring Unit by Zenon

APPENDIX B – Freshpoint Unit

Specifications for the Freshpoint unit by Pentek

APPENDIX C – Water Sample Results

APPENDIX D – Dual POE Chamber Conceptual Model

APPENDIX E – Map of Sanca Water System