

Drinking Water Pilot Case History:

Surface Water Pilot



Background

Bowen Island Municipality's Cove Bay Water System (CBWS) treats surface water from Grafton Lake to drinking water. Historically, the lake water was treated with hypochlorite addition however this treatment is insufficient to meet the Canadian Drinking Water Quality Guidelines (CDWQG) for several parameters including protozoa, turbidity, manganese and colour.

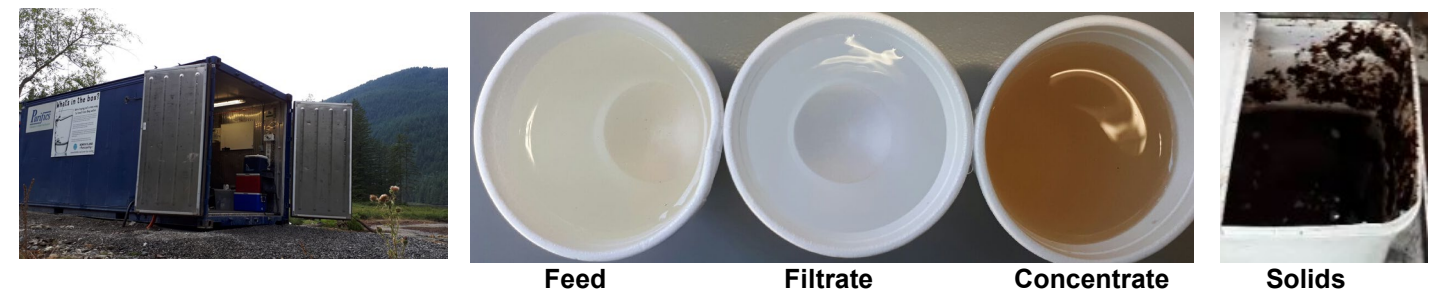
Full Scale in Production



Pilot Program Overview

To comply with CDWQG, the Municipality reviewed several treatment technologies for ability to meet the treatment commitment and affordability of treatment¹. From the review it was concluded that the financial and operational benefits offered by Purifics **Cuf** (Continuous Ultra Filtration) surpassed those offered from other technologies. Therefore, a continuous 3-month pilot study was conducted to determine **Cuf** treatment efficiency and optimum operating conditions for full-scale plant.

The packaged **Cuf** + **DeWRS** pilot plant operated 24/7 from August - November 2017. Raw water was pumped from the lake and sent directly to the **Cuf**. There is: No backwash, No Clean-In-Place (CIP) and No Pre-Treatment.



Cuf concentrate is sent to the **DeWRS** for solids recovery and to achieve Zero Liquid Discharge (ZLD). The solids produced via the **DeWRS** were characterized to determine any factors that may impact their beneficial use for land application.

Additional information on Pilot performance and solids use are detailed below. Results from the Pilot prompted the application for a full-scale **Cuf** + **DeWRS** drinking water plant, currently in production.

Flux (LMH / GFD)	400 / 236
Duty	99%
Filtrate	>99%

Performance

Analyte	Units	MCL	CDWQG Standards	Raw Water	<i>Cuf</i> Filtrate
UVT @ 254 nm - Unfiltered	% T	0.1	N/A	74.8	97.9
Colour, True	CU	5	AO ≤ 15	18	< 5.0
Carbon, Dissolved Organic	mg/L	0.5	N/A	2.17 – 4.01	< 0.5 – 2.08
Turbidity	NTU	0.1	OG < 0.1	0.72 – 1.62	< 0.10
Arsenic, total	µg/L	0.5	MAC = 10	0.5 – 1.4	< 0.50
Iron, total	mg/L	0.01	AO ≤ 0.3	0.13 – 0.65	< 0.010
Manganese, total	mg/L	0.0002	AO ≤ 0.05	0.08 – 0.27	0.058

*MCL = maximum contaminant level, AO = aesthetic objectives, OG = operational guideline, MAC = maximum acceptable concentration.

Reduced THM & HAA Formation

A simulated distribution system (SDS) test was used to monitor trihalomethanes (THM) and haloacetic acids (HAA) production. The SDS test involves dosing the tested water with the estimated actual demand free chlorine that would provide the required Cl residual for the distribution system. The sample is then incubated for 5 days.

The SDS test results demonstrated that the *Cuf* reduced free Chlorine demand by over 68 % and reduced THM and HAA formation by over 80 and 89%, respectively.

Analyte	Units	MCL	Raw Water	<i>Cuf</i> Filtrate
Free Cl, initial	mg/L	--	9.2	6.1
Free Cl, final	mg/L	--	0.8	3.5
Free Cl Demand, total	mg/L	--	8.3	2.6
THMs	µg/L	80	67	10.7
HAAs	µg/L	60	53	5.5

DeWRS Residuals Characterization & Use

Characterization of the residuals confirmed that the solids met all Code of Practice for Soil Amendments Standards and could be used for land application.

The aluminum content of the solids helps immobilize excess phosphorus in the soil which is beneficial for:

- agricultural amendment
- co-applied with manure/biosolids for nutrient management.

Recovery of the solids for land application makes the residuals a value-added product.

Residuals Characterization	
Moisture, Average	88.9 %
Organic Content	35.5 %
Wet Bulk Density, (as-is)	1.03 – 1.15 kg/L
Dry Bulk Density	0.10 – 0.15 kg/L
Size Distribution	Consistent
Sample Classification	Sandy Loam
pH	5.5 – 6.3

References:

¹BIM (2018) Pilot Plant Study Ceramic Ultrafiltration. <<https://bowenland.civicweb.net/document/152264>>



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