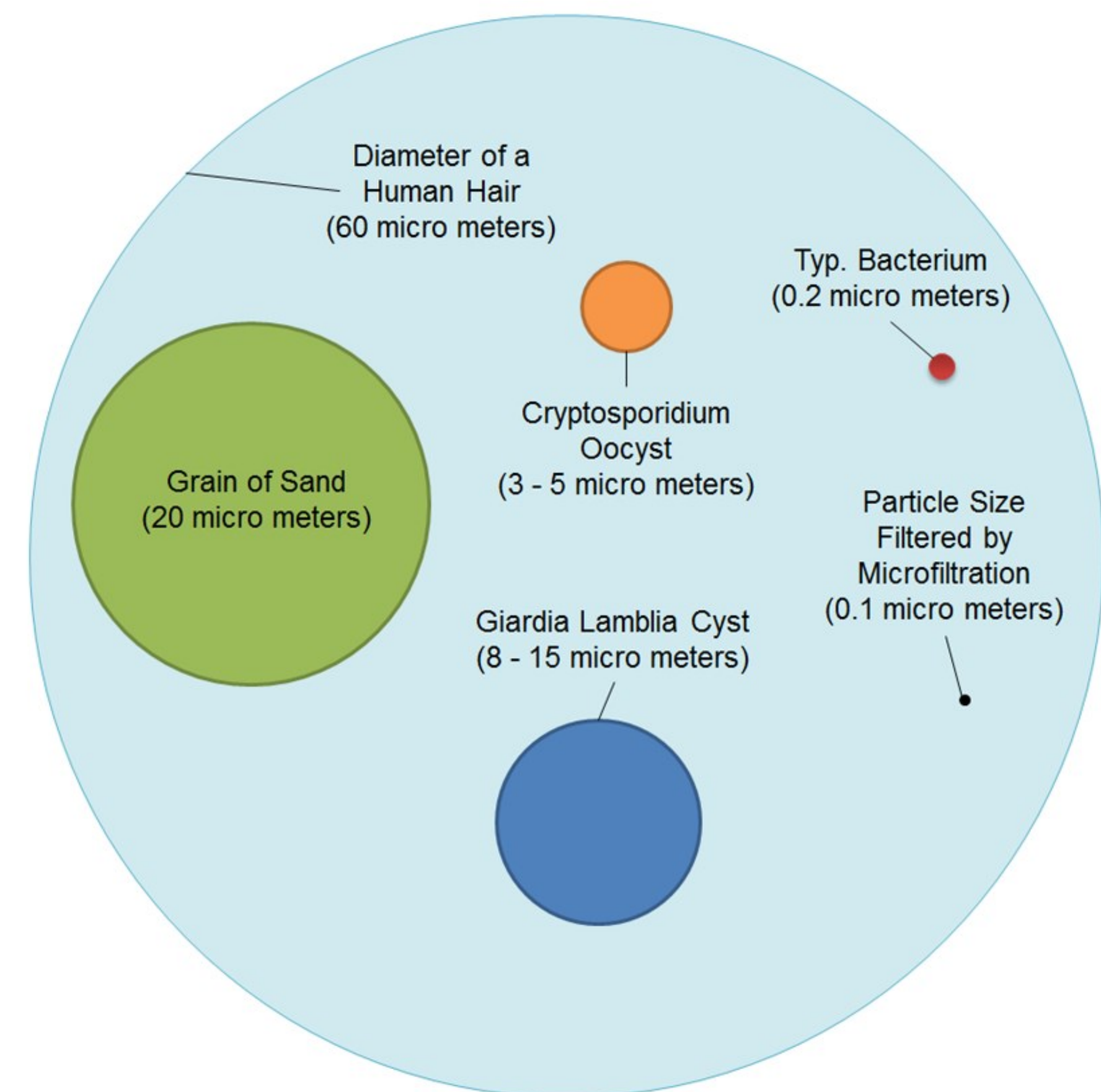


WHY TREAT SURFACE WATER?

There are naturally occurring microbiological pathogens such as E. coli present in our surface water which has typically been removed using chlorine disinfection. There are also organisms such as Cryptosporidium and Giardia which are not removed with the use of chlorine. The most effective means of ensuring such organisms do not find their way into the community's potable water supply is by using the multi barrier approach. The illustration below shows the filtration size required in order to completely remove all biological threats to our drinking water.

A multi-barrier approach to water treatment of surface water is required by Island Health to meet their health standards and to be in compliance with Canadian Drinking Water Guidelines. The multi-barrier approach, filtration, ultraviolet light and chlorination works to ensure safe healthy water is delivered to residents.



HANDLING TURBIDITY (muddy water)

If water from the Englishman river was relatively free of the silts and sediment (turbidity) treating the water would only require simple direct filtration, disinfection by means of ultraviolet light followed by chlorine disinfection. This is not the case with the Englishman River water source as turbidly events happen on a regular basis through the fall, winter and spring and occasionally during the summer months. With turbidity a problem throughout the year any treatment system must be able to achieve turbidity and microbiological removal at the same time.

Several options have been investigated to remove turbidly and settle it out prior to treatment including constructing raw water reservoirs ahead of the water treatment plant. A few days of raw water storage may reduce turbidly spikes entering the treatment facility during the events therefore allowing a low-turbidity tolerant process such as direct filtration. Ultraviolet light disinfection. However, raw water reservoir construction costs, security and algae control related operating issues negate the benefit of a raw water reservoir. Limited site availability and hydraulic considerations would also pose a challenge, and therefore the construction of raw water reservoirs were not considered further for this project.



Englishman River During Turbidity Event

CAN WATER TREATMENT BE PHASED IN AT A LATER DATE?

Filtration processes and equipment are one of the leading costs for the proposed treatment plant. The province can consider the introduction of filtration at a later date if certain conditions are met. The filtration avoidance criteria were reviewed to determine whether filtration of Englishman River water could be deferred past 2016. Part of the criteria as defined by Health Canada and by the BC Ministry of Health requires that turbidity not exceed 5 NTU for more than two days in a 12 month period and that E. coli levels never exceed 20 counts/100mL in the raw water. The Englishman River does not satisfy either of these criteria and therefore, an application for filtration deferral would likely be rejected.

WATER TREATMENT OPTIONS

A number of water treatment technology processes were reviewed and considered suitable for treating the Englishman River water source, these were:

- Direct filtration
- Conventional treatment (sedimentation/media filtration)
- Dissolved air flotation/media filtration (DAF)
- Membrane filtration
- Ballasted flocculation (Actiflo®/media filtration)

Direct filtration technology was ruled out due to the inability to readily handle turbidity spikes. The pilot testing for dissolved air flotation technology showed that organic material was too heavy to allow this technology to perform well under all conditions. Ballasted flocculation technology uses rapid sand filtration and easily handles high turbidity spikes however this technology was determined to be too excessive in low turbidity events and therefore results in high operational costs.

Two technologies were selected for small scale water treatment piloting: conventional treatment and pressurized membrane treatment. The piloting project started in fall 2011 and finished in spring 2012 and used water from the Englishman River to flow through the small scale water treatment plants to test the treatment processes under the challenging conditions. The purpose of doing small scale water treatment plant piloting is to prove out such technologies and ensure treatment objectives are met prior to building the full scale water treatment plant. During this period, the pilot water treatment plants went through typical high turbidity events in the fall as result from the first initial winter storms and early spring freshet flows.

Conventional treatment did not perform well over the duration of the pilot test period and could not adjust rapidly enough to sudden changes in turbidity levels. The pilot test results for the pressurized membranes performed well and consistently demonstrated that the membranes could reliably reduce turbidity to potable water objectives and efficiently remove all biological threats. Pilot testing determined membrane technology water treatment best suits the Englishman River water source.



Typical Pressurized Ultrafiltration Membrane Package Treatment Plant

NEXT STEPS

- DFO approval is expected before yearend.
- Referendum on borrowing in early 2016.
- River intake construction in summer 2016 or 2017, depending upon DFO approval and construction windows.
- Treatment plant construction is subject to funding Phase 1 of Plan B, including treatment plant commissioning. This could potentially be completed by June 2018, in time to meet 2018 peak summer requirements.

This timeline will not meet Island Health's December 2016 treatment requirement and an extension will be required. ERWS has been working closely with Island Health since summer 2014 when the uncertainty of the grant amounts brought into question the overall fiscal risks and community impacts of proceeding with or without senior government support.

In order to bridge the water demand deficit from the summer of 2016 to 2018 both jurisdictions need to consider redeveloping and developing additional wells as an interim redundancy measure. If Island Health was not willing to change the Operating Conditions very stringent watering restrictions would be required for 2017 if the river intake was not used or a boil water advisory would be required if it was used.

WHERE IS THE PROJECT AT?

We have retained professional experts in water treatment, supply, distribution, geology, hydrogeology and environmental engineering to establish an efficient, reliable and cost-effective treatment and distribution system which will meet needs now and into the future. Project components include:

- New river water supply intake to withdraw water from the Englishman River, carefully designed and located to consider the needs of river users and protect aquatic habitat.
- New water treatment plant and distribution system to meet Island Health's drinking water quality standards.
- Phased design and construction to meet community growth and ensure affordability.

The project has been completed to the predesign stage in an effort to further refine capital and operating costs, proceed with required senior government approvals and apply for grants.

There are a number of critical dates and factors which need to be addressed before proceeding with detailed design, tendering and construction:

- Department of Fisheries and Oceans Canada construction approval
- Federal/provincial grant funding
- Assent of the electorate (referendum) for borrowing

Plan A and Plan B

Two plan options have been prepared to date:

Plan A will provide the community with 24 million litres per day of membrane filtration, UV and chlorine disinfection, a new intake and transmission mains to connect to each jurisdiction capable of supply the community for over 20 years without further upgrades or phasing.

Plan B option is a multi phased approach with reduced water treatment of 8 million litres per day of membrane filtration, UV and chlorine disinfection, a new intake and transmission mains to connect to each jurisdiction. This option is capable of supplying the community's needs for the next 8 to 10 years until further water treatment capacity is added. The initial cost for Phase 1 of the option is \$24.3 million and \$16.4 million in year 2024 for additional phased water filtration expansion to meet water demand needs.

PLAN A

Water intake, pump station and raw water main	\$ 4.3 million
Water treatment and site servicing	\$ 18.8 million
Aquifer storage and recovery	\$ 2.6 million
Region joint transmission main upgrades	\$ 0.8 million
City of Parksville supply system upgrades	\$ 5.6 million
RDN – Nanoose supply system upgrades	\$ 1.7 million
Design, tendering, construction administration	\$ 3.2 million

Total \$ 37 million

PLAN B

Water intake, pump station and raw water main	\$ 4.0 million
Water treatment and site servicing	\$ 8.5 million
Aquifer storage and recovery	\$ 2.6 million
Region joint transmission main upgrades	\$ 0.8 million
City of Parksville supply system upgrades	\$ 3.5 million
RDN – Nanoose supply system upgrades	\$ 1.7 million
Design, tendering, construction administration	\$ 3.2 million

Sub-Total (Phase 1) \$ 24.3 million

Upgrade WTP to 24 ML/d. \$ 16.4 million

Sub-Total (Phase 2) \$ 16.4 million

Total Project (Phase 1 & 2) \$ 40.7 million

Description of Works	Plan A - Original Predesign Report	Plan B - Multi Phased Approach with Reduced Treatment Capacity
Phase I – Firm Water Treatment Membrane Filtration Capacity	24 ML/d	8 ML/d
Water Intake / Raw Water Main	48 ML/d	48 ML/d
Transmission Mains	OCP Build Out	OCP Build Out
Total - Phase I Cost	\$37 Million	\$24.3 Million
Year 2024 Phase II Water Treatment Plant Upgrade to 24 ML/d Cost:	Not Required	\$16.4 Million
Total - (Phase I and Phase II) Cost	\$37 Million	\$40.7 Million



GRANT FUNDING

A grant application for the New Building Canada Fund: Small Communities Fund (federal/provincial) was submitted in November 2014 for \$24 million. Initial indications were that these grants would be announced in spring 2015 and that there was a reasonable expectation of between \$15 million and the full \$24 million applied for being awarded. Current indications are that the announcements will not be until at least October 2015 and the amounts will likely be 25% of (or even less than) what was applied for, this would indicate that "Plan A" is financially unachievable and all efforts should be directed to "Plan B", a multi-phased approach with reduced water treatment plant capacity as the recommended option.

Annual water rate increases for the City of Parksville required to fund the project would be in the 2.25 % range for 2016 through 2024 based on receiving federal / provincial grants in the order of \$ 6 million.

The Regional District funds the Nanoose Bay Bulk Water Service through parcel taxes and has projected a 10% per year increase for 2015 through to 2018 in order to both transfer funds to reserve for these projects and to ensure adequate funding for debt servicing based on receiving no federal / provincial grant assistance.