June 30, 2022

To: Ted Robbins, General Manager of Integrated Water Services, CRD

From: Water Advisory Council

Re: Additional detailed comments on the 2022 CRD Water Master Plan

Wildlife

- What would be the impact on wildlife if any of the recommendations outlined in the Master Plan are implemented?

Water Use: Differentiating between 'de-generative' water use vs. 'regenerative' water use

- not all water use provides the same value to our region
- when it comes time to pay for this, we need to find creative ways of distributing the cost fairly between those who are using it for regenerative uses and those who are not
- some megaliters grow acres of crops for local consumption while others irrigate estate lawns for properties that sit dormant half the year
- it is important to maintain a significant subsidy rate for those engaged in agriculture & landscape restoration and find better ways to either tax poor water usage; or reward beneficial water use

Agriculture: Little Recognition of the Importance of Agricultural Water Use in the Master Plan

- there is a logical reason for this as it stands now; agriculture only represents 3% of annual demand (according to page 65)
- however, agricultural water usage occurs when water reserves are lowest (drought), so it should already be weighted more heavily weighted as a risk factor
- The plan states: "There is an assumption that water use segregation between residential, ICI and agricultural consumption will remain consistent with population growth." While this is logical for forecasting, it does not take into account any large-scale shocks to food/energy markets that might suddenly make agriculture in the CRD become several orders of magnitude more necessary and important

Treatment and Design (previously submitted to Ted by Wilf but included here for completeness)

- To me the most important upgrade that should be at the front of the line is to design and build a water treatment plant that can deal with the above issues and is also designed to quickly adapt in a modular fashion to new threats such as an outbreak of toxic blue green algae, forest fire ash and debris, changes to the aquatic environment and damage from invasive species such as the giant American bullfrog, large quantities of storm - flood debris, new nasties on the horizon such as rare but deadly parasitic brain eating amoeba which are now found as far north as Minnesota and Seattle (Balamuthia mandrillaris).

- Page 51 from the executive summary:

- I am in favor of the deep intake and Leech River future supply option. Also, yes to the floating pump station if gravity flow is deemed not a viable option.
- use gravity flow if possible.
- two treatment plants - at Sooke and Japan Gulch are my preference _ if possible and in the future allow backup treated water flow from each plant to the other, if an event occurs and the Sooke treatment plant is used for supplying the rest of the region the volume produced would be to supply emergency water volumes only. This would require an east west connector.
- filtration using T5 and T6. Plus have a plan in place to handle unexpected events like a bloom from blue green algae.

General Comments:

1) due to the sensitive environmental location for a new treatment plant the disposal of chemicals used in the treatment process needs to be carefully regulated and monitored to avoid discharge to fish bearing streams and the environment in general. All drainage sources from the plant need to be carefully engineered and be capable of containment in an emergency where they can be neutralized prior to discharge. Secure storage of chemicals on site with spill retention is required.

2) the plant will produce large quantities of backwash and rinse water that will need to be cleaned and disposed of. Part of the waste stream can be cleaned and recycled back to the plant inlet piping, but a large quantity of sludge will still be produced. The quantities shown in the plan seem very optimistic for a filter train that will most likely use DAF, multi media filters, carbon media filters, and membranes. Further engineering is required to confirm the percentage of waste water used and this could also result in larger gross water supply requirements than the plan shows. Also where will the waste line end up - piped to the Victoria sewage system?? I understand the new Victoria sewage plant is pretty close to capacity as it is. Don't see where it can be disposed of anywhere near the plant or reservoir.

3) use of centrifuges and/or filter presses can result in removal of as much as 80% of solids from backwash water. The solids are then compressed into filter cake bars that can be trucked to landfill. The volumes need to be established and a clear disposal plan presented to the landfill operator and sewage plants who will be receiving solid waste and liquid waste at their doorsteps. This issue can be included in the testing of selected filter systems for performance evaluation. Does the budget include provision for advanced disposal techniques?

4) the plan points out there is not much storage for flow balancing in Greater Victoria and additional reservoirs need to be built. More storage means large savings as the water treatment plant can be smaller and is not designed to handle peak flows which is a very inefficient and costly way to run a treatment plant. The CRD should work closely with munies to help them evaluate their storage needs for water usage as well as sufficient reserves for fire fighting and emergency use in case an earthquake knocks out the water supply. Proscrastination only means the price tag will soar. CRD water should not be subsidizing munies that have insufficient storage capacity and are relying on upsized water mains and filter systems. As the study shows there are some potentially enormous booster pumps required that will be very costly to purchase, maintain and operate. The system should be designed to be as efficient as possible and sized to complement a set of strategic storage facilities located in the CRD region. Some pain to taxpayers in areas that do not currently have sufficient storage will result.

5) I believe the water treatment system that includes membranes is the best choice even though it is the most expensive. Consideration should be given to include a treatment train but at a reduced rate for emergency supply levels should blue green algae emerge as a threat. This could include UV and hydrogen peroxide injection with specific NSF carbon filters rated for the application along with daily EPA limit testing for the microcipline limit of 0.3 ug/l and the cylindrospermopsis limit of 0.7 ug/l. Should blue green algae become established in the supply most water usage would have to stop without advanced treatment. This would have an immediate and very negative effect on hospitals and especially dialysis clinics. It might be time for hospitals to consider adding on site emergency water storage tanks that they could pull into service for hopefully short term emergencies.

Also pH and alkalinity needs to be boosted to prevent copper corrosion in piping systems as well as lead leeching. The allowable copper levels and lead levels could be lowered by Health Canada in the future which would be difficult for the system to meet. As well - water with low alkalinity, very low negative reading LSI (Langlier Saturation Index) low TDS (total dissolved solids) can cause issues with effective water treatment. It is possible to dose the water prior to the filtration plant. Contact time is required which would be the piping and head tank, in-line mixers would be helpful also.

6) Water draw from the deep north part of Sooke Lake should be pursued. I recommend a floating pump station with 2 or 3 floating HDPE supply pipes to the south end. Modular pump packages will be easier to pull for maintenance. Floating pipes would save big money over a tunnel or piping thru rock. Some innovative engineering is required to make this work. There is a good example serving Seattle.

7) Question- is it possible to use a siphon(s) system to draw water from the north end of the lake with large diameter floating HDPE piping and only a small pump station would then be required to fill and activate the siphons? Could save a large amount of money on construction and operation. also electrical costs will be greatly reduced. A new head tank may be required.

8) Look for opportunities for placement of power generating turbines to generate power from the system. Involve a third party to own the power generation system(s) install and maintain the equipment and pay CRD a fee for use of the water. It may take some time to make this feasible depending on future power rates. However adding tees and connections for future power generation at suitable locations will be inexpensive and would save money in the future.

9) The overall water plan should include some provisions for providing access to the public to obtain water in case of an earthquake knocking out the water supply long term. Educate the public on solutions - for example every hot water tank that is strapped to the wall could survive and hold 40 to 60 gallons of safe drinking water, all they need is a short washing machine hose to connect to the drain!!!! Let the public know where they can pick up water in containers. Set up an emergency supply protocol with hospitals. There are locations in Victoria which have private wells drilled for example in Fernwood, Vic West, Oak Bay, adjacent to Beacon Hill Park that can supply high quantities of well water. Perhaps an arrangement with the owners would be a good idea - they would need standby power to operate and should have some basic filtration installed.

10) more on emergency supply - encourage large condo and apartment buildings to install water storage tanks in their parkades sufficient for 2 weeks or more of emergency usage in case of earthquake induced water system shutdown.

11) ban using once thru water cooled condensers for refrigeration and air conditioning applications.

Many of the facilities like pubs who use water cooled condensers for their big walk in coolers could reclaim heat extracted by a closed loop cooling system and use it to provide free heat for their kitchen make up air units, space heating and high domestic hot water production.

12) the shaft horsepower shown for pumps for the new overland route, (13,302) - Goldstream connection (41,366) - overland highway (41,366) are extremely high requirements. What is the estimated cost for a sub station, wiring to the pumps, electrical costs, pump costs, etc. are pumps that large even feasible? Gravity flow should be used wherever possible. Huge locomotive sized generators for standby power will be required.

13) more work needs to be done with munies to verify how much actual water storage is required in areas of Greater Victoria to allow efficient and optimal sizing for supply mains and treatment plants, to satisfy fire loads and the Fire Underwriters of Canada, we need multiple emergency storage facilities in case of earthquakes. Not all reservoirs will survive a big shake.

14) detailed discussions with BC Hydro should be initiated now to determine the cost and technical requirements of supplying 3 phase power to the very large water booster pumps specified in the report. Also note that the pump motors will most likely be high voltage 1000 to 2000 volts to keep wire sizing to a reasonable level and require so special reduced voltage starter systems. High voltage pump starters and components require special maintenance and can be very hazardous to work on. Work safe BC (WCB) and Technical Safety BC should be consulted early on to determine their requirements so the regulatory requirements can be allowed for in the initial design.

15) a 5% contingency allowance per 8.1.3 is definitely too low, I think based on the complexity and size of this plan it could easily end up at 20% or more.

16) move up pilot plant studies on effectiveness of filter trains and membranes for application on Sooke Lake and Leech River supply water. Also carefully evaluate how suspended solids, silt, algae, organics, tannins, are collected over a year for a measured ratio of treated water. Also verification of backwash levels required to clear filters in the test stage are required as the stated 5% is very optimistic.

17) see 5.4.1 large water mains can quickly become a home for invertebrates, biofilm, algae, etc. they can also become a reservoir for bacteria that attacks piping systems and causes pinholes. Tiny Invertebrates carry up to 4000 bacteria each which can be pathogenic to humans see paper by E. Wolmarans on pubmed.com. As well the masking of bacteria tests, odor and taste problems, production of regulated by products can be increased. An aggressive program of removing interior pipe coating and buildup is required - plan for cleaning the mains with pipe pigs, increased flushing and disinfection. The current municipal system in greater Victoria has a very heavy dirt buildup in piping especially on older lines. As well in buildings entry valves, PRV stations, control valves and backflow devices can be almost totally blocked by layers of debris buildup. Building operators need to be educated on cleaning their equipment to assure high water quality.

18) see 5.4.2 I believe the CRD has under estimated the amount of corrosion caused by The water supply. The water shows a negative Langlier Index, has very low TDS and alkalinity. By definition it is very corrosive. It is said that water is the greatest solvent in the world. With the change in plumbing code in 1992, pipe sizes were upsized substantially so where a small 42 unit condo previously was served by a 2 inch main with new code that changed to 4 inch and all the branch lines were also upsized. At the same time As the code water pipe sizing was increased flow rates were decreasing due to more efficient

fixtures and regulations reduced water closet flush volumes. Plumbing code does not consider diversity - and actual flow rates in residential buildings are far lower than that calculated for design. Many condo buildings in Victoria show blue green staining on shower walls and fixtures from copper deposition. A report on waste sitting on the ocean floor in 2016 from years of raw sewage dumping noted that the there were elevated levels of copper shown in chemical analysis of the waste material. I'm pretty sure that copper was dissolved from copper piping in local buildings. Condo Buildings are choosing to install expensive chemical injection systems to treat incoming water from the CRD supply to stop corrosion. Water treatment at source to raise alkalinity and pH should be enacted to correct this issue.

19) 5.5.2 power supply ~ as the natural gas main for Vancouver Island runs south of Shawnigan Lake under the right of way it will be easy to connect gas service to provide fuel for the standby generation plants that are required at pump stations and the treatment plant. Diesel fuel should not be considered as it is higher in cost and potential spills could be a big problem.

20) building a diesel fuel tank farm at the site of the treatment plant is not a great idea. With a damaging earthquake the diesel fuel spill could result in major environmental damage as the tanks rupture and raw fuel runs down the mountain. The island natural gas main is located very close to the site in the corridor between Shawnigan Lake and Sooke Lake. The standby generators should be gas fired instead. Also maintenance and operating costs will be far less. No tank farm required. Natural gas also runs cleaner. Tank farms need to be filled on a regular basis which means fuel trucks running up and down in a very delicate environment. Bound to be one roll over and have a potential nasty spill. Remember the one that flipped in Goldstream Park a few years ago plus there was another rolled right by the Salmon River by Sayward up island. Both were major incidents that could have easily polluted vast areas of pristine rivers and oceanfront.

21) with the unparalleled rise in material costs, inflation, material shortages, Surety Companies will be raising rates on bid bonds, performance bonds, and labour - material bonds from the current low rates that we have been used to for many years. I can see these rates easily doubling. Contractor insurance rates will also rise substantially over the next few years saddling larger projects with additional costs.

22) how accurate are the cost estimates in appendix B, how detailed was the information and design data that allowed the Stantec engineers to come up with the numbers and how confident are they that the construction budgets proposed are based on hard data. Did they estimate the numbers on actual quotes from suppliers. Did Stantec review the scope of the project and projected costs with any of the large experienced contractors who would be potential bidders for their opinion?? Any comment either way on this item from CRD engineering? Might be a tough call for CRD to confirm an accurate cost review as this project is far larger and more complex than anything they have done in the past.

23) borrowing costs are going up, up, up so the financing of the tiered water project will cost much more and this will come as a direct hit to the water customers in the Greater Victoria area and beyond. Hopefully Federal and Provincial funds can be secured to cover some of the costs.

24) as soon as CRD starts providing filtered treated water the value of the water rises significantly and its sell price will become much higher. Municipalities need to recognize due to lack of investment in upgrading old infrastructure, high leakage rates mean money down the drain. Old piping mostly blocked by accumulated dirt and buildup means the clean filtered water will, still come out of the tap with color as the water picks up dirt in the piping and appurtenances.

25) performance bonds and labour- material bonds both of which CRD requires from their contractors to protect them from defaults are good for one year, and as a lot of this work will take 2 or 3 years to complete (maybe longer) the budget allowance shown for bonds is only 50% or 33% of what the actual cost will be. Plus, there is also a strong possibility the net cost for bonding to contractors is going to rise as I mentioned in the previous submittal.

Insurance for contractors is also sold by the year, and contractors are required to provide and hold significant and costly liability insurance which names the CRD as a beneficiary on claims for the whole length of the project from day one thru the whole term of contract, plus the one year warranty period that starts after satisfactory job completion completion. These costs are significant on large complex projects.

26) The consultants should show an operating budget yearly for the booster pumps showing anticipated amperage draw converted to KWH and costed out. I imagine the BC Hydro rate will be based on a demand meter system which means the price of electricity is based on the highest draw in the billing period which then sets the rate to be charged. This will be quite costly and we know BC Hydro rates will continue to climb up.