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RWSC 22-06

REPORT TO REGIONAL WATER SUPPLY COMMISSION
MEETING OF WEDNESDAY, MAY 18, 2022

SUBJECT **2022 Master Plan - Regional Water Supply Service**

ISSUE SUMMARY

To present the 2022 Regional Water Supply (RWS) Master Plan (2022 Master Plan) to the RWS Commission, and seek direction to receive public feedback.

BACKGROUND

The Greater Victoria Water District adopted the last Long Term Water Supply Plan in 1994 (1994 Master Plan). The 1994 Master Plan executive summary is attached as Appendix A. The 2022 Master Plan has been prepared to update the 1994 Master Plan and to advance the Commitments, Strategic Priorities and Actions set out in the Regional Water Supply Strategic Plan that was adopted in 2017 (2017 Strategic Plan).

The 1994 Master Plan, recommended many system improvements, 21 in total, which are summarized in Appendix B. Many of the improvements and subsequent decisions have focused on securing supply, such as raising of Sooke Lake Dam, rehabilitating the Goldstream Water System dams, and the acquisition of the Leech Water Supply Area. The 2022 Master Plan focuses on a new infrastructure program intended to address the highest risks facing the RWS System including lack of redundancy of critical components, climate change impacts, seismic vulnerabilities, and changing water treatment needs, as well as increasing water supply to serve a growing population to 2050 and beyond.

The Capital Regional District (CRD) retained Stantec Consulting Ltd. (Stantec) to prepare the 2022 Master Plan. The (2022 Master Plan) executive summary is attached as Appendix C. In early 2021 Stantec initiated the process, along with three other system related assignments; Deep Northern Intake Feasibility Study, Risk and Resiliency Assessment and Seismic Assessment - Phase 1 Facility Screening Level. The 2017 Strategic Plan Commitments, Areas of Focus, and Strategic Priorities, were used to guide the master planning process, with a goal of providing recommendations that would be adaptable over time, but would ultimately result in new resilient supply system infrastructure that would mitigate or address near and long-term water supply and system risks. This report summarizes the key findings and recommendations which have been incorporated into the plan.

To arrive at the final list of recommendations, Stantec and CRD staff developed 18 options for future improvements and evaluated the options against 2017 Strategic Plan objectives. This resulted in four alternatives that grouped together combinations of compatible projects. The four alternatives were then compared and scored against six non-financial criteria and construction and operational cost estimates. This resulted in 21 recommendations spanning a 30 year program of system improvements attached as a summary in Table E.4 of Appendix C. Although there is no immediate urgency for any particular project to proceed, the planning and design project phases are recommended to begin in the coming years.

The following summarizes the primary elements of the 2022 Master Plan:

Future Water Demand – Determining the future water demand is a significant task in master planning and involves establishing the volume of water required to meet the projected demand. Further, it also establishes the capacity of the supply system components such as transmission main sizing, water treatment plant process rate, and balancing storage volumes. Stantec reviewed the historical demands, population growth, and the effect of water conservation measures, as well as the Regional Growth Strategy, and recommended that, for the master plan planning horizon, a 1.25% annual population growth rate be used, resulting in a projected population in the service area of 569,000 at 2050.

The total supply-level (all sectors/uses and nonrevenue water) per capita water demand is currently 337 litres per capita per day (L/c/d), down from the 2010 to 2019 average of 366 L/c/d. This equates to a total annual demand of 48 million cubic metres per year. Although per capita water demand has remained relatively stable over the past ten years, further reductions in residential demand could be achieved up to a certain limit. For the 2022 Master Plan, using a conservative approach, the recent ten year average of 366 L/c/d has been used, and demand has been estimated to remain stable when projecting future demands. With population growth, the total annual demand is forecasted to be 74 million cubic metres per year at 2050, excluding environmental release commitments.

Water Supply – The hydrological assessment completed for the Sooke watershed determined that Sooke Lake Reservoir has the capability to supply an additional 40% increase in annual demand, up to 67 million cubic metres per year. This equates to the maximum annual demand that can be sustained without impacting the ability of the Sooke Lake Reservoir filling during a normal precipitation year following a 1:50 drought year, and no multi-year drought scenario. So for the short-term, there is sufficient water supply, but in the future there will be a threshold where a supplementary water source(s) will be required. Water from the northern basin of Sooke Lake Reservoir can be accessed with new deep intake and transmission infrastructure, but eventually, additional sources will be required to supplement supply and storage in Sooke Lake Reservoir. Similar to most water systems in the Pacific Northwest that rely primarily on rainfall (and less on snowpack) for supply, the RWS is challenged by the annual precipitation pattern and annual water demand trend. There is more water than needed in the rainy season but very little inflow into the reservoirs during the summer months. Climate change is expected to yield more precipitation in the rainy season (e.g. atmospheric rivers) and less in the summer season (drought conditions), with higher summer temperatures. Another factor is the requirement of the BC Provincial Water Sustainability Act's *Environmental Flow Needs Policy* that could reduce the licensed quantity of water available from the Leech Watershed for drinking water supply.

With these forecasts, assumptions and limitations, to support subsequent growth beyond 2045 additional source water such as drawing from the deep north basin of Sooke Lake Reservoir and diverting the Leech River into Sooke Lake Reservoir, as well as new infrastructure and increased capacity for the system is projected to be required.

The Goldstream Reservoirs store about ten million cubic metres of water at full capacity and will continue to be used as a secondary or emergency source of water when Sooke Lake Reservoir is not available. Currently, this source can be subject to turbidity fluctuations during heavy rainfall due to landslides which can occur in the Goldstream River Canyon upstream of the raw water intake in Japan Gulch Reservoir. Connecting the Goldstream source directly to the transmission

system via a pipeline from the Goldstream Reservoir, eliminating the Goldstream River risks, would improve the overall resiliency of supply.

Water Quality and Treatment – Treated water meets the current drinking water quality regulations and most aesthetic criteria with the current means of disinfection. But it was concluded that it is likely that a filtration process will be required to supplement the existing disinfection processes in the future, particularly when water from the Goldstream and Leech water sources are used to supplement supply. Although the water sources are bacteriologically similar, the Leech River water tends to be more turbid, nitrogen-rich, sulfate deficient, and have higher True Colour levels. Filtration not only removes turbidity (organic and inorganic particles), but also harmful bacteria, protozoa, algal cells, and other True Colour causing substances. Over time, even the Sooke source water quality is expected to decrease due to the impacts of climate change, mixing with the other source(s), and more significant seasonal water level fluctuations resulting from increasing demand. Source water quality could also be significantly impacted by wildfire and other natural hazards. Provincial drinking water quality regulations and Federal drinking water quality guidelines are expected to become more stringent. Several nearby water suppliers have implemented filtration over the past two decades, including Metro Vancouver (2010), Nanaimo (2016), Comox Valley (2021), Seattle-Tacoma (2001/2015), and Portland (2027). Planning and implementing filtration treatment will take several years and it is recommended to have filtration systems ready in advance of any needs or requirements. Three options for siting a filtration plant were identified which resulted in the Japan Gulch area being the preferred location.

The use of ultraviolet and chloramine disinfection will continue to satisfy current Island Health treatment requirements as long as the raw water quality characteristics remain stable. However, as noted, there is some uncertainty as to the future watershed health and raw water quality even with proactive risk management. The addition of filtration in combination with existing disinfection processes would provide a robust multi-barrier system able to better mitigate potential adverse raw water quality, reduce the vulnerability of the current treatment system, and protect public health.

Treated Water Balancing Storage – There are two general needs for water storage; raw water storage within the watershed(s) (reservoirs and related dams) and treated water balancing or equalization storage (storage tanks) which is an integral part of the transmission system.

Currently, the transmission system has limited balancing storage which results in higher than necessary (or desirable) peak flows through the transmission system during high daily and seasonal demand periods. There are two active balancing storage tanks in the transmission system, at Mt. Tolmie and McTavish Road. Without water being stored and available to meet the peak demands, the existing system capacity and future sizing of improvements will need to be larger than necessary – treatment and transmission system infrastructure is typically sized to meet future total annual demand and total summer demand capacity requirements; balancing storage provides maximum day and peak hour capacity requirements. Between the water supply and the customers, there should be a combination of transmission and distribution system storage (storage tanks) for which there is currently a deficiency, hence the proposed improvement to provide storage at both Japan Gulch (relative to the filtration plant) and at Smith Hill in the City of Victoria to address short and long term balancing during high demand periods. Although not the primary function or reason for creating storage, additional storage has a benefit for post-disaster/emergency water supply.

Water Transmission System – Several transmission system improvements have been recommended, some of which would result from other infrastructure projects referenced above and some address deficiencies, including:

- Replacing transmission main segments where headloss is greater than 2.5 m/km
- Twinning deficient sections of transmission mains to provide redundancy to critical mains and increase hydraulic capacity
- Increased operating pressure
- Installing new transmission mains to provide interconnections to improve redundancy

ALTERNATIVES

Alternative 1

1. That staff be directed to seek public feedback on the 2022 Master Plan through the CRD website public engagement portal and report back to the Commission with a summary of the public feedback as well as the Water Advisory Committee feedback resulting from the staff referral of the 2022 Master Plan, and that the Commission consider endorsing the 2022 Master Plan at that time.

2. That the 2022 Master Plan be forwarded to the CRD Board for information.

Alternative 2

That the 2022 Master Plan be referred back to staff for more information.

IMPLICATIONS

Intergovernmental

The proposed projects in the 2022 Master Plan are located in traditional territories of local First Nations and some projects are likely located in areas of cultural significance to Nations. The CRD is committed to engaging with First Nations on the projects in the early phases of project development.

The Regional Water Supply Service provides drinking water service to 13 municipalities and one Electoral Area across Greater Victoria, via the water distribution systems operated by the municipal and sub-regional service providers, who in turn provide drinking water to eight First Nations. All of these local and First Nations governments will be engaged as the plan is implemented over time. The plan will inform how the municipal and sub-regional service providers plan for the future needs of their water distribution systems, particularly with respect to system capacity, infrastructure improvements and financial sustainability.

Regulatory and Policy

The 2022 Master Plan aligns with CRD Board and Regional Water Supply Commission plans including:

- CRD Board 2019 – 2022 Corporate Plan – Drinking Water Community Need: Envision a sustainable and resilient water supply
- Regional Water Supply Commission – 2017 Regional Water Supply Service Strategic Plan: Commitments, Strategic Priorities and Actions

- 2018 CRD Regional Growth Strategy: Environment and Infrastructure
- CRD 2019 – 2038 Population Report – BC Stats

The 2022 Master Plan aligns with current Provincial drinking water quality regulations and Federal drinking water quality guidelines, and anticipates future requirements. The regulatory requirements are subject to change, particularly in the longer term, in response to changing environmental and health parameters, and the service will need to be prepared to adapt to these requirements.

Environmental
The 2022 Master Plan acknowledges the need to meet the requirements of the Provincial Water Sustainability Act and Environmental Flow Needs Policy with any future water licensing additions or amendments. For many years, the CRD has released raw water from the Regional Water Supply storage reservoirs to help support fish and fish habitat in the downstream rivers.

Regional projections of potential climate change impacts relevant to water quantity within the CRD watersheds were assessed using the Pacific Climate Impacts Consortium 2021 data. Predicted changes in total annual precipitation within the CRD range from minor increases in the near future to increases of 2.3% in the 2050s and 8.0% in the 2080s, with total annual precipitation expected to increase. Seasonal distributions are projected to change with increasing precipitation an intensity variation in winter months and decreasing precipitation during summer months. Future temperatures within the CRD are projected to increase in every season through to 2100, with the greatest temperature increases expected in the summer months. Based on these climate change projections, there are anticipated impacts on water supply, watershed health, water quality and water demand, all of which have been considered in the 2022 Master Plan.

Social
The RWS System provides drinking water across Greater Victoria area for residential, commercial, agriculture, institutional and industrial uses, as well as fire protection. Water use across the Region almost doubles in the summer months due to irrigation and other outdoor uses. The CRD's Demand Management Program has assisted in managing water demand and water conservation efforts and the public have responded in many ways, including reducing outdoor lawn watering in the summer and replacing inefficient appliances and fixtures. The CRD has also benefited by having water metering in place across Greater Victoria for many years, which supports awareness around water use and the user-pay approach. Any significant water demand reductions on a per capita basis in the future have the potential to partially offset projected demand increases and defer source development and capacity related infrastructure improvements in the future.

With respect to public engagement on the 2022 Master Plan, the CRD plans to post the 2022 Master Plan and summary documents on the CRD website's public engagement platform and receive feedback. All feedback received will be shared with the RWS Commission and considered as the individual major projects are planned and implemented moving forward which is also when staff will be seeking specific project direction and approvals from the RWS Commission and CRD Board. CRD staff have presented a summary report of the Plan to the Water Advisory Committee and have asked for written feedback that will also be shared with the Commission.

Financial

The 2022 Master Plan recommends 21 major projects be implemented over the next 30 years that will come at considerable cost, but they are deemed critical to improve the resiliency of the Regional Water Supply Treatment and Transmission System and will be necessary in the longer term in order to provide enough drinking water to support the growing Region.

For each of the projects, present and future conceptual inflated capital costs to mid-construction year have been developed for budgeting and financial planning purposes. In total, the recommended projects are valued at $1.53 billion in 2022 dollars and $2.05 billion in inflated dollars to 2050 to account for future design and construction costs. A 2% per year inflationary factor has been used to derive future costs from 2022 estimates. There will also be new operating costs associated with the new infrastructure. All of the existing and new capital and operating costs have been conceptually forecast to 2050, and are graphically represented in Appendix D. Capital spending is projected to begin increasing in 2024, and peak and stabilize in the late 2030s.

The CRD ensures the financial integrity of the RWS Service through sound financial management of the water utility. The CRD considers water rate implications and an equitable allocation of capital costs between current and future ratepayers. One of the key financial health indicators evaluated is with respect to maintaining an affordable level of service debt. To fund the capital program, it would be necessary to debt finance a significant portion, potentially in the range of $1.31 billion. A capital plan of this magnitude is going to increase the percent of revenue used for debt servicing costs on an annual basis. Although it would be preferable to target a percentage in the range of 25%, for a larger water utility, the percentage could be as high as +/- 40%, particularly during periods of more intensive capital investment and borrowing. Based on the conceptual financial modeling completed for the Plan, the percentage of revenue used for debt servicing could range between 20% in the early years to 43% in the mid-2030s, then dropping below 40% by 2050. To achieve this, 25 year amortization periods would be used for the loans and annual cash funding (transfer to water capital fund) would be increased significantly.

The wholesale water rate was also conceptually modeled. In order to balance the annual budgets to 2050, the rate would have to substantially increase on a year over basis at least until the late 2030s, when it is forecast that growth related demand and revenue would begin to mitigate larger year over year increases. Through the mid to late 2020s, the rate could increase in the 10% to 20% range on a year over year basis, based on projected water demand with increasing population. The rate could peak in late 2030s at approximately $3.60 per cubic meter, which has been estimated based on inflationary adjusted construction cost estimates.

The funding and water rate implications noted above are based on 100% of the required funding being derived from the service ratepayers. There has been no allowance for senior government grant funding or allowance for a portion of the capital funding that is expected to be provided through RWS development cost charges in the near future (CRD staff are currently advancing this initiative). CRD staff will actively seek grant opportunities where the eligibility criteria align with the recommended projects and make application for funding. Grant funding would help offset the debt burden and help mitigate water rate increases. Although development cost charges will increase the cost of development, these funds would also help mitigate the cost of water for the average ratepayer over time.

Future Plan Updates
The 2022 Master Plan recommendations and proposed infrastructure will continue to be reassessed, on a five to 10 year cycle, to consider new information and latest trends in population growth and water demand, and evaluate risks to the service, including climate change and water quality. Current technology and construction costs will also be evaluated. As a result of this continuous and adaptive process, the 2022 Master Plan implementation will be adjusted moving forward, to reflect any changes in assumptions or conditions.

CONCLUSION

The investments that have been made in the existing Regional Water Supply system have served its customers reliably and the system continues to perform very well. Recognizing the outcomes of the 1994 Plan and decades of implementing system improvements, particularly with respect to securing long term water supply, the Regional Water Supply Commission has taken steps to stay ahead of any emerging issues.

The 2022 Master Plan assessed the existing water system from a variety of perspectives consistent with the 2017 Regional Water Supply Strategic Plan. The 2022 Master Plan focuses on a new infrastructure program intended to address the highest risks facing the RWS System including lack of redundancy of critical components, climate change impacts, seismic vulnerabilities, and changing water treatment needs, as well as increasing water supply to serve a growing population to 2050 and beyond.

RECOMMENDATION

1. That staff be directed to seek public feedback on the 2022 Master Plan through the CRD website public engagement portal and report back to the Commission with a summary of the public feedback as well as the Water Advisory Committee feedback resulting from the staff referral of the 2022 Master Plan, and that the Commission consider endorsing the 2022 Master Plan at that time.

2. That the 2022 Master Plan be forwarded to the CRD Board for information.

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ATTACHMENTS

Appendix A: 1994 Long Term Water Supply Plan Executive Summary
Appendix B: 1994 Long Term Water Supply Plan “Alternative A” Capital Works Recommendations
Appendix C: Regional Water Supply 2022 Master Plan Executive Summary
Appendix D: Conceptual Model of RWS Service Operating and Capital Forecast Costs