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Cedars of Tuam Water Service WATER CONSERVATION PLAN

C. Sunderland
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Updated: Dean Olafson, January 2022

As a condition of the British Columbia Community Water Improvement Program grant awarded for upgrades to the Cedars of Tuam water system, this Water Conservation Plan identifies targets and opportunities for sustainable water use in the Cedars of Tuam community.

2022 Update - As a requirement for the Canada - British Columbia, Investing in Canada Infrastructure Program grant application for the Cedars of Tuam new water well and water treatment plant, this Water Conservation Plan has been reviewed and updated. Since the original date of this plan in 2011, there are very few changes to the plan, strategy, well performance, number of users, demand, supply, conservation measures and targets however this summer's past drought conditions, which necessitated the trucking of water to meet demand, has highlighted the need for a new well and water treatment plant. A new section, "**Water Production and Demand – 2022 Update**" (below) has been added to update the plan with currently available information.

This plan supplements the *Manual for Owners and Residents of the Cedars of Tuam Water System* (Bain et. al., 2010), which was adopted by the Cedars of Tuam Water Service Commission at its Annual General Meeting of September 27, 2010.

Population and Potential Growth

The Cedars of Tuam Water Service Area includes 16 taxable folios, all of which are connected to the water system. Each connection serves a single-family dwelling. Population fluctuates seasonally. For the purpose of this analysis, the population is assumed to average 24 residents (Bain et. al., 2010).

There is limited potential for population growth in the Cedars of Tuam Water Service Area. There are no undeveloped folios in the area, and based on the relatively small lot sizes, steep topography and lack of a sewer system, subdivision is extremely unlikely. Secondary dwellings are allowed on residential parcels on Salt Spring Island; however, the Islands Trust (which has jurisdiction for land use) restricts the approval of secondary dwellings where drinking water supply capacity or wastewater facilities are constrained. Thus it is estimated that the area has already achieved its maximum number of households.

Expansion of the service area is subject to the approval of the Capital Regional District Board (normally following a recommendation by the local service commission). There are several dwellings in immediate proximity to the Cedars of Tuam water system, served by individual private wells. It is possible that the owners of some of those dwellings may seek inclusion in the Cedars of Tuam water service area in the future. Inclusion of additional properties in the service area would be contingent upon sufficient water supply capacity, which does not currently exist.

There is potential for an increase in average household size, although there are no apparent drivers for such an increase in order to predict a significant change. For the purpose of this study, it is assumed that the maximum population of the service area is 32, or two residents per existing dwelling.

Current Water Demand (2011)

Water treated and supplied to the distribution system is measured monthly. Total annual water production and water production per capita for the years 2006-2010 is shown in Figure 1. Customer water meters were read March 31, June 30, September 30 and December 31, 2010. Quarterly water production, retail demand and non-revenue water for April-December 2010 are shown in Figure 2 (total cubic metres) and Figure 3 (litres per capita per day).

The annual average retail water demand in the Cedars of Tuam Water Service Area in 2010 is estimated to have been 192 litres per capita per day (l/c/d). Seasonal variation in water demand is primarily the result of the changes in occupancy of part-time dwellings. Landscape irrigation also accounts for a portion of summer demand.

Figure 1. Water Production

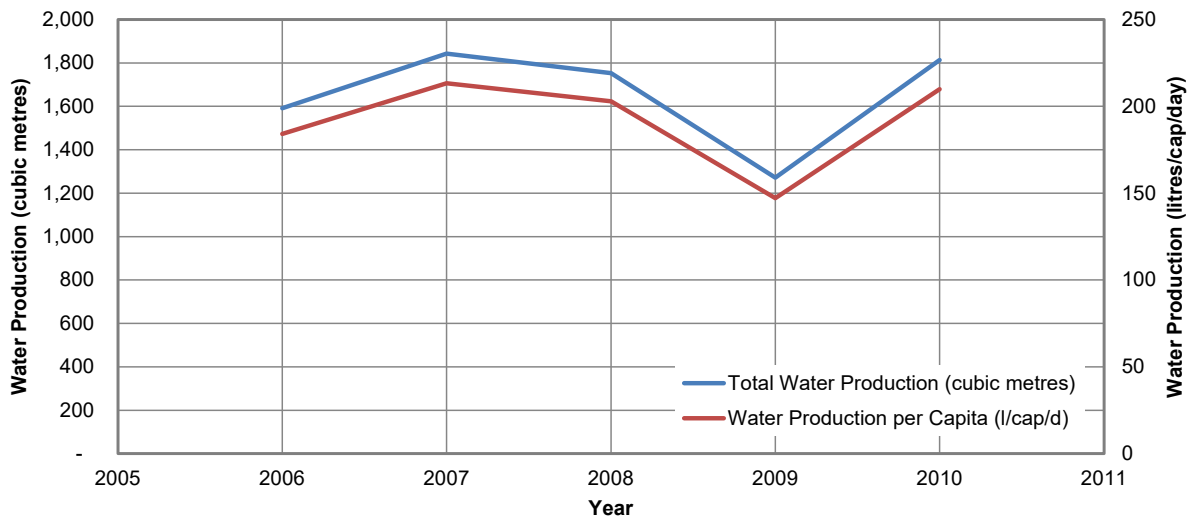


Figure 2. Quarterly Water Production, Retail Use and Non-Revenue Water (2010)

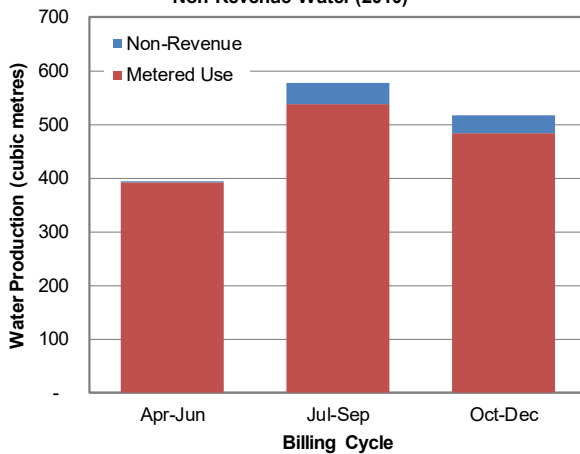


Figure 3. Water Production, Retail Use and Non-Revenue Water Per Capita (2010)

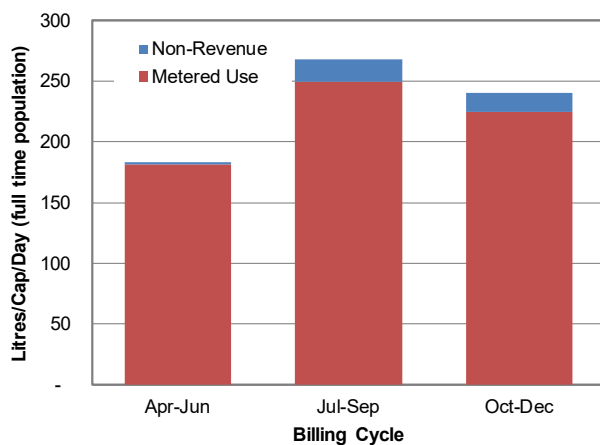
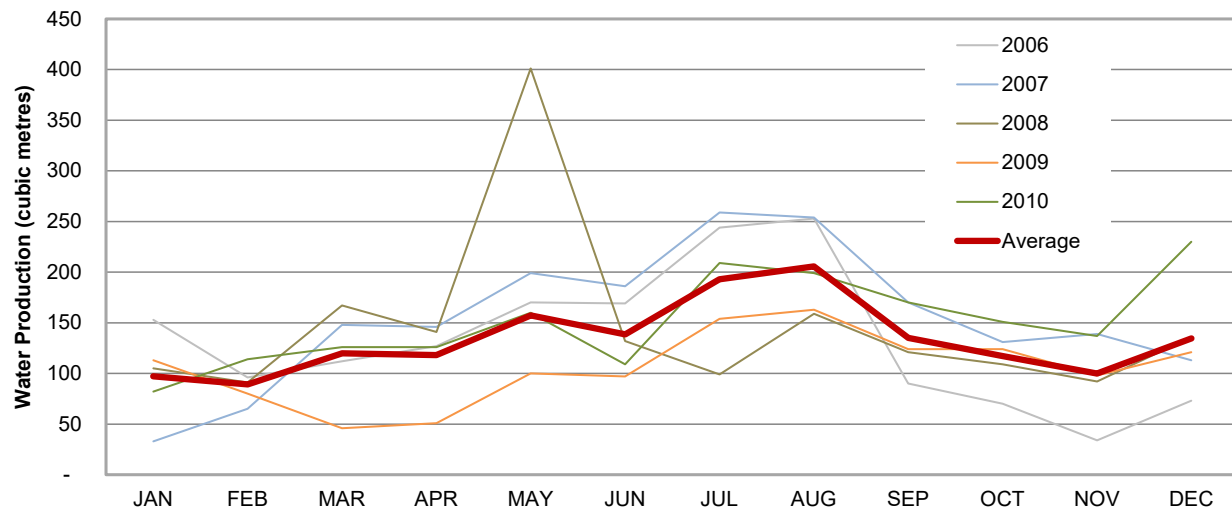


Figure 4. Monthly Average Water production



Water Supply Capacity

Well drawdown test records are not available; however, operational experience indicates that the Cedars of Tuam well currently operating is able to sustain demands typically in excess of 7 m³/day (1 lgpm) in late summer and early fall in an average year although shortfalls have been experienced in dry years and under unusually high demands (e.g. significant leak or irrigation system malfunction). The seasonal period of lowest well yield (and lowest groundwater level) corresponds with maximum seasonal demand. Well yield is greater at other times of year; however, storing a sufficient volume of water to significantly increase water supply capacity during the period of low well yield is impracticable.

For the purpose of this analysis, it is assumed that the seasonal minimum yield of the existing well is 10 m³/day (1.5 lgpm) in an average year. Based on historical climate data for Mayne Island, precipitation in the driest year on record was 69% of average. Assuming well yield is directly related to annual precipitation (likely worst-case scenario), the seasonal minimum well yield in a drought is assumed to be 7 m³/day (1.0 lgpm).

The community has developed and secured access to a new well near the service area that will provide a sufficient quantity and quality of water to meet the long term needs of the community; however, the cost to develop a pump house and pipeline to connect the new well to the service area will be substantial, and it will benefit the community to defer this project as long as possible.

Water Production and Demand – 2022 Update

Referring to Figure 5, the amount of water extracted (water production) from the ground water in 2020 is unfortunately unknown. This is the result of inaccurate water meter readings due to sand intrusion from the ground water source. Sand builds up in the meter creating a false low reading. Water demand (customer water billing) for the service totaled 1,476 m³ of water; a 2% decrease from the previous year and an 18% increase from the 5 year rolling average.

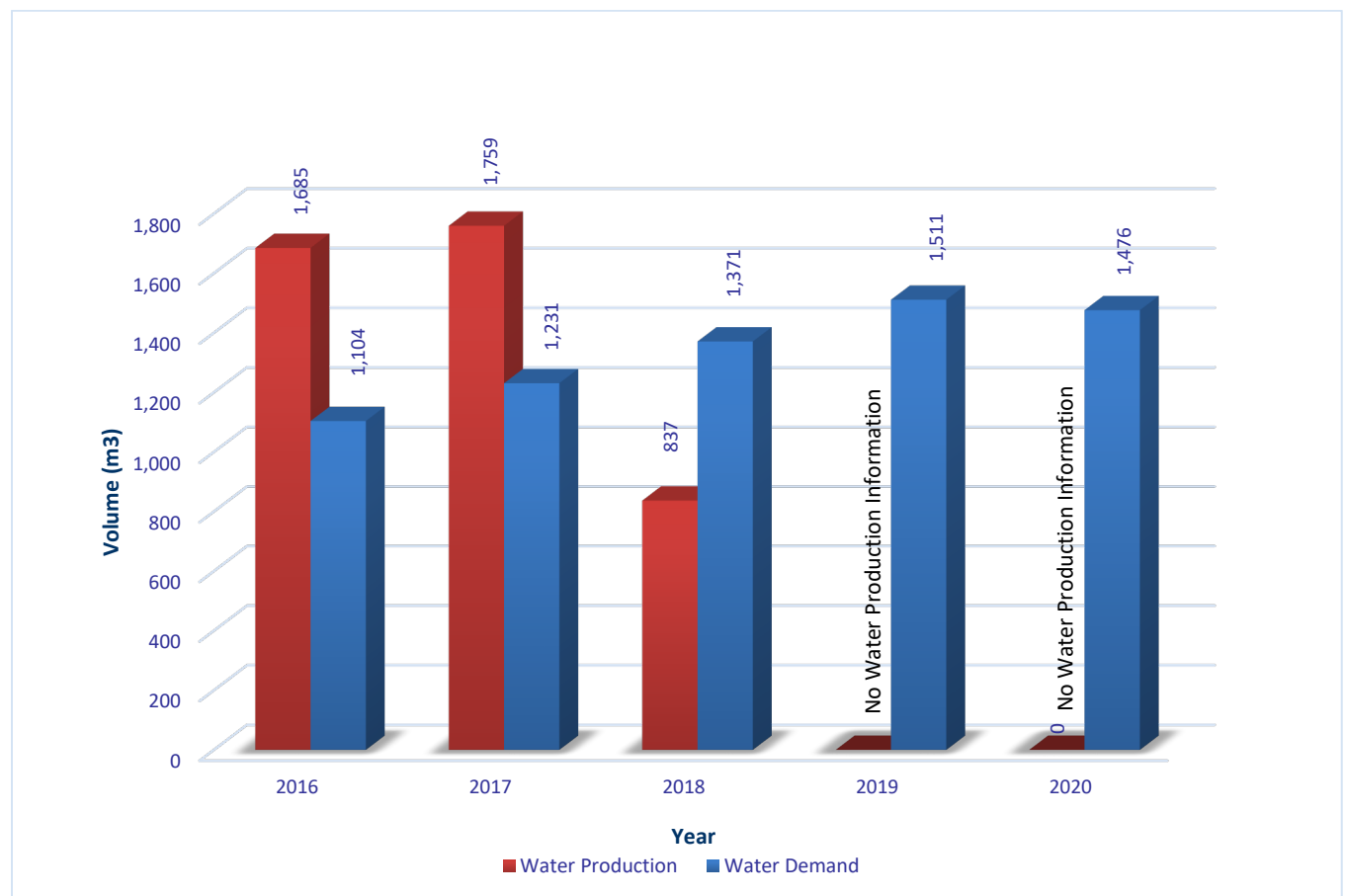


Figure 5: Cedars of Tuam Water Service Annual Water Production and Demand

The Cedars of Tuam Water System is fully metered, and water meters are read quarterly. Water meter information enables water production and consumption to be compared in order to estimate leakage losses in the distribution system. The difference between water produced and water demand (total metered consumption) is called non-revenue water and includes distribution leaks, meter error, and unmetered uses such as standpipe usage, distribution system maintenance and process water for the treatment plant. For 2020, the non-revenue water cannot be calculated due to the erroneous raw water meter production information. This inaccurate water production information will need to be resolved by either replacing the water meter with a different technology that is not influenced by sand or grit in the raw water source or investigating and eliminating the sand intrusion into the well. Capital improvements are planned in 2022 to address this issue.

Climate Change Adaptation and Mitigation

Precipitation patterns are expected to change in coming decades. For the CRD region, by the 2050s, annual precipitation is likely to increase, but probable scenarios based on Global Climate Model projections range from a decrease of 3 percent to an increase of 12 percent (Pacific Climate Impacts Consortium). For the purpose of this analysis, it is assumed that the worst case annual precipitation would be 3% less than the driest year on historical record. Again, assuming well yield is proportional to annual precipitation, climate change within the next 50 years may further reduce the seasonal minimum yield to 6.7 m³/day.

The Cedars of Tuam water system has a relatively low carbon footprint due to its elevated source. However, reducing water use per capita will benefit the community and the environment by:

- reducing the costs and carbon emissions of expanding the infrastructure to accommodate growth (e.g. manufacturing, transporting and installing larger water mains)
- reducing the carbon emissions associated with trucking in water to overcome supply shortfalls in drought years
- maintaining more water storage in reserve for emergencies such as wildfires or extreme drought, which may increase due to climate change

Water Demand Reduction Target

Peak monthly water demand in the Cedars of Tuam Water Service Area occurs in August, coinciding with the seasonal minimum well yield. The average daily water production for August between 2006 and 2010 was 6.6 m³/day. If the population of the area increases to 32 without corresponding changes in usage per capita, water demand in August would increase to 8.8 m³/day, possibly exceeding available supply in the worst case drought year by up to 2.1 m³/day. Peak month water demand would need to decrease to 207 l/c/d (72% of the 2006-2010 average) to avoid a water supply shortfall under the worst case scenario.

In order to minimize the risk of a supply shortfall in a drought year and to defer the need to develop and connect the new well, the following water conservation targets are proposed:

- Maintain total annual water supply and peak month water supply flows at or below the 2006-2010 averages of 1,650 m³ and 206 m³, respectively
- By 2020, reduce annual average water demand to 147 l/c/d
- By 2020, reduce peak month (August) water demand to 206 l/c/d

These targets can be achieved if the following occur by 2020:

- High efficiency toilets and front loading washing machines replace most existing fixtures and appliances.
- Leaks are found and repaired promptly in the distribution system and customer plumbing systems.
- Rainwater is harvested and stored by customers for non-potable uses, including all irrigation uses.

Current and Planned Water Conservation Measures

A planned adaptive strategy for water conservation is proposed for Cedars of Tuam, enabling conservation measures to be tailored to meet the changing needs of the community over time. This approach has proven successful for the CRD Greater Victoria water system. The following conservation measures are proposed as elements of a water conservation plan for Cedars of Tuam:

1. **Universal metering** (current) – Each customer connection to the water system is fitted with a water meter, which is read quarterly.

The meters are estimated to be approaching the end of their service lives. The ongoing annual cost to read the meters and to replace them every 15 years is estimated to be \$1,000, of which \$500 (meter reading cost) is currently budgeted. Recovery of the replacement cost is expected to be addressed as an outcome of a Strategic Asset Management Plan for the service, scheduled to be completed in 2011.

2. **Reporting usage and water budgets on water bills** (current) – Information about water use has been displayed on water bills since January 2011, raising customer awareness about their water use. Further information is presented at annual general meetings and in community newsletters, enabling customers to compare their own usage with the range and average in their community and others. The following annual water budget target could be displayed on water bills:

Billing Period	Water Budget (cubic metres)
January-March (Q1)	20
April-June (Q2)	25
July-September (Q3)	33
October-December (Q4)	22
Annual Total	100

The cost of reporting usage and providing conservation messages on the water bills is currently budgeted.

3. **Consumption based water billing** (current) – Water is billed using a two-tier inclining block structure. Water for basic household needs (up to 75 m³ every three months) is billed at \$0.90/m³, and water use in excess of 75 m³ every three months is billed at \$7.70/m³. The upper tier rate is approximately equivalent to the cost of trucking in water, ensuring that the cost of very high usage is not passed on to careful water users. Customers very seldom use more than the quarterly water budget of 75 m³. The consumption charges recover about 5% of the cost of water service, and the remaining 95% is recovered through a fixed annual charge.

This structure maintains stable revenue for fixed costs (almost all costs unless trucked water is required), provides a sufficient quantity of water at an affordable cost for essential customer needs, and provides a strong price signal to reduce excessive usage in any of the four billing cycles. This structure has proven well suited to Gulf Island communities with a large proportion of seasonal or occasional users. Based on recent implementation of this structure in other CRD water services, an overall demand reduction of 5-10% may be reasonably expected. A third (middle) tier could be added to the consumption charge structure to provide a financial incentive to maintain water use below 25 cubic metres per quarter.

The cost of consumption based billing is currently budgeted.

4. **Community Awareness and Education** (current; expand as needed to meet target) – Information about water use and conservation is provided in community newsletters and at typically well attended annual general meetings. Members of the community have prepared a *Manual for Owners and Residents of the Cedars of Tuam Water System* (attached) that includes water conservation advice. The manual has been endorsed by the Cedars of Tuam Water Service Commission and distributed to all residents in the service area. A more formal conservation awareness program may be implemented by linking information presented by mail and at the AGM with a community homepage on the CRD website that includes:
 - a. water use statistics, and comparison with other areas and benchmarks/targets
 - b. best practice guides (e.g. fixture and appliance standards, rainwater harvesting, leak prevention)
 - c. links to CRD regional water conservation resources
 - d. links to other organizations that provide water conservation resources tailored to the Gulf Islands (e.g. Mayne Island Integrated Water Systems Society, Salt Spring Island Water Council).

The cost of a modest community awareness program including the AGM, newsletters and website content, is currently budgeted.

5. **Water Conservation Plan Renewal** (2016, and every five years thereafter) – A review of this plan will be conducted approximately every five years to update forecasts and targets, consider new information, and adjust program activities as required to meet targets.

The cost to review and update this conservation plan is anticipated to be roughly \$1,000 every five years, which would require a new annual contribution of \$200 to the capital reserve fund.

Program Implementation Responsibility, Cost and Schedule

This Water Conservation Plan will be implemented by CRD staff, under the authority of the Cedars of Tuam Water Service Commission. The Commission has administrative authority delegated by the CRD Board under CRD Bylaw No. 3693, “Salt Spring Island Water, Sewer and Liquid Waste Disposal Commissions Bylaw No. 1, 2010” for provision of the water service.

The following implementation schedule is proposed:

Item No.	Implementation Year	New Budget Requirement	Note
1	2009 (completed)	\$ 500	Estimated annual cost of asset maintenance and renewal
2	2011 (completed)	\$ 0	Included in current budget
3	2012	\$ 0	Included in current budget
4	2012	\$ 0	Included in current budget
5	2016	\$ 200	Annual contribution to reserve for plan renewal

Linkages to Other Plans and Policies

Water Conservation Plans for CRD electoral area water services will adhere to a similar format. Targets, program measures and knowledge will be shared between these service areas. Where the CRD provides sewer services, the benefits of water conservation for these services will be taken into account. Water Conservation Plans will be linked to Strategic Plans for the services. Where practicable, planning and program implementation will also be linked with the Greater Victoria water conservation and climate action services delivered by the CRD. Knowledge will be shared, and policies and programs will be coordinated, with other stakeholders such as improvement districts, other regional districts, the Islands Trust and the Mayne Island Integrated Water Systems Society and the Salt Spring Island Water Council.

References

1. Hendren, Gary and Richard H. Edwards. Cedars of Tuam Feasibility Study, Salt Spring Island, BC – Preliminary Report for Comment. Capital Regional District. May 2000.
2. Walker, Deborah and Colwyn Sunderland. Water Use and Conservation Update 2008. Capital Regional District. 2008.
3. Bain, Ronald et.al. A Manual for Owners and Residents of the Cedars of Tuam Water System. Salt Spring Island. January 2010.
4. www.plan2adapt.ca website. “Summary of Climate Variables – Climate Change for CRD Region in 2050s Period”. Pacific Climate Impacts Consortium. Accessed 24 June 2011.