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# 2010 Annual Overview of Greater Victoria's Drinking Water Quality

*(Executive Summary and Selected Charts Only)*

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ENVIRONMENTAL SUSTAINABILITY  
**CAPITAL REGIONAL DISTRICT**  
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## *Executive Summary*

This report is the annual overview of water quality testing that was conducted in 2010 for the Greater Victoria Drinking Water System. The test results show that Greater Victoria's drinking water continues to be good quality and is safe to drink. With a few minor exceptions, all the results were within the limits of both the *Guidelines for Canadian Drinking Water Quality* and the *BC Drinking Water Protection Regulation*. This report is posted at <http://www.crd.bc.ca/water/waterquality/annualreports.htm> on the Capital Regional District (CRD) website.

**Samples and Tests.** In 2010, the Water Quality Division collected 7,675 samples from the Greater Victoria Drinking Water System and analyzed those samples for 47,743 individual tests. Approximately 300 different types of analyses were conducted on these samples. The data collected in 2010 are reported in the water quality data tables (**Tables 1, 2 and 3**) that are posted in the Water Quality section of the CRD website at <http://www.crd.bc.ca/water/waterquality/datatables.htm>

**Bacteria in Source Water.** In 2010, as in the past few years, the level of total coliform bacteria in the raw (untreated) source water entering the Japan Gulch Disinfection Plant continued to be higher during the late summer and peaked in late August (**Figure 3**). Nevertheless, the quality of the raw water entering the treatment plant continued to easily meet the fecal coliform bacteria (*E. coli*) limit of 20 colony forming units per 100 mL at least 90% of the time as stipulated in the USEPA Surface Water Treatment Rule and therefore continued to qualify to remain an unfiltered surface water supply under this portion of the USEPA regulations (**Figure 3A**). In 2010, all of the *E. coli* positive samples contained *E. coli* concentrations below 20 CFU/100mL.

**Treatment.** The treatment process used to disinfect the raw source water entering the distribution system continued to be ultraviolet (UV) disinfection followed by free chlorine and then ammonia (to produce chloramines). The chlorine dosage level was increased four times during the year to keep the chlorine residual in the distribution system relatively constant in response to a significant nitrification event. These changes resulted in monthly median total chlorine residuals ranging from 0.73 to 1.52 mg/L at the entry point to the distribution system (**Figure 4**).

**Bacteria at First Customer.** While five total coliform positive samples were found in samples taken at the first customer sampling location below the Japan Gulch Disinfection Plant during 2010, the 10% monthly limit was never exceeded (**Figure 4**). The annual total coliform positive sample rate of 2.0% was similar to the previous eight years and much better than earlier years before the use of UV and free chlorine as primary disinfectants. No *E. coli* bacteria were found in any of the samples collected at the entry point to the distribution system. This provides assurance that Greater Victoria's primary disinfection process is working in a satisfactory manner.

**Bacteria in Distribution System.** When all of the results from the various municipal distribution systems are grouped together (**Figure 5**), the percentage of total coliform positive samples in the Greater Victoria distribution system did not exceed the 10% Guideline limit during any month in 2010 and was therefore in compliance with the *BC Drinking Water Protection Regulation*. Over the last 19 years, a broad reduction in total coliform bacteria detection (see inset in **Figure 5**) has been observed and hence, an overall improvement in the bacteriological quality of the water. The relatively low level of total coliform positive samples (under 1%) reflects the balance maintained between reasonable concentrations of chlorine in the distribution system and acceptable levels of positive bacterial samples.

**Parasites.** In 2010, no *Giardia* cysts were detected in the raw source water entering Japan Gulch Treatment Plant (**Figure 6**). In addition, none of the 2010 samples contained *Cryptosporidium* oocysts (**Figure 7**). The 10-year average total *Giardia* cyst and total *Cryptosporidium* oocyst concentrations were only 0.02 cysts and 0.04 oocysts per 100 L, respectively (**Figures 6 and 7**). While these are extremely low values for a surface water supply, the addition of UV disinfection provides assurance that no infective parasites can enter the Greater Victoria Drinking Water System.

**Physical-Chemical-Radiological.** All the physical, chemical and radiological parameters were well within the Canadian Guideline limits except for summer water temperatures (aesthetic limit of 15°C). In 2010, the water temperature was above the 15°C limit for a period of about three months from mid-July to mid-October (**Figure 3**). This is similar to the previous five years and an improvement from earlier years when the water temperature was above the 15°C limit for about 4 months of the year (**Figure 2**). This cooler water is one of the benefits of raising the water level in Sooke Reservoir and the ability to draw from deeper and cooler strata.

**Inorganic and Organic Chemicals.** All inorganic chemicals including metals and non-metals were within Guideline values at the entry point to the distribution system. No synthetic organic chemicals including pesticides and herbicides were detected in the raw water entering the treatment plant.

**Disinfection By-Products.** Disinfection by-products such as total trihalomethanes (TTHMs) were well below (range of 11.0-23.9 µg/L) the Canadian Guideline limit of 100 µg/L in the chloraminated distribution system (**Figure 8**). The TTHMs were higher in a small section of the distribution system in North Saanich that is subject to rechlorination (Upper Dean Park Reservoir) but were still below Guideline values, ranging from 15.4 to 46 µg/L. Similarly, a second group of disinfection by-products, haloacetic acids (referred to as HAA5 because the limit is based on the concentration of a group of five HAAs) were low in the chloraminated distribution system, ranging from 8.45-32.6 µg/L (**Figure 9**) but were unusually elevated at the plant in the summer. The Canadian Guideline limit for HAAs of 80 µg/L was introduced in 2008.

**Sooke Reservoir Biological Activity.** The overall level of algal activity in Sooke Reservoir is measured using chlorophyll-a, a component of all algal cells. In 2010, the concentration of chlorophyll-a in the south and north basins continued to be elevated (as was observed in past years) following the raising of the water level in Sooke Reservoir (**Figure 10**). In the past 4 years, chlorophyll-a concentrations appear to have reached a steady state (with some variation).

**Phosphorus.** The primary contributor to the higher levels of chlorophyll-a observed in Sooke Reservoir in 2003 through 2010 was higher levels of total phosphorus, a nutrient that is needed for the algae to grow. The median concentration of total phosphorus was approximately 53% higher than in the years prior to inundation in both the north and south basins of Sooke Reservoir (**Figure 11**). However, the levels of total phosphorus are declining as the median concentration in 2008 through 2010 was only 16% higher than in the years prior to inundation. The highest phosphorus levels coincided with flooding of the newly cleared lands around the margin of Sooke Reservoir when the reservoir was expanded. In 2010, the phosphorus levels were similar, albeit slightly lower, than 2009 and substantially lower than during the inundation.

**Algae.** In 2010, one distinct, but not particularly significant algal bloom occurred in Sooke Reservoir in spring. The diatom, *Asterionella formosa* (**Figure 12**) was the main contributor to the higher levels of chlorophyll-a during this time (**Figure 10**). *Tabellaria fenestrata* (a diatom) also contributed to the overall increase in algal abundance (**Figure 13**).

**Water Quality Complaints.** In 2010, the number of water quality complaints received by CRD Water Services was very low (lowest in nineteen years) (**Figure 14**).















