



# 2004 Annual Overview of Greater Victoria's Drinking Water Quality

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## *Executive Summary*

This report is the annual overview of water quality testing that was conducted in 2004 from 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 2004 *Guidelines for Canadian Drinking Water Quality* and the 2003 *BC Drinking Water Protection Regulation*. This report is posted on the CRD website at [http://www.crd.bc.ca/water/water\\_quality/water\\_quality\\_reports.htm](http://www.crd.bc.ca/water/water_quality/water_quality_reports.htm).

**Samples and Tests.** In 2004, the Water Quality Division collected 7,473 samples from the Greater Victoria Drinking Water System and analyzed those samples for 36,991 individual tests. Approximately 300 different types of tests were conducted on these samples.

**Bacteria in Source Water.** In 2004, as in the past few years, the level of total coliform bacteria in the raw source water entering the treatment plants continued to be elevated during the summer (**Figure 1**). A bacterial spike was observed in late July, 2004 closely following the transplant of several thousand fish from Deception Creek and Deception Reservoir into Sooke Reservoir (**Figure 1A**) under the direction of Fisheries and Oceans Canada. Nevertheless, as in previous years, the quality of the raw water entering the plant easily met the fecal coliform limit of 20 colony forming units per 100 mL in the USEPA Surface Water Treatment Rule and therefore continued to qualify to remain an unfiltered surface water supply under this portion of their regulations (**Figure 1B**). The level of 20 per 100 mL was only exceeded once the entire year. Both the median value of 0 per 100 mL and the maximum value of 21 per 100 mL indicate a good quality source that is not subject to contamination.

**Treatment.** In 2004, ultraviolet (UV) disinfection was added to the disinfection process. For the third year, the Water Services Department used free chlorine followed by chloramines to disinfect the raw source water entering the distribution system. The chlorine dosage level was maintained at 1.6 mg/L for the majority of the year. This dosage level resulted in a monthly average total chlorine residual ranging from 1.08 to 1.29 mg/L at the entry point to the distribution system (**Figure 2**).

**Bacteria at First Customer.** Total coliform bacteria were observed at the first customer sampling location below the Japan Gulch Treatment Plant during July (**Figure 2**) but did not exceed the Canadian Guideline limit of 10% monthly percentage total coliform positive samples. The annual total coliform positive sample rate of 0.4% was similar to 2003 and one of the lowest ever observed and was due to the use of the combination of UV and free chlorine as primary disinfectants. No fecal coliform (*E. coli*) bacteria were found in any of the samples collected at this point. This provides further assurance of the bacterial safety of Greater Victoria's drinking water.

**Bacteria in Distribution System.** When all of the results from the various municipal distribution systems are grouped together, the percentage of total coliform positive samples in the distribution system did not exceed the 10% Guideline limit during any month in 2004 and was therefore in compliance with the *BC Drinking Water Protection Regulation*. Over this 13 year period of time, the reduction in total coliform detection, and hence, the improved bacteriological water quality (**Figure 2A**), can be attributed to a number of factors including:

- **1990** Relining of old cast iron water mains in Oak Bay, Saanich and Victoria
- **1993** Annual reservoir cleaning (Water Services Dept. & member municipalities)

- **1995** Introduction of unidirectional flushing in a number of municipal systems to reduce the sediment load in the water mains.
- **1995** Use of water quality as one of the criteria for replacing ageing infrastructure (e.g. replaced old cast iron water main to William Head Institute)
- **1996** Introduction of the seasonal increase in chlorine dosage in summer months to provide better disinfection and chlorine residuals to the extremities
- **2001** Use of free chlorine for primary disinfection to provide improved bacteriological disinfection of the raw water entering the system
- **2002** Start up of Rocky Point Rd Rechloramination Station.
- **2004** Use of UV disinfection to provide improved bacteriological disinfection

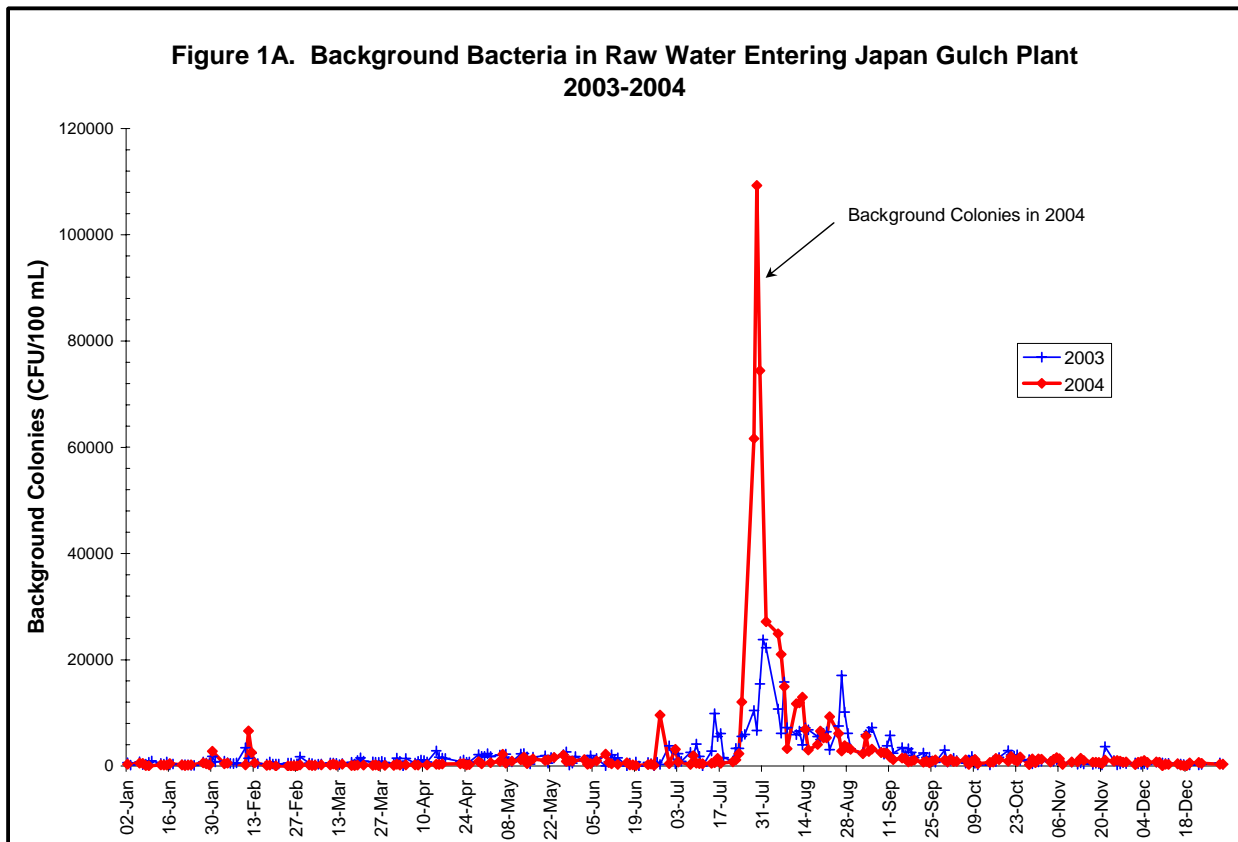
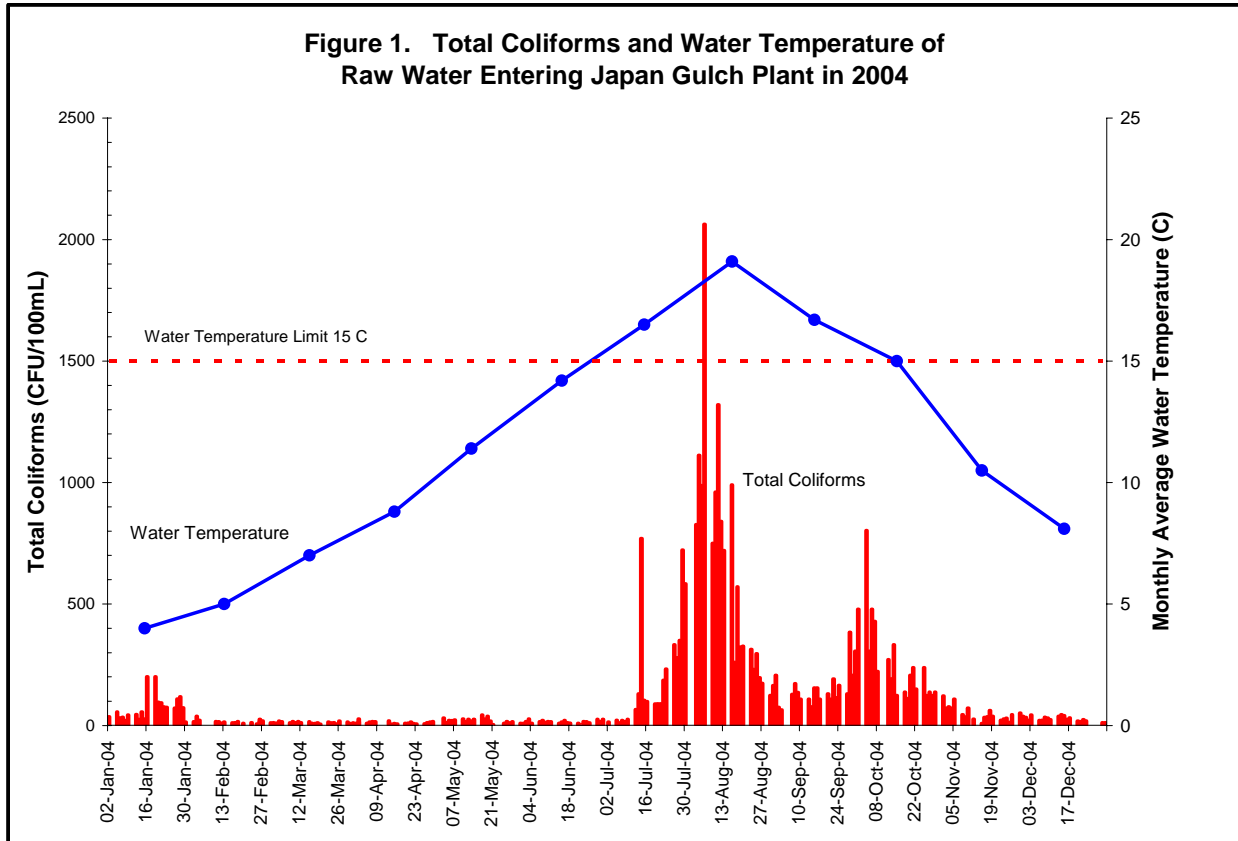
**Parasites.** In 2004, none of the samples were positive for *Giardia* cysts (**Figure 3**). One sample containing one non-viable *Cryptosporidium* oocyst was found (**Figure 5**). The average annual oocyst concentration was 0.04 per 100 L which is similar to 2002 and 2003 (**Figure 7**). The maximum oocyst concentration in any one sample was 6.2. The long term average (1992-2004) oocyst concentration was 0.09 oocysts per 100 L. While this is an extremely low value for a surface water supply, the addition of UV disinfection provides assurance that no infective *Cryptosporidium* oocysts are present in Greater Victoria's drinking water.

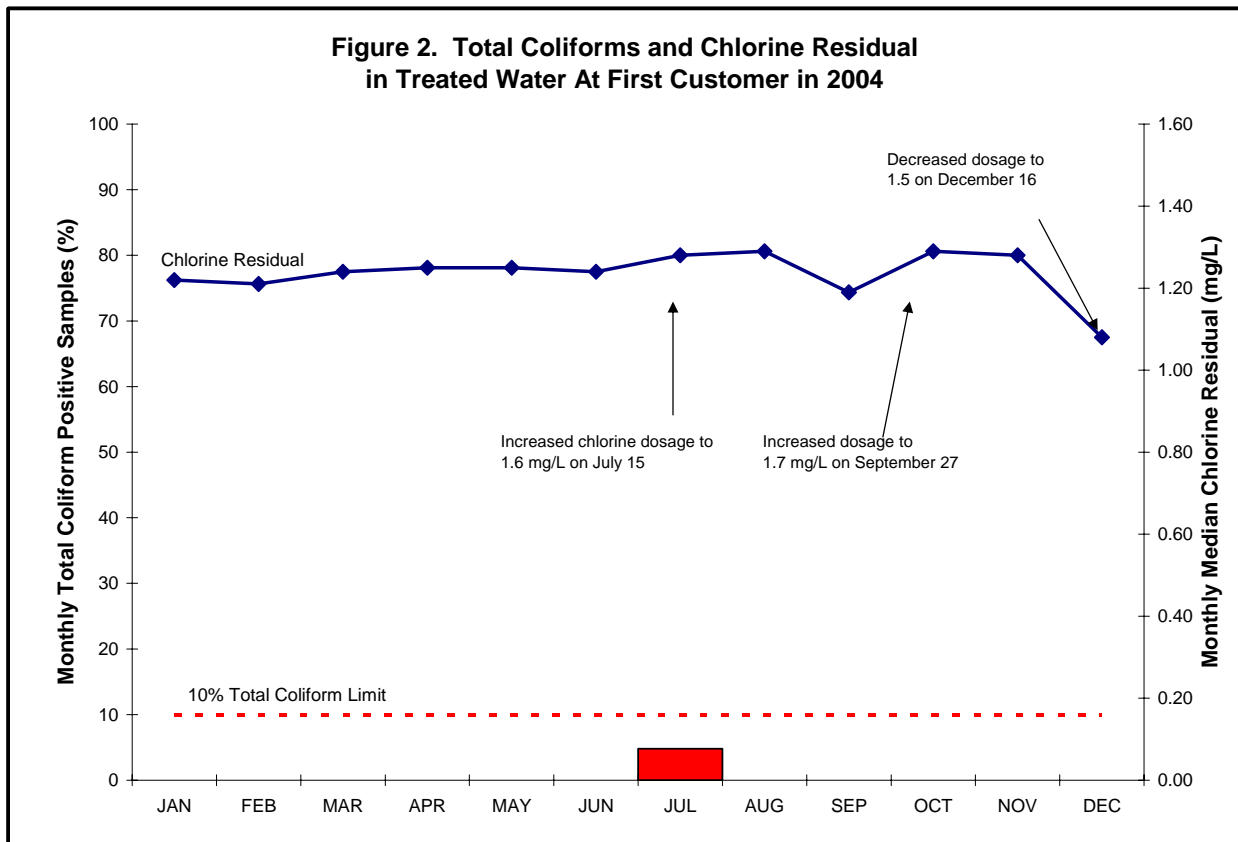
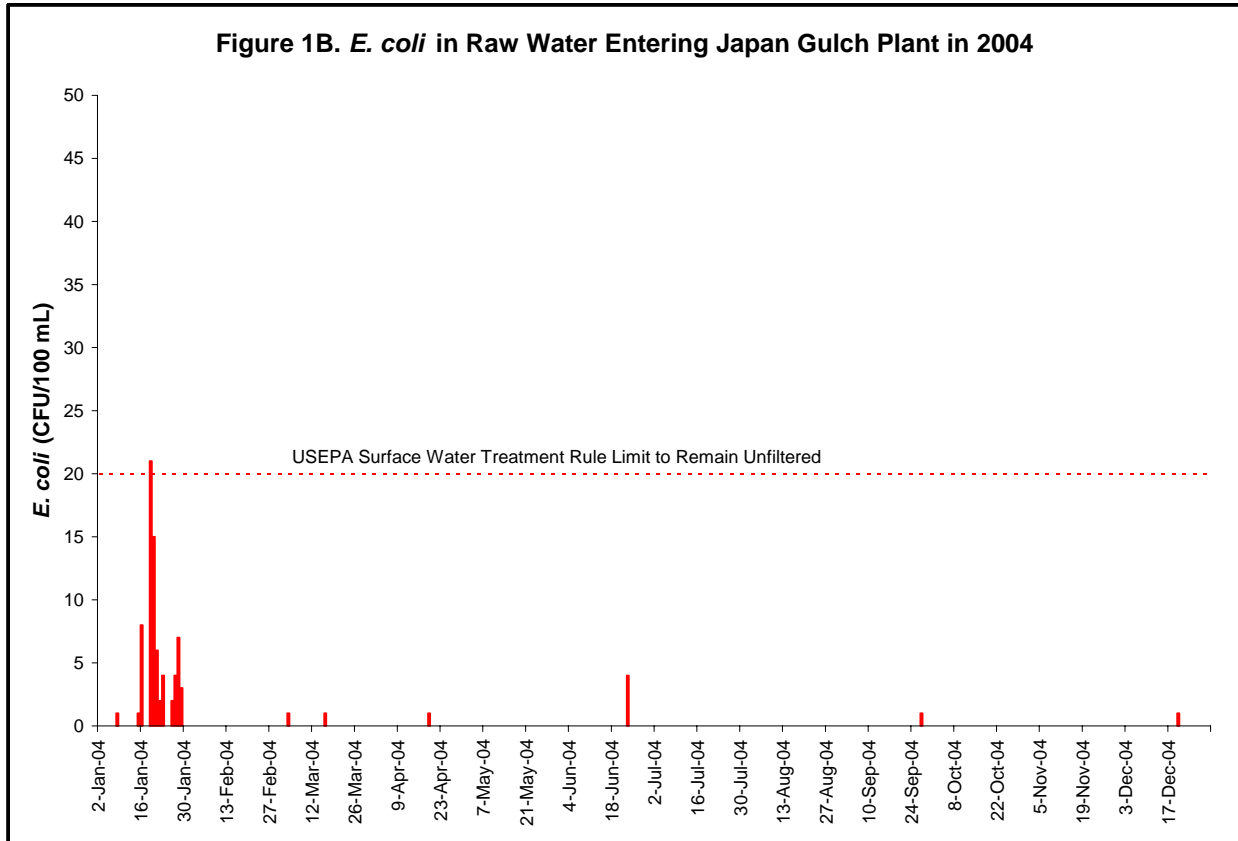
**Algae.** In 2004, a spring bloom of a diatom called *Tabellaria* (**Figure 11**) was the only algal species considered to achieve bloom status in Sooke Reservoir. No specific water quality problems were attributed to this bloom other than contributing to the overall load of particulate material entering the distribution system. As in 2003, a higher level of chlorophyll-a which is an overall measure of algal concentrations (**Figures 8 and 9**) were consistent with an increased level of phosphorus observed in Sooke Reservoir (**Figure 10**).

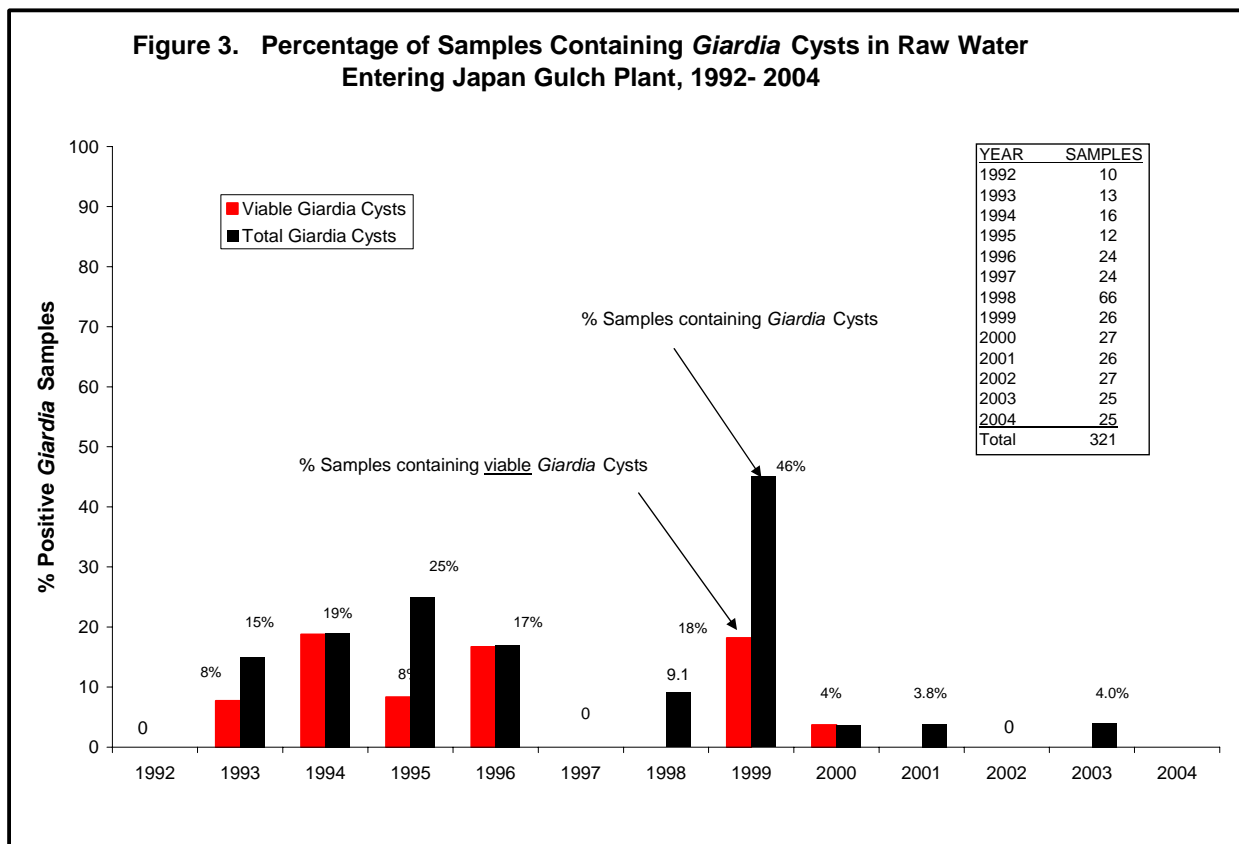
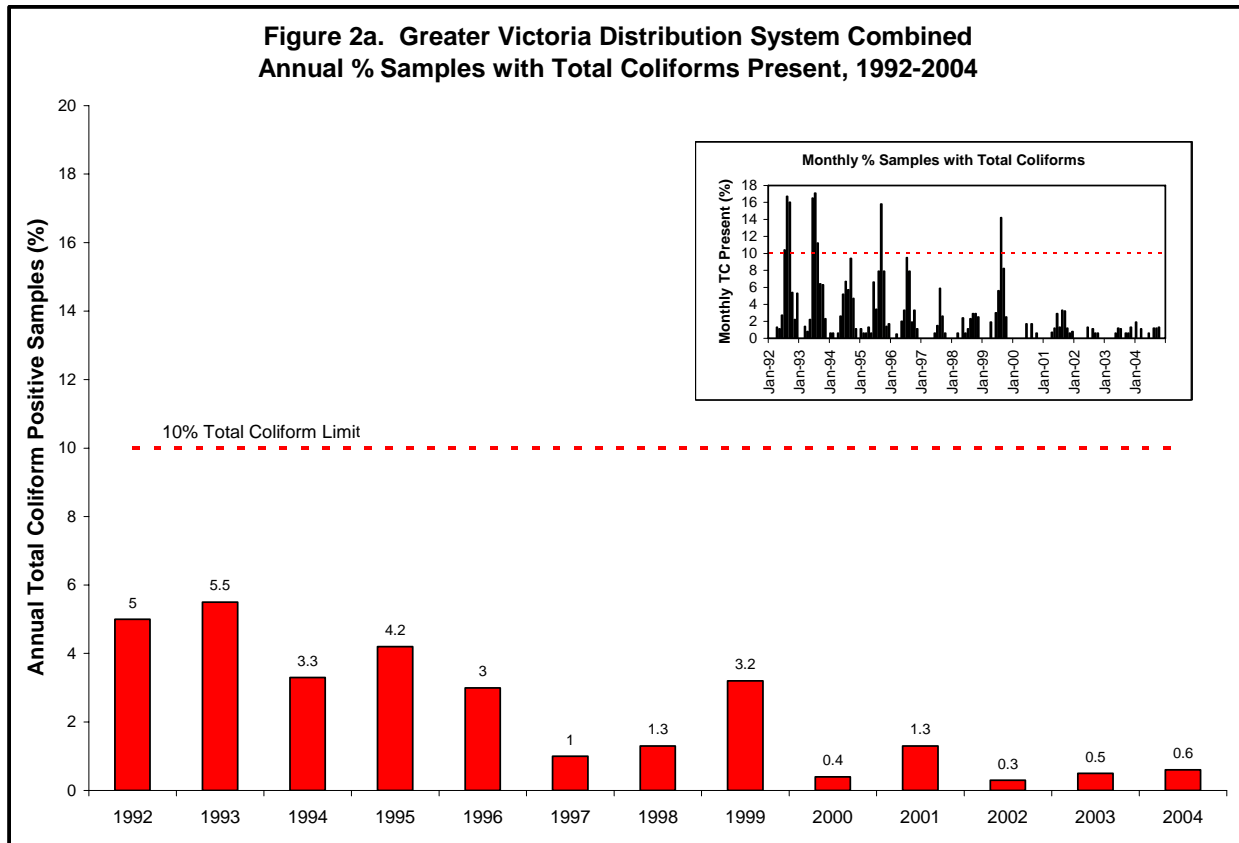
**Physical-Chemical-Radiological.** All the physical, chemical and radiological parameters were well within the Canadian Guideline limits except for water temperature (aesthetic limit of 15°C) which cannot be controlled by the Department. All inorganic chemicals including metals and non-metals were within Guideline values. No synthetic organic chemicals including pesticides and herbicides were detected in the raw water entering the treatment plants.

**Disinfection By-Products.** Disinfection by-products such as total trihalomethanes (TTHMs) were well below (range of 5.8-19.1 µg/L) the Canadian Guideline value of 100 µg/L in the chloraminated portion of the distribution system but were higher in the portion of the distribution system in North Saanich where periodically additional chlorine is being added to the water to prevent the regrowth of bacteria. In that section of the distribution system, during the period when the additional chlorine is being added, the total trihalomethane concentration ranged from 32 to 58 µg/L. Similarly, in that same portion of the distribution system, 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 also elevated and ranged from 44-69 µg/L.

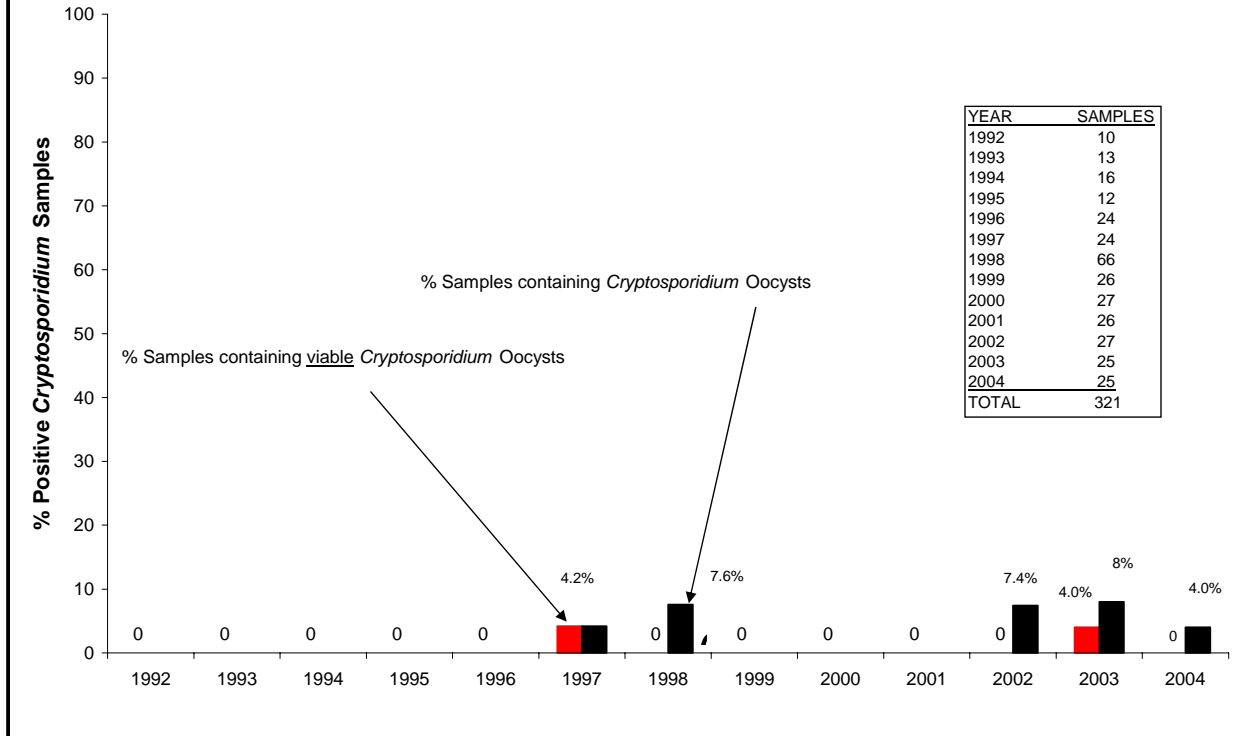
**Water Quality Complaints.** In 2004, the number of water quality complaints received by the Water Services Department was similar to 2002 and much less than the record number received in 2003 (**Figure 12**).







**Figure 5. Percentage of Samples Containing *Cryptosporidium* Oocysts in Raw Water Entering Japan Gulch Plant, 1992- 2004**



**Figure 7. Annual Average Total *Cryptosporidium* Oocysts Levels in Raw Water Entering Japan Gulch Plant, 1992-2004**

