

Chapter 7 Conclusions/Recommendations

7.1 Conclusions

The main conclusions of this report are as follows:

1. The literature indicates that trihalomethanes (THMs) are the most commonly found CDBPs due to the fact that chlorination has been the most common method of water disinfection.
2. It is estimated that approximately 85% of all Newfoundland and Labrador public water supply systems use surface water, while the remaining 15% use groundwater. The data indicates that 312 of the total 772 communities in the province meet their demand through surface-based water supply systems, 38 communities rely on groundwater-based systems and the remaining 422 unserved communities rely on privately-owned systems which are comprised of dug and drilled wells. Approximately 71% of the total population meets its municipal water demand through surface water and the remaining 29% through groundwater. There are a total of 329 surface water supplies throughout the province with approximately 313 in active use.
3. The THM formation potential of the 258 public water supply sources for which DOC and colour data were available showed that at the provincial level, 144 water supply sources are classified as having "low" THM formation potential, while 69 have "medium" potential and 45 have "high" THM formation potential. This analysis indicates that about 50% of the surface drinking water sources throughout Newfoundland are "naturally" predisposed to have "medium" to "high" THM formation potential. No precursor data is available for about 53 public water supplies.
4. To date, 207 of 313 active surface water supplies are involved in the THM monitoring program, while 106 surface water supplies remain uninvolved in the program. It was observed that of the 207 active water supplies with THM data, 82 have adequate seasonal data while 125 have inadequate seasonal data.
5. There are a total of 2157 THM samples recorded in the THM database as of Dec. 31st, 1999. The total number of samples in the database, collected during the time period of Jan.1st, 1996 to Dec. 31st, 1999 and selected for data analyses, are 2054. Of the total 2054 records, 124 values are recorded as 0 µg/L, 1084 values fall between > 0 µg/L and 100 µg/L, and 846 values are recorded as > 100 µg/L. It is most likely that samples with zero THM values were collected at a time when chlorination was either non-operational or partially operational.
6. It was observed that approximately 70% of the water supplies recorded seasonal or simple averages below the national guideline of 100 µg/L while approximately 30% are above 100

µg/L. When the data is broken into ranges, 65 water supplies show THM values ≤ 50 µg/L; 67 water supplies between > 50 µg/L and 100 µg/L; 24 water supplies between > 100 µg/L and 150 µg/L; 21 water supplies between > 150 µg/L and 200 µg/L; 7 water supplies between > 200 µg/L and 250 µg/L; 2 water supplies between > 250 µg/L and 300 µg/L; and 2 water supplies between > 300 µg/L and 350 µg/L.

7. In total there are 82 water supplies with adequate seasonal data throughout the province. Of these 82 water supplies, 46 are below 100 µg/L and 36 are above 100 µg/L. In the eastern region, the majority of water supplies (21) are below the national guideline while 9 water supplies are above 100 µg/L. In the western region and Labrador, the number of water supplies (13) below 100 µg/L is slightly higher than the number of water supplies (9) above 100 µg/L. Finally, in the central region, 12 water supplies are below 100 µg/L while 18 water supplies are above 100 µg/L.
8. Seasonal variations were evident at several sites, however, the level of variation differed from site to site. The most significant increases in THM levels were seen between spring and fall seasons. Spatial variations were also evident at several sites, however, the variation was not consistent and predictable in all cases mainly due to the complex layout of distribution systems.
9. Lack of proper training and professional development of operators has been identified as a major problem with respect to the proper operation and maintenance of water treatment facilities.

7.2 Recommendations

It is suggested that the following recommendations be considered for implementation:

1. THM monitoring should continue until there is sufficient data for every public water supply across the province. Presently, there are about 106 water supplies with no THM data, and about 125 water supplies with inadequate seasonal and spatial data. In order to fill-in the identified data gaps, it is essential that every public water supply be monitored to provide adequate seasonal and spatial coverage. The monitoring program should also be developed to fill-in data gaps for THM precursors.
2. There must be constant improvements to the provincial THM database in order to respond to emerging public needs for easy and frequent data access. The data dissemination process (reporting, web page update and others) should also be improved to provide full and free access of all available data to the consumers.
3. Future available data along with the present data should be analyzed for seasonal and spatial variations in order to devise and implement appropriate THM reduction strategies.

4. THM control is a complex process and must be carried out on a case-by-case basis, using site-specific data and multi-barrier approach, as outlined in Section 5 of the report. Measures such as watershed protection, chlorine demand management, removal of THM precursors, use of alternative disinfectants, conventional water treatment and assessment of alternative water supply sources, be assessed and implemented by using a cautious, progressive and sequential approach. The most appropriate control strategy should be decided in consultation with municipal governments and other provincial government departments such as Municipal and Provincial Affairs, Government Service Center and Lands, and Health and Community Services. Implementation of various control strategies should be carried out as pilot projects for selected water supply systems.
5. Pilot project results along with data collected through other phases of the program should be used to develop chlorine demand guidelines.
6. Case-by-case analysis of each water supply should continue until the THM levels have been reduced to acceptable levels in all public water supplies.
7. The THM monitoring program should be carried out simultaneously with other drinking water quality monitoring (source water and tap water) activities of the Water Resources Management Division. Also, it should remain an integral part of the Protection of Public Water Supply Areas Program.
8. Municipal operators responsible for the treatment of public water supplies should be trained and educated on a regular basis in order to deal with emerging drinking water quality issues on a pro-active basis.
9. Public education and communication between government and citizens should also be a main priority in the upcoming years. It is necessary to ensure that the residents of Newfoundland and Labrador understand the issue of THMs in drinking water and feel confident that the public water supplies are being improved to continue to provide water that is safe and of good quality.