

Chapter 1 Introduction

1.1 Background

A high level of public awareness about drinking water quality issues has arisen over the last several years. The issue of greatest concern is disinfection by-products, most particularly trihalomethanes (THMs). This prompted a need for information on the quality and safety of drinking water. In the Province of Newfoundland and Labrador, provincial and municipal governments have been working to ensure that the integrity of drinking water sources is preserved and enhanced. In order to accomplish this goal, the provincial government, in cooperation with municipal governments, has initiated a number of activities including protection of drinking water sources, monitoring of physical and chemical drinking water quality parameters and formation of watershed monitoring committees. These joint initiatives have been useful to:

- (i) protect the integrity of source water quality,
- (ii) collect baseline information on drinking water quality,
- (iii) keep the public informed about drinking water quality,
- (iv) identify emerging drinking water quality related issues, and
- (v) deal with these issues on a pro-active basis.

One of the main drinking water issues identified as a part of these initiatives is the formation of trihalomethanes (THMs) as a by-product of the treatment process.

THMs are formed when chlorine is added to water which contains elevated levels of natural organic matter (NOM). The addition of chlorine to water is an effective, simple and economic means of providing primary and secondary disinfection to public water supplies. Chlorine disinfection of drinking water has eliminated numerous waterborne diseases such as cholera and typhoid in Canada and other countries. It is recognized that the lack of adequate disinfection, particularly of surface waters, can lead to a re-appearance of waterborne diseases. Accordingly, it is mandatory for the owners and operators of public water supply systems to disinfect water and maintain 0.2 to 0.5* mg/L of chlorine residual throughout water distribution systems.

Chlorine has the capability to react with naturally occurring organics formed by the decay of algae and vegetation in raw water and form chlorination disinfection by-products (CDBPs) such as THMs. Surface water containing high organics will often have high colour levels and high THM formation potential.

** provided by the Department of Health and Community Services*

A study entitled “Atlantic Region Federal-Provincial Toxic Chemical Survey of Municipal Drinking Water Sources” based on the drinking water quality monitoring results for 1985-88 reported that numerous surface water sources in Newfoundland and Labrador have high values for dissolved organic carbon (DOC) and colour. The study noted that since these two parameters are considered precursors for the formation of THMs, there is a potential for high levels of THMs in provincial public water supplies. It was recommended that close attention be given to this issue in the future. In line with the recommendations of this study and the department’s own work in drinking water quality monitoring, in April 1996, the Water Resources Management Division of the Department of Environment and Labour established a partnership program with municipal governments for the monitoring of drinking water quality in general and THMs in particular. This partnership program has been in place for the last four years. Routine THM monitoring in this province began in 1996 as a three-phase project to accomplish the following:

- Establish baseline THM data on all public water supplies;
- Analyze the data to identify water supplies with high THM levels; and
- Develop and implement THM reduction strategies.

Since the beginning of the program in April 1996, it has grown to include the monitoring of approximately 230 surface water sources throughout the province. With four years of THM data on hand, it is time to analyze and interpret the available data to identify supplies with high levels of THMs. The preparation of this report is a step in that direction and its results will be used for the identification of future THM monitoring requirements and measures to control THM levels.

1.2 Objectives

This report has the following main objectives:

- Review the available water quality data on THM levels and analyze it to identify seasonal and spatial data gaps for each public water supply.
- Assess the water quality of public water supplies in reference to the national guideline for THMs and identify those which exceed the guidelines.
- Identify possible sources and causes of high levels of THMs, based on available data.
- Review various available options for THM control and make recommendations for their implementation.
- Discuss in general a proposed strategy to address the problem of high THM levels across the province.

1.3 Report Outline

As listed in the previous section, the purpose of this report is to assess the status of THMs in provincial public water supplies and compare the results with the national guideline. This report will also serve as a progress report for the THM monitoring program in the province by identifying any data gaps and future monitoring needs. Finally, this report will determine the future course of action that will be taken to reduce the amount of THMs in public water supplies. The highlights of the technical content of the various sections of this report are as follows:

Chapter 1 - This chapter describes the background and goals of the THM Monitoring Program in the province. It also outlines the purpose and main objectives of this report.

Chapter 2 - This chapter provides background information that is essential for understanding the findings of this report. It defines the term disinfection with particular emphasis on chlorination, and describes the formation of disinfection by-products, including trihalomethanes. Finally, it outlines the potential health risks associated with chlorination disinfection by-products.

Chapter 3 - The characteristics of public water supplies are reviewed. It describes the natural and human factors that contribute to the THM formation process, as well as the main water treatment practices of the province. Finally, it outlines the details of the THM Monitoring Program in the province.

Chapter 4 - This chapter analyses and assesses the available THM data, data gaps and supplies above national THM guidelines. The spatial and seasonal trends are also discussed.

Chapter 5 - This chapter reviews various options available for THM control and their feasibility for this province.

Chapter 6 - This chapter provides a framework for future THM monitoring and THM control strategies.

Chapter 7 - Main findings of the report are documented in this section.