

## 5.42 Ross River - Village of Ross River Water Supply System

The Ross River community water supply has water sourced from a deep, sub-permafrost groundwater well. A new water treatment plant was constructed in 2013. Water treatment includes iron and manganese removal, arsenic removal and chlorination. Water is distributed to residential and commercial properties in the community via trucked bulk delivery. The system is owned and operated by Government of Yukon and serves a population of approximately 293 people (Yukon Bureau of Statistics 2016). The system is classified as a Large Public Drinking Water Supply System under the Yukon Drinking Water Regulations – Guidelines for Part I – Large Public Drinking Water Systems (YG 2007) and is also regulated under the Yukon Drinking Water Regulations - Guidelines for Part II - Bulk Delivery of Drinking Water (YG 2007).

### 5.42.1 Data Compilation Methodology

Tetra Tech approached stakeholders including YG departments, water system operators and owners to let them know the project was in progress and to request their assistance in compiling the most complete data set possible. Through the process of compiling the data, Tetra Tech obtained data regarding the Ross River Water Supply system from the following proponents:

- YG Community Services (the client) – YG CS provided data for the Ross River Water Supply as this system is owned and operated by YG CS. The YG CS operator provided review comments and edits for the final summary to ensure completeness and accuracy.

### 5.42.2 Hydrogeology

Tetra Tech completed a hydrogeological study in 2009 to determine the vulnerability of the Ross River Firehall well to surface sources of contamination. From this study, Tetra Tech found that the well is completed in a confined sand and gravel aquifer overlain by 100 m of clay and silt which were inferred to be lacustrine lake bed sediments. Permafrost was encountered from 8.2 m to 18.6 m below grade (Tetra Tech 2009). Perched groundwater also exists within the active zone (seasonal zone of freezing and thawing) above permafrost. Tetra Tech confirmed through testing completed in 2009 that the perched aquifer is not hydraulically connected to the deep artesian aquifer.

The Ross River water supply system is supplied by one groundwater well. The well is located about 500 m to the southwest of Pelly River. The groundwater flow direction in this area is likely northeast towards the river (Tetra Tech 2006). Other water supply wells exist in Ross River and are used for domestic water supply.

Tetra Tech completed an analysis of the vulnerability of the Ross River community water supply well in 2012 based on the semi-quantitative ISI (Ontario Ministry of Environment, 2001). Based on the Tetra Tech 2009 lithology logging, the ISI score for the deep confined aquifer was calculated to be 393. The ISI method defines aquifers with ISI scores greater than 80 as having low susceptibility to surface sources of contamination, and the score here of 339 suggests that the aquifer underlying the well site has very low to extremely low vulnerability to surface-based contamination.

### 5.42.3 Well Summary

The well log for the Ross River public supply well is included in the GIS map and database portion of this project. The following table summarizes the completion characteristics of the Ross River well.

**Table 5-107: Ross River Community Water Supply Well Summary**

Well Construction Parameters	Details	Source
Date of construction	Well was completed in 1986 by Midnight Sun Drilling Co. Ltd.	Well Log
Total well depth	110 m bgs	
Casing	8" (203 mm) ID Steel Well Casing	
Casing depth	105.1 m bgs	
Well screen	3.7 m of 25 slot (0.64 mm slot) stainless steel well screen from 105.1 m bgs to 108.8 m bgs; and 1.2 m of 30 slot (0.76 mm) stainless steel well screen from 108.8 m bgs to 110.0 m bgs. The total screen length is 4.9 m.	Tetra Tech 2012a
Static water level	3.8 m bgs	Tetra Tech 2010
Sanitary seal	Bentonite surface seal to 4.7 m bgs	Tetra Tech 2012b
Wellhead completion	Pitless unit	
Wellhead stickup	Approximately 1 m ags	
Well rated capacity	18.9 L/s (249 IGPM)	Jacobsen 2003
Well GUDI status	Very unlikely that the well is GUDI	Tetra Tech 2012a
Well Construction Comments:	Well was upgraded to meet Canadian Groundwater Association Well Construction Guidelines.	

#### 5.42.4 Source Water Quality

In 2012, Tetra Tech reviewed water quality result from the Ross River supply system between 2003 and 2009. Tetra Tech made the following observations based on available water quality results:

- Ross River water can be characterized as calcium-sulphate type and is considered to be very hard with hardness ranging from 266 mg/L to 301 mg/L in the sample results reviewed;
- The manganese concentration in water samples obtained from the Ross River Firehall well has been consistently above the GCDWQ AO of 0.05 mg/L over the sampling period;
- The arsenic concentration in water samples obtained from the Ross River Firehall well has exceeded the GCDWQ MAC on each occasion tested; and

Tetra Tech did not review recent water quality data but understands water chemistry analysis is completed at this system annually and bacteriological monitoring is completed on a regular basis with results sent to YG EHS for review.

### 5.42.5 Water Treatment and Distribution

Table 5-108: Ross River Community Water Treatment and Distribution Details		
Item	Details	Source
Owner/Operator	Government of Yukon	
Water source	Groundwater	Tetra Tech 2012a
Wells serving the system	Ross River Firehall Well	
Treatment type	Pre-chlorination, iron and manganese removal by pressure filtration, arsenic removal, filtration, post chlorination	p.c. Rob Anderson March 2017 p.c. Steve Perrin March 2017
Population served	Approximately 293 people	Yukon Bureau of Statistics 2016
Delivery method	Trucked	Tetra Tech 2012a
Age of system/last known update	New Water Treatment Plant completed in 2013.	Tetra Tech 2012b

### 5.42.6 Source Water Protection Planning

Tetra Tech understands that a Source Water Protection Plan (SWPP) was commissioned by YG – SARU, and is in progress and should be completed and delivered in 2017.

Potential sources of contamination in the vicinity of the Ross River community water supply well that were identified as part of the 2012 LPDWSA included:

- Potential sources of contamination to the Ross River supply well and aquifer were identified as part of the 2012 LPDWSA and are mainly related to the storage of heating fuel, historic storage of gasoline and diesel at nearby abandoned service stations, historical fuel spills and septic tanks and fields in the community.
- The Ross River area was traditionally used by the Dena people as a seasonal camp and gathering place. Modern development began in the early 1900s. In the 1940s, the US Army built the Canol pipeline and Canol Road from Norman Wells to Whitehorse.
- Current industrial activity in Ross River is limited to activities related to residential needs with some trucking of equipment for mining activity travelling through the community on the Canol Road.
- The nearest surface waterbody to the Ross River water supply well is the Pelly River which is about 400 m down-gradient of the Firehall well.

In addition to the potential contamination sources that could impact the community water supply well, Tetra Tech notes that water supply system is served by just one well, which means the system will not operate should the well fail, be temporarily shut off for maintenance or repair or impacted by contaminants.

### 5.42.7 Water Supply Information Data Gaps

Tetra Tech has reviewed available information and has been provided review comments from the YG CS water system operator. To our knowledge, this summary is complete and accurate to March 2017. For the purpose of this study, Tetra Tech identified the following data gaps:

- The system is supplied by only one water well (Firehall well). Drilling and connecting a backup water supply well will result in redundancy in the system and reduce the change of the water supply system being shut down for well repair or maintenance.
- The SWPP for this community is currently in progress, and a final completed plan should be included the database once it is published.