

## 5.26 Faro -Community Water Supply

The Town of Faro was established as a mining town in 1968 during the early operation of the Faro Mine. Today, Faro is home to about 348 residents though the mine is closed down and reclamation is in progress (Yukon Bureau of Statistics 2016). The water source for the Town of Faro Large Public Drinking Water System (LPDWS) consists of three groundwater wells (Wells 1, 2 and 3) located in an undeveloped area near the confluence of the Pelly River and Vangorda Creek approximately 700 m southwest of the Faro Town site. Two additional wells, Well 4 and Well 5, were completed in 2016 and will be incorporated into the system in 2017. The system serves more than 20 connections and is classified as a Large Public Drinking Water Supply System under the Yukon Public Drinking Water Regulation – Part I Large Public Drinking Water Systems.

### 5.26.1 Data Compilation Methodology

Tetra Tech approached stakeholders including 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 contacted the following proponents to request data regarding the Faro Water supply system:

- Town of Faro – The Town of Faro manager of operations was able to provide historical documents for the Town of Faro water system and provided contact information for accessing additional data.
- YG Community Services (the client) – YG CS provided data for Faro including well completion reports and information regarding the water treatment system.
- YG Environmental Health – YG EHS was contacted and assisted with the provision of data for the Faro Water Treatment System.

### 5.26.2 Hydrogeology

The public drinking wells in Faro are completed in an unconfined sand and gravel aquifer in close proximity to each other. The sand and gravel aquifer is an alluvial fan deposited by Vangorda Creek as it discharges to the Pelly River flood plain. Wells are relatively shallow and are reportedly completed at total depths of about 12 m bgs. The driller's well log for Well 3 indicates that there is up to 3.6 m of silt overlying the sand and gravel aquifer in this location. There are no well logs available for Well 1 and Well 2 (Tetra Tech 2012).

A comprehensive study of the town of Faro water wells was completed by Gartner Lee Limited (GLL) for Deloitte and Touche Inc. (GLL 2006). Some key findings with respect to the hydrogeology and source water are summarized below:

- Water is being recharged to the Town of Faro water supply aquifer by Vangorda Creek and the Pelly River, with the relative proportion of recharge varying seasonally;
- Given the response of water levels in observation wells between the pumping well and Vangorda Creek, GLL has interpreted that the cone of depression from the wells does extend to Vangorda Creek; and
- Calculated groundwater velocities under pumping conditions in the Town of Faro water supply aquifer are fast (may be less than 7 days travel time from Vangorda Creek).

Tetra Tech assessed the vulnerability of the aquifer encountered by Well 3 in 2012 using the semi quantitative Intrinsic Susceptibility Index (ISI) method suggested by the Ontario Ministry of Environment. The ISI method resulted in a value of 12, which indicates that the aquifer underlying the site has a high vulnerability to potential

surface sources of contamination and the aquifer water quality may be subject to influence from changes in water quality at the Pelly River and Vangorda Creek (Tetra Tech 2012).

### 5.26.3 Summary of Wells

The Town of Faro water supply system is served by three groundwater wells, Well 1, Well 2 and Well 3. Two additional wells, Well 4 and Well 5, completed in 2016, will be incorporated into the system in 2017, and Well 1 and Well 2 will be decommissioned.

The logs for the Well 3 serving the Town of Faro, and the newly completed wells Well 4 and Well 5 are included in the GIS map and database portion of this project. There are no well logs available for Well 1 and Well 2. The following tables summarize the completion characteristics of the Faro wells.

Table 5-62: Town of Faro, Well 1** Summary		
Well Construction Parameters	Details	Source
Date of construction	The well was completed in 1968	
Total well depth	Approximately 12.8 m bgs	
Casing	8" (203 mm) ID Steel Well Casing	
Casing depth	8.2 m bgs	
Well screen	3.8 m long well screen from approximately 8.2 m bgs to 12 m bgs; slot size is unknown.	
Static water level	Unknown	
Sanitary seal	Likely no bentonite surface seal. In addition, no records of well upgrades indicated a subsequent installation of a bentonite seal	Jacobsen 2003 Tetra Tech 2012 GLL 2006 GLL 2008
Wellhead completion	Wellhead is located within Pumphouse 2 which is heated and locked. Wellhouse is equipped with 12 in. thick cement block poured around the well casing to provide some protection form surface sources of contamination.	
Wellhead stickup	0.56 m ags	
Well rated capacity	Unknown; however, it was reported that there have been no historical problem with well yield.	
Well GUDI status	Likely GUDI based on the short travel time (GLL 2006, GLL 2008)	
Well Construction Comments:	Well was not constructed to meet Canadian Groundwater Association Well Construction Guidelines.	

\*\*Tetra Tech understands this well will be decommissioned in 2017 and replaced with Well 4 or Well 5.

**Table 5-63: Town of Faro, Well 2\*\* Summary**

Well Construction Parameters	Details	Source
Date of construction	The well was completed in 1968	
Total well depth	Approximately 12.5 m bgs	
Casing	6" (152 mm) ID Steel Well Casing	
Casing depth	9.4 m bgs	
Well screen	2.6 m long well screen from approximately 9.4 m to 12 m bgs; slot size is unknown.	
Static water level	Unknown	
Sanitary seal	Likely no bentonite surface seal. In addition, no records of well upgrades indicated a subsequent installation of a bentonite seal	Jacobsen 2003 Tetra Tech 2012
Wellhead completion	Wellhead is located within Pumphouse 2 which is heated and locked. Wellhouse is equipped with 12 in. thick cement block poured around the well casing to provide some protection from surface sources of contamination. Well 2 is located 4.5 m from Well 1	GLL 2008
Wellhead stickup	0.57 m ags	
Well rated capacity	Unknown; however, it was reported that there have been no historical problem with well yield.	
Well GUDI status	Likely GUDI based on the short travel time (GLL 2006, GLL 2008)	
Well Construction Comments:	Well was not constructed to meet Canadian Groundwater Association Well Construction Guidelines.	

\*\*Tetra Tech understands this well will be decommissioned in 2017 and replaced with Well 4 or Well 5.

Table 5-64: Town of Faro, Well 3 Summary		
Well Construction Parameters	Details	Source
Date of construction	Well was completed by Midnight Sun Drilling Co. Ltd. in May 1980	Well log
Total well depth	11.9 m bgs	
Casing	12.75" (324 mm) OD Steel Well Casing	
Casing depth	7.3 m bgs	
Well screen	4.6 m 100 slot (2.54 mm) stainless steel well screen from approximately 7.3 m to 11.9 m bgs	
Static water level	2.9 m bgs (May 1980)	
Sanitary seal	Likely no bentonite surface seal. In addition, no records of well upgrades indicated a subsequent installation of a bentonite seal	Tetra Tech 2012 GLL 2008
Wellhead completion	Wellhead is located within Pumphouse 1 which is heated and locked. Wellhouse is equipped with 12 in. thick cement block poured around the well casing to provide some protection from surface sources of contamination.	
Wellhead stickup	0.62 m ags	
Well rated capacity	Unknown; however, it was reported that there have been no historical problem with well yield.	
Well GUDI status	Likely GUDI based on the short travel time (GLL 2006, GLL 2008)	
Well Construction Comments:	Well was not constructed to meet Canadian Groundwater Association Well Construction Guidelines.	

**Table 5-65: Town of Faro, Well 4 Summary**

Well Construction Parameters	Details	Source
Date of construction	The well was completed in July 2016 by Midnight Sun Drilling Inc. under direction by Morison Hershfield	MH 2016
Total well depth	Approximately 9.3 m bgs	
Casing	12" (305 mm) ID Steel Well Casing	
Casing depth	6.4 m bgs	
Well screen	2.9 m Variperms 100 slot (2.5 mm) well screen from approximately 6.4 m bgs to 9.3 m bgs	
Static water level	2.75 m bgs (July 15, 2017)	
Sanitary seal	Bentonite surface seal to 4.9 m bgs	
Wellhead completion	Not yet completed, will most likely be finished with a pitless unit when the well is connected.	
Wellhead stickup	1.2 m ags	
Well rated capacity	34.4 L/s (546 US gpm)	
Well GUDI status	Potentially GUDI based on the shallow well completion and proximity to Vangorda Creek	
Well Construction Comments:	Well was constructed to meet Canadian Groundwater Association Well Construction Guidelines with the exception of the total well depth.	

**Table 5-66: Town of Faro, Well 5 Summary**

Well Construction Parameters	Details	Source
Date of construction	The well was completed in July 2016 by Midnight Sun Drilling Inc. under direction by Morison Hershfield	MH 2016
Total well depth	Approximately 10.2 m bgs	
Casing	12" (305 mm) ID Steel Well Casing	
Casing depth	7.8 m bgs	
Well screen	2.4 m Variperm 100 slot (2.5 mm) well screen from approximately 7.8 m bgs to 10.2 m bgs	
Static water level	4.14 m bgs (July 17, 2017)	
Sanitary seal	Bentonite surface seal to 4.9 m bgs	
Wellhead completion	Not yet completed, will most likely be finished with a pitless unit when the well is connected.	
Wellhead stickup	1.2 m ags	
Well rated capacity	28.6 L/s (453 US gpm)	
Well GUDI status	Potentially GUDI based on the shallow well completion and proximity to Vangorda Creek	
Well Construction Comments:	Well was constructed to meet Canadian Groundwater Association Well Construction Guidelines with the exception of the total well depth.	

#### 5.26.4 Source Water Quality

In general, the raw water from the three public water supply wells meets Health Canada's Guidelines for Canadian Drinking Water Quality (GCDWQ) with the exception of the maximum allowable concentration (MAC) for total dissolved solids (Tetra Tech 2012, J. Gibson Env. Consulting 2017). Key observations and comments on water quality are:

- The water from the Faro groundwater wells can be classified as calcium-sulphate type and has a pH of approximately 7.5 to 7.7;
- Total dissolved solids concentrations were nearing the GCDWQ for majority of the results reported over the period of record, and on one occasion (March 2010) the concentration was found to exceed the GCDWQ MAC; and
- The groundwater source is very hard ranging from 266 mg/L to 630 mg/L on the dates sampled.

Groundwater samples were collected from Well 4 and Well 5 during pumping testing in 2016. Based on the results from these samples, Tetra Tech makes the following observations:

- Water quality from the wells met all GCDWQ health based and aesthetic objectives for the parameters tested;
- The water from the two new wells is very similar, can be classified as calcium-bicarbonate type and the measured pH ranged from 7.67 to 8.03;
- The groundwater is very hard with measured hardness of 275 to 300 mg/L on the dates sampled.

### 5.26.5 Water Treatment and Distribution

Table 5-67: Town of Faro Water Treatment and Distribution Details		
Item	Details	Source
Owner/Operator	Town of Faro	Tetra Tech 2012
Water source	Groundwater	Tetra Tech 2012
Wells serving the system	Wells 1, 2 and 3	Tetra Tech 2012, Confirmed by operator and YG CS
Treatment type	UV and chlorine disinfection	p.c. Trevor Peircey 2017 p.c. Mike O'Connor 2017
Population served	Approximately 348	Yukon Bureau of Statistics 2016
Delivery method	Piped	
Age of system/last known update	New water treatment plant completed in 2014. New Pumphouse #3 in 2014. New water wells completed in 2016 to be commissioned in 2017.	p.c. Trevor Peircey 2017 J.Gibson Env. Consulting 2017

### 5.26.6 Source Water Protection Planning

Tetra Tech understands that new water wells are planned for 2017, and Tetra Tech understands the Town of Faro plans to complete source water protection planning once these wells are in place (p.c. Trevor Peircey 2017). As the current wells will soon be replaced, source water protection planning for the existing wells would not be warranted. As the system is classed as a LPDWS and provides water to the community of Faro, a SWPP which includes the new wells would provide a valuable tool for identifying, monitoring and managing risks to the wells and aquifer.

### 5.26.7 Water Supply Information Data Gaps

Tetra Tech was not able to obtain all known reports and data for the purposes of this summary. For the purpose of this project, the following data gaps were identified:

- There are no well logs available for Well 1 or Well 2 so well completion details and aquifer characteristics in these locations are unknown;
- No Source Water Protection Planning is in place, and ,as new wells have been completed to serve the system, a SWPP should be considered to increase the protection of this shallow groundwater resource
- Tetra Tech understands upgrades to the water system will be completed in 2017 including the decommissioning of Well 1 and 2, commissioning of Well 4 and Well 5, a new above ground pressure reducing valve (PRV) chamber, new water reservoir, new pumphouse and upgrades to the SCADA system.