

Description of Drinking Water Systems

Alto provides water sourced from two groundwater supply wells to approximately 420 domestic connections, 1 school, and 1 church (approximately 1,000 people).

- A pump house located on Lodge Road,
- A booster station on Cheryl Road with two booster pumps (one 15-horsepower and one 7-horsepower),
- Approximately 8.5 km of 200 mm, 150 mm, and 100 mm diameter watermains,
- Twenty-six fire hydrants,
- Two pressure reducing valve stations, and
- Four reinforced concrete storage reservoirs with a total capacity of 1,780 m³.

Location & Topography

The source wells are located at 10397 Lodge Road in Lake Country, BC (the Property) and are at an approximate elevation of 409 metres above sea level. The Property is located on the east side of the south-north trending valley bounded by Ellison Lake (3.4 km to the south) and Wood Lake (1.9 km to the north), making up a portion of the Vernon Creek watershed. The valley bottom is an average of 1 km wide and has relatively low topographical relief. The valley sides are bounded by steep slopes comprising a combination of bedrock outcrops and bench material originating from glacial fluvial activity.

Wood Lake and Ellison Lake were formed from glacial fluvial damming of an ancient single-lake basin. Damming occurred as a result of fluvial deposition from the east, at the outflow of a tributary to the valley now occupied by Vernon Creek.

The Vernon Creek Watershed has an area of 84.5 km² and encompasses Swalwell Lake and surrounding tributaries. From its headwaters, Vernon Creek flows from the eastern plateau, down into the valley, and discharges to the north end of Ellison Lake. From Ellison Lake, there are two primary streams within the valley that flow north from Ellison Lake to Wood Lake. The official naming convention is unclear as it labels both streams on the east and west side of the valley as Vernon Creek. The stream on the west side of the valley is commonly referred to as Winfield Creek and the stream on the east side of the valley as Vernon Creek. Winfield Creek originates from valley-side runoff to the west.

Vernon Creek originates from the highlands to the east, enters the valley approximately 500 m north of Ellison Lake, and travels south discharging into Ellison Lake. From Ellison Lake, Vernon Creek drainage travels through the center of the valley before discharging into Wood Lake approximately 800 m west of the subject wells. Watershed runoff in Vernon Creek is closely controlled for water conservation associated with Swalwell Lake (aka Beaver Lake) located approximately 11 km east of the subject wells. A search of the Water Survey Canada database indicates no current hydrologic data available for Vernon Creek. However, historical data are available from 1919 to 1987. During this time, the mean monthly discharge was 0.452 m³/sec, with a maximum and minimum mean monthly discharge of 1.56 and 0.196 m³/sec in May and January, respectively.

Surficial Geology

Surficial geology in the area consists of a thin layer of alluvial deposits of sand and gravel associated with Vernon Creek. Below this, the soil comprises glacio-fluvial deposits associated with the most recent glaciation and have been mapped as lacustrine deposits of silt, separated by units of coarse sand and gravel. This agrees with well logs provided by drillers for the area which typically describe the surficial materials as comprised of silt with fine sand and clay to 15 m below ground surface (m bgs) followed by loose sand, or sand-and-gravel from 15-25 m bgs, a dense clay and gravel from 25-40 m bgs, then water

bearing sand and gravel from 40-53 m bgs before hitting bedrock at an estimated 53 m bgs in the vicinity of the Property.

Hydrogeology Setting

Provincial mapping indicates that there are two aquifers that underlie the subject wells: a confined, unconsolidated aquifer identified as Aquifer 344, and a deeper bedrock aquifer identified as Aquifer 1021. The provincial well registry indicates that the North and South Wells are completed in Aquifer 344. The DLC has a monitoring well (MW-14) installed to 5.81 m below ground near their sewerage lift station on Lodge Road which suggests the presence of shallow aquifer above the confining unit for Aquifer 344 (the top of the confining unit at the North and South Wells is between 5.49 m bgl, and 13.11 m bgl, respectively. This upper aquifer unit is not mapped by the Province and the extent of it is unknown.

Aquifer 344

Aquifer 344 is a confined glacio-fluvial sand and gravel aquifer, which has high productivity, low demand, and moderate vulnerability to contamination. The mapped area of the aquifer is 8.7 km². It is 5 km long and extends from Wood Lake in the north, to Ellison Lake to the south. There are currently 26 registered wells correlated to the aquifer. Well records indicate a wide range of reported yields, ranging from 0.18 to 23.3 L/s (3 to 370 US gpm). The average recorded well completion depth is an estimated 30 m bgs. Flow direction of the aquifer is from south to north from the Vernon Creek alluvial fan, which is the primary recharge area along with mountain block recharge on the valley sides. Based on the elevation of the aquifer, the high hydraulic head noted very near the south end of Wood Lake, and the shallow nature of Wood Lake (30 m at its deepest), the aquifer is thought to run underneath Wood Lake and discharge into Kalamalka Lake 8 km to the north.

BC Provincial Government and Aquifer 344

The BC Provincial Government recognizes the importance and need to protect its aquifers. To effectively manage groundwater use and the impacts of land development on groundwater availability and quality, it is essential to understand the existence and characteristics of B.C.'s aquifers. Provincial mapping and registration of an aquifer within the [Groundwater Wells and Aquifers \(GWELLS\)](#) is often the first step in developing this understanding ([groundwater and wells](#)).

Alto Utilities and Aquifer 344

Alto Utilities recognizes the critical importance of protecting Aquifer 344. While the BC Provincial government regulates and monitors aquifers across BC, Alto Utilities recognizes the important role it plays in protecting and maintaining this aquifer. One aspect of this role is monitoring. Alto continually monitors and records static and pumping water levels, volumes of water pumped, and turbidity levels. In 2022 Alto contracted a hydrogeologist to perform a Source Water Assessment (SWA) and develop a Source Water Protection Plan (SWPP). The primary purpose of the SWA was to determine whether the water being supplied to Alto Utilities' customers from Aquifer 344 required treatment to meet changing regulations, but this was not the only purpose of the report. Considerable thought was also given to assess vulnerabilities, current conditions, and long-term viability of Aquifer 344. Alto Utilities' hydrogeologist was able to use the data gathered from its wells to develop a more precise understanding of Aquifer 344. The SWPP also made other recommendations for monitoring that Alto will continue to implement going forward.