Wilson's Beach Estates Domestic Groundwater Supply Evaluation

EXECUTIVE SUMMARY

Waterline Resources Inc. was retained by Williams Engineering Canada Inc., on behalf of the Developer, to conduct a groundwater supply investigation and testing program at SW-14-041-28-W4M, near Gull Lake, Alberta. Source water is required to supply the proposed Wilson's Beach Estates 88-lot residential subdivision development. A production well and 2 observation wells were constructed and tested as part of the groundwater exploration program. The maximum daily water requirement for subdivision domestic use is currently estimated at 128 m^3/day (19.5 Igpm). The estimate is conservatively based on year round occupation of 88 residences, 4 persons per residence, and a water requirement of 80 gallons/person/per day.

A groundwater exploration program focused on one of several high permeability water-bearing, fractured sandstone aquifer units which are known to exist in the general Wilson's Beach Estates development area. These aquifers were identified based on the geological interpretation of well logs acquired from Alberta Environment's Provincial Water Well Database and historical groundwater mapping completed by the Alberta Research Council and more recent hydrogeological studies completed for Lacombe County. The production well and an observation well were completed in a deep aquifer intersected between 51 and 61 m below ground level. A second observation well was completed in a shallow aquifer intersected between 16 and 23 m below ground level.

A field verified well survey, completed by Waterline, identified approximately 35 residences and 1 seasonal day use area and campground within a 1.0 km radius of the proposed production well located in SW-14-041-28-W4M. Of these residences, approximately 20 private groundwater wells were confirmed to service 22 residences. In addition, a single groundwater supply well was confirmed to service the seasonal day use area within the campground. Although not confirmed, it is assumed that the remaining 13 unverified residences are serviced by privately owned domestic water wells. Based on Alberta Water Act allocations, the existing groundwater utilization, as sourced from multiple aquifers underlying the investigation area, is conservatively estimated at 42,500 m^3/year (17.8 Igpm).

A pumping test was completed on the production well. The pumping rate was held constant at 90.92 L/min (20 Igpm) for a 48-hour period. During the testing period, 262,759 L (57,800 Imperial gallons) was diverted from the well, resulting in a total drawdown of 22.70 m. Following the pumping cycle, the water level in the pumping well recovered to within 1.0 m of the pre-pumping level within the 63.5-hour recovery monitoring period, representing 96 percent recovery within the recording period. A nested pair of observation wells, offset from the production well by 215 m, were monitored during the 48-hour production test and recovery period. The monitoring well completed in the shallow aquifer did not respond during the testing period and the water level remained unchanged. The monitoring well completed in the deep aquifer was influenced by pumping from the production well and the water level declined by approximately 1.25 m during the pumping period. Based on analysis of the production test data, the deep aquifer hydraulic parameters; transmissivity (T) and storativity (S) were estimated at 7.95 m^2/day and 2.4 x 10^{-4}, respectively.

Based on these aquifer hydraulic parameters, a predictive estimate of drawdown interference in the same aquifer at a distance of 321 m from the production well, following 20-years of continuous pumping at a rate of 128 m^3/day (19.5 Igpm), is calculated to be 11 m. This pumping well offset distance represents the closest water well interpreted to be completed in the same aquifer. It should be noted that aquifer recharge is not considered in the predictive calculations and the observed drawdown after 20-years of pumping may be significantly less than predicted.

Groundwater samples were collected from the production well near the end of the pumping period. The groundwater chemistry is characterized as soft, sodium-bicarbonate water having a total dissolved solids concentration (TDS) of 500 mg/L and a pH of 8.79. The concentration of sodium and TDS, and the pH exceeded the Guidelines for Canadian Drinking Water Quality (GCDWQ) aesthetic objectives (AO). The concentration of fluoride exceeded the GCDWQ maximum acceptable concentration (MAC). Fluoride is a naturally occurring element that commonly exceeds the GCDWQ in the Gull Lake area. If through further testing, the fluoride concentration is confirmed to be elevated above the GCDWQ, water treatment would be required to reduce the concentration of fluoride below applicable standards. A water sample was also collected from Gull Lake. The lake water is characterized as a hard, sodium-bicarbonate water with a TDS concentration of 870 mg/L.

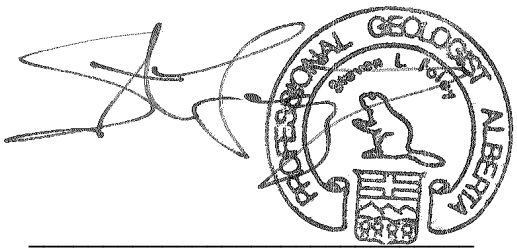
The maximum depth of Gull Lake is referenced as 8 m. The top of the shallow aquifer was intersected at 16 m below ground level. The top of the deep aquifer was intersected at 51 m below ground level. The measured non-pumping water levels in the shallow and deep wells constructed within the development site demonstrated downward gradients across the confining units. During the testing program, no hydraulic response was observed in the shallow aquifer that could be attributed to continuous pumping from the deep aquifer. These data, in addition to differences in water chemistry, demonstrated hydraulic isolation of the shallow aquifer and lake from the deep aquifer.

An estimate of the long-term yield of the production well (Q_{20}) indicates that the well can sustain production at a rate of 128 m^3/day (19.5 Igpm) over a 20-year period, equivalent to the estimated source-water requirement of the proposed subdivision development.

Aquifer testing and analysis has confirmed that groundwater diversion from the production well, at a rate of 128 m^3/day (19.5 Igpm) can be sustained while not unreasonably interfering with existing users of the groundwater resource, or negatively impact the deep aquifer, the shallower aquifers and Gull Lake.

Respectfully submitted

Waterline Resources Inc.
APEGGA Permit To Practice No. P07329



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