Aquifer Name: Arras-Fellers Heights Bedrock Aquifer

Aquifer Number: 1275

Date of Mapping: February 10, 2023

Authors: Tibor Lengyel, M.Sc., P.Geo., Judit Deri-Takacs, Ph.D., and Andrew Hinnell, Ph.D., P.Geo.

# A. AQUIFER DESCRIPTION FOR AQUIFER 1275

## A.1 CONCEPTUAL UNDERSTANDING OF HYDROSTRATIGRAPHY

### A.1.1 AQUIFER EXTENTS

The aquifer is located south of Peace River, between the Pine and Kiskatinaw rivers. It was delineated based on surface water bodies and water licensing watershed boundaries. The aquifer is bound by watershed boundaries in the north, west, by the Kiskatinaw River in the east, and by the Study Area boundary in the south (Lengyel et al. 2023, Figure 1). The aquifer boundaries are uncertain in the south, as the aquifer is likely to extend further south. The aquifer to the north of the aquifer (0595) is part of the same geological/hydrostratigraphical unit.

### A.1.2 GEOLOGIC FORMATION (OVERLYING MATERIALS)

The aquifer is overlain by variable thickness of till and glaciolacustrine deposits (with some veneers). All nine wells associated with the aquifer reported fine-grained material (clay, silt, till) on the surface. The thickness of the overlying material ranges from 6 to more than 90 meters.

### A.1.1 GEOLOGIC FORMATION (AQUIFER) – 5A FRACTURED SEDIMENTARY ROCK

The bedrock aquifer is comprised of sediments of the Kaskapau Formation. The Kaskapau Formation mostly consists of shale, siltstone, and sandstone. Permeability is interpreted to be associated with secondary porosity (through fractures). The Kaskapau Formation is described in further detail by Lengyel et al. (2023).

The aquifer is interpreted to be a confined aquifer based on the thickness and the type of overlying material.

### A.1.2 VULNERABILITY

Depth to groundwater varies from shallow to deep. While the permeability of the aquifer has not been tested, it is expected to be low in shale, moderate in sandstone, and high where fractures are present. Surficial mapping by Reimchen (1980) and borehole logs indicate that the bedrock aquifer is covered by fine-grained materials of variable thickness. The overall vulnerability of the aquifer to surface contamination has been qualitatively assessed to be low.

## A.2 CONCEPTUAL UNDERSTANDING OF FLOW DYNAMICS

### A.2.1 GROUNDWATER LEVELS AND FLOW DIRECTION

Static groundwater levels recorded in the provincial groundwater wells database (GWELLS) range from shallow (6.7 m) to deep (103.6 m). No active provincial monitoring wells within the aquifer extent. Artesian conditions have not been observed in the aquifer. The groundwater surface is interpreted to be a subdued representation of the topography based on regional interpolation of groundwater surface elevations. Groundwater is interpreted to flow primarily to the east.

### A.2.2 RECHARGE

Recharge to the aquifer could occur via distributed infiltration of precipitation and snowmelt through areas with thin overburden (Baye et al. 2016). Much of the recharge is expected to occur in the spring associated with snowmelt. The aquifer may also be recharged by the overlying minor tributaries of the Kiskatinaw River and/or regional groundwater flow in the bedrock units. However, the spatial and temporal understanding of these recharge pathways, as well as vertical flow potential within the bedrock are unknown and further investigation is required to be evaluated.

### A.2.3 POTENTIAL FOR HYDRAULIC CONNECTION

Groundwater in the aquifer is in direct hydraulic connection with the groundwater in the neighbouring bedrock aquifer 0595. Hydraulic connection may exist between aquifer 1275 and overlying overburden aquifers (Goetz 2021, i.e., 0594 and 0596). Groundwater in the aquifer may also be in direct hydraulic connection with the minor tributaries of the Kiskatinaw River where there is limited thickness of the overburden.

## A.3 WATER MANAGEMENT

### A.3.1 ADDITIONAL INFORMATION ON WATER USE AND MANAGEMENT

No water quality concern has been reported in the aquifer. Stated yields in the well records range from 0.12 to 0.95 L/s, with a geometric mean of 0.27 L/s indicating low productivity with pockets of moderate productivity. Groundwater is used primarily for domestic purposes (seven of the nine wells), based on GWELLS well purposes.

### A.3.2 ADDITIONAL ASSESSMENTS OR MANAGEMENT ACTIONS

The regional groundwater flow model developed for the Sunset paleo-valley area (Goetz 2021) concluded that the weathered bedrock aquifer, underlying the Sunset buried channel, is the main source of groundwater recharge to the buried channel aquifer. Similarly, aquifer 1275 may recharge the overlying buried channel aquifers (0594 and 0596), which may guide management actions.

Aquifer 1275 is part of the Kaskapau Formation. Bedrock aquifers in the weathered and fractured Dunvegan and Kaskapau formations in the Study Area (0589, 0591, 0593, 0595, 0633, and 1275) are

inferred to be part of the same hydrostratigraphic unit and are interpreted to be continuous on a regional scale (see Lengyel et al. 2023). The aquifer is differentiated from adjacent aquifers (0593 and 0595) based on regional groundwater flow paths and major geographic features. Water management decisions for the aquifer may require assessment of adjacent aquifers, especially where development is near the aquifer boundaries.

## A.4 AQUIFER REFERENCES


Baye, A., Rathfelder, K., Wei, M., and Yin, J., 2016. Hydrostratigraphic, hydraulic and hydrogeochemical descriptions of Dawson Creek-Groundbirch areas, Northeast BC. Victoria, Prov of B.C. Water Science Series 2016-04.

Geographic datasets from the BC Data Catalogue, accessed November 2022 https://data.gov.bc.ca/.

Goetz, A. M., 2021. Regional groundwater conditions in northeast BC: Results from a monitoring well network in an area of historical and ongoing unconventional natural gas development. M.Sc. Thesis, University of British Columbia, Vancouver, B.C.

Massey, N.W.D., MacIntyre, D.G., Desjardins, P.J. & Cooney, R.T. 2005. Geology of British Columbia. Ministry of Energy and Mines, BC Geological Survey, Geoscience Map 2005-3.

Reimchen, T.H.F, 1980. Surficial Geology Dawson Creek; Geological Survey of Canada, Map 1467A, 1:250000 scale map.


## A.5 REVISION HISTORY

| Date | Version | Revision Class | Comments | Author |
|---|---|---|---|---|
| 02/10/2023 | 1 | Major | Initial mapping of aquifer | Tibor Lengyel, M.Sc., P.Geo., Judit Deri-Takacs, Ph.D., Andrew Hinnell, Ph.D., P.Geo. |