

Aquifer Name: West Arrow Creek Overburden Aquifer

Aquifer Number: 0984

Date of Mapping: December 30, 2022

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A. AQUIFER DESCRIPTION FOR AQUIFER 0984

A.1 CONCEPTUAL UNDERSTANDING OF HYDROSTRATIGRAPHY

A.1.1 AQUIFER EXTENTS

Aquifer 0984 is located along Arrow Creek (see Figure 1; Lengyel et al. 2024). The aquifer boundaries were revised based on the drainage basin encompassing high yielding overburden groundwater wells. Fulton et al. (1984) mapped alluvium along the Arrow Creek floodplain around the mapped aquifer. Aquifer 0984 is separated from aquifer 0487 in the west and aquifer 1279 in the east by inferred bedrock outcrops separating the overburden aquifer systems.

A.1.2 GEOLOGIC FORMATION (OVERLYING MATERIALS)

Borehole records describe the sediments overlying the aquifer as a combination of clay, silty clay, till, boulders, hardpan, and occasionally dirty sand and gravel or silty sand with an average thickness of 24.2 m from 53 well records. Permeable sands and gravels exist at ground surface in some regions.

A.1.3 GEOLOGIC FORMATION (AQUIFER) – SUBTYPE: 4B – CONFINED GLACIOFLUVIAL AQUIFER

Aquifer 0984 is composed of glaciofluvial/fluvial gravel and some sand and gravel. This is a stratified system with some deep, intermediate, and shallow gravel, and sand and gravel deposits. The hydraulic connectivity between these highly permeable lenses is uncertain.

A.1.4 VULNERABILITY – MODERATE

The depth to groundwater varies from shallow to moderately deep, with an average depth to water of 24.7 m. While the permeability of the aquifer has not been tested, it is expected to be high based on the type of aquifer material (glaciofluvial sand and gravel). There is a confining layer protecting the aquifer from contaminants from the surface, however there are windows of vulnerability shown in nine well records. The overall vulnerability of the aquifer has been qualitatively assessed as moderate.

A.2 CONCEPTUAL UNDERSTANDING OF FLOW DYNAMICS

A.2.1 GROUNDWATER LEVELS AND FLOW DIRECTION

Static water levels recorded in the provincial groundwater wells database (GWELLS) range between artesian to moderately deep (51.8 m). No provincial observation well is within the aquifer extents. One well was recorded with artesian conditions.

The groundwater surface is interpreted to be a subdued representation of the topography based on regional interpolation of groundwater surface elevations. Groundwater flow is inferred to be generally from the east and west toward Arrow Creek with a southerly component influenced by the slope of the river valley and north and south toward the Goat River (i.e., from locations of high head to locations of low head) with a southwesterly component influenced by the slope of the river valley.

A.2.2 RECHARGE

Recharge to the aquifer varies depending on depth to the aquifer. In areas where the overlying materials are thick, surficial recharge to the aquifer is likely limited. The infiltration of precipitation and snowmelt is expected to focus on areas where fine-grained sediment overlying the aquifer is thinner. Much of the recharge is expected to occur in the spring associated with snowmelt. The aquifer may also be recharged by deep groundwater flow associated with mountain block recharge in adjacent mountain ranges via the underlying bedrock aquifer (0488). However, spatial and temporal understanding of the recharge mechanisms is uncertain and further investigation is required to confirm hydraulic connections.

A.2.3 POTENTIAL FOR HYDRAULIC CONNECTION

Groundwater in the shallower portion of the aquifer may be hydraulically connected to Arrow Creek and Goat River where the intervening sediments are thin and/or permeable. The aquifer may also be connected to the underlying bedrock aquifer (0488).

A.3 WATER MANAGEMENT

A.3.1 ADDITIONAL INFORMATION ON WATER USE AND MANAGEMENT

Based on the water quality comments in the GWELLS database, two well records indicated high iron in the water and one well indicated hard water as water quality concerns. Well yields for 47 out of 55 wells (excluding eight wells that had no reported well yield) within the aquifer range between 0.2 L/s and 3.1 L/s, with a geometric mean of 0.8 L/s, indicating an aquifer with generally moderate productivity.

The intended use of groundwater, where recorded, was for domestic purposes based on land use and well records.

A.3.2 ADDITIONAL ASSESSMENTS OR MANAGEMENT ACTIONS

No water availability or water budget studies have been completed in the area.

A.4 AQUIFER REFERENCES

Berardinucci J. and K. Ronneseth, 2002. Guide to Using the BC Aquifer Classification Maps for the Protection and Management of Groundwater. BC Ministry of Water, Land and Air Protection, Water Air and Climate Change Branch, Water Protection Section.

Fulton, R.J., Shetsen, I., and Rutter, N.W., 1984. Surficial geology, Kootenay Lake, British Columbia-Alberta. Geological Survey of Canada, Open File 1084, 1:1,000,000 scale.

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

Lengyel, T., Verma, S., Deri-Takacs, J., and Hinnell, A. 2024. Aquifer Mapping in the Kootenay/Boundary Region of British Columbia: Creston, Rossland, Castlegar, and Salmo. Water Science Series, WSS2024-05. Prov. B.C., Victoria B.C.

A.5 REVISION HISTORY

Date	Version	Revision Class	Comments	Author
20120330	1	Major	Initial mapping of aquifer	N/A
20221230	2	Minor	Remapping of aquifer	Tibor Lengyel, M.Sc., P.Geo., Simrat Verma, M.Sc., and Andrew Hinnell, Ph.D., P.Geo.

Note: Author of first mapping not available