Aquifer Name: Sunningdale/Glenmerry Bedrock Aquifer

Aquifer Number: 1282

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A. AQUIFER DESCRIPTION FOR AQUIFER 1282

A.1 CONCEPTUAL UNDERSTANDING OF HYDROSTRATIGRAPHY

A.1.1 AQUIFER EXTENTS

Bedrock Aquifer 1282 is located east of the Columbia River near Trail, British Columbia (see Figure 1; Lengyel et al. 2024). Bedrock forms a regionally extensive geological/hydrostratigraphic unit. The southeastern boundary of the aquifer is a fault line (along Beaver Creek) where multiple dry bedrock groundwater wells indicate the absence of active groundwater flow. The rest of the boundaries of the aquifer are defined based on topography, major surface water features, and water licensing watershed boundaries. The aquifer is bound by the Columbia River in the west. The eastern boundary has been defined by the surface licensing watershed boundaries and is a representation of topography in the area. The northeastern groundwater divide (ridge) is defined by the Hartleb Mountain range.

A.1.2 GEOLOGIC FORMATION (OVERLYING MATERIALS)

Fulton et al. (1984) described the area of the aquifer to be overlain by sandy loam and loamy till, silty till, alluvium, and glaciofluvial sand and gravel along the Columbia River floodplain. Sections of the till are described to be thin and discontinuous with thickness up to 2 m in some regions. Aquifer 1282 may be locally overlain by the sediments of overburden aquifers 0483, 0484, and 1284. Depth to bedrock ranges from 0.6 to 62.8 m. The average depth to bedrock is 22.1 m. Bedrock outcrops in higher elevations.

A.1.3 GEOLOGIC FORMATION (AQUIFER) – SUBTYPE: 6B – FRACTURED CRYSTALLINE ROCK

The aquifer is comprised primarily of fractured igneous intrusive rock (granodioritic and granites). There are some fractured volcanics (basaltic), metamorphic rock (gneiss), and sedimentary rock (mudstone, siltstone, shale, fine clastic; Cui et al. 2017). All rock type comprising the aquifer are of the Mesozoic Era.

As the bedrock has been faulted and fractured throughout the area of the aquifer and surrounding region and well yields change over short distances and do not appear to be correlated with bedrock type, secondary permeability is expected to be dominant in all types of bedrock; as such, all these rocks may act as aquifers. Accordingly, bedrock aquifers are expected to extend across lithological boundaries.

A.1.4 VULNERABILITY - MODERATE

The bedrock aquifer is comprised of fractured rock. Depth to groundwater varies from shallow to moderately deep. The average depth to water is 19.1 m and average depth to bedrock is 22.1 m. The bedrock aquifer is confined, however, some areas throughout the aquifer show higher vulnerability (i.e., where permeable deposits are overlying the aquifer, overlying material is thin, and in higher elevations where the aquifer outcrops). There are no artesian wells within the aquifer. Vulnerability across the aquifer ranges from moderate (where the aquifer is confined by overlying sediments [and where most of the development is expected to occur] and where the risk of contamination from land use is expected to be higher) to high (in areas of topographical high where bedrock outcrops and overlying material is thin). The overall vulnerability of the aquifer to surface contamination has been qualitatively assessed to be moderate.

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 (0.3 m) to moderately deep (45.7 m). There are no provincial observation wells within 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 from higher elevations in the east toward the northwest, southwest, and south, to lower elevations (in the direction of the Columbia River floodplain from Hartleb Mountain and to the Beaver Creek (i.e., from locations of high head to locations of low head).

No information has been identified on the primary porosity and permeability of the bedrock unit. Based on the type of material (primarily fine-grained sedimentary rocks), and the large variation of reported well yields over short distances, flow is expected to occur primarily through fractures and through the primary permeability/porosity of the bedrock.

No information is available on how faults impact groundwater flow in the area. Fracturing associated with the faults is interpreted to enhance permeability.

A.2.2 RECHARGE

Recharge to the aquifer varies depending on depth to bedrock. In areas where the overburden is thick, surficial recharge to the aquifer is likely limited. The infiltration of precipitation and snowmelt is expected to focus on areas where fine-grained overburden is thinner, and in areas of higher topographic elevation where overburden is absent and the bedrock outcrops at surface (Fulton et al. 1984). Much of the recharge is expected to occur in the spring associated with snowmelt. The aquifer may also be recharged by overlying tributaries of the Columbia River where the intervening overburden is thin. Aquifer 1282 may recharge the overlying overburden aquifers 0483, 0484, and 1284; however, the spatial and temporal understanding of this recharge mechanism is uncertain and further investigation is required to confirm hydraulic connections.

A.2.3 POTENTIAL FOR HYDRAULIC CONNECTION

Hydraulic connection to various surface water bodies (primarily the Columbia River, which forms the western boundary of the aquifer, and its tributaries) is expected.

As the bedrock has been faulted and fractured throughout the Study Area, hydraulic connection to other aquifers (including the overlying overburden aquifers 0483, 0484, and 1284) is inferred; however, the extent of the fracture network and its continuity requires further study. Hydraulic connection with overburden aquifers may be limited should low permeability layers separate them.

Aquifer 1282 may also be hydraulically connected with bedrock aquifer 0493 in the east.

A.3 WATER MANAGEMENT

A.3.1 ADDITIONAL INFORMATION ON WATER USE AND MANAGEMENT

Reported well yields for ten out of 23 wells (excluding 13 wells that were dry or had no reported well yield) within the aquifer range between 0.2 L/s and 11.5 L/s, with a geometric mean of 1.0 L/s, indicating an aquifer with moderate productivity with localized zones of both low and high productivity. No water quality or quantity concerns were reported in the water quality comments of the GWELLS database.

The wells in the area have been described as water supply wells, while others have been labelled as unknown. The locations of the wells make it likely that they are used for domestic or commercial purposes based on well purpose documented in GWELLS.

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.

Cui, Y., Miller, D., Schiarizza, P., and Diakow, L.J. 2017. British Columbia Digital Geology. BC Ministry of Energy Mines and Petroleum Resources, BC Geological Survey Open File 2017-8, 9p. Data Version 2019-12-19.

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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
20230202	1	Major	Initial Mapping of Aquifer	Tibor Lengyel, M.Sc., P.Geo., Simrat Verma, M.Sc., and Andrew Hinnell, PhD, P.Geo.