Aquifer Name: Blewett Bedrock Aquifer

Aquifer Number: 0511

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A. AQUIFER DESCRIPTION FOR AQUIFER 0511

A.1 CONCEPTUAL UNDERSTANDING OF HYDROSTRATIGRAPHY

A.1.1 AQUIFER EXTENTS

Aquifer 0511 is located south of the Kootenay River in the vicinity of Nelson, British Columbia (see Figure 1; Lengyel et al. 2024). The extent of the aquifer is defined based on topography, major surface water features, and water licensing watershed boundaries within a regionally extensive geological/hydrostratigraphic unit. The northern boundary of the aquifer is located along the Kootenay River and the West Arm of Kootenay Lake (major geographical features). The rest of the aquifer was mapped by inferred groundwater divides (ridges) drawn using the surface licensing watershed boundaries and are a representation of topography (extent of the drainage basin) in the area.

A.1.2 GEOLOGIC FORMATION (OVERLYING MATERIALS)

Fulton et al. (1984) described the area of the aquifer to be overlain by sandy till, sandy loam, loamy till, and by glaciofluvial sand and gravel along the Kootenay River floodplain. Sections of the till are described to be thin and discontinuous with thickness up to 2 m in some regions. Aquifer 0511 may be locally overlain by the sediments of overburden aquifers 1117 and 1278. Depth to bedrock ranges from 0.3 to 85.3 m. The average depth to bedrock is 7.0 m. Bedrock outcrops at higher elevations.

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

Aquifer 0511 is composed of fractured volcanic rock (basalts), igneous intrusive rock (granodioritic and feldspar porphyritic), and sedimentary rock (limestone, slate, siltstone, argillite) of the Mesozoic Era (Cui et al. 2017).

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

Depth to groundwater varies from shallow to deep. The average depth to water is 15.4 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 at higher elevations where the aquifer outcrops).

Average depth to bedrock is shallow (7.0 m). There are 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 topographically elevated areas where overlying material is thin or absent and bedrock outcrops). 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 artesian to deep (128 m). There are 27 wells with artesian groundwater conditions within the aquifer (located along the Kootenay River). 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 south toward the Kootenay River floodplain on the north.

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 topographically elevated areas 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. Recharge may occur through the overlying overburden aquifer 1278. The aquifer may also be recharged by overlying tributaries of the Kootenay River where the intervening overburden is thin; however, spatial and temporal understanding of this recharge mechanism is uncertain and further investigation is required to confirm these hydraulic connections.

A.2.3 POTENTIAL FOR HYDRAULIC CONNECTION

Hydraulic connection to various surface water bodies (primarily the Kootenay River and the West Arm of Kootenay Lake along the northern boundary of aquifer 0511, and the tributaries of these surface water features) is expected. As the bedrock has been faulted and fractured throughout the Study Area, hydraulic connection to other aquifers (including the overlying overburden aquifers 1117 and 1278, as well as the neighbouring bedrock aquifer 0493) is inferred; however, the extent of the fracture network and its continuity requires further studies. Hydraulic connection with overburden aquifers may be limited should low permeability layers separate them.

A.3 WATER MANAGEMENT

A.3.1 ADDITIONAL INFORMATION ON WATER USE AND MANAGEMENT

Well yields for 216 out of 219 wells (excluding three wells that had no reported well yield) within the aquifer range between 0.06 L/s and 7.6 L/s, with a geometric mean of 0.5 L/s, indicating an aquifer with generally moderate productivity with localized zones of low and high productivity. No water quality or quantity concerns were noted in the water quality comments of the GWELLS database.

There are a mix of domestic, commercial, and irrigation wells within aquifer 0511 with most wells being used for domestic purposes based well purpose recorded 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.

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. Stage 1 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
20020321	1	Major	Initial mapping of aquifer	N/A
20160519	2	Minor	Remapping of Aquifer	N/A
20230202	3	Minor	Remapping of Aquifer	Tibor Lengyel, M.Sc., P.Geo., Simrat Verma, M.Sc., and Andrew Hinnell, PhD, P.Geo.

Note: Author of initial and re-mapping not available