Aquifer Name: Sweetwater Bedrock Aquifer

Aquifer Number: 0633

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A. AQUIFER DESCRIPTION FOR AQUIFER 0633

A.1 CONCEPTUAL UNDERSTANDING OF HYDROSTRATIGRAPHY

A.1.1 AQUIFER EXTENTS

The aquifer is located south and west of the Kiskatinaw River. It is a bedrock aquifer delineated based on water licensing watershed boundaries and surface water bodies within a regionally extensive geological/hydrostratigraphic unit. The aquifer is bound to the west and north by the Kiskatinaw River, to the south and east by water licensing watershed boundaries (Lengyel et al. 2023, Figure 1). The aquifer to the south of the aquifer (0593) is part of the same geological/hydrostratigraphical unit.

A.1.2 GEOLOGIC FORMATION (OVERLYING MATERIALS)

The aquifer is primarily overlain by till and glaciolacustrine, and colluvial sediments near the Kiskatinaw River. Twenty-two of the 29 wells associated with the aquifer reported fine-grained material (clay, till) on the surface and three reported bedrock. The remaining wells did not specify surficial lithology. The thickness of the overlying material ranges from 0 to more than 79 meters.

A.1.3 GEOLOGIC FORMATION (AQUIFER) – 5A FRACTURED SEDIMENTARY ROCK

The bedrock aquifer primarily comprises sediments of the Upper Cretaceous Kaskapau Formation, with sediments of the Dunvegan Formation limited to near the Kiskatinaw River. The Dunvegan Formation consists of massive conglomerate, fine to coarse-grained sandstone, and carbonaceous shale (Massey et al. 2005), and the Kaskapau Formation mostly consists of shale, siltstone, and sandstone. Permeability may be associated with both the primary and the secondary porosity (through fracturing) of the formations. The Dunvegan and Kaskapau formations are described in further detail by Lengyel et al. (2023).

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

A.1.4 VULNERABILITY

Depth to groundwater varies from shallow to deep. Baye et al. (2016) reported relatively stable water levels for August 2014-July 2015 and extremely low well yield at provincial observation well OW-418 (Well Tag Number [WTN] 104709). 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 most of the bedrock aquifer is covered by

fine-grained materials of variable thickness, with potential windows where bedrock is on surface. 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) and in reviewed research wells (Goetz 2021) range from shallow (0.3 m) to moderately deep (76.8 m). Flowing artesian conditions were encountered at one well (WTN 17941). There is one active bedrock provincial observation well within the aquifer extents, OW-418 (WTN 104709).

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 toward the Kiskatinaw River and its tributaries.

A.2.2 RECHARGE

Recharge to the aquifer could occur via distributed infiltration of precipitation and snowmelt through the 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 uncertain 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 its neighbouring bedrock aquifer 0593. Hydraulic connection may exist between aquifer 0633 and the coarse-grained sediments in aquifer 0851, where they are not separated by thick fine-grained sediments. Groundwater in the aquifer may also be in direct hydraulic connection with the minor tributaries of the Kiskatinaw River where the thickness of the overburden is limited.

A.3 WATER MANAGEMENT

A.3.1 ADDITIONAL INFORMATION ON WATER USE AND MANAGEMENT

Baye et al. (2016) reported elevated concentrations for arsenic, iron, sulphate, total dissolved solids (TDS), and hardness in some of the bedrock wells within the extent of aquifer 0633. Stated yields in the well records range from 0.02 to 5.55 L/s, with a geometric mean of 0.42 L/s indicating moderate productivity with localized zones of both low and high productivity. Several wells were reported as dry. Where identified, groundwater is primarily used for domestic purposes. Commercial and industrial purpose is also reported at one well in the aquifer based on GWELLS.

A.3.2 ADDITIONAL ASSESSMENTS OR MANAGEMENT ACTIONS

Baye et al. (2016) concluded that recharge occurs in upland areas by precipitation percolating through the till, however the exact recharge source of the regional bedrock aquifer is currently uncertain and requires further investigation.

Aquifer 0633 is part of the Kaskapau Formation and, where present, the Dunvegan 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.

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A.5 REVISION HISTORY

Date	Version	Revision Class	Comments	Author
2011	1	Major	Initial mapping of aquifer	Lowen Hydrogeology Consulting Ltd. 2011
02/10/2023	2	Major	Aquifer boundaries updated to include hydraulically connected geologic formations	Tibor Lengyel, M.Sc., P.Geo., Judit Deri-Takacs, Ph.D., Andrew Hinnell, Ph.D., P.Geo.