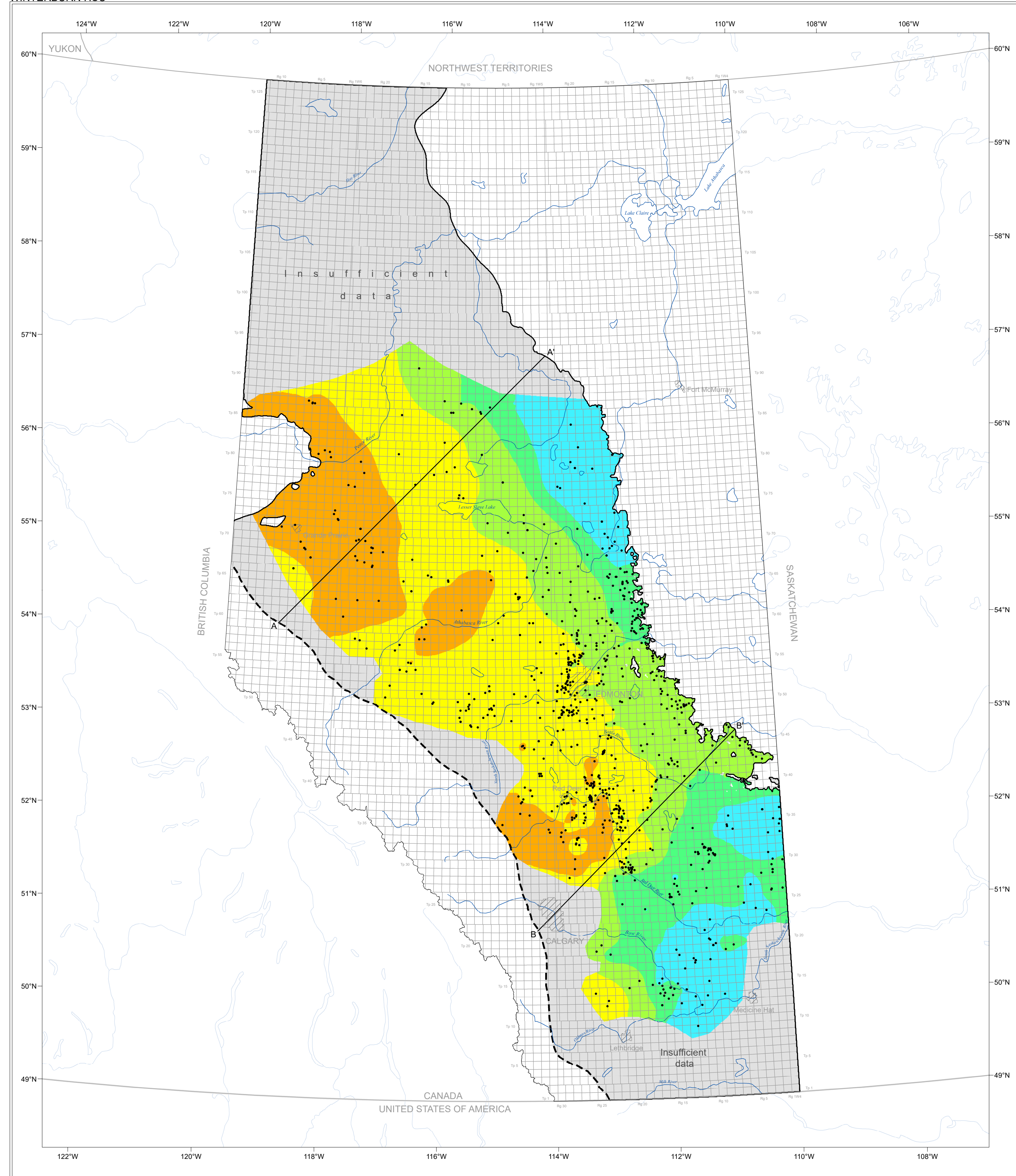
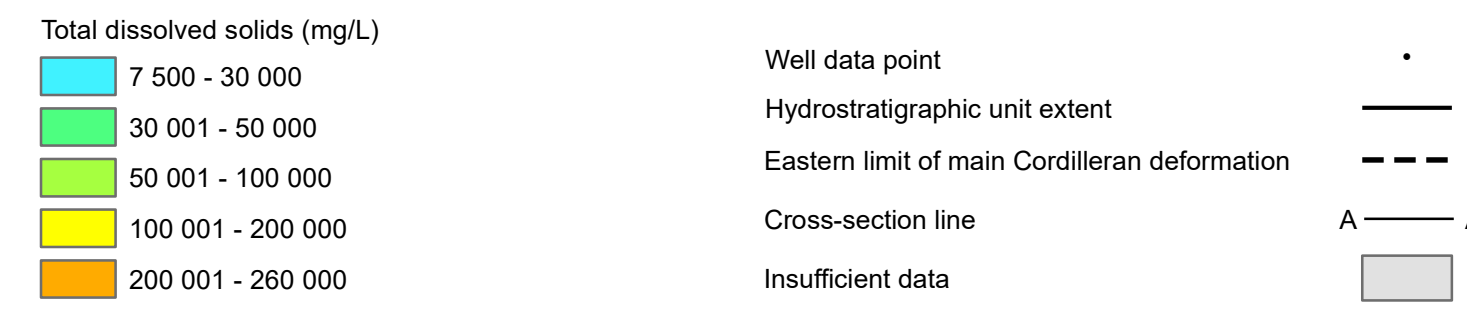


TOTAL DISSOLVED SOLIDS
WINTERBURN HSU



SYMBOL LEGEND



This map depicts the distribution of total dissolved solids (TDS) in groundwater in the Winterburn hydrostratigraphic unit (HSU). The horizontal and vertical extent of the unit was adopted from the 3D Provincial Geological Framework Model of Alberta, Version 2 (Alberta Geological Survey, 2019a). The relationship of the Winterburn HSU with the units above and below as well as its geometry can be seen in Figures 1 and 2.

Methodology

The TDS distribution map is a result of an empirical Bayesian kriging technique using publicly available data from 879 water chemistry analyses from oil and gas wells. A screening process modified from Jensen et al. (2013) was used to ensure that only representative formation water chemistries were used. Measured TDS values range from 6 889 mg/L to 277 977 mg/L. The final gridded map surface was clipped based on the spatial distribution of representative data. Residual values are plotted at each location (Figure 3) to indicate where underprediction or overprediction occurs compared to the measured TDS values.

Additional formation-scale hydrogeological maps for the Winterburn HSU are shown in Figures 4 and 5. Figure 4 illustrates the distribution of hydraulic head in the Winterburn HSU, with hydraulic heads calculated using fresh water density. Figure 5 shows the water driving force (WDF) vector map for the Winterburn HSU. The WDF vector map allows identification of areas where the inferred magnitude and direction of formation water density has the potential to change some influence in the dark orange areas, where larger angles between the WDF vector and hydraulic gradient vector are observed.

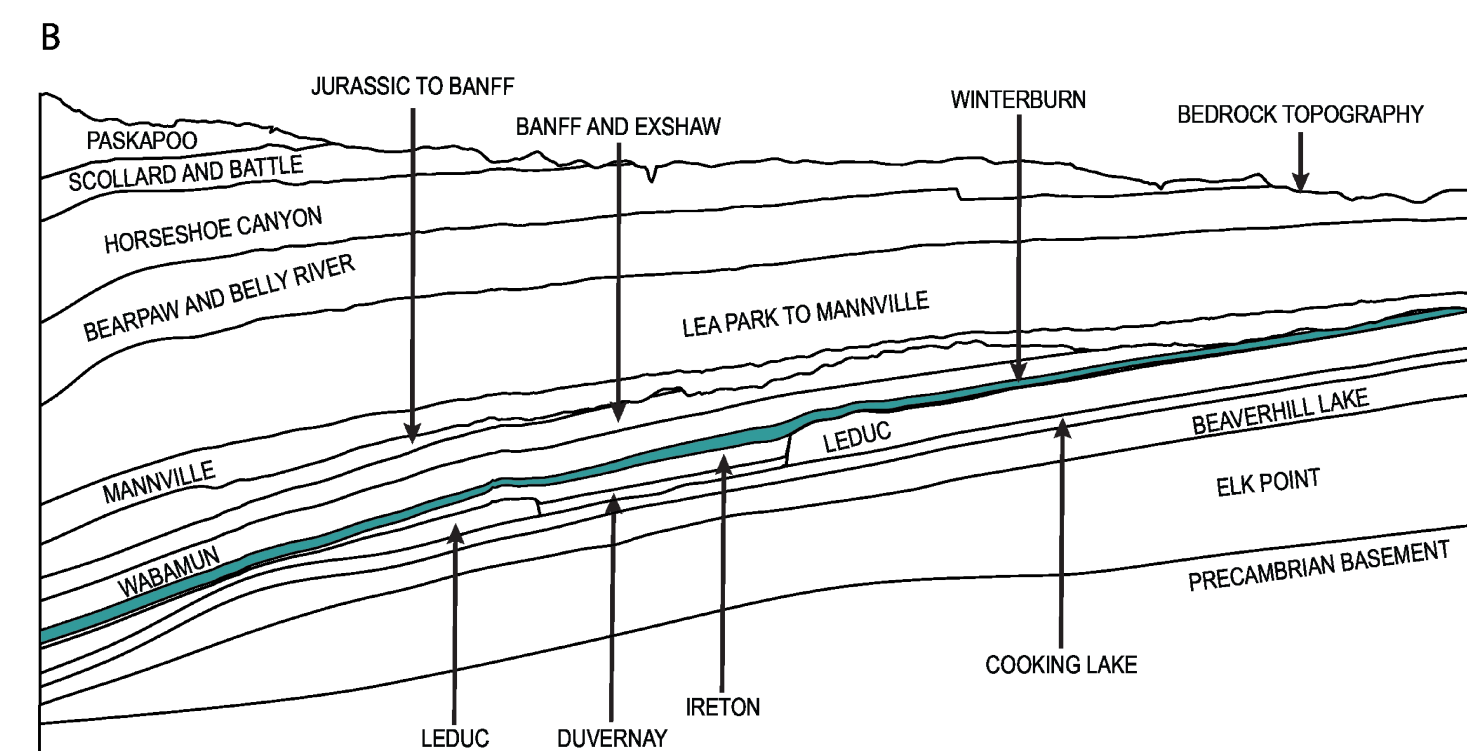
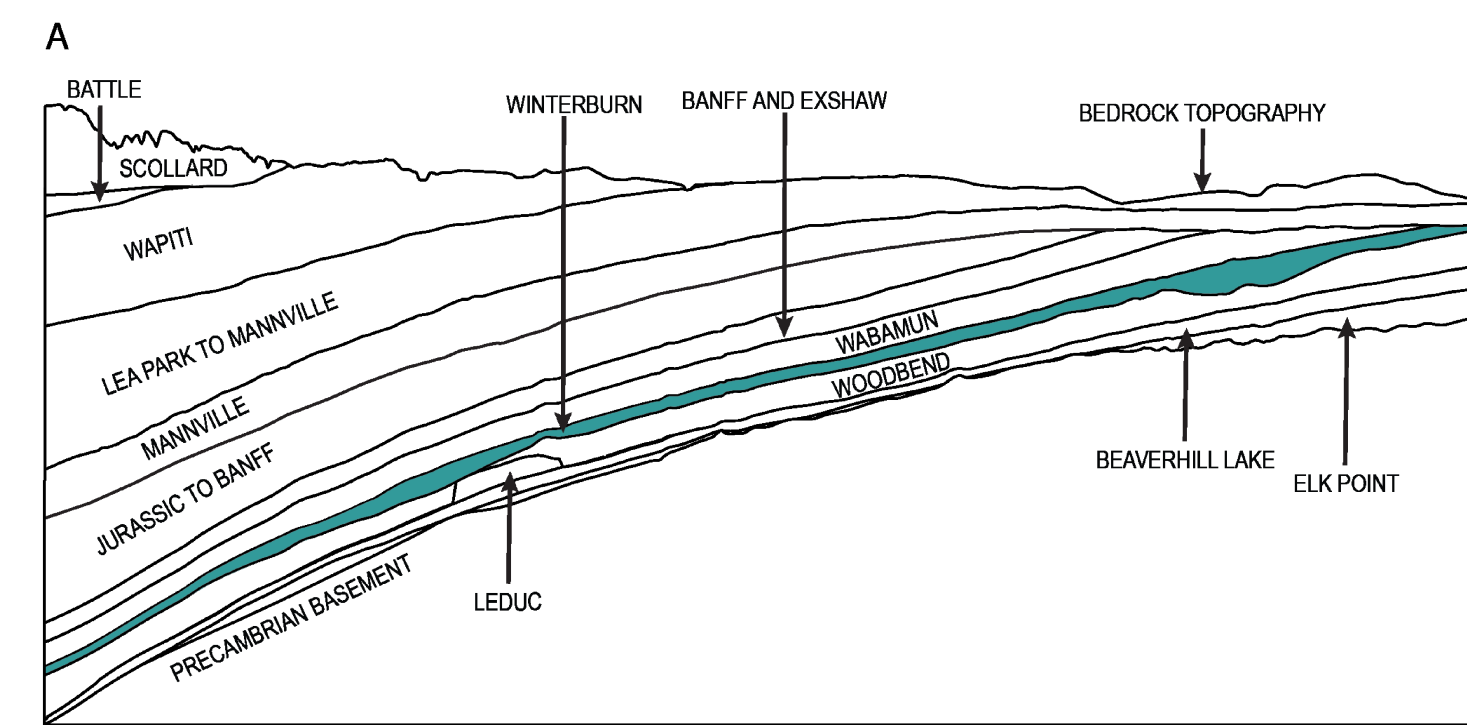


Figure 1. Schematic cross-sections identifying the geometry and variable thickness of the Winterburn HSU (not to scale). Strata within the Lea Park to Mannville and Jurassic to Banff intervals have not been subdivided at the scale of these cross-sections.

Acknowledgements

Data processing support by S. Stewart. Water driving force vector map created by A. Singh. Base data from the Atlas of Canada (Natural Resources Canada, 2012) and Spatial Data Warehouse, Ltd.

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Recommended Reference Format

Brinsky, J. (2022): Distribution of total dissolved solids in the Winterburn hydrostratigraphic unit, Alberta Energy Regulator / Alberta Geological Survey, AER/AGS Map 634, scale 1:3 000 000.

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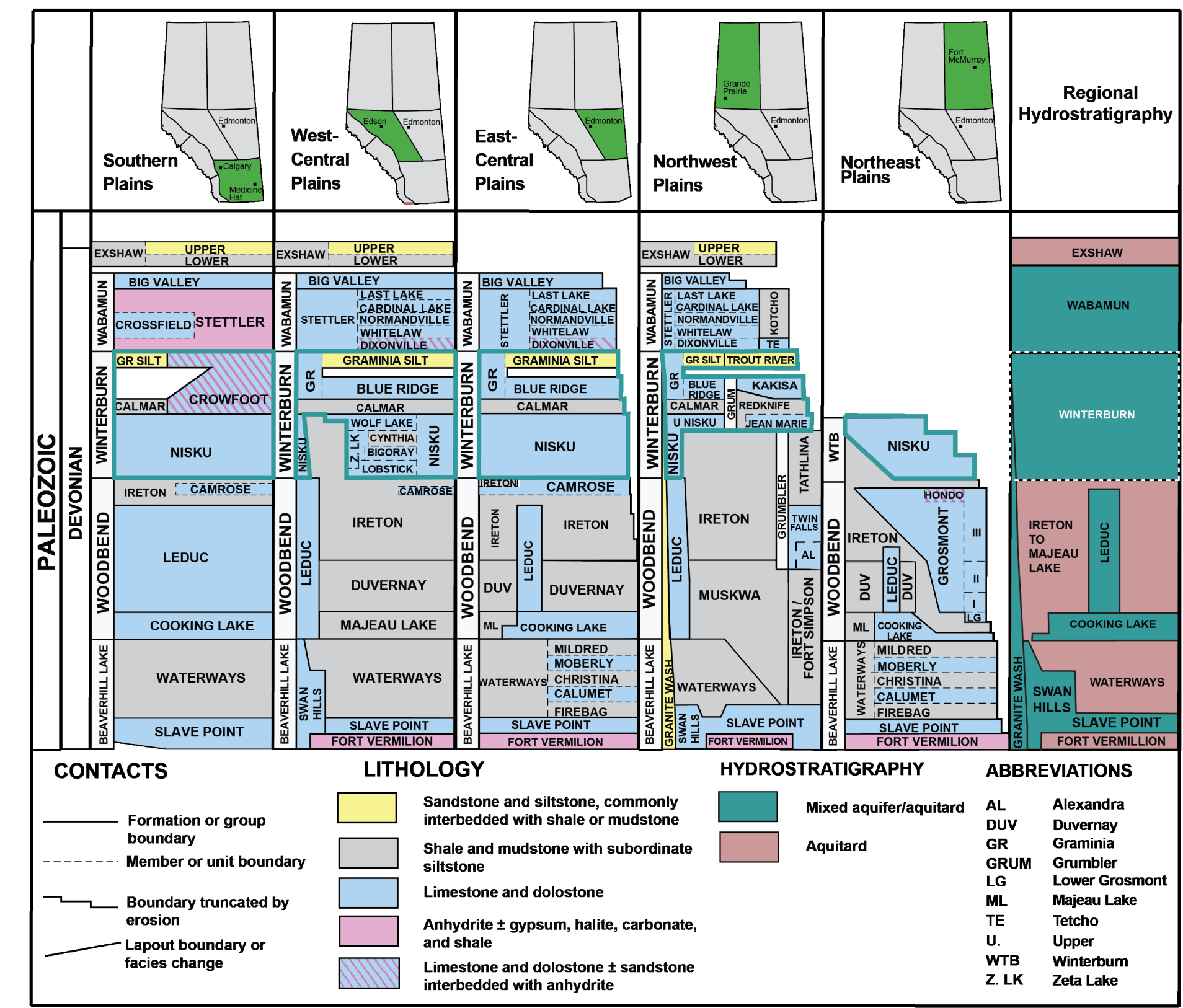


Figure 2. Regional lithostratigraphy and hydrostratigraphy (based on Alberta Geological Survey, 2019b). Solid teal lines highlight the Winterburn Group. Dashed white lines depict the Winterburn HSU within the regional hydrostratigraphy. Strata above the Exshaw Formation and below the Slave Point, Swan Hills, or Fort Vermillion formations are not shown.

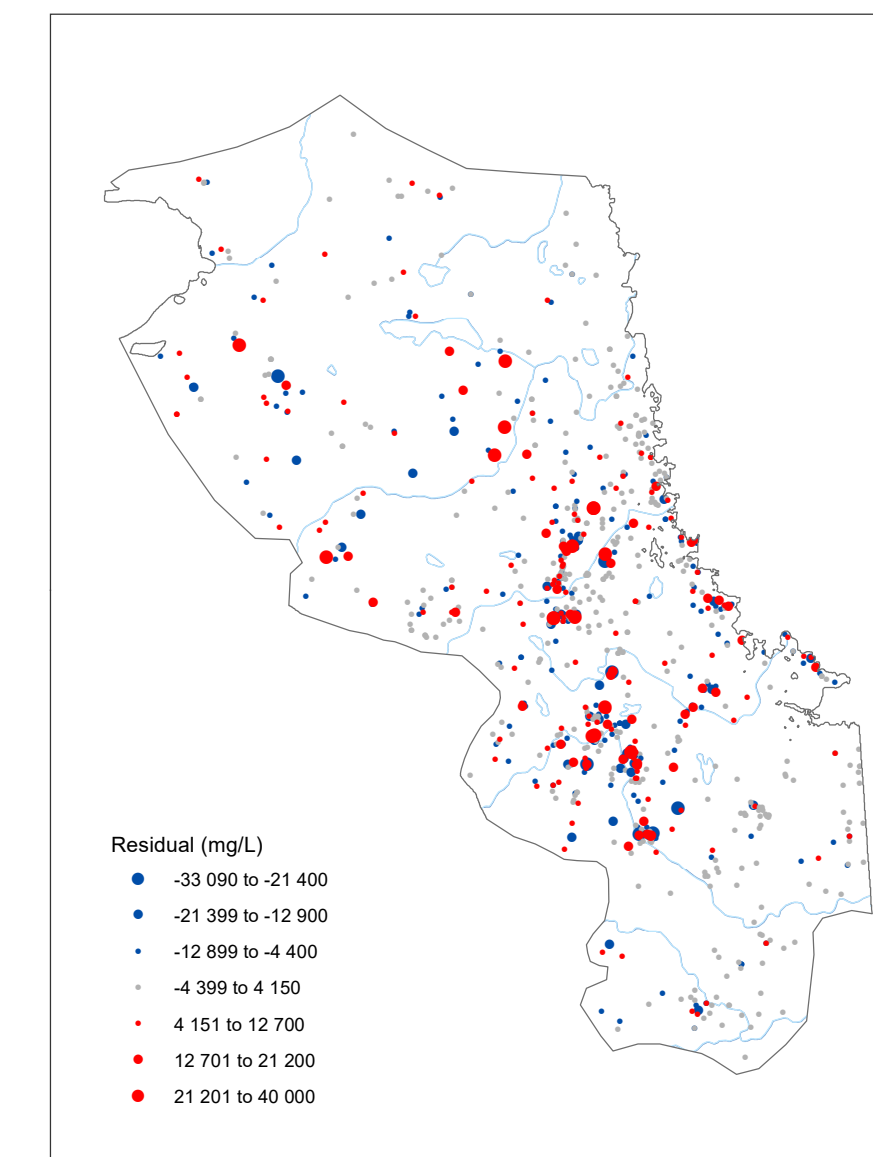


Figure 3. Calculated residuals between the modelled distribution of TDS and measured values. Symbol classes are based on the standard deviation of the calculated residuals.

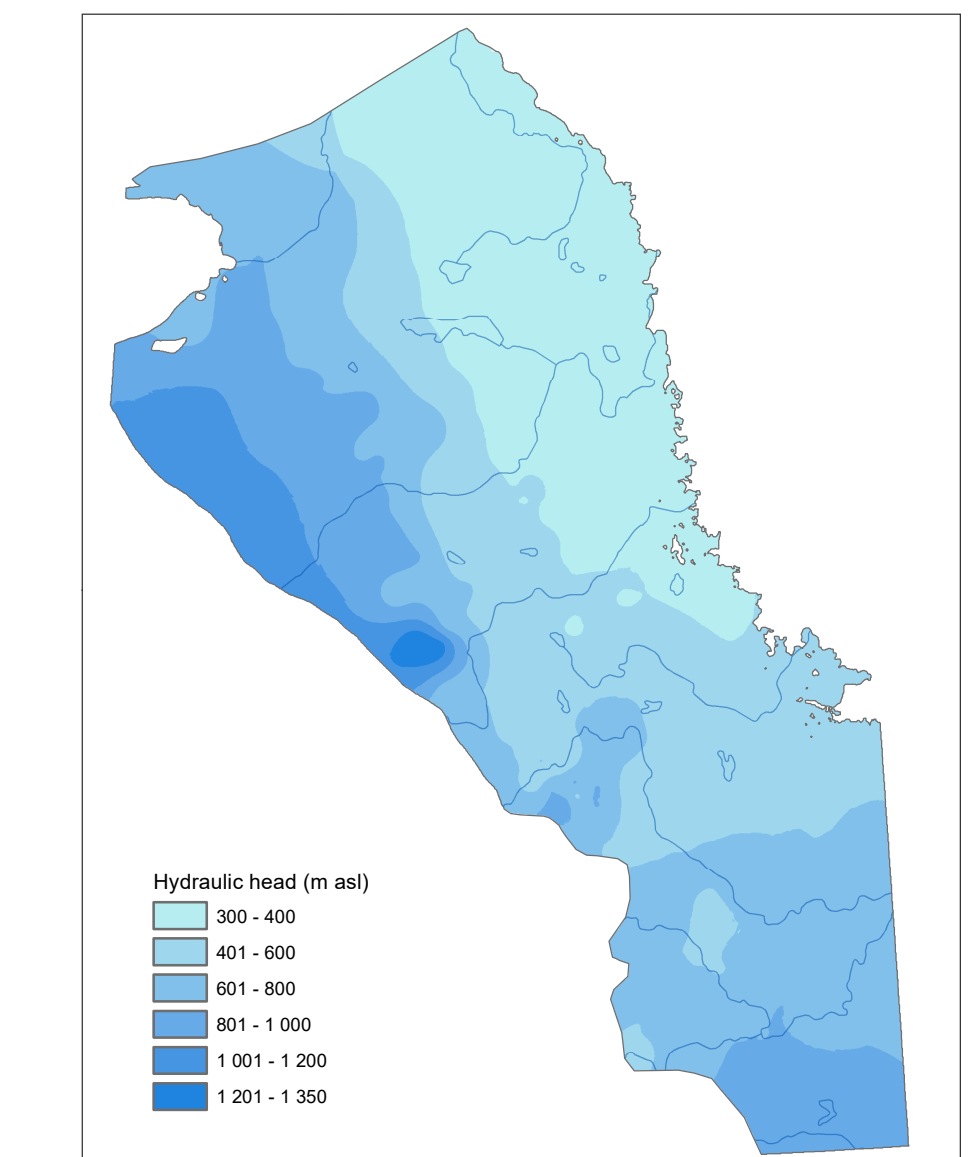


Figure 4. Distribution of hydraulic head in the Winterburn HSU (Brinsky, 2022). The map extent is based on the spatial distribution of hydraulic head data and differs from the extent of the main map.

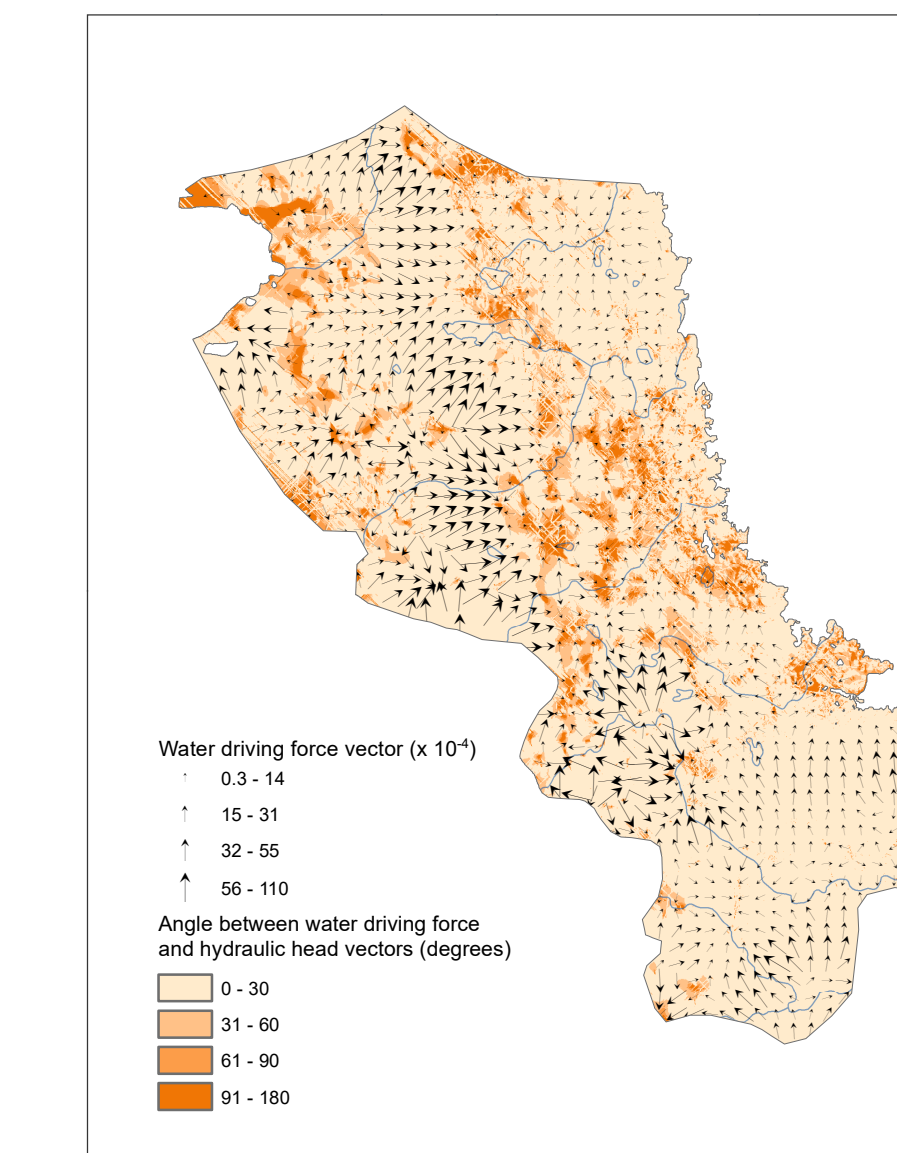


Figure 5. Water driving force vector map of the Winterburn HSU. The map covers only the area where the hydraulic head and TDS gridded surfaces overlap.

