

SYMBOL LEGEND

- Total Dissolved Solids (mg/L)
 - 30 000 - 50 000
 - 50 001 - 80 000
 - 80 001 - 110 000
 - 110 001 - 140 000
 - 140 001 - 160 000
- Well data point
- Hydrostratigraphic unit extent
- Eastern limit of main Cordilleran deformation
- Cross-section line
- Insufficient data

This map depicts the distribution of total dissolved solids (TDS) in groundwater in the Montney 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 Montney 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 189 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 31 909 mg/L to 167 563 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 measured TDS values.

Additional formation-scale hydrogeological maps of the Montney HSU are presented in Figures 4 and 5. Figure 4 shows the distribution of hydraulic head in the Montney HSU, with hydraulic heads calculated using fresh water density. Figure 5 shows the water driving force (WDF) vector map for the Montney HSU. The WDF vector map allows identification of areas where the buoyancy effect of formation water density has the potential to change the inferred magnitude and direction of groundwater flow (Singh et al., 2017). Buoyancy appears to have some influence in the western and southern portion of the mapped Montney HSU.

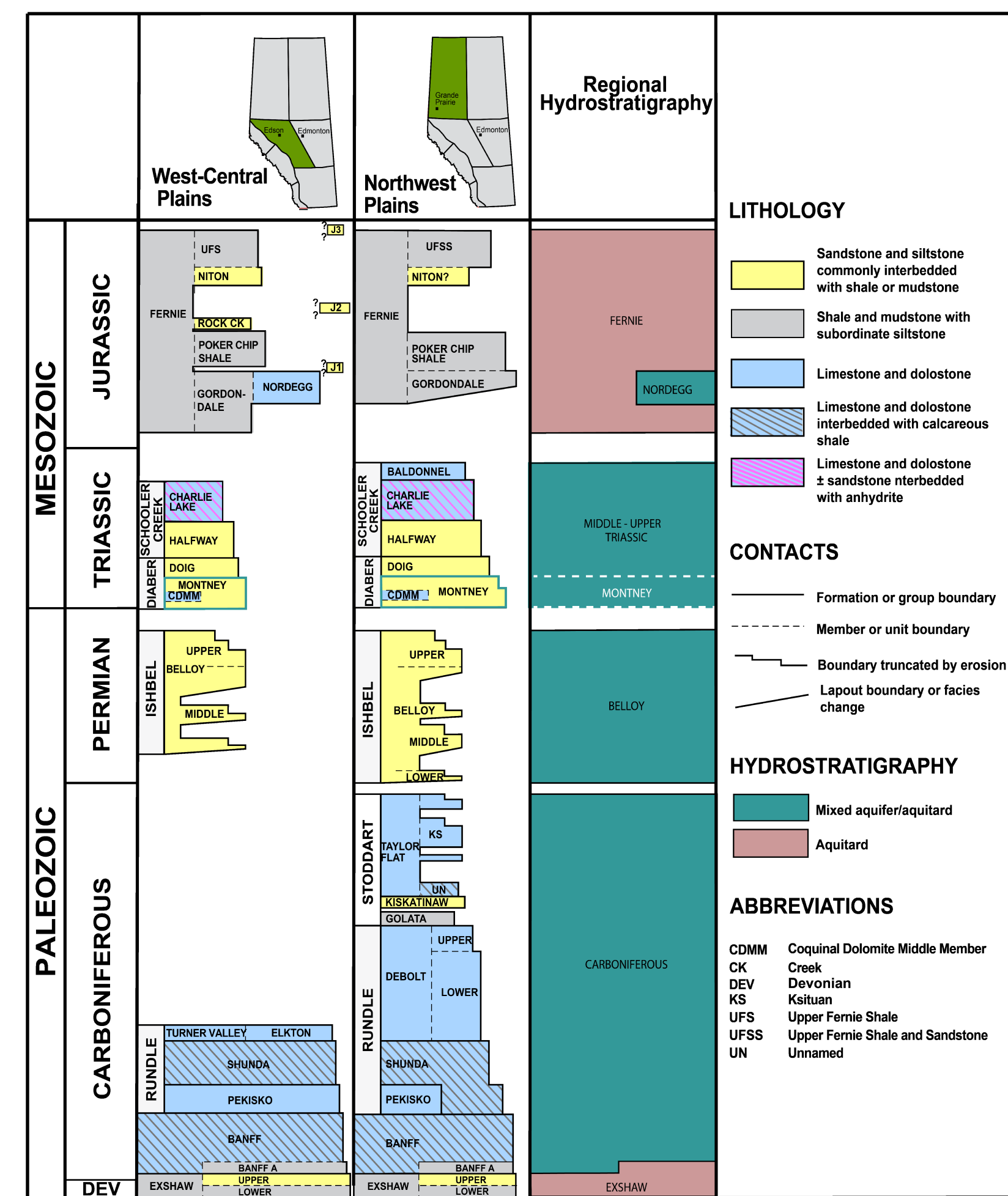


Figure 1. Regional lithostratigraphy and hydrostratigraphy (based on Alberta Geological Survey, 2019b). Solid teal lines highlight the Montney Formation. Dashed white lines depict the Montney HSU within the regional hydrostratigraphy. Strata above the Fernie Formation are not shown.

References

Alberta Geological Survey (2019a). 3D Provincial Geological Framework Model of Alberta, version 2; Alberta Energy Regulator / Alberta Geological Survey, AER/AGS Model 2018-02. URL <https://ags.aer.ca/publication/3d-pgf-model-v2.html> [November 2020].

Alberta Geological Survey (2019b). Alberta Table of Formations; Alberta Energy Regulator, URL <https://ags.aer.ca/publications/Table_of_Formations_2019.html> [October 2019].

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Jensen, G.K.S., Rostron, B., Palombi, D. and Melnik, A. (2013). Saskatchewan Phanerozoic Fluids and Petroleum Systems project: hydrogeological mapping framework; in Summary of investigations 2013, v.1, Saskatchewan Geological Survey, Saskatchewan Ministry of the Economy, Miscellaneous Report 2013-4-1, Paper A-5, 10 p.

Natural Resources Canada (2012). CanVec digital topographic data; Natural Resources Canada, Earth Sciences Sector. <https://open.canada.ca/data/en/dataset/8ba2aa2a-7bb9-4448-b4d7-f164409e056> [May 2021].

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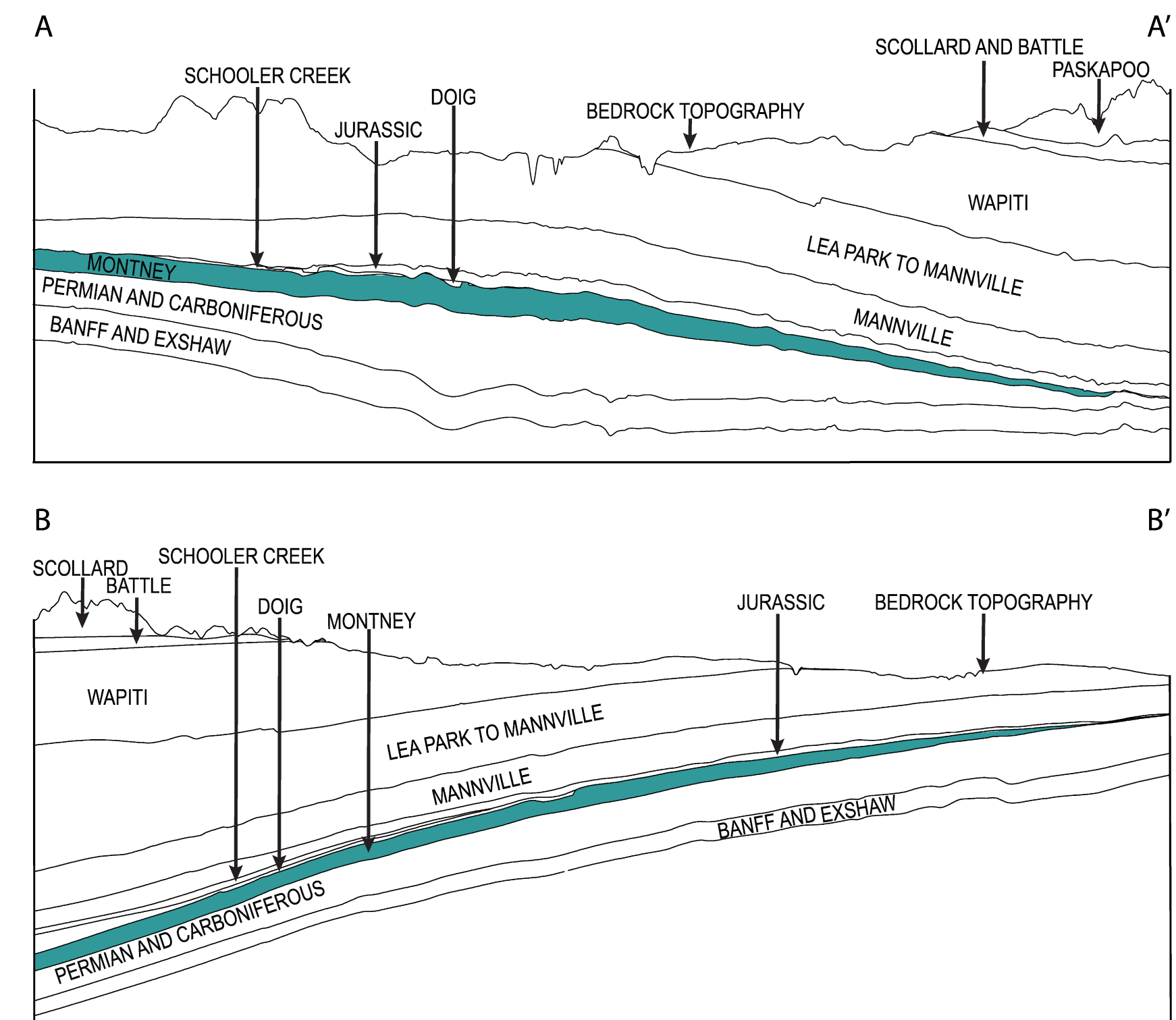


Figure 2. Schematic cross-sections identifying the geometry and variable thickness of the Montney HSU (not to scale). Permian and Carboniferous strata up to the Banff and Exshaw are not subdivided at the scale of these cross-sections.

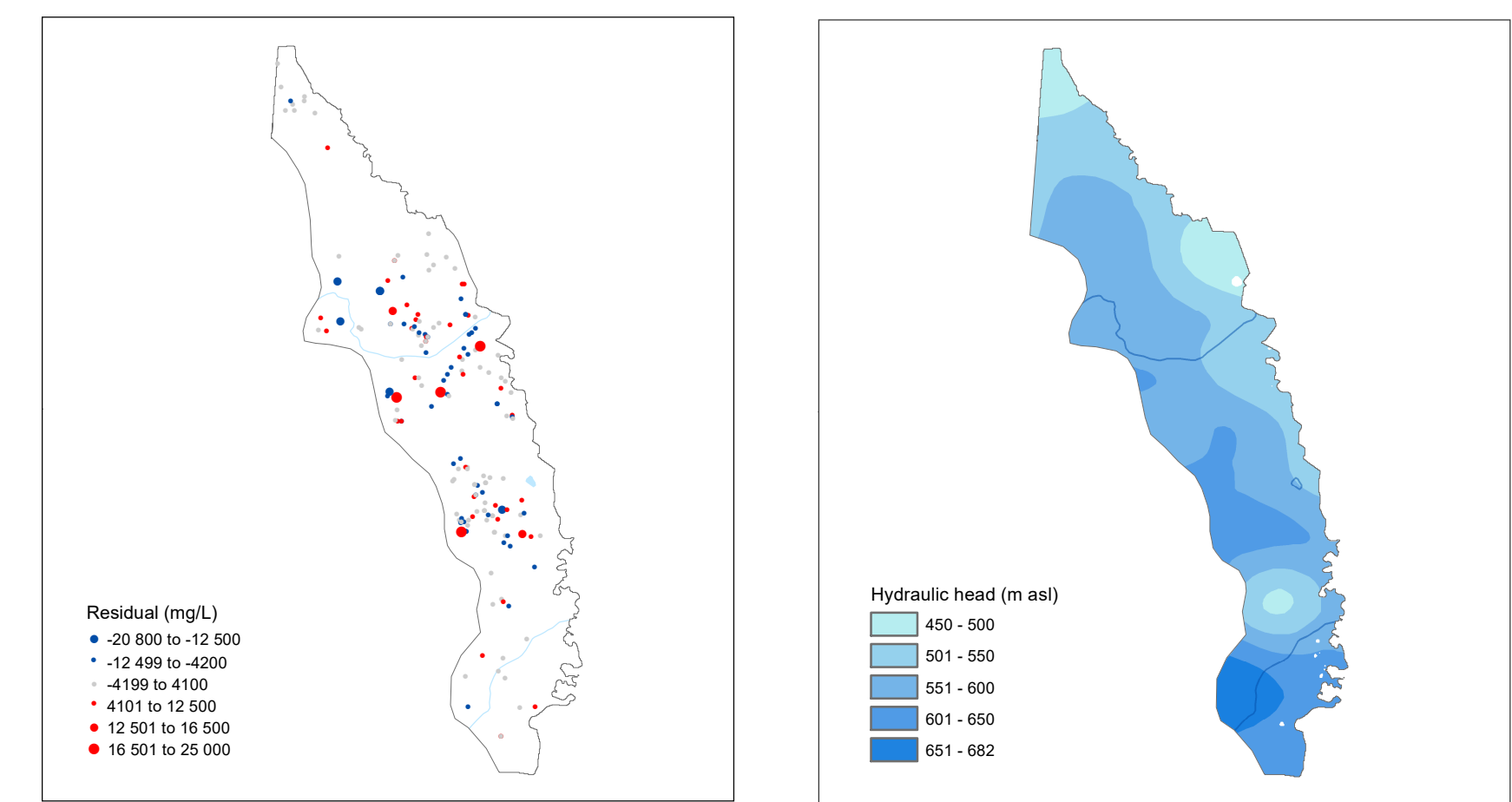


Figure 3. Calculated residuals between the modelled distribution of TDS and measured values. Symbol classes are based on the standard deviation of the calculated residuals.

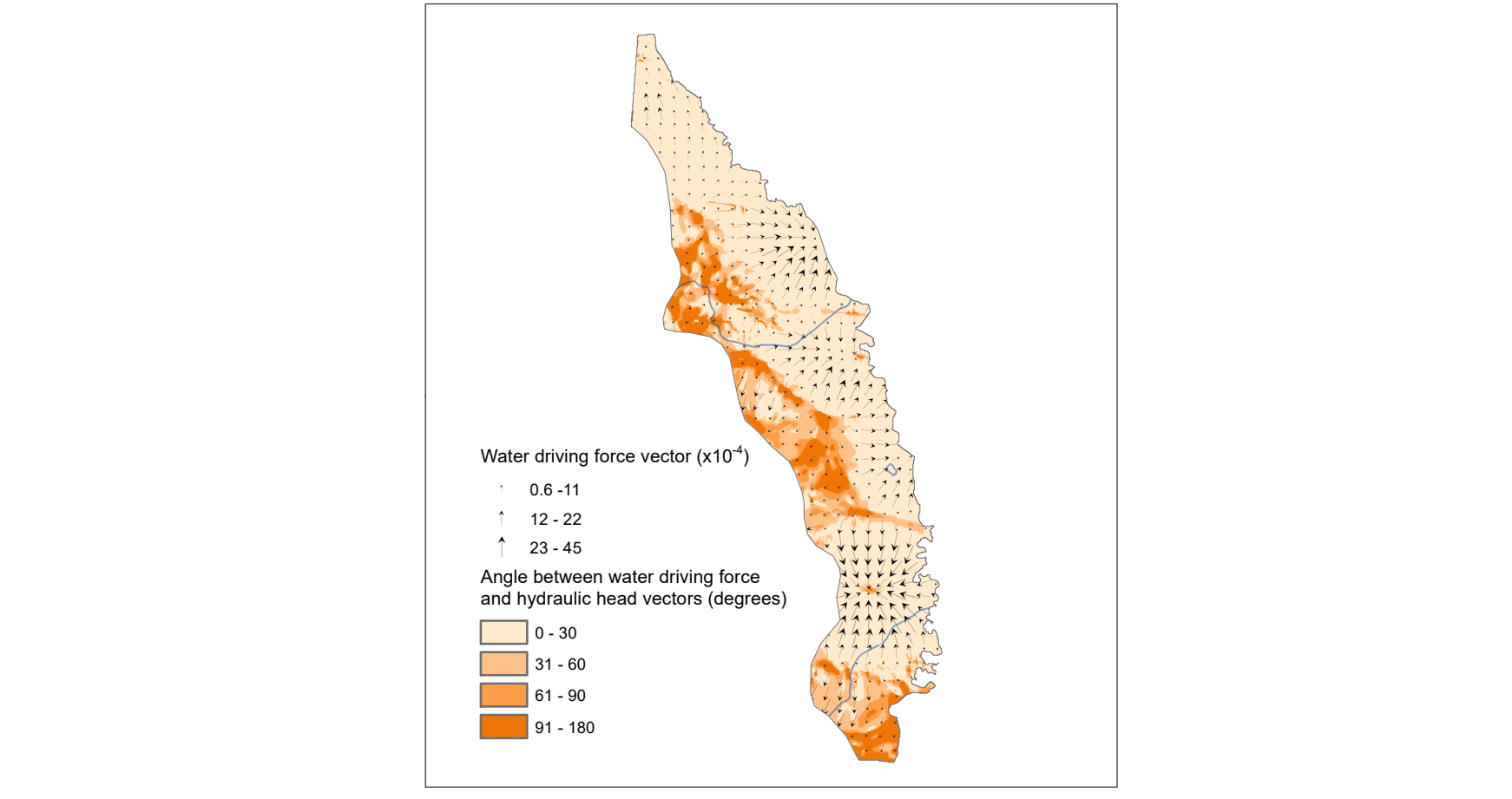


Figure 4. Distribution of hydraulic head in the Montney HSU (Brinsky, 2021). The map extent is based on the spatial distribution of hydraulic head data and differs from the extent of the main map.

Acknowledgements

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Recommended Reference Format

Brinsky, J. (2021). Distribution of total dissolved solids in the Montney hydrostratigraphic unit; Alberta Energy Regulator / Alberta Geological Survey, AER/AGS Map 615, scale 1:1 250 000.

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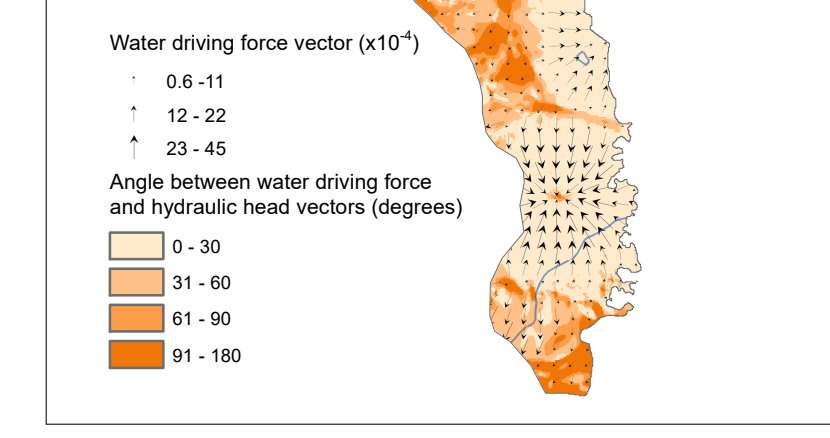
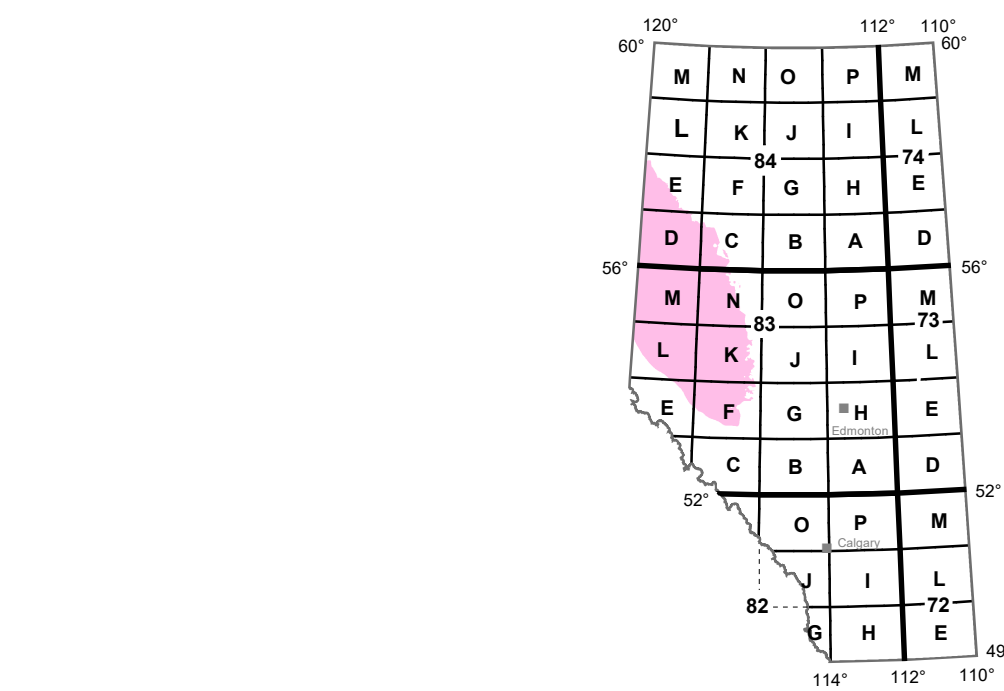


Figure 5. Water driving force vector map of the Montney HSU. The map covers only the area where the hydraulic head and TDS gridded surfaces overlap.