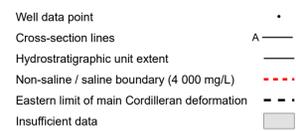
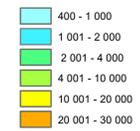


SYMBOL LEGEND

Total dissolved solids (mg/L)



This map depicts the distribution of total dissolved solids (TDS) in groundwater in the Dunvegan 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 Dunvegan 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 7 water chemistry analyses from oil and gas wells, and 21 water chemistry analyses from water wells. A screening process modified from Jensen et al. (2013) was used to ensure that only representative water chemistries were used. Measured TDS values range from 310 mg/L to >20 000 mg/L. The final gridded map surface was clipped based on the spatial distribution of representative water chemistry data and where the trend in TDS appears plausible even though data control is insufficient to fully support the trend. 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 Dunvegan HSU are shown in Figures 4 and 5. Figure 4 illustrates the distribution of hydraulic head in the Dunvegan HSU, with hydraulic heads calculated using fresh water density. Figure 5 illustrates the water driving force (WDF) vector map. The WDF vector map allows identification of areas where buoyancy differences from changes in formation water density have the potential to affect the inferred magnitude and direction of groundwater flow (Singh et al., 2017). Buoyancy does not appear to have a significant effect on groundwater flow in the Dunvegan HSU.

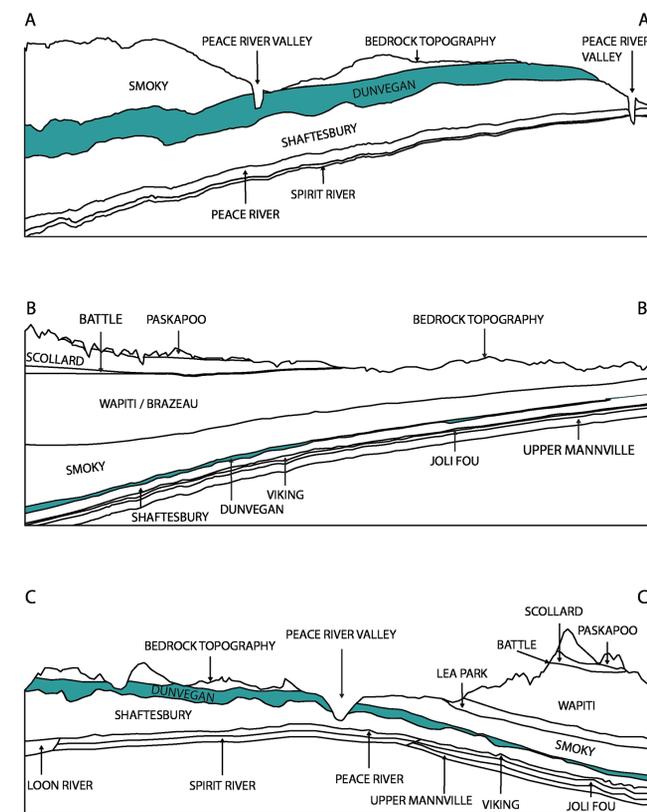


Figure 1. Schematic cross-sections identifying the geometry and variable thickness of the Dunvegan HSU (not to scale). Strata below the Spirit River Formation and equivalents are not shown.

References

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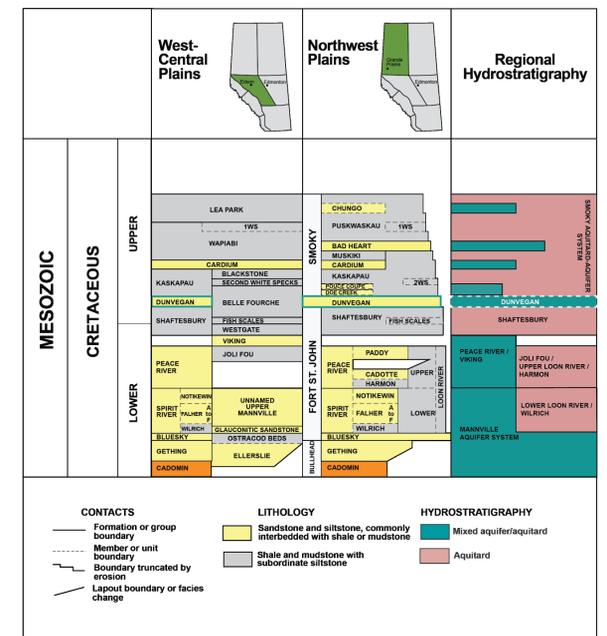


Figure 2. Regional lithostratigraphy and hydrostratigraphy (based on Alberta Geological Survey, 2019b). Solid teal lines highlight the Dunvegan Formation. Dashed white lines depict the Dunvegan HSU within the regional hydrostratigraphy. Strata above the Smoky Group are not shown.

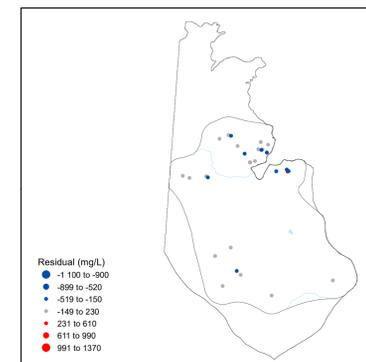


Figure 3. Calculated residuals between the modelled distribution of TDS and measured TDS values. Symbol classes are based on the standard deviation of the calculated residuals.

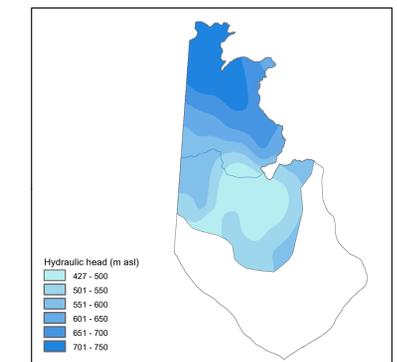


Figure 4. Distribution of hydraulic head in the Dunvegan HSU (Singh and Lemay, 2021). The map extent is based on the spatial distribution of hydraulic head data and differs from the extent of the main map.

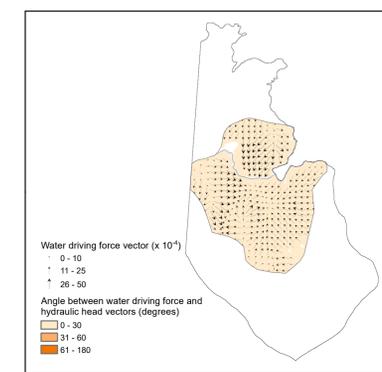


Figure 5. Water driving force vector map of the Dunvegan HSU. The map only covers the area where hydraulic head and TDS gridded surfaces overlap.

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Recommended Reference Format

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