

Structural Assessment of the Cordilleran Foreland Belt: Status of the Two Atlas Chapters

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Summary

This paper discusses the progress to date and forward plans for two of the chapters in the Atlas.

1. Rocky Mountains and Foothills Fold and Thrust Belt (Peter Fermor, Glen Stockmal, Bob McMechan, Mark Cooper, Marian Warren, Dinu Pana, Elena Konstantinovskaya, Kevin Root, Thomas Kubli and Eva Enkelmann)
2. Northern Foreland Fold and Thrust Belt (Karen Fallas, Larry Lane, Glen Stockmal, Peter Fermor and Margot McMechan)

These chapters will contain a set of consistent structural cross-sections to illustrate the variation of structural style in the deformed belt from the US border to the Arctic. This requires integration of surface geology, existing published cross-sections, well data and seismic data to construct the cross-sections. Following the compilation of datasets section construction is now progressing.

Current Status of Section Selections

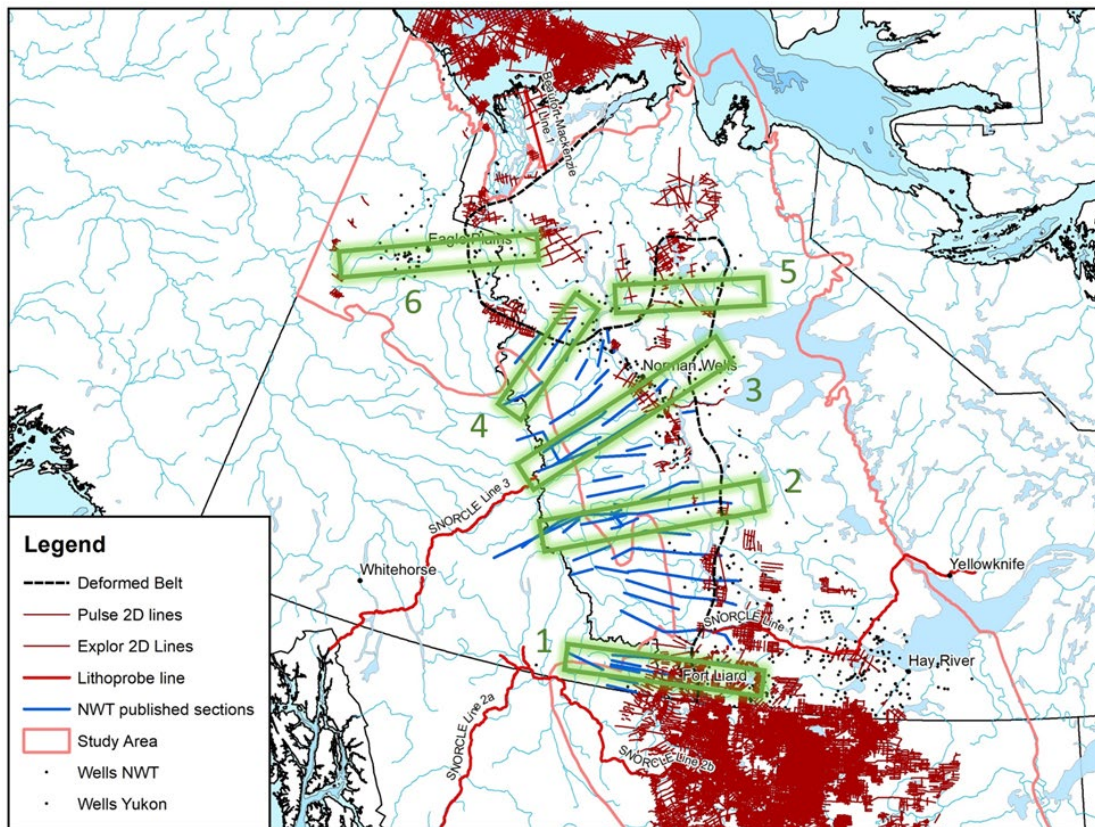


Fig.1. Map for north of 60 showing published sections, wells and seismic lines owned by Pulse and Explor.

Seismic and well coverage north of 60 is quite sparse with few published structural sections in the NWT the majority of which come from first-generation sections published with GSC A-series maps. There are only two palinspastic restorations of sections that have been published for the Mackenzie Mountains both of which have some challenges. Areas outlined in green show areas targeted for cross-sections (Fig. 1.). These would cover the northern Liard Basin east to the Bovie Fault (1), Mackenzie and Franklin mountains (2, 3, and 4), the Colville Hills (5, could connect to 4), and Eagle Plain + Richardson Mountains (6).

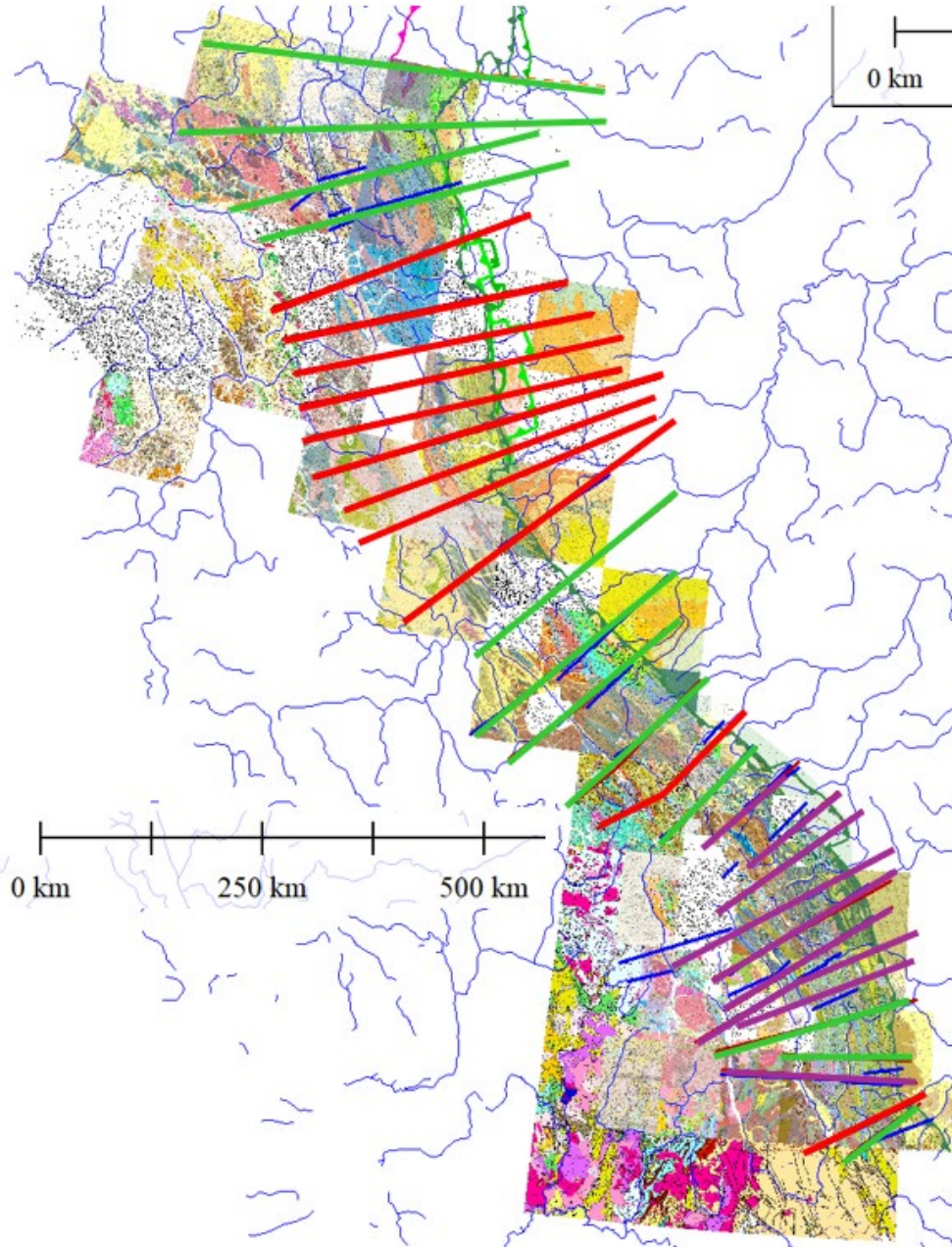


Fig.2. Map showing planned sections for Alberta and BC. Blue Lines are existing published cross-sections being included in sections. Red Lines are sections nearing completion. Purple lines indicate sections that have authors assigned. Green lines are sections with no author assigned.

The base map (Fig.2) shows major rivers and lakes, provincial boundaries and surface geology mapping primarily from the GSC and supplemented by provincial survey maps and local thesis maps. A total of 33 sections are planned and we have section “authors” assigned to 65% of these sections.

In BC there are some published cross-sections with good coverage except in the northern area. The example section shown in Fig.3 is part of a series of 9 cross-sections of the BC Foothills created using extensive well data and some seismic data as part of a project to assess water disposal well potential for the Montney Play (Hayes et al, 2021). These sections are currently being revised by utilizing seismic data provided by Pulse extending the sections to the SW to the W edge of the North American Craton.

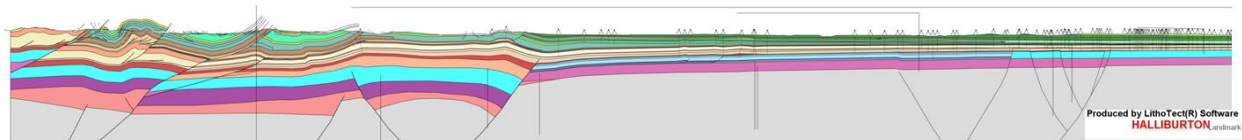
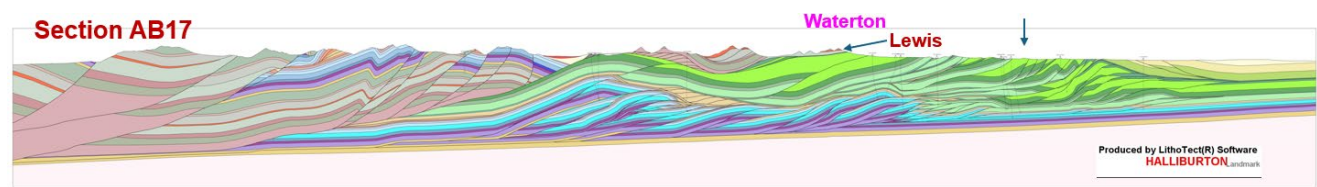
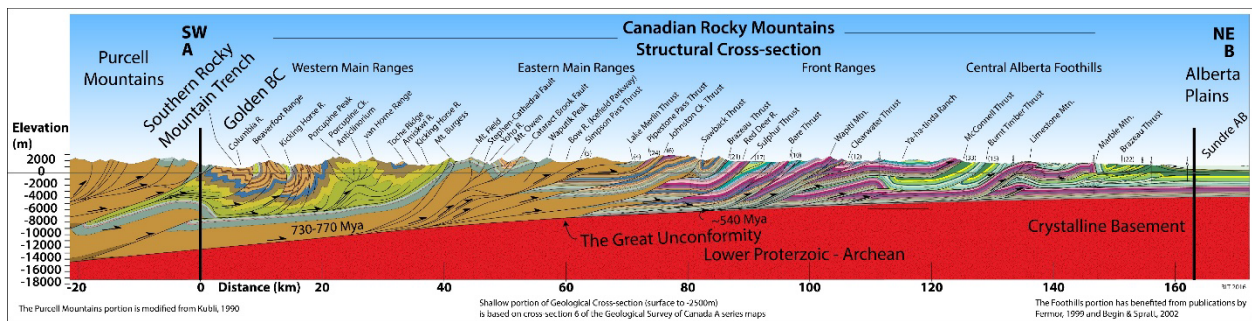


Fig. 3. Portion of the BC14 Carbon Cross-section from Hayes et al. (2021).

In Alberta there are many structural cross-sections to choose from that come from the GSC, AGS publications, PhD and MSc theses and published papers (Fig.4.). Finalizing the sections to form the basis for the cross-sections to be used for the Atlas is close to completion.



Konstantinovskaya & Fermo section, 19th Nov 2024, Final Model pending review and using the standardised foothills colour scheme

Fig. 4. The Taerum (2011) section (the upper section) requires seismic data control and any newer wells to be incorporated. The lower section is a newly constructed section which includes the Waterton Field and is close to the US border.

Plans for 2025

The Atlas sections that we have shown as being under construction will be completed by the end of Q4 2025.

Planned section spacing is about 50km but based on author assignments we can infill to achieve this as time/resources permit. Authors working on multiple sections will have to prioritize the order in which they work on the sections.

Workflows for how to compile data into the sections have been developed to provide the section authors with a complete template that contains all available data so that author effort is focused on section interpretation and construction rather than data input.

We are using Lithotect licences provided by Halliburton for most of the structural cross-section construction work although in addition one author is using Move and another author is using CorelDraw.

There are areas where alternative models are possible, e.g. detachment depths, thin vs thick skinned deformation. Subsurface control is variable and not always definitive so alternative models are being considered.

Some selected sections are being extended into the foreland basin to illustrate the linkage between deformation in the deformed belt to deformation in the foreland basin. We are also extending some sections to W across the RMT to link deformation back into the Cordillera in BC. The goal is to provide a holistic view of deformation of the North American Margin.

Once the work on the cross-sections is completed the team will then be able to create a synthesis of the deformation history of the FTB through the Mesozoic and Cenozoic and to consider the relationship between deformation and the stratigraphic history of the basin including palinspastic restorations of selected units during Q4 2025.

References

Hayes, B., 2021, Wastewater Disposal in the Maturing Montney Play Fairway of Northeastern British Columbia, Geoscience BC Report March 2021
Taerum, R. L., 2011. Effect of mechanical stratigraphy on structural style variations in the central Alberta fold and thrust belt (Unpublished doctoral thesis). University of Calgary, Calgary, AB. doi:10.11575/PRISM/24411, [http://hdl.handle.net/1880/48515doctoral thesis](http://hdl.handle.net/1880/48515doctoral%20thesis)