New Regional Mapping within the Foothills of Halfway River Map Area (NTS 94B/2 and 7)

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Summary

A new, multi-year, 1:50 000 scale regional mapping program was initiated by the BC Ministry of Energy, Mines and Petroleum Resources in the summer of 2008 with the goal of updating the geological data base within the Foothills of the Halfway River map area (94B). This is a collaborative project with the Geological Survey of Canada and the University of Alberta. Initial mapping commenced on the north side of Williston Lake and encompassed the northern portion of 94B/2 and southern parts of 94B/7. Triassic clastic and carbonate rocks comprise approximately 80 per cent of surface exposures with the remainder being Jurassic to Cretaceous clastics and Late Paleozoic sediments. Folding within Triassic strata displays a chevron style and fold trains are separated across strike by broad synclines or relatively undeformed panels. Tight folds defined by Triassic strata suggest the Lower Triassic Toad-Grayling succession is acting as a detachment horizon. Structural culminations of the Mississippian Debolt (Prophet) Formation are the primary exploration targets within the map area, although there may be potential for Triassic targets along the eastern margins of the map area.

Introduction

The Halfway River map area (94B) of northeastern British Columbia is bounded to the south by the Peace Arm of Williston Lake. the falls within. The map area encompasses the width of the Rocky Mountains, includes the Rocky Mountain Trench in the southwest corner and extends to the undisturbed western limit of Western Canada Sedimentary Basin. The eastern third of the map area is easily accessible by primary and secondary logging roads, and there is limited road access in the western part. Access to the southern-most part of the map area is also afforded by Williston Lake.

The Rocky Mountains-Foothills division occurs in the middle part of the southern map area and separates regions dominated by Lower to Middle Paleozoic carbonates (Rocky Mountains) in the west from those underlain by Upper Paleozoic to Cretaceous clastics (Foothills) in the east. Although the sheet was mapped by Thompson (1989) at a scale of 1:250 000, detailed mapping is limited and covers only within the south eastern part of the map sheet (94B/1) which was mapped by Legun (1984) at a scale of 1:50 000. In light of the hydrocarbon potential of the Foothills and the increased exploration activity, the Geoscience Branch of the BC Ministry of Energy, Mines and Petroleum Resources initiated a new 1:50 000 scale mapping project within the Foothills of southern Halfway River map area. The initial map area is bounded by Legun's

(1984) mapping to the east, Williston Lake to the south, Black Bear Ridge to the west and encompasses the northern parts of 94B/2 and southern end of 94B/7.

The primary objective of this project is to update the geological data base of this region and assist with the interpretation of seismic data over the area. In addition detailed examination of these economically important Triassic lithologies will assist in their subsurface interpretation to the east.

Primary products will include a standard hard copy map together with a digital version (ESRI ArcInfo format), including field notes and several interpretive cross-sections. Field data was captured digitally using personal digital assistants running the Ganfeld program (Buller, 2004) which runs within ArcPad on the Microsoft Mobile 6 operating platform.

The Geological Survey of Canada (GSC) and the University of Alberta are collaborating in this project. The GSC is providing logistical support through the use of its organic geochemistry laboratory in Calgary. As well, GSC Vancouver will be processing samples for conodont biostratigraphy so as to better constrain the depositional age of Triassic and older rocks. GSC Vancouver assisted in the development of the Ganfeld program and was able to tailor it for our use. A grant has been provided to the University of Alberta to fund graduate student projects aimed at aspects of Triassic clastic sedimentology.

Stratigraphy

The oldest rocks exposed in the map sheet belong to the Carboniferous Stoddart Group and Permian Kindle Formation; the latter being comprised of chert and forming an excellent marker horizon. These are followed by over 1500 metres of Triassic rocks belonging to the Toad-Grayling, Liard, Charlie Lake, Baldonnel and Pradonet formations. Above these are clastic rocks of the Fernie Formation and Minnes Group which are upwards of 900 metres thick. The youngest unit in the map area is the Cretaceous Cadomin Formation and is composed of over 350 metres of sandstone and lesser conglomerate.

Toad-Grayling and Liard units are equivalent to the Montney and Doig-Halfway formations, respectively, in the subsurface. Lower to Middle Triassic Toad-Grayling rocks are dominated by recessive siltstones, shales and fine sandstones of primarily turbiditic origin and range in thickness from 500 to over 700 metres. These are succeeded by 400 to 500 metres of Middle Triassic fine sandstones, siltstones and limestone belonging to the Liard Formation and which represent shelf to shore line environments. These are followed by 125 to 150 metres of sabkha-related light coloured dolomite, dolomitic limestone, sandstone, anhydrite and minor siltstone of the Upper Triassic Charlie Lake Formation. Above this are 100 to 200 metres of fetid, medium grey lime mudstone to skeletal or peloidal packstone or grainstone of the Upper Triassic Baldonnel Formation. The top of the Triassic is represented by the 50 to 75 metres of the Pardonet Formation which is characterized by dark grey silty lime mudstone to dolostone with horizons dominated by *Halobia* or *Monotis* remains.

Triassic rocks undergo a significant facies change within the adjacent western map sheet whereby rocks of the Liard to Baldonnel formations disappear and are represented by deeper water siltstones, fine sandstones and calcareous turbidites of the Luddington Formation.

The Jurassic Fernie Formation is from 150 to 200 metres thick and characterized by dark grey siltstone and shale at its base with an upwards increase in coarser, micaceous sandstone. The succeeding Upper Jurassic to Lower Cretaceous Minnes Group occurs at the first thick sandstone succession. This unit can be up to 700 metres thick and subdivided into the Monteith, Beattie Peaks and Monach formations whereby thick, dominantly sandstone sequences of the Monteith and Monach formations are separated by recessive, interbedded siltstones and fine sandstones of the Beattie Peaks Formation.

Structure

The map area lies entirely within the Foothills belt of the Rocky Mountains. Folding is primarily chevron in nature, is the dominant mechanism for shortening. The intensity and tightness of folding increases towards

the western part of the map area. Several homoclinal features are also present along the north shore of Williston Lake (at the inlets related to Aylard and Adams creeks) which are consistent with the chevron style of folding. Tight chevron folds are separated by wide synclines or areas of relatively undisturbed strata. Tight folds within Liard or higher strata suggests a major detachment horizon within the Toad-Grayling succession. A large, tight anticline within the western part of the map area, which is cored by Stoddart and Prophet sediments, indicates involvement of sub-Triassic stratigraphy in shortening. Several thrust faults are developed within the map area; along Twenty Mile Ridge, within Aylard Creek and cutting through Jones Peak. Thrusts along Twenty Mile Ridge and Jones Peak die off northward into anticlinal structures whereas the fault along Aylard Creek (which starts near the mouth of the creek) can be traced northward, off the map area.Acknowledgements

Exploration

Due to the level of units exposed in the map area, the primary exploration targets are structural plays within the Mississippian Debolt Formation and older units. Although seismic data has been acquired across the map area, no petroleum exploration wells have been drilled within it, though tests have been made east of the map area into the Debolt Formation (CNRL et al. Dunlevy a-40-L/94-B-1) and to the west within Devonian strata (CNRL Nabesche b-33-E/94-B-6). Directly to the north, reserves and production have been established within the Debolt Formation (Federal pool). The thrust along Aylard Creek, with Middle Triassic rocks in its hanging wall, may mark the western limit of Triassic targets in the map area.

References

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