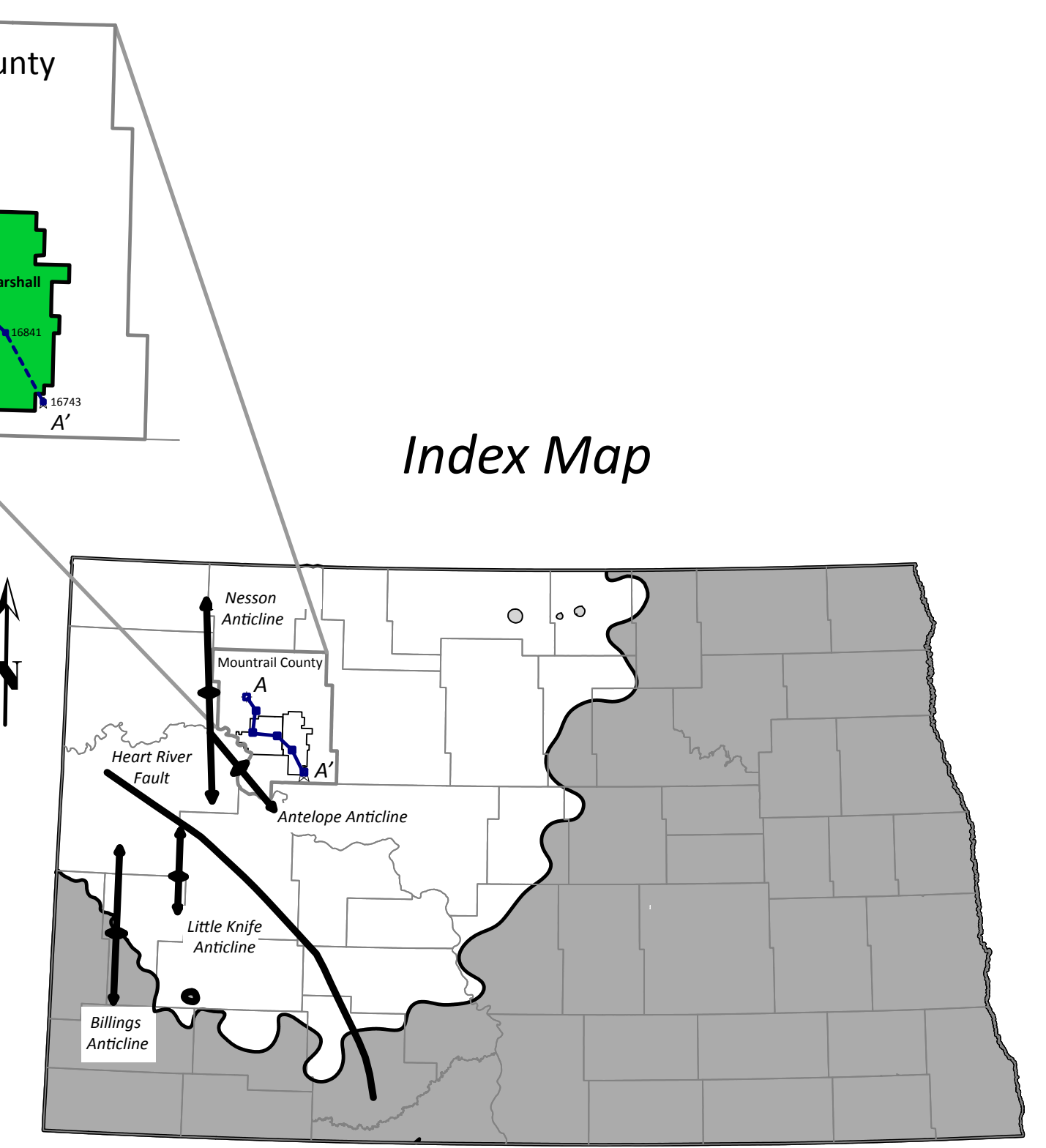
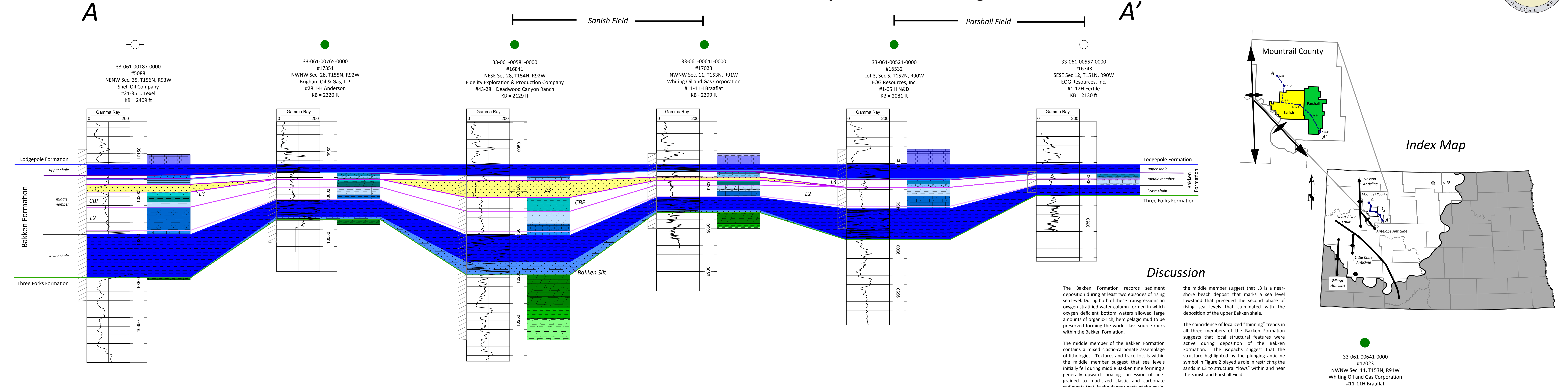
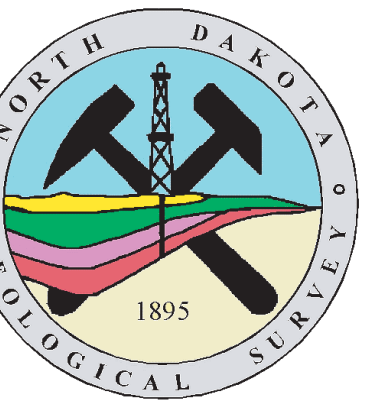


Stratigraphic Transect of the Sanish and Parshall Fields, Bakken Formation, Mountrail County, North Dakota

Julie A. LeFever and Stephan H. Nordeng



Discussion

The Bakken Formation records sediment deposition during at least two episodes of rising sea level. During both of these transgressions an oxygen-stratified water column formed in which oxygen deficient bottom waters allowed large amounts of organic-rich, hemipelagic mud to be preserved forming the world class source rocks within the Bakken Formation.

The middle member of the Bakken Formation contains a mixed clastic-carbonate assemblage of lithologies. Textures and trace fossils within the middle member suggest that sea levels initially fell during middle Bakken time forming a generally upward shoaling succession of fine-grained to mud-sized clastic and carbonate sediments that, in the deeper parts of the basin, are capped by clean, fine-grained, cross-stratified sandstones or grainstones. In North Dakota this sandstone unit is referred to as Lithofacies 3 (L3) and frequently forms a characteristic "clean gamma-ray" bench on logs (see Fig. 5). The vertical succession of facies in the middle member suggest that L3 is a near-shore beach deposit that marks a sea level lowstand that preceded the second phase of rising sea levels that culminated with the deposition of the upper Bakken shale.

The coincidence of localized "thinning" trends in all three members of the Bakken Formation suggests that local structural features were active during deposition of the Bakken Formation. The isopachs suggest that the structure highlighted by the plunging anticline symbol in Figure 2 played a role in restricting the sands in L3 to structural "lows" within and near the Sanish and Parshall Fields.

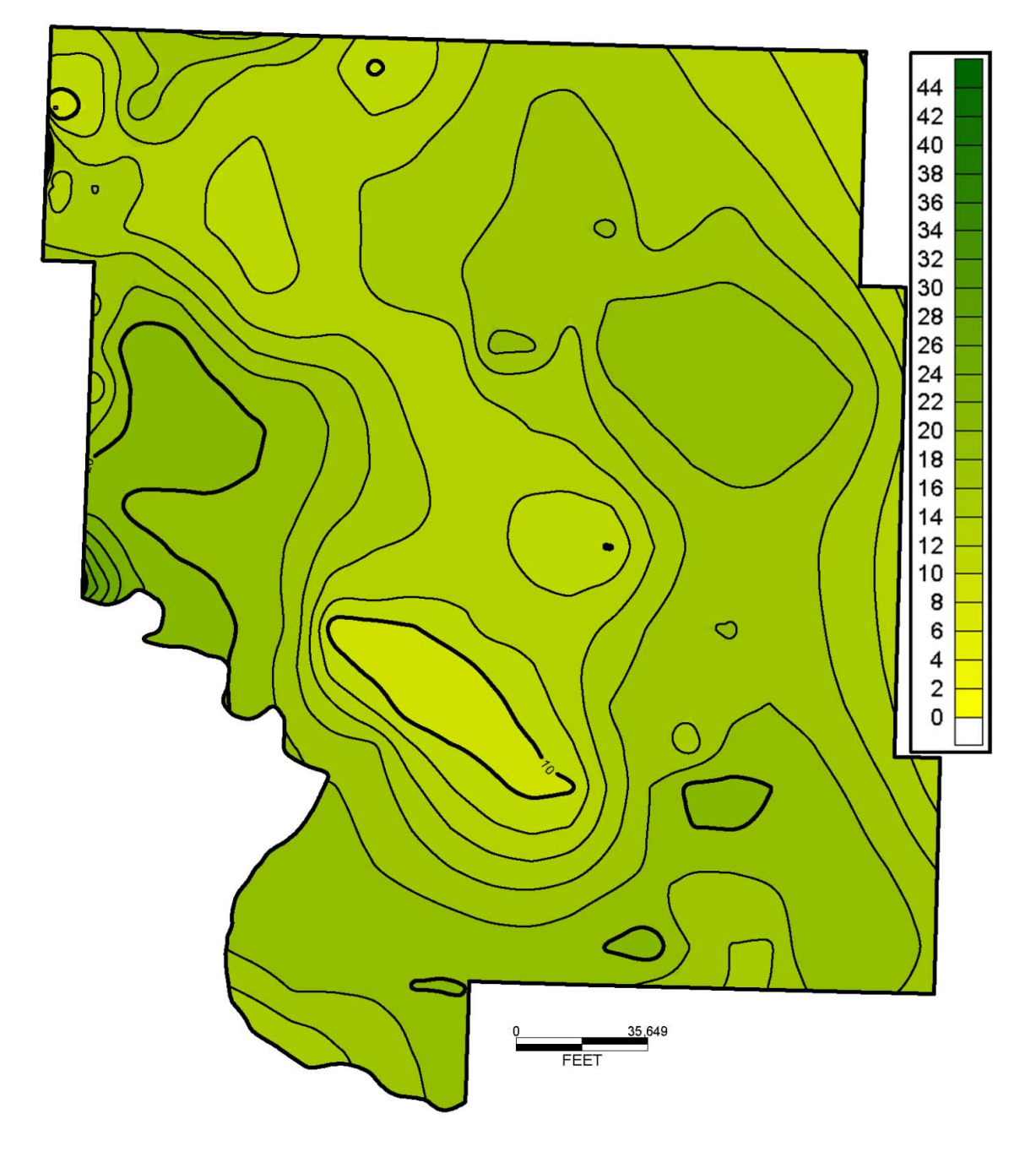


Figure 1 Isopach of the upper shale member of the Bakken Formation in Mountrail County, ND.

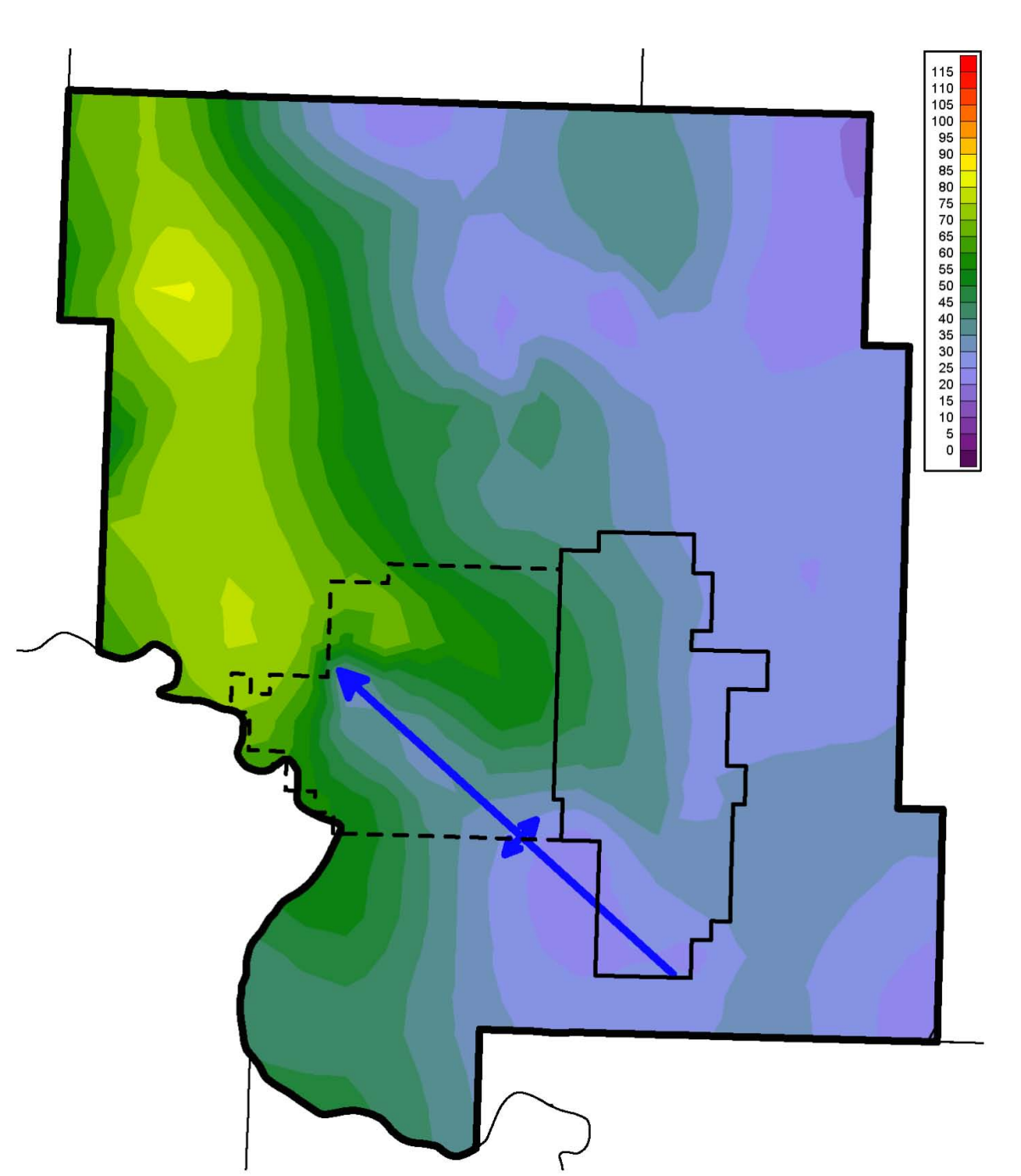


Figure 2 Coincident thinning in the isopach maps of the upper, middle (shown here) and lower members of the Bakken Formation indicate that a positive structural element, shown here as a plunging anticline, was active during Bakken time.

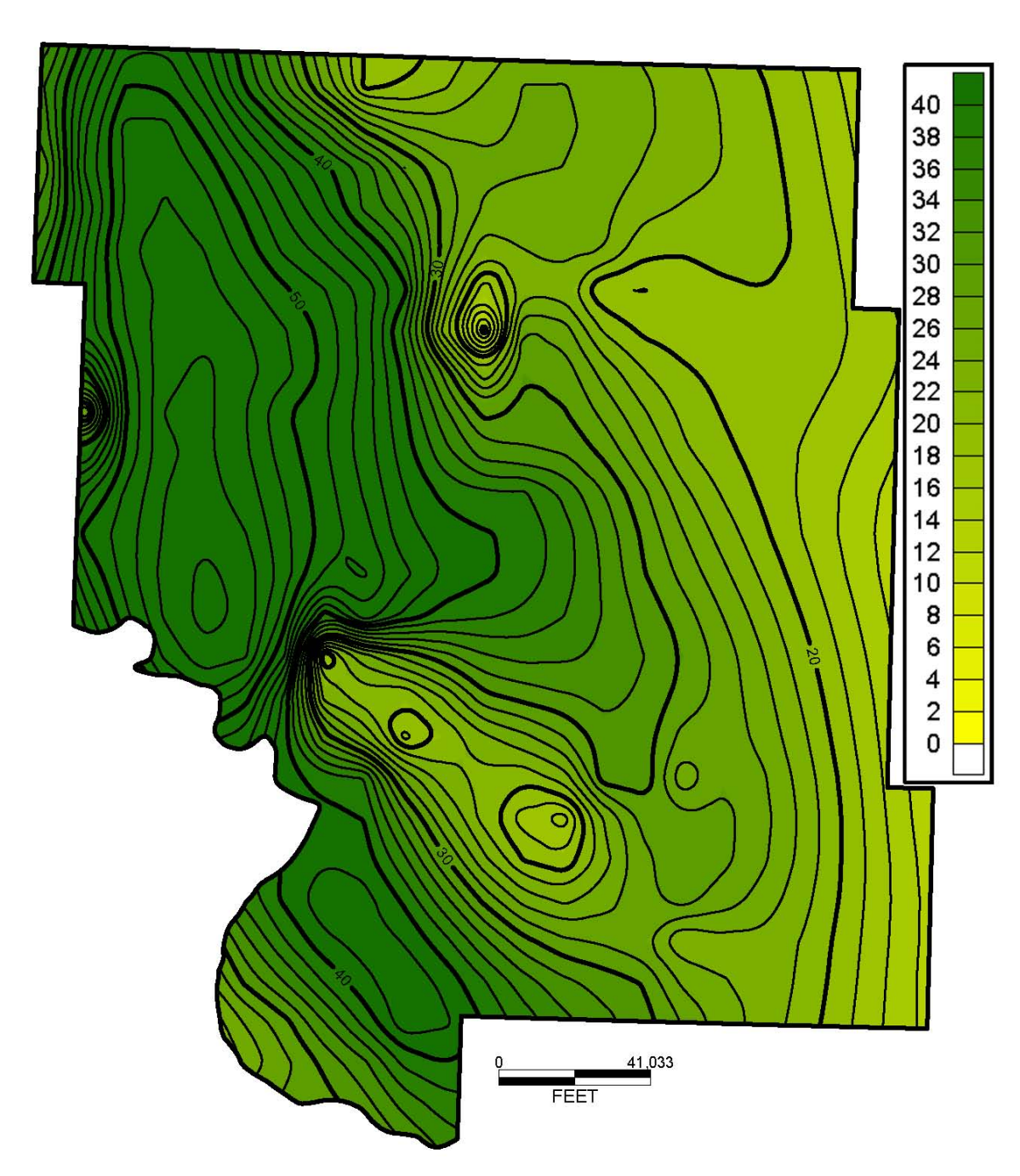


Figure 3 Isopach of the lower shale member of the Bakken Formation in Mountrail County, ND.

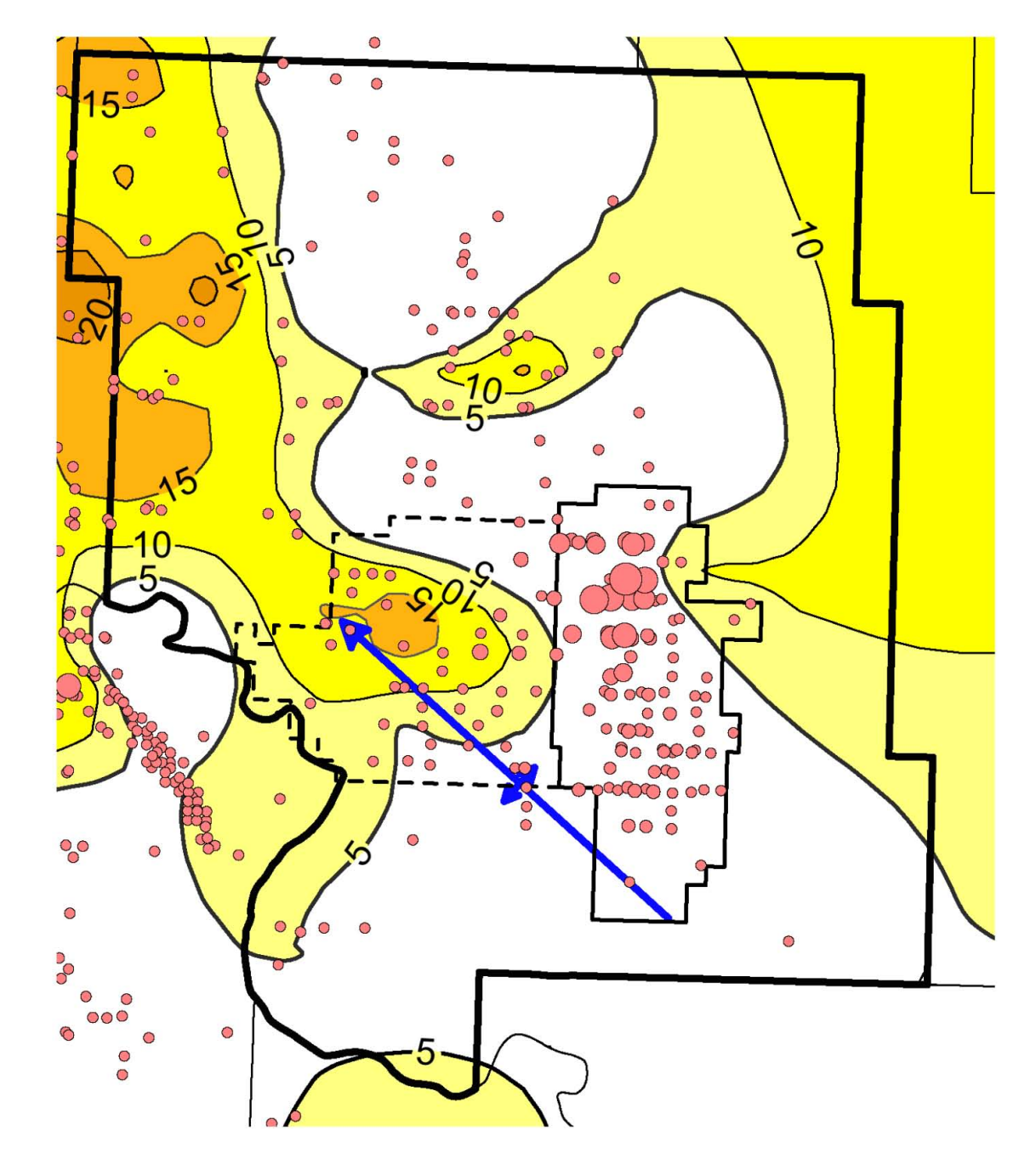


Figure 4 An isopach of Lithofacies 3 showing an updip pinch-out of the unit. The shaded intervals areas in which L3 is at least 5 ft thick. Each color change represent a 5 ft increase in thickness. Production levels in the county are plotted as circles with the radius being proportional to the daily average of the first 60 days of production.

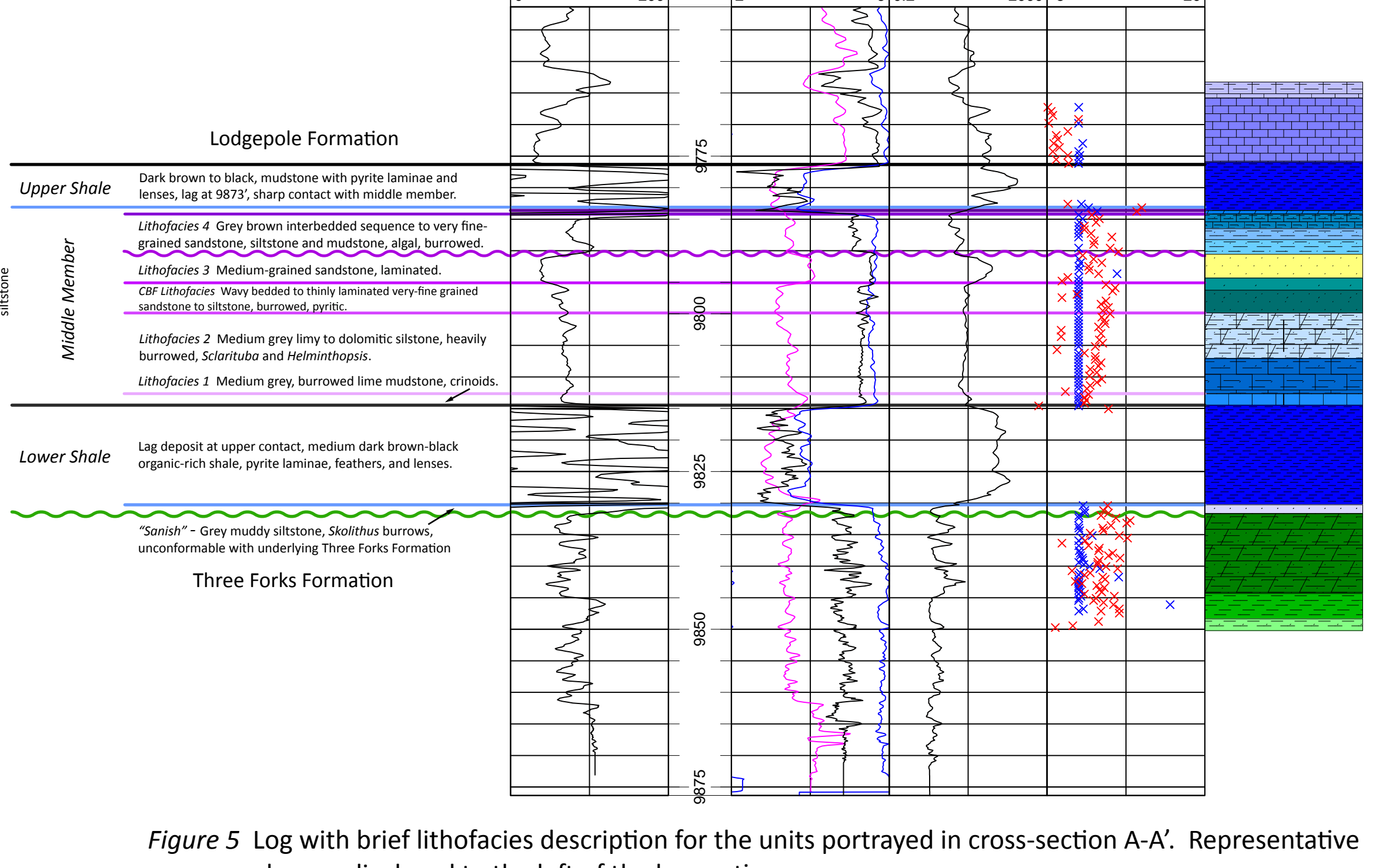
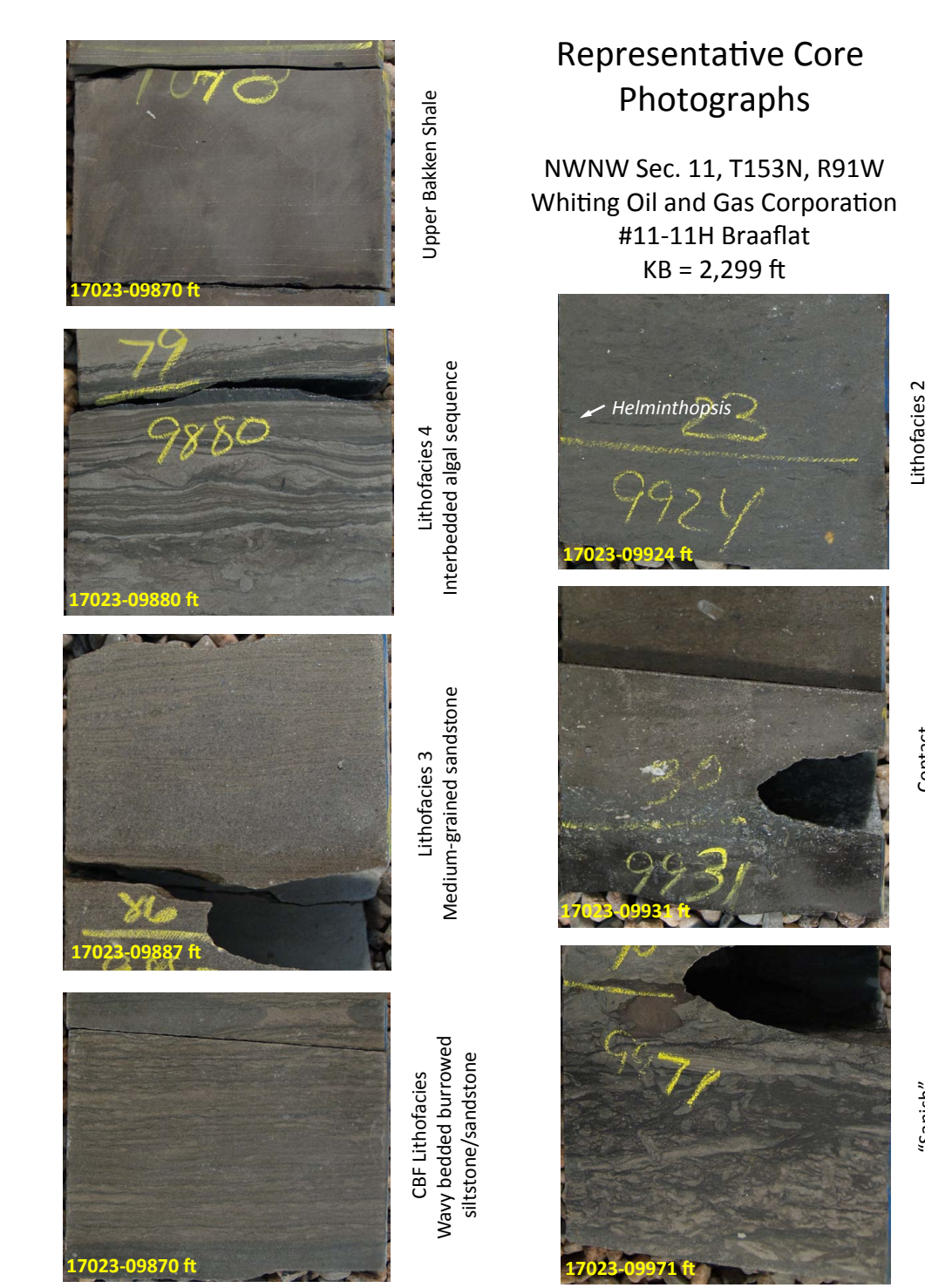


Figure 5 Log with brief lithofacies description for the units portrayed in cross-section A-A'. Representative core samples are displayed to the left of the log section.