

Stratigraphic Correlation and Thermal Maturity of Kukersite Petroleum Source Beds within the Ordovician Red River Formation

Plate I: Kukersite Correlations

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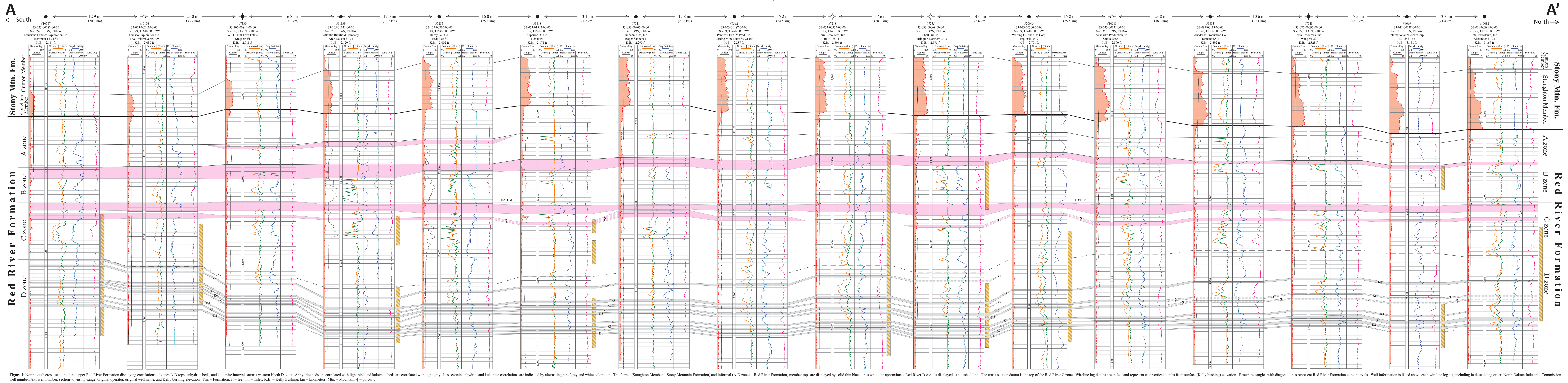


Figure 1: North-south cross-section of the upper Red River Formation displaying correlations of zones A-D tops, anhydrite beds, and kukersite intervals across western North Dakota. Anhydrite beds are correlated with light pink and kukersite beds are correlated with light gray. Less certain anhydrite and kukersite correlations are indicated by alternating pink/gray and white coloration. The formal (Stoughton Member - Stony Mountain Formation) and informal (A-D zones - Red River Formation) member tops are displayed by solid thin black lines while the approximate Red River D zone is displayed as a dashed line. The cross-section datum is the top of the Red River C zone. Wireline log depths are in feet and represent true vertical depths from surface (Kelly bushing) elevation. Brown rectangles with diagonal lines represent Red River Formation core intervals. Well information is listed above each wireline log set, including in descending order: North Dakota Industrial Commission well number, API well number, section-township-range, original operator, original well name, and Kelly bushing elevation. Fm. = Formation; ft. = feet; mi. = miles; K.B. = Kelly Bushing; km = kilometers; Mtn. = Mountain; ♯ = porosity.

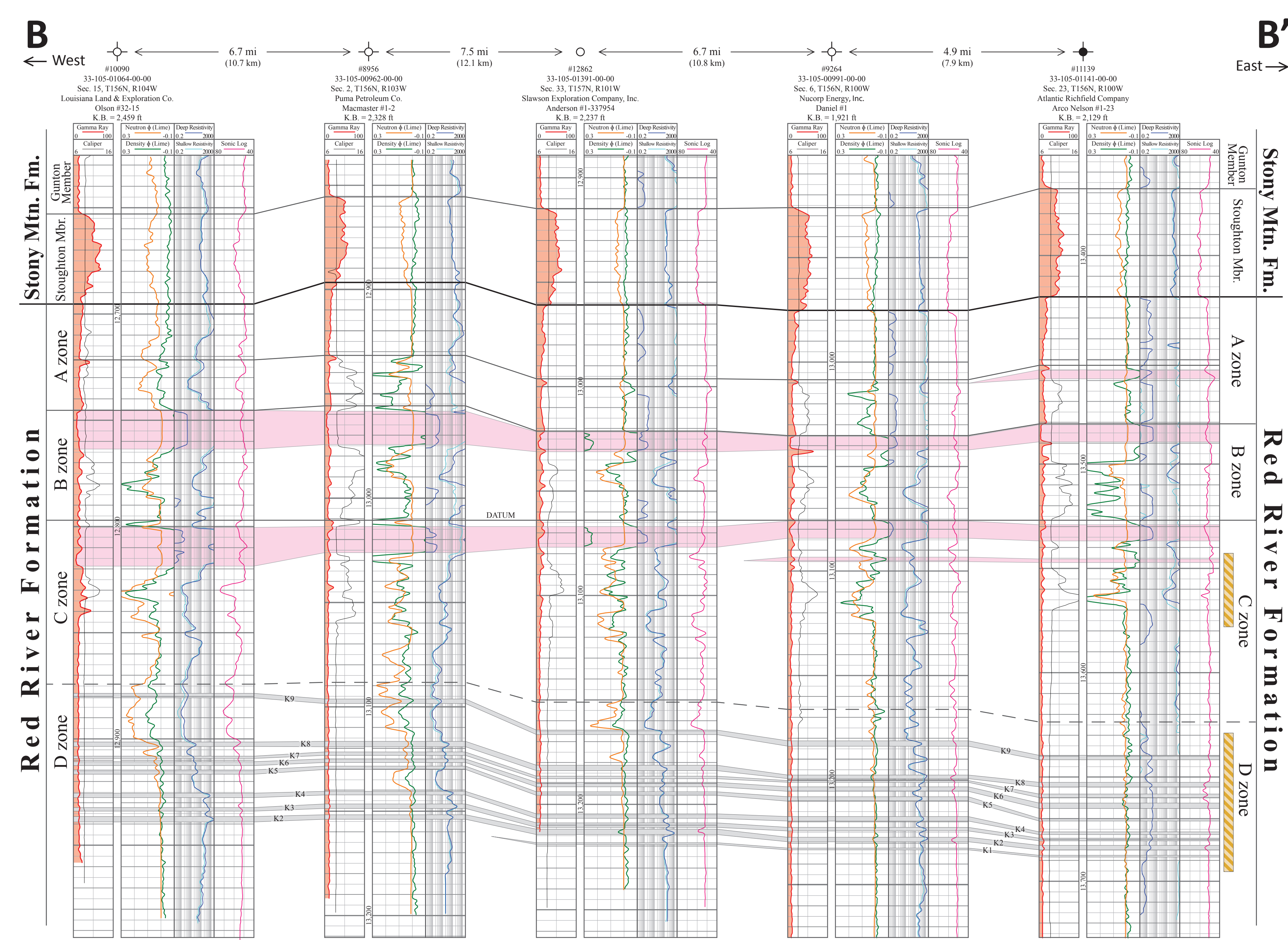


Figure 2: East-west cross-section of the upper Red River Formation displaying correlations of zones A-D tops, anhydrite beds, and kukersite intervals across western North Dakota. Anhydrite beds are correlated with light pink and kukersite beds are correlated with light gray. Less certain anhydrite and kukersite correlations are indicated by alternating pink/gray and white coloration. The formal (Stoughton Member - Stony Mountain Formation) and informal (A-D zones - Red River Formation) member tops are displayed by solid thin black lines while the approximate Red River D zone is displayed as a dashed line. The cross-section datum is the top of the Red River C zone. Wireline log depths are in feet and represent true vertical depths from surface (Kelly bushing) elevation. Brown rectangles with diagonal lines represent Red River Formation core intervals. Well information is listed above each wireline log set, including in descending order: North Dakota Industrial Commission well number, API well number, section-township-range, original operator, original well name, and Kelly bushing elevation. Fm. = Formation; ft. = feet; mi. = miles; K.B. = Kelly Bushing; km = kilometers; Mtn. = Mountain; ♯ = porosity.

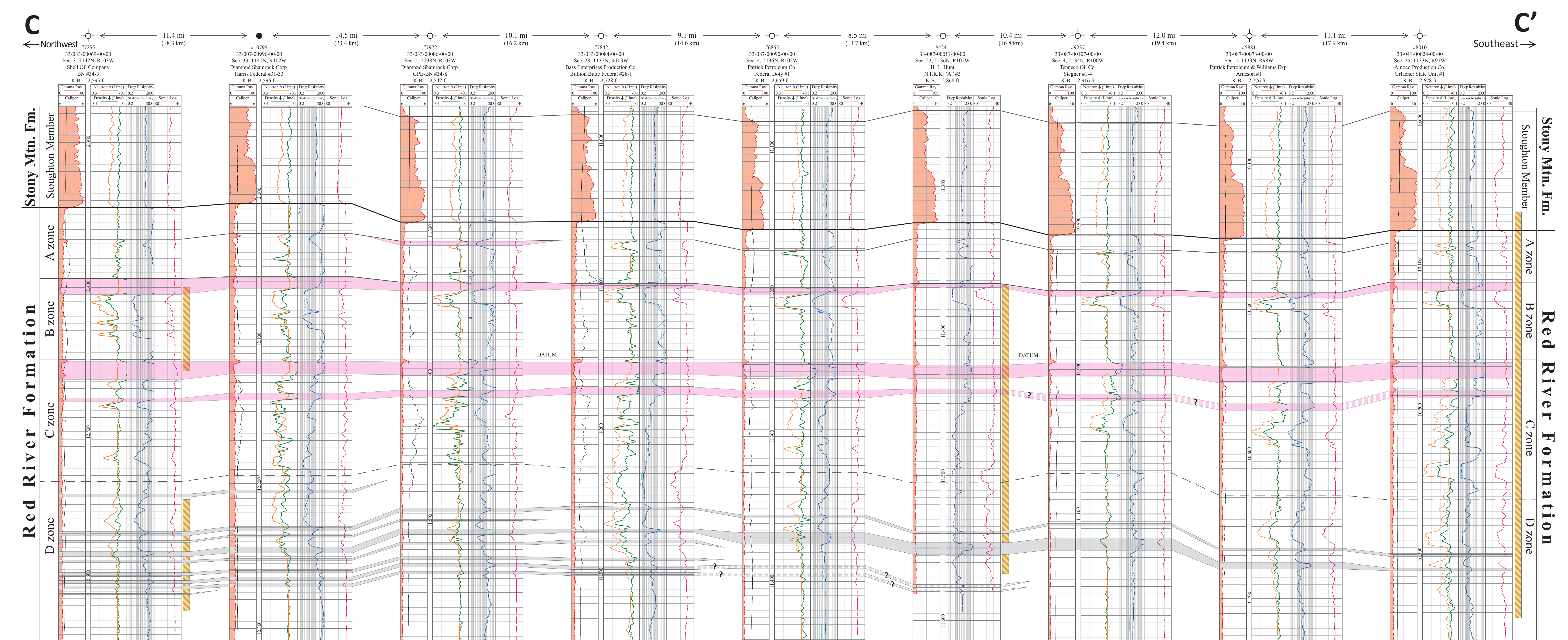


Figure 3: Northwest-southeast cross-section of the upper Red River Formation displaying correlations of zones A-D tops, anhydrite beds, and kukersite intervals across western North Dakota. Anhydrite beds are correlated with light pink and kukersite beds are correlated with light gray. Less certain anhydrite and kukersite correlations are indicated by alternating pink/gray and white coloration. The formal (Stoughton Member - Stony Mountain Formation) and informal (A-D zones - Red River Formation) member tops are displayed by solid thin black lines while the approximate Red River D zone is displayed as a dashed line. The cross-section datum is the top of the Red River C zone. Wireline log depths are in feet and represent true vertical depths from surface (Kelly bushing) elevation. Brown rectangles with diagonal lines represent Red River Formation core intervals. Well information is listed above each wireline log set, including in descending order: North Dakota Industrial Commission well number, API well number, section-township-range, original operator, original well name, and Kelly bushing elevation. Fm. = Formation; ft. = feet; mi. = miles; K.B. = Kelly Bushing; km = kilometers; Mtn. = Mountain; ♯ = porosity.

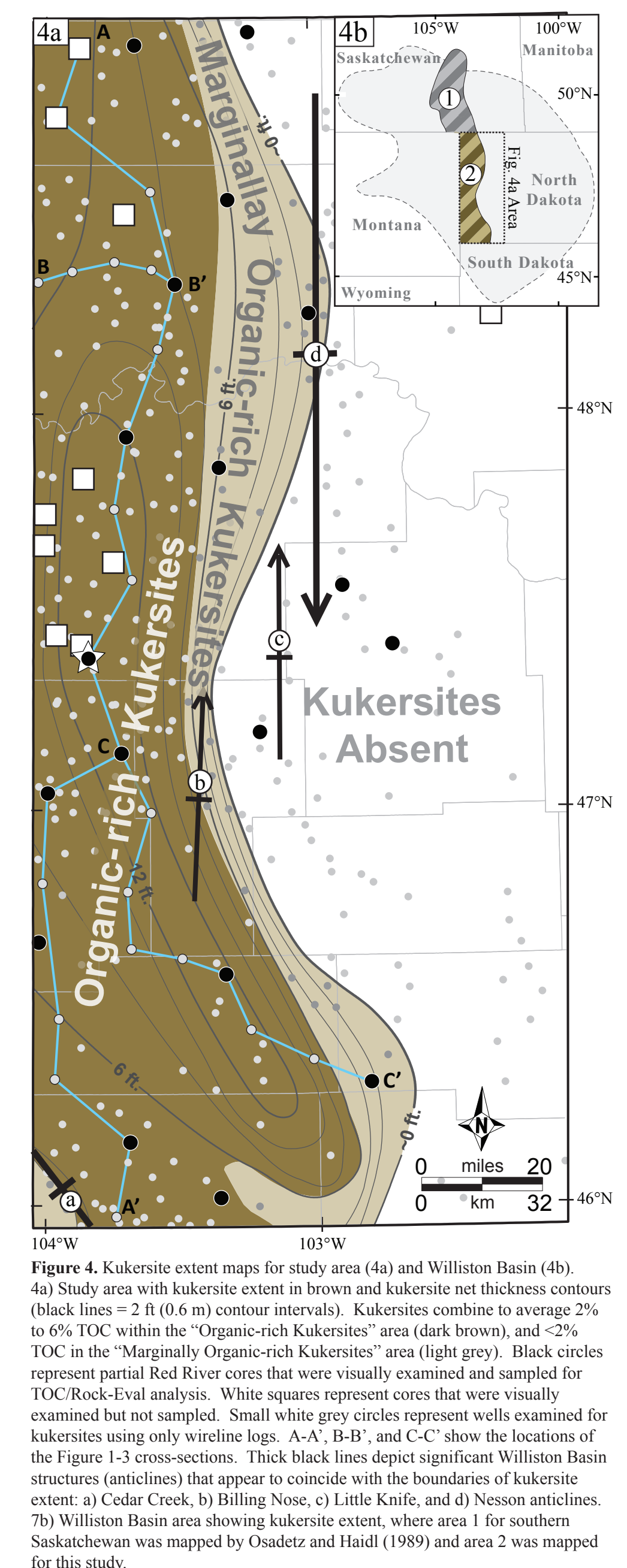


Figure 4: Kukersite extent maps for study area (4a) and Williston Basin (4b). 4a) Study area with kukersite extent in brown and kukersite net thickness contours (black lines - 2 ft (0.6 m) contour intervals). Kukersites combine to average 2% to 4% TOC within the "Organic-rich Kukersites" area (dark brown) and 2% to 4% TOC in the "Marginally Organic-rich Kukersites" area (light gray). Black circles represent partial Red River cores that were visually examined and sampled for TOC-Rock-Eval analysis. White squares represent cores that were visually examined but not sampled. Small white grey circles represent wells examined for kukersite using only wireline logs. 4b) Williston Basin area showing kukersite extent, where area 1 is southern Saskatchewan as mapped by Osadec and Hladil (1995) and area 2 was mapped for this study.