

Isopach of the Devonian Prairie Evaporite

Crosby 100K Sheet, North Dakota

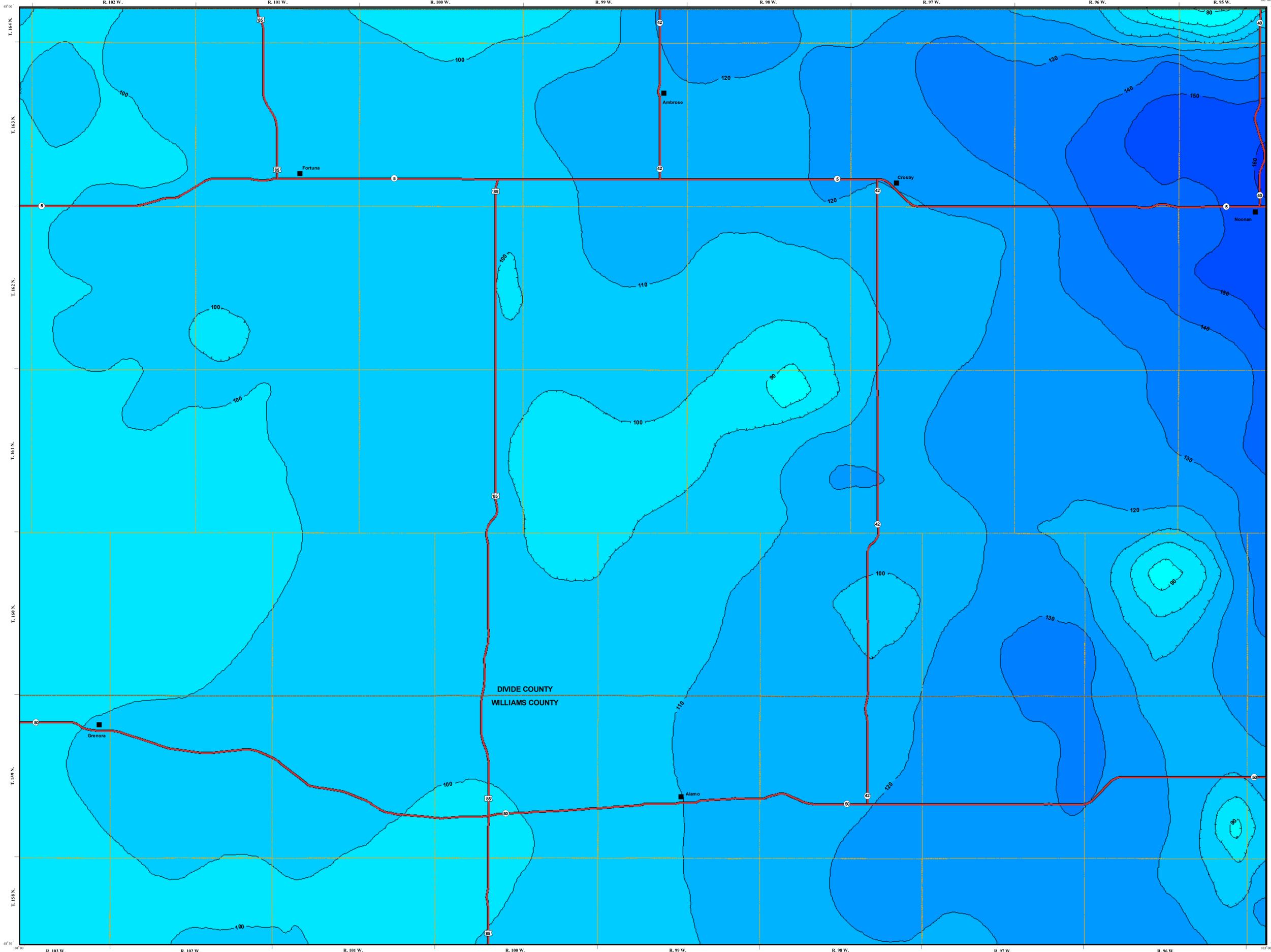
Parish/County	City	Plan name
Culbertson	Williston	Starkey
Sidney	Williston	Parade

Adjoining 100K Maps



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GENERAL INFORMATION ABOUT THE PRAIRIE EVAPORITE

The Prairie evaporite is the salt unit of the Middle Devonian Prairie Formation. The Prairie Formation consists of argillaceous dolostone, shale, and salts that represent a minor regressive phase of deposition in the overall transgression of the Middle Devonian sea into North Dakota. The majority of the formation is composed of the salt mineral halite. Predominantly normal marine carbonates of the Middle Devonian Winnipegosis Formation conformably underlie the Prairie and represent the transgressive marine phase of deposition. The top of the Prairie Formation is the top of the argillaceous Second Red beds (Heck and Burke, 1991). The marine carbonates of the lower Dawson Bay Formation conformably overlie the Prairie Formation and represent renewed transgression of the Devonian sea into North Dakota (Pound, 1985).

The Prairie evaporite unit consists of anhydrite, halite and potash lithologies. These lithologies were deposited during a forced regression resulting from restriction of circulation of normal marine seawater into the North Dakota portion of the Devonian Elk Point Basin, recognized then as the Williston sub-Basin. Restriction resulted from a combination of earlier reef growth during Winnipegosis time and a relative drop in sea level. This combination of events physically reduced the inflow of seawater but did not stop the inflow of seawater into the Williston sub-Basin. Very arid conditions existing in this region at this time resulted in high evaporation rates that concentrated sea salts from the reduced inflow to the point of precipitation of large volumes of a variety of salt minerals. The Prairie evaporite is principally composed of halite salt with lesser amounts of potassium salts (potash) such as sylvite and carnallite. Over 198 meters (650 feet) of salt were deposited in Burke County, North Dakota, just east of this map sheet.

THE CROSBY SHEET

The Prairie evaporite in the mapped area is composed primarily of halite and potash salts. In general, evaporite thickness doubles from west to east from about 91 meters (299 feet) to over 160 meters (525 feet) although some anomalously thin (81 m or 266 ft) occurrences are present within the thick salts on the eastern side of the map. In general, the top of the Prairie evaporite is about 2,750 to 3,350 meters (9,000 to 11,000 feet) below the surface. Pressures at these depths are great enough to make salt mobile and is one reason that open hole mining of salt from the surface is not practical.

Abrupt change in evaporite thickness is seen in T160W R96W where the salt thins from the regional background of about 120 meters (394 feet) to less than 90 meters (295 feet). The thinning is the result of dissolution of salt. Dissolution of Prairie salt has occurred numerous times throughout geologic time and is an ongoing process in some portions of the Williston Basin (Anderson, S. B. and Swinehart, R.P., 1979).

REFERENCES

Anderson, S. B. and Swinehart, R.P., 1979. Potash Salts in the Williston Basin, Economic Geology, 74(2): 358-376.

Heck, T.J. and Burke, R.B., 1991. Devonian Stratigraphy of North Dakota from Wireline-log Sections. North Dakota Geological Survey Report of Investigation No. 90, pages 8, plates 28.

Pound, W.R., 1985. The geology and hydrocarbon potential of the Dawson Bay Formation carbonate unit (Middle Devonian), Williston Basin North Dakota. Unpublished M.S. Thesis, University of North Dakota, 320 p.

EXPLANATION

- ISOPACH CONTOURS (intervals in meters)**
- 70 - 80
 - 80 - 90
 - 90 - 100
 - 100 - 110
 - 110 - 120
 - 120 - 130
 - 130 - 140
 - 140 - 150
 - 150 - 160
 - 160 - 170
- GEOLOGIC SYMBOLS**
- 100— Isopach Contour (in meters)
 - Hash Marks point to Thins
- OTHER FEATURES**
- Town Sites
 - County Boundary
 - State Highway
 - Township Boundary
 - U.S. Highway

The North Dakota Geological Survey compiled this map according to conventional cartographic standards, using what is thought to be the most reliable information available. The North Dakota Geological Survey does not guarantee freedom from errors or inaccuracies and disclaims any legal responsibility or liability thereon.

Scale 1:100,000

0 1 2 3 4 Miles

Mercator Projection 1927 North American Datum
Standard parallel 48°30' Central meridian 103°30'