



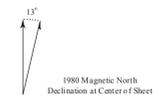
Belfield 100K Sheet, North Dakota

Alumina Content of Paleocene Claystones

Belfield 100K Sheet, North Dakota

Glendive	Grassy Butte	Killdeer
Wibaux		Dickinson
Baker	Bowman	Mott

Adjoining 100K Maps



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Only a handful of studies have published the alumina (Al₂O₃) contents of claystones in western North Dakota: Clarke (1948), Hansen (1959), Chew and Boyd (1960), Prichard (1980), and Murphy (2012). Clarke (1948) collected 417 samples primarily from the Chalky Buttes in Slope County and the Little Badlands in Stark County. All but eight of his samples were from bentonites (primarily the South Heart Member of the Chadron Formation). Clarke's sample localities were not plotted on any of the map sheets because the current project is focused on the alumina content of kaolin deposits.

Hansen (1959) collected 125 claystone samples from 44 sites in the Bear Den Member of the Golden Valley Formation and in the Sentinel Butte and Bullion Creek Formations. Hansen collected samples from four sites that plot on this map. All four sites appear to be in either the Bullion Creek or Sentinel Butte Formations. The placement of Hansen's sample sites is not exact because the locations were only listed down to the section (square mile). Hansen used the legal description as his sample number.

Chew and Boyd (1960) reported alumina values for 52 sample sites in western North Dakota. They plotted the sample locations on county maps published by the ND Highway Department at one inch to the mile and a map of the Deep Creek area at 0.125 inches to the mile. They also mapped the surface bedrock units, but in the absence of topographic base maps their geologic contacts are not very accurate. In numerous instances their locations were modified for a more accurate plot on the North Dakota Geological Survey's surface geology base maps. All of the Chew and Boyd analyses reported on this map are from single samples. Chew and Boyd's map indicates that all four samples in T138N, R98W were obtained from the White River Group. However, at least one of those samples plots in an area of the Golden Valley Formation. Their sample along Deep Creek (T135N, R103N) was obtained from the Rhame Bed. Chew and Boyd sample numbers were not plotted on the map because no additional published data is available.

The North Dakota Geological Survey collected 232 samples from 62 localities in western North Dakota in 2011 and 2012. The initial results were published in NDGS Geologic Investigations no. 158 and the full report will be published in NDGS Report of Investigations no. 112. Multiple samples were collected from all but the most limited outcrops. The NDGS alumina values plotted on this map represent an average of three analyses (range from 2 to 4) per site. The alumina value is a weighted percent (the sum of individual analyses were multiplied by individual bed thickness and then divided by the thickness of the entire kaolin layer).

REFERENCES

Chew, R.T. III, and Boyd, G.A., 1960. A preliminary investigation of clay deposits in Minnesota, North Dakota, Montana, Northern Idaho, and Washington. Northern Pacific Railroad Company, Properties and Industrial Development Department, 161 p.
 Clarke, F.F., 1948. Southeastern North Dakota clay deposits. Stark, Slope, and Billings counties, N.Dak. U.S. Bureau of Mines Report of Investigations 3219, 32 p.
 Hansen, Miller, 1959. Clays of North Dakota as a potential source of alumina. North Dakota Geological Survey Report of Investigation no. 33, 15 p.
 Murphy, E.C., Hoganson, J.W., and Foreman, N.F., 1993. The Chadron, Brule, and Arikaree Formations in North Dakota: the bases of western North Dakota. North Dakota Geological Survey Report of Investigation No. 96, 144 p., 7 plates.
 Murphy, E.C., 2012. Alumina content of the Bear Den Member and the Rhame Bed in North Dakota. North Dakota Geological Survey Geologic Investigations no. 158.
 Prichard, G.H., 1980. Authigenic kaolinite in the Bear Den Member (Paleocene) of the Golden Valley Formation in southwestern North Dakota. unpublished Master's Thesis, University of North Dakota, 174 p.
 Wehrfritz, B.D., 1978. The Rhame bed (Slope Formation, Paleocene), A siltstone and deep-weathering profile, in southwestern North Dakota: unpublished Master's Thesis, University of North Dakota, 158 p.

EXPLANATION

- 48 Sample or Site I.D.
- 18% Alumina Percent
- 13' Bed Thickness (underlined if it is the entire bed)
- WHITE RIVER and ARIKAREE Strata (Eocene through Miocene)
- GOLDEN VALLEY FORMATION (Paleocene and Eocene)
- RHAME BED (Paleocene)
- Geology Undifferentiated

The White River and Arikaree rocks were plotted on this map because they may contain various concentrations of erionite. Erionite is a fibrous zeolite that has been identified by the World Health Organization as a Group 1 carcinogen. Any proposed mining of the Bear Den in the vicinity of White River or Arikaree rocks will require the overburden be tested for erionite and could, depending upon results, curtail mining in the area.

The Bear Den Member is generally at the surface along the outer edges (contact between the Golden Valley and Sentinel Butte Formations) of the deposit.

The top of the Rhame Bed marks the contact between the Slope Formation and the overlying Bullion Creek Formation. The Rhame Bed contact was modified from Wehrfritz (1978). Wehrfritz mapped at a scale of 1:125,000.

Geology Undifferentiated

Other Features

- Water
- Water - Intermittent
- River/Stream - Perennial
- River/Stream - Intermittent
- Section Corners
- County Boundary
- Interstate Highway
- US Highway
- State Highway
- Paved Road
- Unpaved Road

Scale 1:100,000



Mercator Projection 1927 North American Datum
Standard parallel 46°30' Central meridian 103°30'
USGS NED Shaded Relief - Vertical Exaggeration 9x

Note: This map was expanded beyond the normal Belfield 100K Sheet to include an additional width of two miles west to the Montana border.