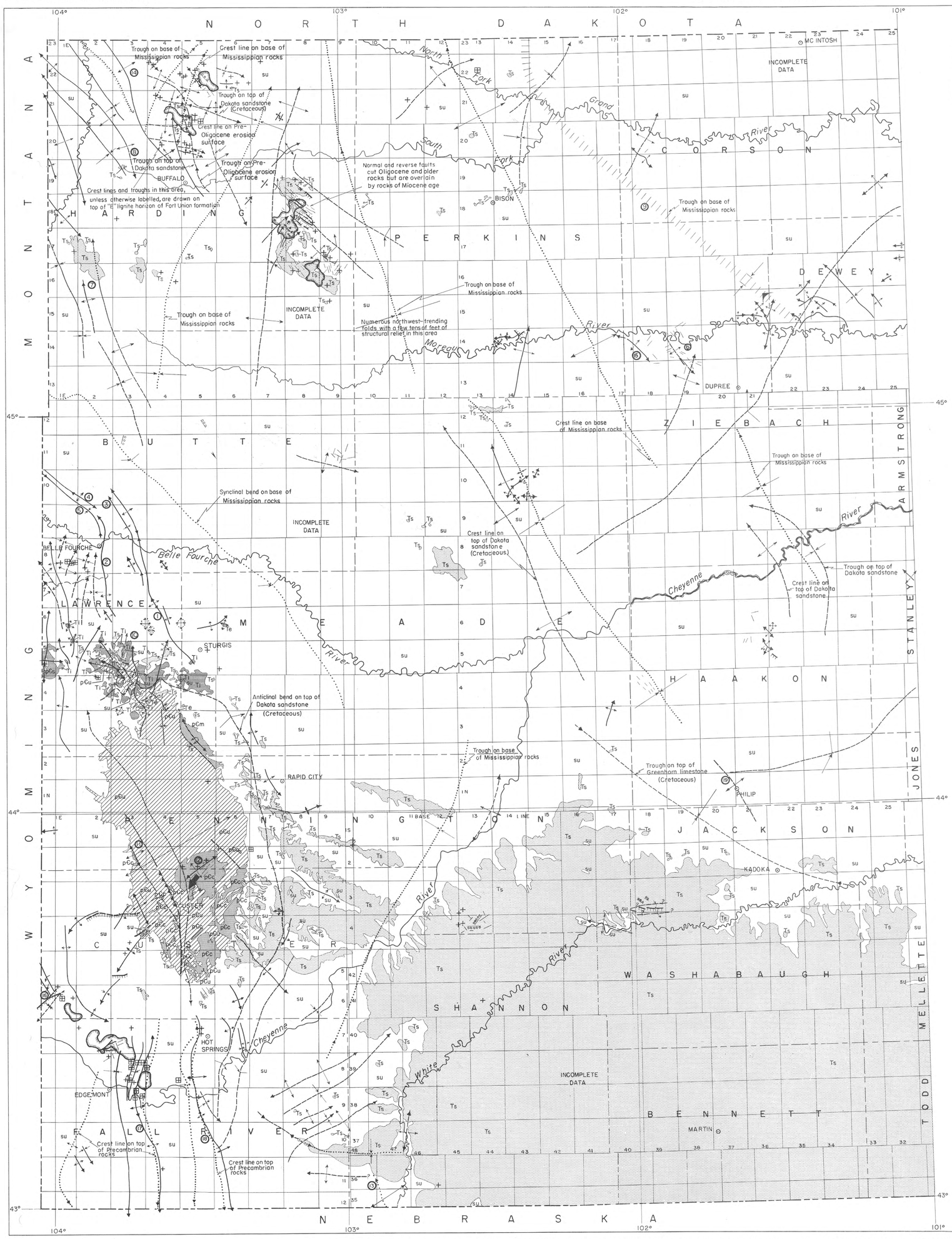
PREPARED IN COOPERATION WITH THE
U. S. ATOMIC ENERGY COMMISSION



EXPLANATION

SEDIMENTARY ROCKS

Oligocene and Miocene	Ts — Sedimentary rocks, undifferentiated	TERTIARY
Upper Cambrian to Eocene	su — Sedimentary rocks, undifferentiated	CAMBRIAN TO TERTIARY

IGNEOUS AND METAMORPHIC ROCKS

Upper Tertiary	Te — Extrusive rocks	TERTIARY
Lower Tertiary	Ti — Intrusive rocks	TERTIARY
	p€m — Metasedimentary rocks. *Chiefly quartzite and similar rocks which have undergone slight metamorphic changes.*	PRECAMBRIAN
	p€c — Coarsely crystalline rocks. *Mostly massive granitoid rocks; some slightly to moderately foliated.*	PRECAMBRIAN
	p€s — Schist and gneiss. *General trend of foliation shown by curved linear pattern.*	PRECAMBRIAN

IGNEOUS, METAMORPHIC, AND SEDIMENTARY ROCKS

	p€u — Precambrian rocks, undifferentiated	PRECAMBRIAN

Approximate contact

Fault
Dashed where inferred or indefinite; dotted where concealed or recognized from subsurface data; queried where doubtful or probable. Hachures are on relatively downthrown side.

Low-angle thrust fault
Sawteeth on relatively overthrust side.

The following fold symbols are solid where position of fold is known; dashed where indefinite or inferred; dotted where concealed or recognized from subsurface data; queried where doubtful or probable. The relative wave length of folds is indicated by length of cross arrows.

Anticline, showing crest line or trace of axial plane and direction of plunge

Asymmetric anticline
Short arrow indicates steeper limb.

Dome

Overturned anticline, showing trace of axial plane and direction of dip of limbs

Syncline, showing position of trough or trace of axial plane and direction of plunge

Asymmetric syncline
Short arrow indicates steeper limb.

Anticlinal bend of monocline or terrace

Synclinal bend of monocline or terrace

Broad syncline, showing approximate position of trough and direction of plunge
Dips associated with these structures are very low; position of trough is shown only within wide limits.

Joints and small faults, some are filled by veins and dikes

Clastic dike

Vein and igneous dike

Intrusive rocks not exposed at surface

Numbers refer to list of named structures

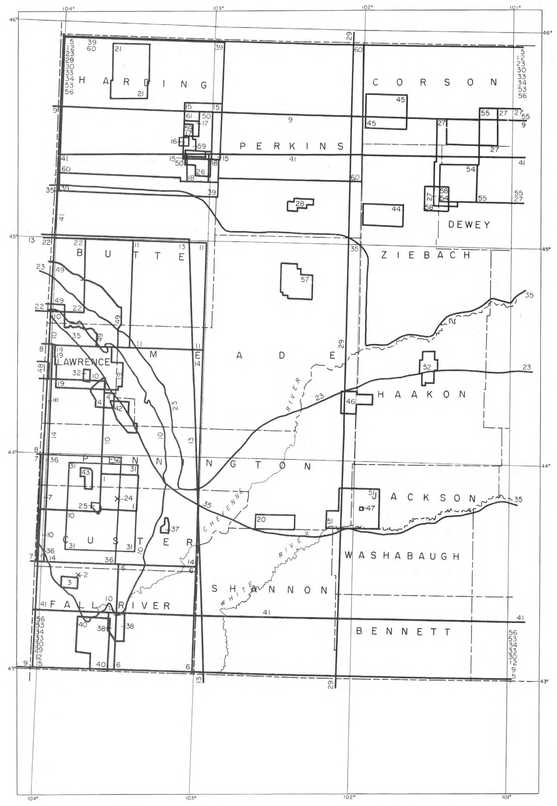
Uranium deposit, or a locality from which a sample containing 0.01% or more uranium has been obtained or from which visible uranium minerals have been obtained
Box around symbol indicates deposit yielded uranium ore.

Group of uranium deposits or localities

Direction of plunge of intrusion

LIST OF STRUCTURES

1. Whitewood anticline
2. Belle Fourche anticline
3. Dry Creek syncline
4. Box Elder anticline
5. Crow Creek syncline
6. Red Elm anticline
7. Gustave anticline
8. Gallup Creek dome
9. Lemmon syncline
10. Lead—Deadwood dome
11. Bear Mountain dome
12. Harney Peak dome
13. Chadron arch
14. Cedar Creek anticline
15. Flint Rock anticline
16. Dewey fault
17. Chilson anticline
18. Cascade Springs anticline
19. Philip anticline



INDEX MAP OF WESTERN SOUTH DAKOTA, SHOWING SOURCES OF DATA
Compiled by Arloa Shipman
APPROXIMATE SCALE 0 10 20 30 40 MILES

SOURCES OF DATA

Index Map Number[1]

1 Balk, Robert, 1931, Inclusions and foliation of the Harney Peak granite, Black Hills, South Dakota: Jour. Geology v. 39, p. 736-748.
2 Braddock, W. A., 1954, written communication.
3 Bell, Henry, and Bales, W. E., 1955, Uranium deposits in Fall River County, South Dakota: U. S. Geol. Survey Bull. 1009-G, p. 211-233.
4 Berg, R. J., 1946, Pre-Cambrian geology of the Galena-Rochain district, Black Hills, South Dakota: South Dakota Geol. Survey Rept. Inv. No. 52, 50 p.
*5 Blackstone, D. L., Jr., written communication.
6 Darton, N. H., 1902, Description of the Oelrichs quadrangle (South Dakota-Nebraska): U. S. Geol. Survey Geol. Atlas, folio no. 85, 6 p.
7 Darton, N. H., 1904, Description of the Newcastle quadrangle (Wyoming-South Dakota): U. S. Geol. Survey Geol. Atlas, folio no. 107, 9 p.
8 Darton, N. H., 1905, Description of the Sundance quadrangle (Wyoming-South Dakota): U. S. Geol. Survey Geol. Atlas, folio no. 127, 12 p.
9 Darton, N. H., 1918, The structure of parts of the central Great Plains: U. S. Geol. Survey Bull. 691-A, 26 p.
10 Darton, N. H., 1918, Artesian waters in the vicinity of the Black Hills, South Dakota: U. S. Geol. Survey Water Supply Paper 428, 64 p.
11 Darton, N. H., 1919, Description of the Newell quadrangle, South Dakota: U. S. Geol. Survey Geol. Atlas, folio no. 209, 7 p.
*12 Darton, N. H., 1951, Geologic map of South Dakota: U. S. Geol. Survey Map.
13 Darton, N. H., and O'Harra, C. C., 1909, Description of the Belle Fourche quadrangle, South Dakota: U. S. Geol. Survey Geol. Atlas, folio no. 164, 9 p.
14 Darton, N. H., and Paige, Sydney, 1925, Description of the central Black Hills: U. S. Geol. Survey Geol. Atlas, folio no. 219, 34 p.
15 Denson, N. M., Bachman, G. O., and Zeller, H. D., 1955, Geologic map of the Slim Butte area, Harding County, South Dakota: U. S. Geol. Survey Coal Inv. Map C-35.
16 Gill, J. R., 1954, written communication.
17 Gill, J. R., 1955, Geologic map of Reva Gap area, Slim Buttes, Harding County, South Dakota, *in* Geologic investigations of radioactive deposits, semiannual progress report, December 1, 1954 to May 31, 1955: U. S. Geol. Survey TEI-549, p. 157, issued by U. S. Atomic Energy Comm. Tech. Inf. Service, Oak Ridge, Tenn.
18 Gill, J. R., and Denson, N. M., 1955, Lignite investigations; regional synthesis, eastern Montana and North and South Dakota, *in* Geologic investigations of radioactive deposits, semiannual progress report, June 1 to November 30, 1955: U. S. Geol. Survey TEI-590, p. 233-240, issued by U. S. Atomic Energy Comm. Tech. Inf. Service, Oak Ridge, Tenn.
** Gill, J. R., and Moore, G. W., 1955, Carnotite-bearing sandstone in Cedar Canyon, Slim Buttes, Harding County, South Dakota: U. S. Geol. Survey Bull. 1009-I, p. 249-264.
** Gries, J. P., 1940, A structural survey of northeastern Stanley County, South Dakota: South Dakota Geol. Survey Rept. Inv. No. 34, 52 p.
19 Irving, J. D., and Emmons, S. F., 1904, Economic resources of the northern Black Hills, pt. II, Mining geology: U. S. Geol. Survey Prof. Paper 26, p. 43-215.
20 Kepferle, R. C., 1954, Geology of a portion of the White River Badlands, Pennington County, South Dakota: unpublished M.A. thesis, South Dakota School of Mines and Technology.
21 Kepferle, R. C., and Chisholm, W. A., 1955, Lignite investigations, Cave Hills, Harding County, South Dakota, *in* Geologic investigations of radioactive deposits, semiannual progress report, June 1 to November 30, 1955: U. S. Geol. Survey TEI-590, p. 240-247, issued by U. S. Atomic Energy Comm. Tech. Inf. Service, Oak Ridge, Tenn.
22 Knechtel, M. M., and Patterson, S. H., 1955, Bentonite deposits of the northern Black Hills district, Montana, Wyoming, and South Dakota: U. S. Geol. Survey Mineral Inv. Field Studies Map MF 96.
23 Kunkel, R. P., 1954, Structure contour map of the base of Mississippian rocks in the Williston Basin and adjoining areas of Montana, North Dakota, South Dakota, and Wyoming: U. S. Geol. Survey Oil and Gas Inv. Map OM 165.
24 Kupfer, D. H., and Langen, R. E., written communication.
25 Lang, A. J., Jr., and Redden, J. A., 1953, Geology and pegmatites of part of the Fourmile area, Custer County, South Dakota: U. S. Geol. Survey Circ. 245, 20 p.
26 Moore, G. W., and Gill, J. R., 1955, Geologic map of the southern part of the Slim Buttes area, Harding County, South Dakota: U. S. Geol. Survey Coal Inv. Map C-36.
27 Morgan, R. E., and Petsch, B. C., 1945, A geological survey in Dewey and Corson Counties, South Dakota: South Dakota Geol. Survey Rept. of Inv. No. 49, 58 p.
28 Moulton, G. F., 1923, Oil and gas prospects in southern Perkins County: South Dakota Geol. and Natural Hist. Survey Circ. 14, 12 p.
29 Noble, J. A., 1952, Structural features of the Black Hills and adjacent areas developed since Precambrian time: Billings Geol. Soc. Third Ann. Field Conf. Guidebook, p. 31-37.
30 Noble, J. A., written communication.
31 Norton, J. J., 1956, written communication.
32 Paige, Sydney, 1924, Geology of the region around Lead, South Dakota, and its bearing on the Homestake ore body: U. S. Geol. Survey Bull. 765, 58 p.
*33 Petsch, B. C., 1955, Structure map, State of South Dakota: Rocky Mountain Oil Reporter, v. 12, p. 17.
*34 Petsch, B. C., 1955, Map of Precambrian surface, the State of South Dakota: Rocky Mountain Oil Reporter, v. 12, p. 18.
35 Petsch, B. C., and Carlson, L. A., 1950, Magnetic observations in South Dakota: South Dakota Geol. Survey Rept. Inv. No. 66, 33 p.
36 Redden, J. A., 1956, written communication.
37 Rothrock, E. P., 1930, The Fairburn structure: South Dakota Geol. Survey Rept. Inv. No. 6, 12 p. (1940 revisions).
38 Rothrock, E. P., 1931, The Cascade anticline: South Dakota Geol. Survey Rept. Inv. No. 8, 19 p.
39 Rothrock, E. P., 1937, Structural conditions in Harding County: South Dakota Geol. Survey Rept. Inv. No. 28, 30 p. (reprinted 1946).
40 Rothrock, E. P., 1931, The Chilson anticline: South Dakota Geol. Survey Rept. Inv. No. 9, 2d. ed., 26 p.
41 Rothrock, E. P., and Robinson, T. R., 1936, Artesian conditions in west-central South Dakota: South Dakota Geol. Survey Rept. Inv. No. 26, 92 p.
42 Runner, J. J., 1934, Pre-Cambrian geology of the Nemo district, Black Hills, South Dakota: Am. Jour. Sci., 5th ser., v. 28, p. 353-371.
43 Runner, J. J., 1943, Structure and origin of Black Hills pre-Cambrian granite domes: Jour. Geology, v. 51, p. 431-457.
44 Russell, W. L., 1925, The possibilities of oil in western Ziebach County: South Dakota Geol. and Nat. Hist. Survey Circ. 20, 25 p.
45 Russell, W. L., 1926, The possibilities of oil in western Corson County: South Dakota Geol. and Nat. Hist. Survey Circ. 27, 18 p.
46 Russell, W. L., 1926, Structures in western Haakon and eastern Pennington Counties: South Dakota Geol. and Nat. Hist. Survey Circ. 28, 24 p.
47 Smith, K. G., 1952, Structure plan of clastic dikes: Trans. Am. Geophysical Union, v. 33, p. 892-899.
48 Smith, W. C., and Page, L. R., 1941, Tin-bearing pegmatites of the Tinton district, Lawrence County, South Dakota: U. S. Geol. Survey Bull. 922-T, p. 595-630.
49 Stevenson, R. E., 1952, Structures and stratigraphy of southwestern Butte County: South Dakota Geol. Survey Rept. Inv. No. 69, 32 p.
50 Toepelman, W. C., 1923, The possibilities of oil in eastern Harding County: South Dakota Geol. and Nat. Hist. Survey Circ. 12, 12 p.
51 Ward, Freeman, 1922, The geology of a portion of the Badlands: South Dakota Geol. and Nat. Hist. Survey Bull. 11, 80 p.
52 Ward, Freeman, 1925, Structures in northern Haakon County: South Dakota Geol. and Nat. Hist. Survey Circ. 22, 15 p.
*53 Ward, Freeman, 1925, The structure of western South Dakota: South Dakota Geol. and Nat. Hist. Survey Circ. 25, 7 p.
54 Ward, Freeman, and Wilson, R. A., 1922, The possibilities of oil in western Dewey County: South Dakota Geol. and Nat. Hist. Survey Circ. 9, 10 p.
55 Wilson, R. A., 1922, The possibilities of oil in northern Dewey County: South Dakota Geol. and Nat. Hist. Survey Circ. 10, 6 p.
*56 Wilson, R. A., 1923, The bearing of geologic features in South Dakota upon oil possibilities: Am. Assoc. Petroleum Geologists Bull., v. 7, p. 507-516.
57 Wilson, R. A., 1925, Oil and gas possibilities in northeastern Meade County: South Dakota Geol. and Nat. Hist. Survey Circ. 23, 14 p.
58 Wilson, R. A., 1925, The Ragged Butte structure (in southwestern Dewey County, South Dakota): South Dakota Geol. and Nat. Hist. Survey Circ. 24, 7 p.
59 Winchester, D. E., 1913, Cross-bedding in the White River formation of northwestern South Dakota: Jour. Geology, v. 21, p. 550-556.
60 Winchester, D. E., Hares, C. J., Lloyd, E. R., and Parks, E. J., 1916, The lignite field of northwestern South Dakota: U. S. Geol. Survey Bull. 627, 169 p.
61 Zeller, H. D., 1955, Geologic map of the Bar H area, Slim Buttes, Harding County, South Dakota: U. S. Geol. Survey Coal Inv. Map C 37.

[1] Numbers refer to index map indicating areas to which sources of data apply.
* One asterisk indicates source data that apply to all of western South Dakota.
** Two asterisks indicate source data obtained from text only.

PRELIMINARY TECTONIC MAP OF WESTERN SOUTH DAKOTA, SHOWING THE DISTRIBUTION OF URANIUM DEPOSITS

Compiled by
F. W. Osterwald and B. G. Dean

Scale 1:500 000
10 0 10 20 30 Miles

1957

~~South Dakota (West). Structure. 1:500,000. 1957.~~
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Compiled from sources of data shown on index map

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