DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

Table 22.--Analyses, in percent, of representative samples of Oligocene, Miocene, and Pliocene rocks from eastern Montana and the Dakotas

[Analyses shown graphically on plate 18A in U.S. Geol. Survey Prof. Paper 463, 1965. M, >10 percent; 0, looked for but not detected. Analysts: Chemical, S. D. Botts, P. L. D. Elmore, and K. E. White; spectrographic, Charles Annell, P. J. Dunton, J. C. Hamilton, and H. W. Worthing]

Sample No.	Location (section, township, range, and county)	Area	Sample description	Core hole	Stratigraphic position	Chemical analyses[1]											
						Si	Al	Fe	Mg	Ca	Na	K	Ti	P	Mn	H_2O	CO_2
Flaxville Formation (upper Miocene or Pliocene)																	
248478	NENE 24 35N 42E, Valley County, Mont.	Opheim	Volcanic ash (clean)	.....	15 ft bed; 20 ft above base.	30.8	6.0	1.44	0.45	3.3	1.60	3.70	0.13	0.02	0.03	5.1	2.7
Arikaree Formation (Miocene)																	
147773	SWNW 8 3S 62E, Carter County, Mont.	Long Pine Hills	Tuffaceous sandstone	.....	300 ft above base	34.3	6.1	1.63	0.78	1.8	1.30	2.70	0.24	0.04	0.03	4.2	0.08
765	SENW 28 1S 57E, Carter County, Mont.	Chalk Buttes	do	.....	265 ft above base	28.3	4.9	.89	.50	9.9	1.60	1.70	.11	.04	.05	1.2	9.5
764	NENW 34 135N 98W, Slope County, N. Dak.	Rainy Buttes	Quartzitic sandstone	.....	12 ft bed; capping butte.	38.2	4.6	1.24	.33	1.1	.14	.15	.12	.06	.02	2.5	.07
144495	NWNW 31 18N 8E, Harding County, S. Dak.	Slim Buttes	Tuffaceous sandstone	24	185 ft above base	28.2	6.5	2.70	1.20	4.1	.80	2.80	.23	.06	.06	9.6	2.8
496	do	do	do	24	170 ft above base	28.1	7.3	2.90	1.80	2.4	1.00	2.00	.23	.03	.05	12.1	1.2
497	do	do	do	24	160 ft above base	30.5	6.6	2.10	.80	2.6	1.10	3.00	.21	.03	.02	7.6	1.1
498	do	do	do	24	140 ft above base	31.2	6.6	2.90	.80	2.0	1.40	2.90	.22	.03	.02	7.7	.59
499	do	do	do	24	120 ft above base	32.9	6.8	3.10	.80	1.4	1.60	2.70	.23	.03	.02	7.1	.00
500	do	do	do	24	100 ft above base	27.3	6.0	2.90	.70	6.5	1.60	2.50	.21	.03	.11	6.2	5.6
501	do	do	do	24	70 ft above base	29.8	6.5	3.50	1.40	2.6	1.90	2.70	.23	.03	.06	6.7	2.4
502	do	do	do	24	50 ft above base	27.5	6.2	2.90	.80	4.3	1.90	3.00	.24	.04	.05	8.6	3.5
503	do	do	Tuffaceous claystone	24	30 ft above base	24.2	6.1	3.20	1.30	6.3	1.60	2.70	.29	.09	.09	10.3	6.0
504	do	do	Tuffaceous sandstone	24	10 ft above base	30.3	6.8	3.80	.80	1.6	2.20	2.60	.29	.05	.06	8.0	.57
Brule Formation (middle and upper Oligocene)																	
147761	SESE 7 137N 97W, Stark County, N. Dak.	Little Badlands	Calcareous claystone	.....	43 ft above base	17.6	4.4	2.13	1.10	14.1	1.00	1.30	0.20	0.08	0.15	5.3	17.0
Chadron Formation (lower Oligocene)																	
144505	NWNW 31 18N 8E, Harding County, S. Dak.	Slim Buttes	Claystone	24	12 ft below top	28.9	6.1	4.00	1.60	2.6	0.80	2.30	0.30	0.12	0.08	7.2	4.0
506	do	do	do	24	20 ft below top	27.1	7.2	5.40	1.60	2.0	1.00	2.50	.35	.12	.06	7.1	3.7
147769	SENE 12 17N 7E, Harding County, S. Dak.	do	Bentonite	16A	9 ft bed; 16 ft below top.	26.2	8.3	4.12	1.81	1.1	.82	2.20	.30	.03	.01	12.2	.82
Basal part of Chadron Formation																	
147762	NESW 23 138N 97W, Stark County, N. Dak.	Little Badlands	Silicified arkose	.....	20 ft bed at base	36.9	4.6	2.10	0.24	0.4	0.07	0.30	0.38	0.01	0.01	6.8	0.06
770	SENE 12 17N 7E, Harding County, S. Dak.	Slim Buttes	Arkose	16A	18 ft bed at base	35.1	5.3	.56	1.00	1.4	1.30	2.70	.14	.02	.02	3.0	2.1

Sample No.	Semiquantitative spectrographic analyses																							
	Si	Al	Ca	Na	K	Mg	Fe	Ti	Ba	Mn	Sr	Zr	V	B	Cr	Y	Cu	Ni	Ga	Pb	Sc	Co	Yb	Other elements
Flaxville Formation (upper Miocene or Pliocene)																								
248478	M	3	7.	3.	3.	0.7	0.7	0.07	0.03	0.15	0.003	0.015	0.003	0	0.0007	0.003	0.0015	0	0.0015	0.003	0	0	0.0003	Ce, 0.015; Li, 0.015; La, 0.003; Nb, 0.0015; Be, 0.00015; Sn, 0.0007.
Arikaree Formation (Miocene)																								
147773	M	7	3.	3.	3.	1.5	1.5	0.3	0.15	0.03	0.07	0.03	0.015	<0.005	0.0015	0.007	0.0015	0	<0.001	0.0015	0	0	0.0007	La, 0.007; Sn, 0.0015; Be, 0.00015.
765	M	7	M	3.	1.5	.7	.7	.15	.07	.03	.07	.007	.03	0	.007	.003	.0003	< .001	< .001	.0015	.0015	< .001	.0003	
764	M	7	0.7	1.5	1.5	.7	.7	.15	.07	.03	.03	.015	.007	0	.015	0	.0003	< .001	< .001	0	.0015	< .001	.00015	
144495	M	7	7.	1.5	3.	1.5	1.5	.3	.15	.03	.15	.015	.007	< .005	.0030	.003	.0015	< .001	< .001	0	.0015	< .001	.0003	
496	M	7	3.	1.5	3.	3.	1.5	.3	.03	.03	.03	.015	.007	< .005	.0015	.003	.0015	< .001	< .001	.0015	.0015	< .001	.0003	
497	M	7	3.	1.5	3.	1.5	1.5	.3	.15	.015	.15	.015	.007	< .005	.0015	.003	.0015	< .001	< .001	.0015	.0015	< .001	.0003	
498	M	7	3.	3.	3.	1.5	1.5	.3	.15	.015	.07	.015	.007	< .005	.0015	.003	.0015	< .001	< .001	.0015	.0015	< .001	.0007	
499	M	7	3.	3.	3.	1.5	1.5	.3	.15	.015	.07	.015	.007	< .005	.0015	.003	.0015	< .001	.003	.0015	.0015	< .001	.0003	
500	M	7	7.	3.	3.	1.5	1.5	.3	.07	.15	.07	.015	.003	< .005	.0015	.007	.0015	< .001	< .001	.0015	.0015	< .001	.0007	
501	M	7	3.	3.	3.	1.5	1.5	.3	.07	.07	.07	.015	.007	< .005	.0015	.003	.0015	< .001	< .001	.0015	.0015	< .001	.0003	
502	M	7	7.	7.	3.	1.5	1.5	.3	.07	.03	.15	.015	.003	< .005	.0015	.007	.0015	< .001	< .001	.0015	.0015	< .001	.0007	
503	M	7	7.	3.	3.	1.5	1.5	.3	.07	.07	.15	.015	.003	< .005	.0015	.007	.0015	< .001	< .001	.0015	.0030	< .001	.0007	
504	M	7	3.	3.	3.	1.5	1.5	.3	.3	.015	.07	.015	.007	< .005	.003	.007	.0015	< .001	< .001	.0015	.0015	< .001	.0007	La, 0.007.
Brule Formation (middle and upper Oligocene)																								
147761	M	7	M	1.5	1.5	1.5	1.5	0.15	0.03	0.15	0.03	0.015	0.003	0	0.003	0.003	0.0015	0.0015	<0.001	0	0.0015	<0.001	0.0003	
Chadron Formation (lower Oligocene)																								
144505	M	7	3.	1.5	3.	3.	1.5	0.3	0.03	0.07	0.015	0.015	0.015	<0.005	0.0070	0.003	0.0015	0.0015	<0.001	0.0015	0.0015	0.0015	0.0003	
506	M	7	3.	3.	3.	1.5	3.	.3	.03	.03	.03	.015	.015	< .005	.0070	.003	.003	.0015	< .001	0	.0015	.0015	.0003	
147769	M	M	.7	1.5	3.	1.5	1.5	.3	.015	.015	.007	.007	.007	.007	.003	0	.0015	.0015	< .001	.0015	.0015	< .001	.00015	
Basal part of Chadron Formation																								
147762	M	7	0.3	0.07	0	0.7	1.5	0.7	0.03	0.015	0.007	0.03	0.007	<0.005	0.003	0.003	0.0015	0	<0.001	0.0015	0.0015	<0.001	0.0003	
770	M	7	.7	1.5	3.	1.5	.3	.15	.07	.015	.015	.003	.0015	0	.0015	0	.00015	0	< .001	.0015	0	0	0	

[1] Converted from reported oxides with rounding.

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