ENGINEERING INDEX PROPERTIES
Benson County Area, North Dakota

Engineering Index Properties table gives the engineering classifications and the range of index properties for the layers of each soil in the survey area. Depth to the upper and lower boundaries of each layer is indicated. Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. Loam, for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, gravelly. Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 1998) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 1998). The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection. If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in Engineering Index Properties table.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage. Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and plasticity index (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination. The estimates of particle-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is generally omitted in the table.

ENGINEERING INDEX PROPERTIES--Continued
Benson County Area, North Dakota

(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
3:												
Parnell--------	0-14		CH, CL, OL	A-7	0	0-1	100	100	95-100	85-100	40-55	20-35
	14-36		CH, CL	A-7	0	0-2	100	95-100	90-100	70-100	50-75	30-50
	36-60		CH, CL	A-7	0	0-2	95-100	90-100	80-95	70-95	50-60	30-40
4:												
Fargo----------	0-12		CH, CL	A-7	0	0	100	100	95-100	85-95	40-55	20-35
	12-30		CH	A-7	0	0	100	100	95-100	85-100	55-75	35-50
	30-60		CH	A-7	0	0	100	100	95-100	85-100	55-75	35-50
5:												
Hegne----------	0-10		CH	A-7	0	0	100	100	95-100	90-98	55-75	35-50
	10-24		CH	A-7	0	0	100	100	95-100	95-98	55-75	35-50
	24-42		CH	A-7	0	0	100	100	95-100	95-100	55-75	35-50
	42-60		CH	A-7	0	0	100	100	95-100	95-100	55-75	35-50
7:												
Colvin---------	0-12		CL, CL-ML	A-4, A-6	0	0	100	100	90-100	80-95	30-35	10-15
	12-30		CL, CL-ML	A-4, A-6, A-7	0	0	100	100	90-100	80-95	30-45	10-20
	30-60		CL, CL-ML	A-4, A-6, A-7	0	0	100	100	90-100	70-95	30-45	10-20
8:												
Colvin---------	0-12		CL	A-6	0	0	100	100	90-100	80-95	25-40	10-20
	12-30		CL	A-6, A-7	0	0	100	100	90-100	80-95	25-50	10-30
	30-60		CL	A-6, A-7	0	0	100	100	90-100	70-95	25-50	10-25
9:												
Rauville-------	0-20		CL, ML	A-6, A-7	0	0	100	100	90-100	80-100	35-50	10-25
	20-60		CH, CL, MH, ML	A-7, A-6	0	0	100	100	90-100	85-100	35-60	15-28
11:												
Svea----------	0-12		CL, CL-ML	A-4, A-6	---	0-5	95-100	85-100	80-95	60-90	25-40	10-20
	12-22		CL, CL-ML	A-4, A-6, A-7	---	0-5	95-100	85-100	80-100	60-90	25-45	10-25
	22-60		CL, CL-ML	A-4, A-6, A-7	---	0-5	95-100	85-100	80-100	60-85	25-45	10-25
Barnes---------	0-8		CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	80-100	60-80	25-35	10-20
	8-18		CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	75-95	55-80	25-45	10-25
	18-60		CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	75-95	55-80	25-45	10-25
12B:												
Barnes---------	0-8		CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	80-100	60-80	25-35	10-20
	8-18		CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	75-95	55-80	25-45	10-25
	18-60		CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	75-95	55-80	25-45	10-25
Svea----------	0-12		CL, CL-ML	A-4, A-6	---	0-5	95-100	85-100	80-95	60-90	25-40	10-20
	12-22		CL, CL-ML	A-4, A-6, A-7	---	0-5	95-100	85-100	80-100	60-90	25-45	10-25
	22-60		CL, CL-ML	A-4, A-6, A-7	---	0-5	95-100	85-100	80-100	60-85	25-45	10-25
13C:												
Barnes---------	0-8		CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	80-100	60-80	25-35	10-20
	8-18		CL, CL-ML	A-6, A-4	0	0-5	90-100	85-100	75-95	55-80	25-45	10-25
	18-60		CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	75-95	55-80	25-45	10-25
Buse----------	0-8		CL, CL-ML	A-4, A-6	0	0-5	90-100	85-95	70-95	55-90	25-35	10-15
	8-60		CL-ML, CL	A-4, A-6, A-7	0	0-5	90-100	85-100	70-90	55-85	25-45	10-25
13D:												
Barnes---------	0-8		CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	80-100	60-80	25-35	10-20
	8-18		CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	75-95	55-80	25-45	10-25
	18-60		CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	75-95	55-80	25-45	10-25
Buse----------	0-8		CL, CL-ML	A-4, A-6	0	0-5	90-100	85-95	70-95	55-90	25-35	10-15
	8-60		CL, CL-ML	A-4, A-6, A-7	0	0-5	90-100	85-100	70-90	55-85	25-45	10-25
14:												
Svea----------	0-12		CL, CL-ML	A-4, A-6	---	0-5	95-100	85-100	80-95	60-90	25-40	10-20
	12-22		CL, CL-ML	A-4, A-6, A-7	---	0-5	95-100	85-100	80-100	60-90	25-45	10-25
	22-60		CL, CL-ML	A-4, A-6, A-7	---	0-5	95-100	85-100	80-100	60-85	25-45	10-25
Hamerly--------	0-8		CL, CL-ML	A-4, A-6	0	0-5	95-100	90-100	80-95	60-90	20-40	5-20
	8-22		CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-75	20-45	5-25
	22-60		CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	75-95	55-75	20-45	5-25
14B:												
Svea----------	0-12		CL, CL-ML	A-4, A-6	---	0-5	95-100	85-100	80-95	60-90	25-40	10-20
	12-22		CL, CL-ML	A-4, A-6, A-7	---	0-5	95-100	85-100	80-100	60-90	25-45	10-25
	22-60		CL, CL-ML	A-4, A-6, A-7	---	0-5	95-100	85-100	80-100	60-85	25-45	10-25
Hamerly--------	0-8		CL, CL-ML	A-4, A-6	0	0-5	95-100	90-100	80-95	60-90	20-40	5-20
	8-22		CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-75	20-45	5-25
	22-60		CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	75-95	55-75	20-45	5-25
15:												
Vallers, Saline	0-9		CL, CL-ML	A-4, A-6	0-1	0-5	95-100	90-100	80-90	65-80	25-40	10-20
	9-22		CL	A-4, A-6, A-7	0-1	0-5	95-100	90-100	80-95	50-80	25-45	10-25
	22-60		CL, CL-ML	A-4, A-6	0-1	0-5	95-100	90-100	85-95	60-75	25-45	10-25
16:												
Vallers--------	0-9		CL-ML, ML	A-4	0-1	0-5	95-100	90-100	80-90	50-80	30-40	4-10
	9-22		CL	A-6	0-1	0-5	95-100	90-100	80-95	50-80	30-40	11-20
	22-60		CL, CL-ML	A-4, A-6	0-1	0-5	95-100	90-100	85-95	60-85	20-40	5-20
18E:												
Buse----------	0-8		CL, CL-ML	A-4, A-6	0	0-5	90-100	85-95	70-95	55-90	25-35	10-15
	8-60		CL, CL-ML	A-4, A-6, A-7	0	0-5	90-100	85-100	70-90	55-85	25-45	10-25
19:												
Tonka----------	0-22		CL, CL-ML	A-4, A-6	0-1	0-2	100	95-100	90-100	70-90	35-45	15-25
	22-38		CH, CL	A-6, A-7	0-1	0-2	100	95-100	90-100	75-95	50-60	30-40
	38-60		CL, CL-ML	A-4, A-6, A-7	0-1	0-3	90-100	85-100	60-100	50-90	35-55	15-30

ENGINEERING INDEX PROPERTIES--Continued
Benson County Area, North Dakota

(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
21:												
Emrick---------	0-12		ML	A-4	0-1	0-1	95-100	95-100	85-100	60-90	0-40	NP-10
	12-34		ML	A-4	0-1	0-1	95-100	95-100	85-95	55-75	0-40	NP-10
	34-60		ML, SC, SM	A-6, A-4	0-1	0-5	90-100	90-100	60-100	35-90	0-40	NP-10
Heimdal--------	0-8		ML	A-4	0-1	0-1	95-100	95-100	85-100	60-90	20-40	NP-10
	8-19		ML	A-4	0-1	0-1	95-100	95-100	85-95	60-75	20-40	NP-10
	19-60		CL, ML, SC, SM	A-4, A-6	0-1	0-5	95-100	90-100	60-100	35-90	20-40	NP-15
22B:												
Heimdal--------	0-8		ML	A-4	0-1	0-1	95-100	95-100	85-100	60-90	20-40	NP-10
	8-19		ML	A-4	0-1	0-1	95-100	95-100	85-95	60-75	20-40	NP-10
	19-60		CL, ML, SC, SM	A-4, A-6	0-1	0-5	95-100	90-100	60-100	35-90	20-40	NP-15
Emrick---------	0-12		ML	A-4	0-1	0-1	95-100	95-100	85-100	60-90	0-40	NP-10
	12-34		ML	A-4	0-1	0-1	95-100	95-100	85-95	55-75	0-40	NP-10
	34-60		ML, SC, SM	A-4, A-6	0-1	0-5	90-100	90-100	60-100	35-90	0-40	NP-10
23C:												
Heimdal--------	0-8		ML	A-4	0-1	0-1	95-100	95-100	85-100	60-90	20-40	NP-10
	8-19		ML	A-4	0-1	0-1	95-100	95-100	85-95	60-75	20-40	NP-10
	19-60		CL, ML, SC, SM	A-4, A-6	0-1	0-5	95-100	90-100	60-100	35-90	20-40	NP-15
Esmond---------	0-9		ML	A-4	---	0-1	95-100	95-100	85-100	60-90	20-40	NP-10
	9-60		CL, ML, SC, SM	A-4, A-6	---	0-5	90-100	85-100	60-100	35-90	20-40	NP-15
24:												
Fram----------	0-13		ML	A-4	---	0-1	95-100	95-100	85-100	60-90	20-40	NP-10
	13-60		ML, SM	A-4	---	0-1	95-100	90-100	60-100	35-90	20-40	NP-10
Emrick---------	0-12		ML	A-4	0-1	0-1	95-100	95-100	85-100	60-90	0-40	NP-10
	12-34		ML	A-4	0-1	0-1	95-100	95-100	85-95	55-75	0-40	NP-10
	34-60		ML, SC, SM	A-4, A-6	0-1	0-5	90-100	90-100	60-100	35-90	0-40	NP-10
25D:												
Esmond---------	0-9		ML	A-4	---	0-1	95-100	95-100	85-100	60-90	20-40	NP-10
	9-60		CL, ML, SC, SM	A-4, A-6	---	0-5	90-100	85-100	60-100	35-90	20-40	NP-15
Heimdal--------	0-8		ML	A-4	0-1	0-1	95-100	95-100	85-100	60-90	20-40	NP-10
	8-19		ML	A-4	0-1	0-1	95-100	95-100	85-95	60-75	20-40	NP-10
	19-60		CL, ML, SC, SM	A-4, A-6	0-1	0-5	95-100	90-100	60-100	35-90	20-40	NP-15
25E:												
Esmond---------	0-9		ML	A-4	---	0-1	95-100	95-100	85-100	60-90	20-40	NP-10
	9-60		CL, ML, SC, SM	A-4, A-6	---	0-5	90-100	85-100	60-100	35-90	20-40	NP-15
Heimdal--------	0-8		ML	A-4	0-1	0-1	95-100	95-100	85-100	60-90	20-40	NP-10
	8-19		ML	A-4	0-1	0-1	95-100	95-100	85-95	60-75	20-40	NP-10
	19-60		CL, ML, SC, SM	A-4, A-6	0-1	0-5	95-100	90-100	60-100	35-90	20-40	NP-15
26E:												
Esmond---------	0-9		ML	A-4	---	0-1	95-100	95-100	85-100	60-90	20-40	NP-10
	9-60		CL, ML, SC, SM	A-4, A-6	---	0-5	90-100	85-100	60-100	35-90	20-40	NP-15
Sioux----------	0-5		CL, ML	A-4, A-6	0	0-5	95-100	85-100	70-90	55-75	30-40	5-15
	5-9		GM, SM	A-1, A-2, A-4	0	0-5	60-90	50-80	45-70	15-50	20-35	NP-7
	9-60		GM, GP, SM, SP	A-1	0	0-5	25-75	20-60	5-35	0-25	0-25	NP-5
27C:												
Barnes---------	0-8		CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	80-100	60-80	25-35	10-20
	8-18		CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	75-95	55-80	25-45	10-25
	18-60		CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	75-95	55-80	25-45	10-25
Sioux----------	0-5		CL, ML	A-4, A-6	0	0-5	95-100	85-100	70-90	55-75	30-40	5-15
	5-9		GM, SM	A-1, A-2, A-4	0	0-5	60-90	50-80	45-70	15-50	20-35	NP-7
	9-60		GM, GP, SM, SP	A-1	0	0-5	25-75	20-60	5-35	0-25	0-25	NP-5
28D:												
Barnes---------	0-8		CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	80-100	60-80	25-35	10-20
	8-18		CL-ML, CL	A-4, A-6	0	0-5	90-100	85-100	75-95	55-80	25-45	10-25
	18-60		CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	75-95	55-80	25-45	10-25
Sioux----------	0-5		CL, ML	A-4, A-6	0	0-5	95-100	85-100	70-90	55-75	30-40	5-15
	5-9		GM, SM	A-1, A-2, A-4	0	0-5	60-90	50-80	45-70	15-50	20-35	NP-7
	9-60		GM, GP, SM, SP	A-1	0	0-5	25-75	20-60	5-35	0-25	0-25	NP-5
30D:												
Barnes---------	0-8		CL	A-6	0-5	3-25	90-100	85-100	80-100	60-75	25-40	10-20
	8-18		CL, CL-ML	A-4, A-6	0-5	0-20	90-100	85-100	75-95	60-80	25-40	5-20
	18-60		CL, CL-ML	A-4, A-6	0-5	0-15	90-100	85-100	75-95	60-80	25-40	5-20
Buse----------	0-8		CL, ML	A-4, A-6	0-70	0-70	90-100	85-95	70-90	55-80	30-40	5-15
	8-34		CL	A-4, A-6	0-30	0-30	90-100	85-95	70-90	60-80	25-40	8-15
	34-60		CL	A-4, A-6	0-30	0-30	90-100	85-95	70-90	60-80	25-40	8-15
31B:												
Towner---------	0-8		SC-SM, SM	A-2, A-4	0	0	100	100	60-85	30-45	15-25	NP-5
	8-34		SC-SM, SM, SP-SM, SW-SM	A-2, A-3	0	0	100	95-100	50-100	5-35	15-20	NP-5
	34-60		CL, CL-ML	A-4, A-6	0	0-5	95-100	90-100	85-100	55-100	25-40	5-15

ENGINEERING INDEX PROPERTIES--Continued
Benson County Area, North Dakota

(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
33C:												
Dickey---------	0-8		SC-SM, SM	A-4	0	0	100	100	65-85	35-50	15-25	NP-5
	8-28		SM	A-2-4	0	0	100	100	50-80	15-35	---	NP
	28-60		CL, CL-ML	A-4, A-6	0	0-5	95-100	90-100	85-100	60-90	25-40	5-15
34:												
Embden---------	0-12		CL-ML, SC, SC-SM	A-2, A-4	0	0	100	100	60-95	30-75	20-30	4-10
	12-34		CL-ML, SC, SC-SM	A-2, A-4	0	0	100	100	60-100	25-55	20-30	5-10
	34-60		CL-ML, SC, SM	A-2, A-4	0	0	100	100	50-100	15-55	15-30	NP-10
Heimdal--------	0-8		ML	A-4	0-1	0-1	95-100	95-100	85-100	60-90	20-40	NP-10
	8-19		ML	A-4	0-1	0-1	95-100	95-100	85-95	60-75	20-40	NP-10
	19-60		CL, ML, SC, SM	A-4, A-6	0-1	0-5	95-100	90-100	60-100	35-90	20-40	NP-15
34B:												
Embden---------	0-12		CL-ML, SC, SC-SM	A-2, A-4	0	0	100	100	60-95	30-75	20-30	4-10
	12-34		CL-ML, SC, SC-SM	A-2, A-4	0	0	100	100	60-100	25-55	20-30	5-10
	34-60		CL-ML, SC, SM	A-2, A-4	0	0	100	100	50-100	15-55	15-30	NP-10
Heimdal--------	0-8		ML	A-4	0-1	0-1	95-100	95-100	85-100	60-90	20-40	NP-10
	8-19		ML	A-4	0-1	0-1	95-100	95-100	85-95	60-75	20-40	NP-10
	19-60		CL, ML, SC, SM	A-4, A-6	0-1	0-5	95-100	90-100	60-100	35-90	20-40	NP-15
34C:												
Embden---------	0-12		CL-ML, SC, SC-SM	A-2, A-4	0	0	100	100	60-95	30-75	20-30	4-10
	12-34		CL-ML, SC, SC-SM	A-2, A-4	0	0	100	100	60-100	25-55	20-30	5-10
	34-60		CL-ML, SC, SM	A-2, A-4	0	0	100	100	50-100	15-55	15-30	NP-10
Heimdal--------	0-8		ML	A-4	0-1	0-1	95-100	95-100	85-100	60-90	20-40	NP-10
	8-19		ML	A-4	0-1	0-1	95-100	95-100	85-95	60-75	20-40	NP-10
	19-60		CL, ML, SC, SM	A-4, A-6	0-1	0-5	95-100	90-100	60-100	35-90	20-40	NP-15
41:												
Overly---------	0-10		CL, CL-ML	A-6, A-7	0	0	100	100	90-100	80-100	35-45	15-20
	10-42		CL, CL-ML	A-4, A-6, A-7	0	0	100	100	90-100	80-100	30-45	10-20
	42-60		CH, CL, CL-ML	A-4, A-6, A-7	0	0	100	100	90-100	80-100	30-65	10-40
42:												
Gardena--------	0-15		CL, ML	A-4, A-6	0	0	100	100	90-100	70-100	25-40	NP-15
	15-60		CL, CL-ML, ML	A-4, A-6	0	0	100	100	75-100	55-100	20-40	NP-15
42B:												
Gardena--------	0-15		CL, ML	A-4, A-6	0	0	100	100	90-100	70-100	25-40	NP-15
	15-60		CL, CL-ML, ML	A-4, A-6	0	0	100	100	75-100	55-100	20-40	NP-15
Eckman---------	0-11		ML	A-4	0	0	100	100	85-100	70-90	20-40	NP-10
	11-26		ML	A-4	0	0	100	100	85-100	55-90	20-40	NP-10
	26-60		ML, SM	A-4	0	0	100	100	65-100	40-90	20-40	NP-10
43C:												
Eckman---------	0-11		ML	A-4	0	0	100	100	85-100	70-90	20-40	NP-10
	11-26		ML	A-4	0	0	100	100	85-100	55-90	20-40	NP-10
	26-60		ML, SM	A-4	0	0	100	100	65-100	40-90	20-40	NP-10
Zell----------	0-8		CL, CL-ML, ML	A-4	0	0	100	95-100	85-100	80-100	20-30	5-10
	8-13		CL, CL-ML, ML	A-4	0	0	100	95-100	85-100	70-100	20-30	5-10
	13-60		CL, CL-ML, ML	A-4	0	0	100	95-100	85-100	60-100	15-30	NP-10
44:												
Glyndon--------	0-14		ML	A-4	0	0	100	100	95-100	70-95	20-40	NP-10
	14-29		CL-ML, ML, CL	A-4	0	0	100	100	90-100	80-95	20-30	NP-10
	29-46		CL, ML, SC, SM	A-4, A-6	0	0	100	100	85-100	35-75	10-35	NP-15
	46-60		CL, ML, SC, SM	A-4, A-6	0	0	100	100	85-100	35-75	10-35	NP-15
45:												
Bearden--------	0-10		CL, CL-ML	A-4, A-6	0	0	100	100	90-100	70-90	30-35	10-15
	10-23		CL	A-4, A-6, A-7	0	0	100	100	90-100	80-95	30-45	10-20
	23-48		CL, CL-ML	A-4, A-6, A-7	0	0	100	100	90-100	80-95	30-45	10-20
	48-60		CH, CL, CL-ML	A-6, A-7	0	0	100	100	90-100	80-95	30-65	10-40
46:												
Borup----------	0-12		ML	A-4	0	0	100	100	95-100	70-95	20-34	NP-7
	12-30		ML	A-4	0	0	100	100	90-100	60-95	0-30	NP-5
	30-60		ML	A-4	0	0	100	100	85-100	50-90	0-30	NP-5
47:												
Fossum---------	0-12		SC, SC-SM, SM	A-4	0	0	100	100	60-85	35-50	15-20	NP-10
	12-19		SM, SP-SM	A-2, A-3	0	0	100	100	60-80	5-30	---	NP
	19-60		SM, SP-SM	A-2, A-3	0	0	95-100	95-100	60-100	5-20	---	NP
50B:												
Great Bend-----	0-9		CL, CL-ML	A-7	0	0	100	100	95-100	90-100	35-45	15-20
	9-15		CL, CL-ML	A-4, A-6, A-7	0	0	100	100	95-100	85-100	30-45	10-20
	15-25		CL, CL-ML	A-4, A-6, A-7	0	0	100	100	95-100	85-100	30-45	10-20
	25-40		CL, CL-ML	A-4, A-6, A-7	0	0	100	100	95-100	85-100	30-45	10-20
	40-60		CL, CL-ML, SM	A-4, A-6, A-7	0	0	100	100	95-100	65-100	30-45	10-20

ENGINEERING INDEX PROPERTIES--Continued
Benson County Area, North
Dakota

(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
52B:												
Embden---------	0-12		CL-ML, SC, SC-SM	A-2, A-4	0	0	100	100	60-95	30-75	20-30	4-10
	12-34		CL-ML, SC, SC-SM	A-2, A-4	0	0	100	100	60-100	25-55	20-30	5-10
	34-60		CL-ML, SC, SM	A-2, A-4	0	0	100	100	50-100	15-55	15-30	NP-10
Egeland--------	0-7		SC, SC-SM	A-2, A-4	0	0	100	95-100	75-100	30-50	20-30	5-10
	7-31		SC, SC-SM	A-2, A-4	0	0	95-100	85-100	70-100	15-50	20-30	5-10
	31-60		SC-SM, SM	A-2, A-4	0	0	95-100	85-100	70-100	10-50	15-20	NP-5
53:												
Hecla----------	0-12		SC-SM, SM	A-2, A-4	0	0	100	95-100	60-85	30-50	0-25	NP-7
	12-26		SC-SM, SM, SP-SM	A-2	0	0	100	95-100	85-100	10-35	0-25	NP-7
	26-60		SC-SM, SM, SP-SM	A-2	0	0	100	95-100	85-100	10-35	0-25	NP-7
54B:												
Hecla----------	0-12		SC-SM, SM	A-2, A-4	0	0	100	95-100	60-85	30-50	0-25	NP-7
	12-26		SC-SM, SM, SP-SM	A-2	0	0	100	95-100	85-100	10-35	0-25	NP-7
	26-60		SC-SM, SM, SP-SM	A-2	0	0	100	95-100	85-100	10-35	0-25	NP-7
Maddock--------	0-21		SM	A-2, A-4	0	0	100	100	60-85	30-50	---	NP
	21-60		SM, SP-SM	A-2, A-3	0	0	95-100	95-100	60-100	5-35	---	NP
58:												
Hecla----------	0-12		SC-SM, SM, SP-SM	A-2	0	0	100	95-100	85-100	12-35	10-20	NP-5
	12-26		SC-SM, SM, SP-SM	A-2, A-3	0	0	100	95-100	85-100	5-35	10-20	NP-5
	26-60		SC-SM, SM, SP-SM	A-2, A-3	0	0	100	95-100	85-100	5-35	10-20	NP-5
Maddock--------	0-21		SC-SM, SM	A-2, A-4	0	0	100	95-100	50-80	15-35	15-20	NP-5
	21-60		SC-SM, SM, SP-SM	A-2, A-3	0	0	100	95-100	60-100	5-35	15-20	NP-3
59B:												
Maddock--------	0-21		SC-SM, SM	A-2, A-4	0	0	100	95-100	50-80	15-35	15-20	NP-5
	21-60		SC-SM, SM, SP-SM	A-2, A-3	0	0	100	95-100	60-100	5-35	15-20	NP-3
Hecla----------	0-12		SC-SM, SM, SP-SM	A-2	0	0	100	95-100	85-100	12-35	10-20	NP-5
	12-26		SC-SM, SM, SP-SM	A-2, A-3	0	0	100	95-100	85-100	5-35	10-20	NP-5
	26-60		SC-SM, SM, SP-SM	A-2, A-3	0	0	100	95-100	85-100	5-35	10-20	NP-5
59D:												
Maddock--------	0-21		SC-SM, SM	A-2, A-4	0	0	100	95-100	50-80	15-35	15-20	NP-5
	21-60		SC-SM, SM, SP-SM	A-2, A-3	0	0	100	95-100	60-100	5-35	15-20	NP-3
61:												
Renshaw--------	0-7		ML	A-4	0	0-5	95-100	90-100	70-100	50-75	20-40	NP-10
	7-16		CL, ML, SC, SC-SM	A-4, A-6	0	0-5	95-100	55-100	45-90	35-70	20-40	3-15
	16-60		GW-GM, SM, SW, SW-SM	A-1, A-2	0	0-5	45-95	30-80	10-60	0-15	0-25	NP-5
61B:												
Renshaw--------	0-7		ML	A-4	0	0-5	95-100	90-100	70-100	50-75	20-40	NP-10
	7-16		CL, ML, SC, SC-SM	A-4, A-6	0	0-5	95-100	55-100	45-90	35-70	20-40	3-15
	16-60		GW-GM, SM, SW, SW-SM	A-1, A-2	0	0-5	45-95	30-80	10-60	0-15	0-25	NP-5
63:												
Brantford------	0-8		CL, CL-ML	A-4	0	0	90-100	85-95	80-90	60-80	20-30	4-10
	8-16		CL, CL-ML	A-4, A-6	0	0	90-100	85-95	80-90	60-80	30-35	10-15
	16-60		GM, GP-GM, SM, SP-SM	A-1, A-2, A-3	0	5-25	50-95	30-75	15-60	5-30	15-20	NP-5
63B:												
Brantford------	0-8		CL, CL-ML	A-4	0	0	90-100	85-95	80-90	60-80	20-30	4-10
	8-16		CL, CL-ML	A-4, A-6	0	0	90-100	85-95	80-90	60-80	30-35	10-15
	16-60		GM, GP-GM, SM, SP-SM	A-1, A-2, A-3	0	5-25	50-95	30-75	15-60	5-30	15-20	NP-5
63C:												
Brantford------	0-8		CL, CL-ML	A-4	0	0	90-100	85-95	80-90	60-80	20-30	4-10
	8-16		CL, CL-ML	A-4, A-6	0	0	90-100	85-95	80-90	60-80	30-35	10-15
	16-60		GM, GP-GM, SM, SP-SM	A-1, A-2, A-3	0	5-25	50-95	30-75	15-60	5-30	15-20	NP-5
64:												
Divide---------	0-10		CL, CL-ML	A-4, A-6	0	0-5	95-100	95-100	85-95	60-85	25-35	5-15
	10-22		CL, CL-ML	A-6, A-7	0	0-5	95-100	75-100	55-90	35-80	30-45	10-25
	22-60		GP-GM, SM, SP-SM	A-1, A-2, A-3	0	0-5	25-100	15-100	10-70	5-25	0-15	NP-5

ENGINEERING INDEX PROPERTIES--Continued
Benson County Area, North Dakota

(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
65:												
Vang----------	0-17		CL, CL-ML, ML	A-4, A-6, A-7	0	0	100	100	85-100	60-80	25-45	5-15
	17-30		CL, ML, SC, SM	A-4, A-6, A-7	0	0	65-100	50-100	40-100	35-80	25-45	5-15
	30-60		GM, SM	A-1, A-2	0-5	5-25	50-95	30-75	15-60	15-30	0-14	NP
65B:												
Vang----------	0-17		CL, CL-ML, ML	A-4, A-6, A-7	0	0	100	100	85-100	60-80	25-45	5-15
	17-30		CL, ML, SC, SM	A-4, A-6, A-7	0	0	65-100	50-100	40-100	35-80	25-45	5-15
	30-60		GM, SM	A-1, A-2	0-5	5-25	50-95	30-75	15-60	15-30	0-14	NP
66:												
Marysland------	0-8		CL	A-4, A-6, A-7	0	0-5	95-100	95-100	85-95	50-80	25-50	10-25
	8-26		CL, SC	A-6, A-7	0	0-5	90-100	85-100	80-95	45-80	20-45	10-20
	26-60		GP-GM, SM, SP-SM	A-1, A-2, A-3	0	0-5	70-95	50-90	35-70	5-20	0-15	NP-5
67:												
Marysland------	0-8		CL	A-6, A-7	0	0	95-100	95-100	85-95	50-80	30-50	10-25
	8-26		CL, SC	A-6	0	0	90-100	85-100	80-95	45-80	20-40	10-20
	26-60		SM, SP-SM	A-3, A-1, A-2	0	0	70-95	50-90	35-70	5-20	0-14	NP
68B:												
Arvilla--------	0-8		SM, SC, SC-SM	A-2, A-4, A-6	0	0	95-100	90-100	50-80	20-45	15-30	NP-15
	8-22		SC, SC-SM, SM	A-2, A-4, A-6	0	0	90-100	85-100	50-80	20-45	15-40	NP-15
	22-60		GM, GP-GM, SP, SP-SM	A-1, A-2, A-3	0	0	35-100	25-100	10-60	0-15	---	NP
70B:												
Binford--------	0-6		SC, SC-SM, SM	A-2, A-4	0	0	95-100	95-100	60-95	30-50	15-30	NP-10
	6-24		CL, ML, SC-SM, SM	A-2, A-4	0	0	95-100	95-100	60-85	30-60	15-30	NP-10
	24-60		GM, GP-GM, SM, SP-SM	A-1, A-2	0	5-25	50-95	30-75	15-60	5-30	15-20	NP-5
71:												
Svea----------	0-12		CL, CL-ML	A-4, A-6	---	0-5	95-100	85-100	80-95	60-90	25-40	10-20
	12-22		CL, CL-ML	A-4, A-6, A-7	---	0-5	95-100	85-100	80-100	60-90	25-45	10-25
	22-60		CL, CL-ML	A-4, A-6, A-7	---	0-5	95-100	85-100	80-100	60-85	25-45	10-25
Cresbard-------	0-8		CL, ML	A-4, A-6	0	0	100	100	85-100	60-80	30-40	5-15
	8-16		CH, CL	A-6, A-7	0	0	95-100	90-100	90-100	65-85	30-60	15-30
	16-24		CH, CL	A-7	0	0	95-100	90-100	85-100	65-85	40-60	15-30
	24-60		CH, CL	A-6, A-7	---	0-5	95-100	90-100	85-100	50-80	25-55	10-27
71B:												
Svea----------	0-12		CL, CL-ML	A-4, A-6	---	0-5	95-100	85-100	80-95	60-90	25-40	10-20
	12-22		CL, CL-ML	A-4, A-6, A-7	---	0-5	95-100	85-100	80-100	60-90	25-45	10-25
	22-60		CL, CL-ML	A-4, A-6, A-7	---	0-5	95-100	85-100	80-100	60-85	25-45	10-25
Cresbard-------	0-8		CL, ML	A-4, A-6	0	0	100	100	85-100	60-80	30-40	5-15
	8-16		CH, CL	A-6, A-7	0	0	95-100	90-100	90-100	65-85	30-60	15-30
	16-24		CH, CL	A-7	0	0	95-100	90-100	85-100	65-85	40-60	15-30
	24-60		CH, CL	A-6, A-7	---	0-5	95-100	90-100	85-100	50-80	25-55	10-27
73:												
Larson---------	0-7		CL, CL-ML	A-4, A-6	0	0-5	95-100	85-100	75-100	50-90	15-40	5-20
	7-20		CL	A-6, A-7	0	0-5	95-100	85-100	75-100	60-80	30-45	10-25
	20-60		CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	85-100	75-100	50-90	15-45	5-25
Cathay---------	0-9		CL, CL-ML, ML	A-4	---	0-5	95-100	90-100	75-95	50-95	25-35	5-10
	9-25		CL	A-6	---	0-5	95-100	90-100	85-95	60-85	25-40	10-25
	25-60		CL, CL-ML, ML	A-4, A-6	---	0-5	95-100	90-100	85-95	60-75	25-40	3-25
74B:												
Cavour---------	0-10		MH, ML	A-4, A-6, A-7	0	0	100	90-100	85-100	60-85	30-55	5-20
	10-23		CH, CL, MH, ML	A-6, A-7	0	0	100	90-100	90-100	55-85	35-65	15-30
	23-60		CH, CL	A-6, A-7	---	0-5	95-100	90-100	75-100	50-85	35-65	12-35
Miranda--------	0-5		CL, CL-ML, ML	A-4, A-6	0	0	100	100	85-95	60-85	20-40	3-15
	5-22		CL	A-6, A-7	0	0-5	95-100	95-100	85-95	50-80	30-50	10-30
	22-60		CL, ML, SM	A-4, A-6, A-7	0	0-5	95-100	95-100	60-95	30-80	20-50	NP-30
75:												
Ryan----------	0-3		CH	A-7	0	0	100	100	95-100	90-95	50-75	25-50
	3-60		CH	A-7	0	0	100	100	90-100	75-100	50-75	25-50
78:												
Ladelle--------	0-17		CL, ML	A-4, A-6, A-7	0	0	100	100	90-100	75-100	30-45	7-20
	17-42		CH, CL, MH, ML	A-6, A-7	0	0	100	100	90-100	75-100	30-55	10-25
	42-60		CL, CL-ML	A-4, A-6, A-7	0	0	100	100	90-100	75-100	25-50	5-25
Aberdeen-------	0-9		CL, CL-ML	A-4, A-6	0	0	100	100	95-100	90-100	30-35	10-15
	9-26		CH, CL	A-7	0	0	100	100	95-100	90-100	45-60	20-35
	26-36		CH, CL	A-6, A-7	0	0	100	100	95-100	90-100	30-45	10-25
	36-60		CH, CL, CL-ML	A-4, A-6, A-7	0	0	100	100	95-100	85-100	20-55	4-30
82B:												
Darnen---------	0-22		CL, CL-ML, ML, OL	A-4	0	0	100	100	85-100	60-90	20-35	2-10
	22-34		CL, CL-ML	A-4, A-6, A-7	0	0	95-100	90-100	85-100	60-90	20-45	5-25
	34-60		CL, CL-ML	A-4, A-6, A-7	0	0	90-100	90-100	80-95	50-85	20-45	5-25

ENGINEERING INDEX PROPERTIES--Continued
Benson County Area, North Dakota

(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
83:												
Ladelle--------	0-17		CL, ML	A-4, A-6, A-7	0	0	100	100	90-100	75-100	30-45	7-20
	17-42		CH, CL, MH, ML	A-6, A-7	0	0	100	100	90-100	75-100	30-55	10-25
	42-60		CL, CL-ML	A-4, A-6, A-7	0	0	100	100	90-100	75-100	25-50	5-25
85:												
Lamoure--------	0-5		CL, ML	A-6, A-7	0	0	100	100	95-100	85-100	35-50	10-25
	5-12		CH, CL, MH, ML	A-7	0	0	100	100	90-100	60-100	40-70	15-35
	12-26		CL, ML	A-6, A-7	0	0	95-100	95-100	90-100	60-100	30-70	10-35
	26-60		CL, SC	A-6, A-7	0	0	95-100	95-100	70-95	35-90	30-70	10-35
86:												
Ladelle, Channeled-----	0-17		CL, ML	A-4, A-6, A-7	0	0	100	100	90-100	75-100	30-45	7-20
	17-42		CH, CL, MH, ML	A-6, A-7	0	0	100	100	90-100	75-100	30-55	10-25
	42-60		CL, CL-ML	A-4, A-6, A-7	0	0	100	100	90-100	75-100	25-50	5-25
89:												
Grano----------	0-10		CH	A-7	0	0	100	100	95-100	80-95	50-75	25-50
	10-42		CH	A-7	0	0	100	100	95-100	80-95	50-75	25-50
	42-60		CH, CL	A-7	0	0	100	100	90-100	75-95	40-75	20-50
90:												
Parnell, Ponded	0-14		CH, CL, OL	A-7	0	0	100	95-100	90-100	80-100	40-55	20-35
	14-36		CH, CL	A-7	0	0	100	95-100	90-100	85-100	50-65	30-40
	36-60		CH, CL, CL-ML	A-6, A-7	0	0-1	100	95-100	85-100	60-100	35-65	15-40
Lallie, Ponded-	0-2		CL, CL-ML	A-6, A-7, A-4	0	0	100	100	95-100	60-95	25-45	5-25
	2-60		CH, CL, MH, ML	A-6, A-7	0	0	100	95-100	90-100	85-100	35-95	15-60
91C:												
Sioux----------	0-5		GM, SM	A-2, A-4	0	0-5	60-90	50-80	45-70	25-50	20-35	NP-7
	5-9		GM, SM	A-1, A-2, A-4	0	0-5	60-90	50-80	45-70	15-50	20-35	NP-7
	9-60		GM, GP, SM, SP	A-1	0	0-5	25-75	20-60	5-35	0-25	0-25	NP-5
91E:												
Sioux----------	0-5		GM, SM	A-2, A-4	0	0-5	60-90	50-80	45-70	25-50	20-35	NP-7
	5-9		GM, SM	A-1, A-2, A-4	0	0-5	60-90	50-80	45-70	15-50	20-35	NP-7
	9-60		GM, GP, SM, SP	A-1	0	0-5	25-75	20-60	5-35	0-25	0-25	NP-5
98C:												
Coe----------	0-7		GC-GM, GM, SC-SM, SM	A-2, A-4	0	0-10	50-80	40-70	30-60	25-50	15-30	NP-10
	7-60		GM, GP-GM, SM, SP-SM	A-1, A-2, A-3	0	5-25	50-95	30-75	15-60	5-30	15-20	NP-3
98E:												
Coe----------	0-7		GC-GM, GM, SC-SM, SM	A-2, A-4	0	0-10	50-80	40-70	30-60	25-50	15-30	NP-10
	7-60		GM, GP-GM, SM, SP-SM	A-1, A-2, A-3	0	5-25	50-95	30-75	15-60	5-30	15-20	NP-3
99C:												
Claire---------	0-5		SM, SP-SM	A-1, A-2-4, A-3	0	0	95-100	95-100	30-75	5-15	0-20	NP
	5-42		SM, SP-SM	A-1, A-2-4, A-3	0	0	95-100	95-100	30-75	5-15	0-20	NP
	42-60		SC, SC-SM	A-4, A-6	0	0	90-100	85-100	80-90	35-50	20-35	5-15
101:												
Lallie---------	0-2		CL, CL-ML, ML	A-4, A-6	0	0	100	100	85-100	60-90	20-40	3-20
	2-60		CH, CL	A-7	0	0	100	95-100	90-100	85-100	40-95	20-60
104:												
Lallie, Saline-	0-2		CL, CL-ML	A-4, A-6	0	0	100	100	85-100	60-90	25-40	5-20
	2-60		CH, CL	A-7	0	0	100	95-100	90-100	85-100	45-95	20-60
106:												
Lallie, Wet----	0-2		CL, CL-ML	A-4, A-6, A-7	0	0	100	100	95-100	60-95	25-45	5-25
	2-60		ML, CH, CL, MH	A-6, A-7	0	0	100	95-100	90-100	85-100	35-95	15-60
107:												
Minnewaukan----	0-5		SM	A-2	0	0	90-100	70-100	50-85	15-30	0-20	NP-10
	5-60		SM, SP-SM	A-2, A-3	0	0	90-100	70-100	60-100	5-35	0-20	NP-10
109:												
Aquents--------	0-2		CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	85-100	60-90	25-40	5-20
	2-60		CL, CL-ML	A-4, A-6, A-7	0-1	0-5	90-100	85-100	75-95	55-80	25-45	5-25
110B:												
Aastad---------	0-18		CL, ML	A-6, A-7	0	0-5	95-100	90-100	80-95	50-75	35-45	10-20
	18-38		CL	A-7	0	0-5	95-100	85-100	75-95	50-75	40-50	15-25
	38-60		CL	A-6, A-7	0	0-5	90-100	85-100	75-95	55-75	35-50	12-25
Bottineau------	0-9		CL	A-6, A-7	---	0-5	95-100	90-100	85-95	60-75	25-45	15-25
	9-19		CL	A-6, A-7	---	0-5	95-100	90-100	80-100	65-85	35-50	15-25
	19-60		CL	A-6, A-7	---	0-5	95-100	90-100	80-100	65-85	35-50	15-25
112F:												
Edgeley Variant	0-11		CL, CL-ML, ML	A-4, A-6	---	0-5	95-100	95-100	85-95	60-75	20-40	5-25
	11-24		CL, CL-ML, ML	A-7, A-4, A-6	---	0-5	85-100	75-100	65-95	55-95	20-50	5-30
	24-60		GM, GP-GM, SM, SP-SM	A-1, A-2	---	5-25	50-90	40-85	25-55	10-30	0-14	NP

ENGINEERING INDEX PROPERTIES--Continued
Benson County Area, North Dakota

(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
113C:												
Bottineau------	0-9		CL	A-6, A-7	---	0-5	95-100	90-100	85-95	60-75	25-45	15-25
	9-19		CL	A-6, A-7	---	0-5	95-100	90-100	80-100	65-85	35-50	15-25
	19-60		CL	A-6, A-7	---	0-5	95-100	90-100	80-100	65-85	35-50	15-25
113D:												
Bottineau------	0-9		CL	A-6, A-7	---	0-5	95-100	90-100	85-95	60-75	25-45	15-25
	9-19		CL	A-6, A-7	---	0-5	95-100	90-100	80-100	65-85	35-50	15-25
	19-60		CL	A-6, A-7	---	0-5	95-100	90-100	80-100	65-85	35-50	15-25
119:												
Aberdeen-------	0-9		CH, CL	A-7	0	0	100	100	95-100	90-100	35-45	15-20
	9-26		CH, CL	A-7	0	0	100	100	95-100	90-100	45-60	20-35
	26-36		CH, CL	A-6, A-7	0	0	100	100	95-100	90-100	30-45	10-25
	36-60		CH, CL, CL-ML	A-4, A-6, A-7	0	0	100	100	95-100	85-100	20-55	4-30
122:												
Fram----------	0-13		ML	A-4	---	0-1	95-100	95-100	85-100	60-90	20-40	NP-10
	13-60		ML, SM	A-4	---	0-1	95-100	90-100	60-100	35-90	20-40	NP-10
Cathay---------	0-9		CL, CL-ML, ML	A-4	---	0-5	95-100	90-100	75-95	50-95	25-35	5-10
	9-25		CL	A-6	---	0-5	95-100	90-100	85-95	60-85	25-40	10-25
	25-60		CL, CL-ML, ML	A-4, A-6	---	0-5	95-100	90-100	85-95	60-75	25-40	3-25
123:												
Emrick---------	0-12		ML	A-4	0-1	0-1	95-100	95-100	85-100	60-90	0-40	NP-10
	12-34		ML	A-4	0-1	0-1	95-100	95-100	85-95	55-75	0-40	NP-10
	34-60		ML, SC, SM	A-4, A-6	0-1	0-5	90-100	90-100	60-100	35-90	0-40	NP-10
Cathay---------	0-9		CL, CL-ML, ML	A-4	---	0-5	95-100	90-100	75-95	50-95	25-35	5-10
	9-25		CL	A-6	---	0-5	95-100	90-100	85-95	60-85	25-40	10-25
	25-60		CL, CL-ML, ML	A-4, A-6	---	0-5	95-100	90-100	85-95	60-75	25-40	3-25
123B:												
Emrick---------	0-12		ML	A-4	0-1	0-1	95-100	95-100	85-100	60-90	0-40	NP-10
	12-34		ML	A-4	0-1	0-1	95-100	95-100	85-95	55-75	0-40	NP-10
	34-60		ML, SC, SM	A-4, A-6	0-1	0-5	90-100	90-100	60-100	35-90	0-40	NP-10
Cathay---------	0-9		CL, CL-ML, ML	A-4	---	0-5	95-100	90-100	75-95	50-95	25-35	5-10
	9-25		CL	A-6	---	0-5	95-100	90-100	85-95	60-85	25-40	10-25
	25-60		CL, CL-ML, ML	A-4, A-6	---	0-5	95-100	90-100	85-95	60-75	25-40	3-25
124C:												
Heimdal--------	0-8		ML	A-4	0-1	0-1	95-100	95-100	85-100	60-90	20-40	NP-10
	8-19		ML	A-4	0-1	0-1	95-100	95-100	85-95	60-75	20-40	NP-10
	19-60		CL, ML, SC, SM	A-4, A-6	0-1	0-5	95-100	90-100	60-100	35-90	20-40	NP-15
Sioux----------	0-5		CL, ML	A-4, A-6	0	0-5	95-100	85-100	70-90	55-75	30-40	5-15
	5-9		GM, SM	A-1, A-2, A-4	0	0-5	60-90	50-80	45-70	15-50	20-35	NP-7
	9-60		GM, GP, SM, SP	A-1	0	0-5	25-75	20-60	5-35	0-25	0-25	NP-5
125C:												
Heimdal, Very Stony---------	0-8		ML	A-4	0-1	0-15	95-100	95-100	85-100	60-90	20-40	NP-10
	8-19		ML	A-4	0-1	0-10	95-100	95-100	85-95	60-75	20-40	NP-10
	19-60		CL, ML, SC, SM	A-4, A-6	0-1	0-10	95-100	90-100	60-100	35-90	20-40	NP-15
Emrick, Very Stony---------	0-12		ML	A-4	0-10	1-15	95-100	95-100	85-100	60-90	0-40	NP-10
	12-34		ML	A-4	0-5	1-10	95-100	95-100	85-95	55-75	0-40	NP-10
	34-60		ML, SM	A-4	0-3	1-10	95-100	95-100	60-100	35-90	0-40	NP-10
125F:												
Heimdal, Very Stony---------	0-8		ML	A-4	0-1	0-15	95-100	95-100	85-100	60-90	20-40	NP-10
	8-19		ML	A-4	0-1	0-10	95-100	95-100	85-95	60-75	20-40	NP-10
	19-60		CL, ML, SC, SM	A-4, A-6	0-1	0-10	95-100	90-100	60-100	35-90	20-40	NP-15
Esmond, Very Stony---------	0-9		ML	A-4	---	1-15	95-100	95-100	85-100	60-90	20-40	NP-10
	9-60		CL, ML, SC, SM	A-4, A-6	---	1-10	90-100	85-100	60-100	35-90	20-40	NP-15
126:												
Fram, Saline---	0-13		ML	A-4	---	0-1	95-100	95-100	85-100	60-90	20-40	NP-10
	13-60		ML, SM	A-4	---	0-1	95-100	95-100	60-100	35-90	20-40	NP-10
127:												
Fram----------	0-13		ML	A-4	---	0-1	95-100	95-100	85-100	60-90	20-40	NP-10
	13-60		ML, SM	A-4	---	0-1	95-100	90-100	60-100	35-90	20-40	NP-10
129:												
Colvin, Saline-	0-12		CL	A-6	0	0	100	100	90-100	80-95	20-35	10-20
	12-60		CL	A-6, A-7	0	0	100	100	90-100	80-95	20-50	10-30
Borup, Saline--	0-12		ML	A-4	0	0	100	100	95-100	70-95	20-34	NP-7
	12-30		ML	A-4	0	0	100	100	90-100	80-95	20-30	NP-7
	30-60		CL-ML, ML	A-4	0	0	100	100	85-100	50-90	15-30	NP-7
131D:												
Miranda Variant	0-1		CL	A-6, A-7	0	0	95-100	90-100	85-100	60-75	30-45	10-25
	1-42		CH, CL	A-7	0	0	95-100	90-100	85-100	70-100	40-75	20-45
	42-60				---	---	---	---	---	---	---	---

ENGINEERING INDEX PROPERTIES--Continued
Benson County Area, North Dakota

(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
133:												
Fordville------	0-10		CL, ML	A-4, A-6, A-7	0	0	100	100	70-85	55-75	30-45	5-20
	10-20		CL, ML	A-4, A-6, A-7	0	0	100	95-100	70-95	55-80	30-45	5-20
	20-24		SM, CL, ML, SC	A-4, A-6	0	0	95-100	90-100	65-90	40-55	25-40	3-15
	24-60		SM, SW, SW-SM	A-1	0	0	65-95	45-90	15-45	0-15	0-25	NP-5
134:												
Borup----------	0-12		ML	A-4	0	0	100	100	95-100	70-95	20-34	NP-7
	12-30		ML	A-4	0	0	100	100	90-100	60-95	0-30	NP-5
	30-60		ML	A-4	0	0	100	100	85-100	50-90	0-30	NP-5
Vallers--------	0-9		CL-ML, ML	A-4	0-1	0-5	95-100	90-100	80-90	50-80	30-40	4-10
	9-22		CL	A-6	0-1	0-5	95-100	90-100	80-95	50-80	30-40	11-20
	22-60		CL, CL-ML	A-6, A-4	0-1	0-5	95-100	90-100	85-95	60-85	20-40	5-20
135:												
Miranda--------	0-5		CL, CL-ML, ML	A-4, A-6	0	0	100	100	85-95	60-85	20-40	3-15
	5-22		CL	A-6, A-7	0	0-5	95-100	95-100	85-95	50-80	30-50	10-30
	22-60		CL, ML, SM	A-4, A-6, A-7	0	0-5	95-100	95-100	60-95	30-80	20-50	NP-30
Larson---------	0-7		CL, CL-ML	A-4, A-6	0	0-5	95-100	85-100	75-100	50-90	15-40	5-20
	7-20		CL	A-6, A-7	0	0-5	95-100	85-100	75-100	60-80	30-45	10-25
	20-60		CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	85-100	75-100	50-90	15-45	5-25
137:												
Stirum---------	0-9		SM	A-2, A-4	0	0	100	100	50-80	20-40	0-14	NP
	9-18		CL, ML, SC, SM	A-2, A-4	0	0	100	100	60-95	30-75	15-30	NP-10
	18-60		CL, ML, SC, SM	A-2, A-4, A-6	0	0	100	100	50-100	15-90	0-30	NP-15
140B:												
Svea----------	0-12		CL, CL-ML	A-4, A-6	---	0-5	95-100	85-100	80-95	60-90	25-40	10-20
	12-22		CL, CL-ML	A-4, A-6, A-7	---	0-5	95-100	85-100	80-100	60-90	25-45	10-25
	22-60		CL, CL-ML	A-4, A-6, A-7	---	0-5	95-100	85-100	80-100	60-85	25-45	10-25
Buse----------	0-8		CL, CL-ML	A-4, A-6	0	0-5	90-100	85-95	70-95	55-90	25-35	10-15
	8-60		CL, CL-ML	A-4, A-6, A-7	0	0-5	90-100	85-100	70-90	55-85	25-45	10-25
141:												
Embden---------	0-12		CL-ML, SC, SC-SM	A-2, A-4	0	0	100	100	60-95	30-75	20-30	4-10
	12-34		CL-ML, SC, SC-SM	A-2, A-4	0	0	100	100	60-100	25-55	20-30	5-10
	34-60		CL-ML, SC, SM	A-2, A-4	0	0	100	100	50-100	15-55	15-30	NP-10
Letcher--------	0-10		SC-SM, SM	A-4	0	0	100	100	60-95	35-50	15-30	NP-7
	10-23		SC-SM, SM	A-2, A-4	0	0	100	100	60-95	20-45	15-30	NP-7
	23-39		CL, ML, SC, SM	A-2, A-4, A-6	0	0	100	100	60-95	30-60	25-40	3-18
	39-60		CL, ML, SC, SM	A-2, A-4, A-6	0	0	100	95-100	50-95	30-60	25-40	3-18
144:												
Hamerly--------	0-8		CL, CL-ML	A-4, A-6	0	0-5	95-100	90-100	80-95	60-90	20-40	5-20
	8-22		CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-75	20-45	5-25
	22-60		CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	75-95	55-75	20-45	5-25
Cresbard-------	0-8		CL, ML	A-4, A-6	0	0	100	100	85-100	60-80	30-40	5-15
	8-16		CH, CL	A-6, A-7	0	0	95-100	90-100	90-100	65-85	30-60	15-30
	16-24		CH, CL	A-7	0	0	95-100	90-100	85-100	65-85	40-60	15-30
	24-60		CH, CL	A-6, A-7	---	0-5	95-100	90-100	85-100	50-80	25-55	10-27
144B:												
Hamerly--------	0-8		CL, CL-ML	A-4, A-6	0	0-5	95-100	90-100	80-95	60-90	20-40	5-20
	8-22		CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-75	20-45	5-25
	22-60		CL, CL-ML	A-7, A-4, A-6	0	0-5	95-100	90-100	75-95	55-75	20-45	5-25
Cresbard-------	0-8		CL, ML	A-4, A-6	0	0	100	100	85-100	60-80	30-40	5-15
	8-16		CH, CL	A-6, A-7	0	0	95-100	90-100	90-100	65-85	30-60	15-30
	16-24		CH, CL	A-7	0	0	95-100	90-100	85-100	65-85	40-60	15-30
	24-60		CH, CL	A-6, A-7	---	0-5	95-100	90-100	85-100	50-80	25-55	10-27
145:												
Grano, Saline--	0-10		CH	A-7	0	0	100	100	95-100	80-95	50-75	25-50
	10-60		CH, CL	A-7	0	0	100	100	90-100	75-95	40-75	20-50
146:												
Hamerly--------	0-8		CL, CL-ML	A-4, A-6	0	0-5	95-100	90-100	80-95	60-90	20-40	5-20
	8-22		CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-75	20-45	5-25
	22-60		CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	75-95	55-75	20-45	5-25
Tonka----------	0-22		CL, CL-ML	A-4, A-6	0-1	0-2	100	95-100	90-100	70-90	35-45	15-25
	22-38		CH, CL	A-6, A-7	0-1	0-2	100	95-100	90-100	75-95	50-60	30-40
	38-60		CL, CL-ML	A-4, A-6, A-7	0-1	0-3	90-100	85-100	60-100	50-90	35-55	15-30
149B:												
Maddock--------	0-21		SC-SM, SM	A-2, A-4	0	0	100	95-100	50-80	15-35	15-20	NP-5
	21-60		SC-SM, SM, SP-SM	A-2, A-3	0	0	100	95-100	60-100	5-35	15-20	NP-3
150:												
Pits, Gravel---	0-6		GW-GM, SW-SM	A-1, A-3	0	0-5	25-90	10-65	5-35	0-25	0-15	NP-5
	6-60		GW-GM, SW-SM	A-1, A-3	0	0-10	25-90	10-65	5-35	0-25	0-15	NP-5
W:												
Water----------	---	---	---	---	---	---	---	---	---	---	---	---