

FIGURE 1.—Index map of Delaware showing location of the Ellendale quadrangle

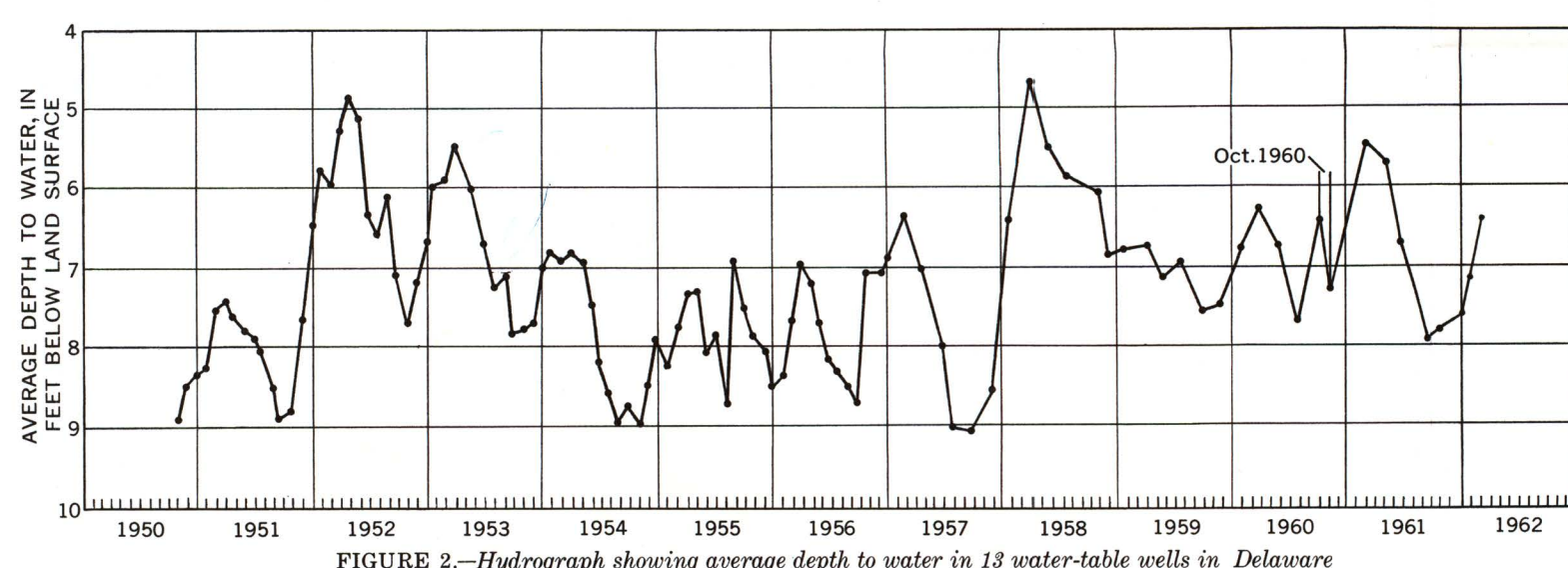


FIGURE 2.—Hydrograph showing average depth to water in 13 water-table wells in Delaware

TABLE 2.—Soils classification

[illegible]

in which: a = That portion of the percentage passing No. 200 sieve greater than 15 percent and not exceeding 75 percent, expressed as a positive whole number 1 to 40;  
b = That portion of the percentage passing No. 200 sieve greater than 15 percent and not exceeding 55 percent, expressed as a positive whole number 1 to 40;  
c = That portion of the numerical liquid plasticity index greater than 40 and not exceeding 60, expressed as a positive whole number 1 to 30;  
d = That portion of the numerical plasticity index greater than 10 and not exceeding 30, expressed as a positive whole number 1 to 30.

TABLE 2.—Results of laboratory analyses of soil samples

Liquid limit: $N_L$ sensitive										Plasticity index: $N_P$ , sensitive				
Sample type	Depth of interval site nos.	Depth of interval (inches)	Mechanical analysis						Liquid limit (%)	Plasticity index (%)	Moisture-density Maximum optimum density <sup>1</sup> moistured, thi. per (percent by weight)	Classifi- cation	Map symbol	
			Cumulative weight passing sieve											Percent by weight retained on No. 200 (0.075mm.)
			3/16 in. (4.75 mm.)	No. 4 (4.75 mm.)	No. 10 (2.0 mm.)	No. 40 (0.425 mm.)	No. 60 (0.25 mm.)	No. 100 (0.15 mm.)						
212	0-10	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0	AM2	
	10-20	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
	20-30	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
214	0-10	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0	AM1	
	10-20	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
	20-30	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
215	0-10	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0	AM2	
	10-20	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
	20-30	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
217	0-10	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0	AM2	
	10-20	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
	20-30	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
218	0-10	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0	AM2	
	10-20	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
	20-30	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
1A	0-10	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0	AM2	
	10-20	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
	20-30	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
1C	0-10	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0	AM2	
	10-20	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
	20-30	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
1E	0-10	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0	AM2	
	10-20	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
	20-30	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
2A	0-10	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0	AM2	
	10-20	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
	20-30	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
2B	0-10	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0	AM2	
	10-20	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
	20-30	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
2C	0-10	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0	AM2	
	10-20	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
	20-30	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
2E	0-10	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0	AM2	
	10-20	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
	20-30	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
3B	0-10	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0	AM2	
	10-20	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
	20-30	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
3C	0-10	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0	AM2	
	10-20	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
	20-30	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
4D	0-10	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0	AM2	
	10-20	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
	20-30	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
4A	0-10	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0	AM2	
	10-20	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
	20-30	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
4B	0-10	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0	AM2	
	10-20	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
	20-30	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
4C	0-10	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0	AM2	
	10-20	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
	20-30	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
4E	0-10	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0	AM2	
	10-20	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
	20-30	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
5A	0-10	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0	AM2	
	10-20	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
	20-30	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
5B	0-10	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0	AM2	
	10-20	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
	20-30	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
5C	0-10	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0	AM2	
	10-20	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
	20-30	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
5D	0-10	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0	AM2	
	10-20	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
	20-30	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
6A	0-10	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0	AM2	
	10-20	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
	20-30	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
6B	0-10	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0	AM2	
	10-20	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
	20-30	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
6C	0-10	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0	AM2	
	10-20	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
	20-30	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
6D	0-10	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0	AM2	
	10-20	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		
	20-30	100	99.6	98.9	98.0	94.9	84.2	1	14	NP	NP	A-3-0		

TABLE 4.—*Characteristics of the engineering soil types in the Ellendale quadrangle*

Soil type <sup>1</sup>	Description	Origin	Engineering properties				Suitable compaction equipment
			In place	Disturbed <sup>2</sup>			
			Suitability as a subgrade	Suitability as a wearing surface	Suitability as an embankment material	Compaction characteristics	
A-M14	Nonplastic to slightly plastic, generally silty soil.	Fluvial deposits of Pleistocene age.	Excellent if material left after grading is predominantly A-4. Poor if material left after grading is predominantly A-4.	Good if surface is A-4. Poor if material left after grading is predominantly A-4.	Excellent if pre-dominant material is A-4. Poor if pre-dominant material is A-4.	Excellent if pre-dominant material is A-4. Poor if pre-dominant material is A-4.	Roller-tired equipment.
A-M2	Nonplastic to slightly plastic, sandy soils.	Fluvial deposits of Pleistocene age.	Good	Excellent to good depending on binder present.	Good	Good	Roller-tired equipment.
A-M21	Nonplastic, generally poorly graded sandy soils.	Fluvial deposits of Pleistocene age.	Good to fair.	Excellent to good depending on binder present. If surface is A-2-1, Pair if pre-dominant material is A-2.	Good if pre-dominant material is A-2. Pair if pre-dominant material is A-2.	Good if pre-dominant material is A-2. Pair if pre-dominant material is A-2. Vibratory equipment for soils which are predominantly A-4.	Roller-tired equipment for soils which are predominantly A-4. Vibratory equipment for soils which are predominantly A-4.
A-M24	Nonplastic to slightly plastic, sandy and silty soil.	Fluvial deposits of Pleistocene age.	Good if material left after grading is predominantly A-4. Pair if material left after grading is predominantly A-4.	Excellent to good depending on binder present. If surface is A-2, Pair if pre-dominant material is A-2.	Good if pre-dominant material is A-2. Pair if pre-dominant material is A-2.	Good if pre-dominant material is A-2. Pair if pre-dominant material is A-2.	Roller-tired equipment.
A-M26	Nonplastic to highly plastic, sandy and clayey soil.	Fluvial deposits of Pleistocene age.	Good if material left after grading is predominantly A-4. Poor if material left after grading is predominantly A-4. Pair if material left after grading is predominantly A-4.	Good if surface is A-4. Poor if surface is poorly graded. Very poor if surface is poorly graded A-6.	Pair if pre-dominant material is A-4. Poor if pre-dominant material is A-4.	Pair if pre-dominant material is A-4. Poor if pre-dominant material is A-4.	Roller-tired equipment for soils which are predominantly A-4. Vibratory equipment for soils which are predominantly A-4.
A-M28	Slightly plastic to highly plastic, clayey and clay soil.	Fluvial, alluvial, and lacustrine deposits of Pleistocene age.	Good if material left after grading is predominantly A-4. Poor if material left after grading is predominantly A-4.	Good if surface is A-4. Poor if surface is poorly graded. Very poor if surface is A-6.	Pair if pre-dominant material is A-4. Poor if pre-dominant material is A-4.	Pair if pre-dominant material is A-4. Poor if pre-dominant material is A-4.	Roller-tired equipment for soils which are predominantly A-4. Vibratory equipment for soils which are predominantly A-4.
A-M3	Alternating gravel, sand, silt, and clay.	Alterations of fluvial age.	Variable	Variable	Variable	Variable	Variable.
M-TM	Silt rich in organic material and frequently poorly drained. May be underlain at shallow depths by gravel, sand, and clay.	Recent age.	Variable	Variable	Variable	Variable	Variable.
Z	Silt rich in organic material and frequently poorly drained. May be underlain at shallow depths by gravel, sand, and clay.	Swamp deposits of Recent age.	Variable	Variable	Variable	Variable	Variable.

<sup>1</sup>Two different soil types may be combined into a single map symbol (AM2/24), but the engineering characteristics of the individual soil types are described separately.