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Harlan County Test Hole Logs

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HARLAN COUNTY
Test-Hole Logs

Raymond R. Burchett and Scott E. Summerside

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The Conservation and Survey Division of the University of Nebraska is the agency designated by statute to investigate and interpret the geologically related natural resources of the state, to make available to the public the results of these investigations, and to assist in the development and conservation of these resources.

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Publication and price lists are furnished upon request.

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INTRODUCTION

In 1930, the Conservation and Survey Division of the University of Nebraska and the U.S. Geological Survey began a program of cooperative groundwater studies in Nebraska. Since then test drilling by use of rotary drilling equipment has been an integral part of that program. This report contains logs of all the test holes drilled in the county under the program as well as those drilled by the Conservation and Survey Division with financial assistance from other government agencies.

The map in this report shows the location of all test holes drilled in the county since 1930.

Present techniques of test-hole logging and sampling include use of drilling mud suitable to drilling conditions, timing by stopwatch of the drilling of each 5-foot increment of depth, and removal of all cuttings from the test hole at intervals of 5 feet or less. During the drilling of the hole, cuttings from each interval are examined immediately; samples representing each 5-foot interval and each recognizable change in material are retained. After samples are washed, they are described lithologically and the color is evaluated by comparison with standard color charts. The samples then are dried, stored, and cataloged. Beginning in September 1951, the test holes have been logged electrically. All samples are processed and kept on open file in the offices of Conservation and Survey Division, 113 Nebraska Hall, University of Nebraska-Lincoln, 68588.

This publication is one of a series being issued to make more readily available the record of test holes drilled since 1930. The series of publications is made on a county basis and includes, with some exceptions, logs of all test holes drilled in each of the counties. The logs have not been reviewed for conformance with editorial standards and nomenclature.

The method whereby the altitude of the land surface at testhole sites was determined is indicated in the heading of each log, as follows: a = altimeter, h = hand leveling, i = spirit leveling, t = estimated from topographic map.

The test-hole records accurately reflect subsurface conditions only at the locations where the test holes were drilled. Interpretive data reflecting probable subsurface conditions between test-holes are being compiled for publication in county reports and are available for inspection in the office of the Conservation and Survey Division.

Each test hole is identified by a number assigned in the field (for example #3-B-67, #41-79), and most are also identified by a number indicating its location within the land divisions of the U.S. Bureau of Land Management's survey of Nebraska. Location numbers of test holes east of the 6th principal meridian, which passes through Columbus in a north-south direction, are preceded by the capital letter A; those west of the principal meridian have no preceding letter. The first numeral indicates the township, the second the range, and the third the section. As shown in figure 1, the letters that follow the section number indicate the location of the test hole within the section, the first letter indicating the quarter section and the second letter indicating the quarter-quarter section. The letters A, B, C, and D are applied in counterclockwise direction beginning with A in the northeast quadrant. The last numeral is the serial number of the test hole within the quarter-quarter section. No number is shown unless more than one test hole is within the given quarter-quarter section.

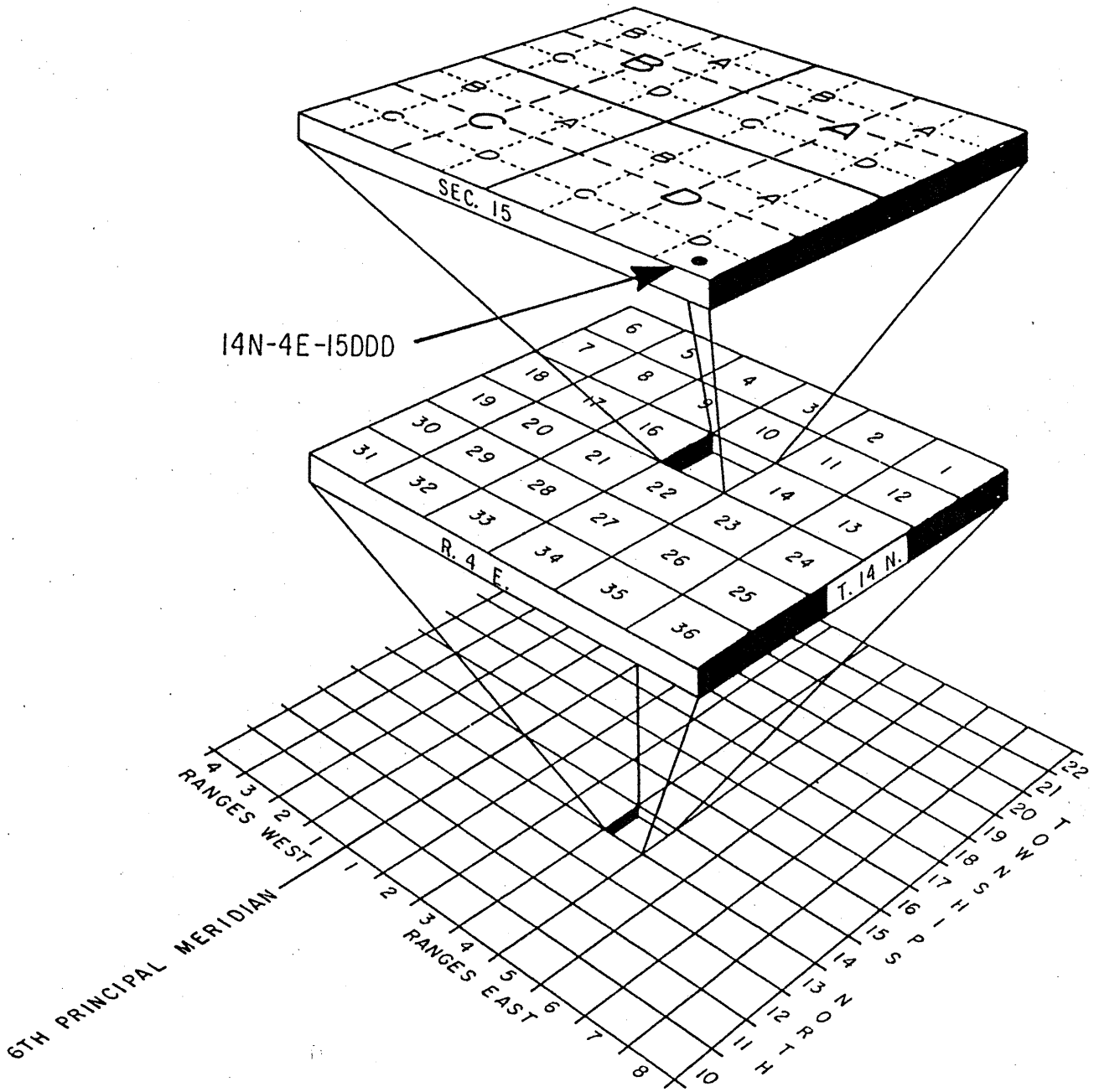

Fig. 1. System for identifying test-holes according to their location.

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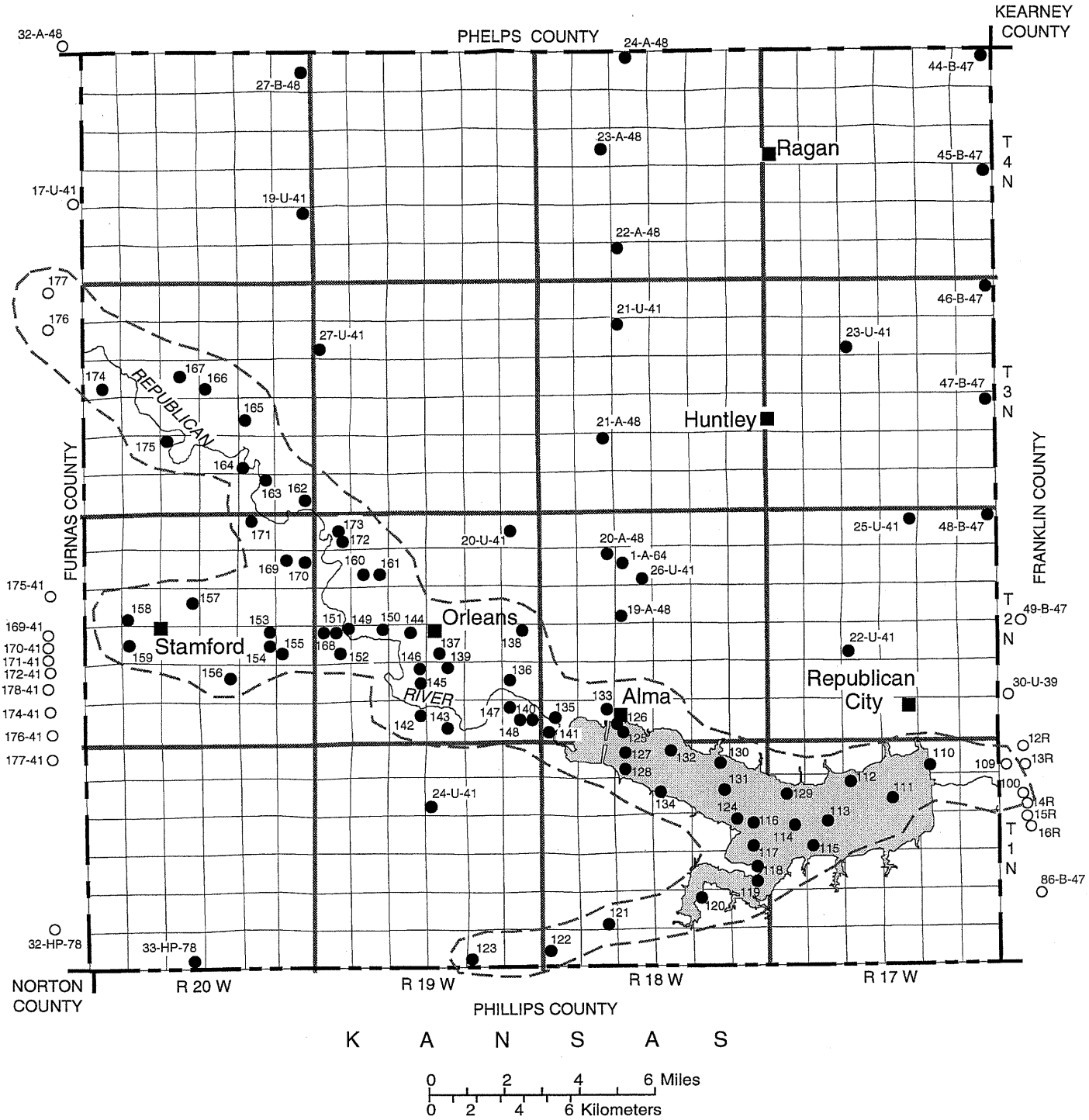
Test-hole logs are arranged in this publication by township, range and section.



● Test hole description published in this report

○ Test hole description published in other report

#100-A-39 to #177-A-39

Fig. 2 Test-hole location map of Harlan County.

Test Hole #110-A-39
(1-17-2ccbc)
Harlan County

Location: SW NW SW SW Sec. 2, T. 1 N., R. 17 W., 0.15 mile north of southwest corner on east edge of road.
Ground elevation: 1,928.0 feet (t). (Republican City 7.5 min. quadrangle)
Depth to water: caved at 39 feet, (October 3, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Road fill	0.0	2.0
Sand, clayey, buff	2.0	23.0
Sand, clayey, gray	23.0	27.0
Gravel, fine to medium	27.0	40.0
Gravel, medium, good	40.0	53.0
Cretaceous System - Upper Cretaceous Series - Colorado Group:		
Niobrara Formation:		
Shale, gray	53.0	58.0

Test Hole #CD(A-1)
(1-17-2bbd)
Harlan County

Location: C SE NW NW Sec. 2, 1 N., R. 17 W., 0.2 mile east and 0.2 mile south of northwest corner of section.
Ground elevation: 1,995 feet (t). (Republican City 7.5 min. quadrangle)
Depth to water: not measured

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Loam, silty, clay	0.0	12.0
Loam, clayey	12.0	31.0
Loam, sandy	31.0	40.0
Loam, silty clay	40.0	49.0
Loam, sandy clay	49.0	62.0
Loam, sandy	62.0	70.0
Sand	70.0	83.0
Clay, medium	83.0	91.0
Cretaceous System - Upper Cretaceous Series - Colorado Group:		
Niobrara Formation:		
Shale, medium hard, silty, calcareous	91.0	141.0

Test Hole #129-A-39
(1-17-7bdca)
Harlan County

Location: NE SW SE NW Sec. 7, T. 1 N., R. 17 W., 0.12 mile south of railroad, 100 ft. east of abandoned brown house.
Ground elevation: 1,909.0 feet (t). (Alma 7.5 min. quadrangle)
Depth to water: 10.4 feet, (October 14, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil and buff sand, some clay.....	0.0	4.0
Sand and fine gravel.....	4.0	9.0
Gravel, fine, some sand.....	9.0	15.0
Gravel, medium, gray.....	15.0	20.0
Cretaceous System - Upper Cretaceous Series - Colorado Group:		
Niobrara Formation:		
Shale, gray.....	20.0	27.0

Test Hole #112-A-39
(1-17-9bbab)
Harlan County

Location: NW NE NW NW Sec. 9, T. 1 N., R. 17 W., 0.15 mile east of northwest corner.
Ground elevation: 1,943.0 feet (t). (Alma 7.5 min. quadrangle)
Depth to water: caved at 31.5 feet, (October 3, 1939)

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil	0.0	2.0
Sand, clayey, buff	2.0	22.0
Sand, clayey, light chocolate gray, (loess-like)	22.0	30.0
Sand, coarse, clayey, gray	30.0	37.0
Gravel, medium, yellow, some clay	37.0	45.0
Cretaceous System - Upper Cretaceous Series:		
Pierre Formation:		
Shale, greenish black	45.0	49.0

Test Hole #111-A-39
(1-17-10cbbc)
Harlan County

Location: SW NW NW SW Sec. 10, T. 1 N., R. 17 W., 0.12 mile south of northwest corner of quarter, east side of road.
Ground elevation: 1,910.0 feet (t). (Republican City 7.5 min. quadrangle)
Depth to water: 11.5 feet, (October 3, 1939).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil, sandy	0.0	3.0
Sand, buff	3.0	6.0
Clay, sandy, dark brown	6.0	9.0
Sand, fine, buff	9.0	12.0
Gravel, fine to medium, water-worn shale	12.0	18.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, dark greenish black	18.0	19.0

Test Hole #CD(A-2)
(1-17-11bdca)
Harlan County

Location: NE SW SE NW Sec. 11, 1 N., R. 17 W., 0.4 mile south and 0.4 mile east of northwest corner of section.
Ground elevation: 1,885 feet (t). (Republican City 7.5 min. quadrangle)
Depth to water: not measured.

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Loam	0.0	3.0
Loam, silty	3.0	5.0
Sand	5.0	8.0
Sand, gravelly	8.0	10.0
Clay, lean	10.0	13.0
Cretaceous System - Upper Cretaceous Series - Colorado Group:		
Niobrara Formation:		
Shale, soft, silty, calcareous	13.0	56.0

Test Hole #CD(A-3)
(1-17-14caab)
Harlan County

Location: NW NE NE SW Sec. 14, T. 1 N., R. 17 W., 0.5 mile south and 0.4 mile east of northwest corner of section.
Ground elevation: 1,985.0 feet (t). (Republican City 7.5 min. quadrangle)
Depth to water: not measured.

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Loam, clayey	0.0	2.0
Loam	2.0	8.0
Loam, silty	8.0	9.0
Loam, clayey	9.0	11.0
Loam	11.0	15.0
Loam, clayey	15.0	19.0
Loam, silty clay	19.0	22.0
Loam, sandy	22.0	29.0
Sand, gravelly	29.0	34.0
Sand	34.0	42.0
Clay, medium	42.0	52.0
Clay, lean	52.0	58.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, medium hard, waxey	58.0	126.0

Test Hole #113-A-39
(1-17-17aab)
Harlan County

Location: Northwest corner of NE NE Sec. 17, T. 1 N., R. 17 W., 0.2 mile south of bridge at end of north-south road.
Ground elevation: 1,892.0 feet. (t). (Alma 7.5 min. quadrangle)
Depth to water: dry at 5.5 ft. (October 3, 1939).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil, sandy.....	0.0	2.0
Soil, black.....	2.0	3.0
Sand, brownish gray.....	3.0	5.0
Gravel and water-worn shale.....	5.0	6.0
Cretaceous System - Upper Cretaceous Series - Colorado Group:		
Niobrara Formation:		
Shale, gray	6.0	8.0

Test Hole #115-A-39
(1-17-17cdcb)
Harlan County

Location: NW SW SE SW Sec. 17, T. 1 N., R. 17 W., 0.2 mile northeast of bridge across Prairie Dog Creek and on east bank of creek.
Ground elevation: 1,900.0 feet (t). (Alma 7.5 min. quadrangle)
Depth to water: 18.6 ft., (September 28, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil, sandy	0.0	3.0
Sand, clayey, buff	3.0	7.0
Sand, clayey, gray	7.0	10.0
Same as above with more clay	10.0	15.0
Sand, clayey, light brown	15.0	17.0
Silt, blue	17.0	27.0
Sand and fine gravel, green	27.0	32.0
Gravel, fine to medium	32.0	39.0
Gravel, medium, some coarse	39.0	55.0
Cretaceous System - Upper Cretaceous Series - Colorado Group:		
Niobrara Formation:		
Shale, gray	55.0	58.0

Test Hole #114-A-39
(1-17-18aaaa)
Harlan County

Location: NE NE NE NE Sec. 18, T. 1 N., R. 17 W., 60 ft. south of river in southwest corner of intersection.
Ground elevation: 1,900.0 feet (t). (Alma 7.5 min. quadrangle)
Depth to water: caved at 12 feet. (September 28, 1939).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Sand, fine, cemented.....	0.0	5.0
Gravel, medium, reddish.....	5.0	13.0
Gravel, medium, green to gray.....	13.0	21.0
Cretaceous System - Upper Cretaceous Series - Colorado Group:		
Niobrara Formation:		
Shale, gray	21.0	25.0

Test Hole #130-A-39
(1-18-2daad)
Harlan County

Location: SE NE NE SE of NW1/4 Sec. 2, T. 1 N., R. 18 W., 65 ft. north of center of highway on west edge of county road.
Ground elevation: 1,935.0 feet (t). (Alma 7.5 min. quadrangle)
Depth to water: 20 feet, (October 14, 1939).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil	0.0	5.0
Sand, clayey, buff	5.0	16.0
Sand, clayey, brown, light colored sand just above gravel	16.0	25.0
Gravel, coarse, light colored	25.0	28.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, black	28.0	35.0

Test Hole #132-A-39
(1-18-3abac)
Harlan County

Location: SW NE NW NE Sec. 3, T. 1 N., R. 18 W., 15 feet north of center of railroad bridge in small drainage.
Ground elevation: 1,930.0 feet (t). (Alma 7.5 min. quadrangle)
Depth to water: 6.5 feet, (October 21, 1939)

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil and clayey sand.....	0.0	6.0
Gravel, medium to coarse.....	6.0	11.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, black.....	11.0	19.0

Test Hole #127-A-39
(1-18-4bcaa)
Harlan County

Location: Northeast corner of SW NW Sec. 4, T. 1 N., R. 18 W., west edge of highway and 20 ft. south of 1/4 mile line.
Ground elevation: 1,934.0 feet (t). (Alma 7.5 min. quadrangle)
Depth to water: 7 feet, (October 14, 1939).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil and fine sand	0.0	5.0
Sand	5.0	10.0
Gravel, medium, some coarse, good	10.0	20.0
Gravel, fine, some coarser	20.0	29.0
Gravel, medium to coarse, good	29.0	36.0
Cretaceous System - Upper Cretaceous Series - Colorado Group:		
Niobrara Formation:		
Shale, gray	36.0	39.0

Test Hole #128-A-39
(1-18-4cbdd)
Harlan County

Location: Center east edge of NW SW Sec. 4, T. 1 N., R. 18 W., west edge of highway, 0.25 mile north of river bridge.
Ground elevation: 1,931.0 feet (t). (Alma 7.5 min. quadrangle)
Depth to water: 8.8 feet, (October 14, 1939).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Sand, fine, soil at top.....	0.0	7.0
Gravel, fine.....	7.0	10.0
Gravel, medium, large pieces shale.....	10.0	20.0
Gravel, medium.....	20.0	31.0
Gravel, medium to coarse.....	31.0	40.0
Gravel, medium to coarse.....	40.0	45.0
Cretaceous System - Upper Cretaceous Series - Colorado Group:		
Niobrara Formation:		
Shale, gray.....	45.0	48.0

Test Hole #134-A-39
(1-18-10bcbb)
Harlan County

Location: NW NW SW NW Sec. 10, T. 1 N., R. 18 W., 100 yards east of farmhouse, 100 yards south and 50 yards east of northwest corner.
Ground elevation: 1,940.0 feet (t). (Alma 7.5 min. quadrangle)
Depth to water: 16.4 feet, (October 21, 1939).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil	0.0	2.0
Sand, clayey, buff	2.0	17.0
Gravel, fine to medium	17.0	25.0
Gravel, medium, some coarse fine, 38 ft. to 41 ft	25.0	50.0
Cretaceous System - Upper Cretaceous Series - Colorado Group:		
Niobrara Formation:		
Shale gray	50.0	55.0

Test Hole #131-A-39
(1-18-11aadd)
Harlan County

Location: Southeast corner of NE NE Sec. 11, T. 1 N., R. 18 W., 0.52 mile south of railroad.
Ground elevation: 1,915.0 feet (t). (Alma 7.5 min. quadrangle)
Depth to water: 8 feet, (October 21, 1939).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil, fine, silty	0.0	1.0
Soil, sandy, dark brownish black	1.0	4.0
Clay, sandy, brownish gray	4.0	6.0
Gravel, fine, and sand	6.0	10.0
Gravel, medium, grayish green, a few pieces clay or shale at 19 ft	10.0	21.0
Gravel, fine to medium	21.0	26.0
Gravel, coarse	26.0	28.0
Cretaceous System - Upper Cretaceous Series - Colorado Group:		
Niobrara Formation:		
Shale, calcareous, gray	28.0	29.0

Test Hole #116-A-39
(1-18-13addd)
Harlan County

Location: Southeast corner of NE 1/4 Sec. 13, T. 1 N., R. 18 W., between road and river, just west of section line.
Ground elevation: 1,915.0 feet (t). (Alma 7.5 min. quadrangle)
Depth to water: Caved at 11 feet, (October 3, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Sand and sandy soil	0.0	5.0
Sand and fine gravel	5.0	7.0
Gravel, medium, reddish	7.0	13.0
Gravel, medium to coarse, greenish, some water-worn shale	13.0	20.0
Gravel, fine, greenish	20.0	25.0
Gravel, medium, greenish	25.0	29.0
Gravel, finer than above, greenish	29.0	35.0
Gravel, medium, greenish	35.0	45.0
Cretaceous System - Upper Cretaceous Series - Colorado Group:		
Niobrara Formation:		
Shale, gray and greenish black	45.0	49.0

Test Hole #117-A-39
(1-18-13dddd)
Harlan County

Location: Southeast corner of Sec. 13, T. 1 N., R. 18 W.
Ground elevation: 1,924.0 feet (t). (Alma 7.5 min. quadrangle)
Depth to water: 25.3 feet, (October 3, 1939).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil and road fill	0.0	5.0
Sand, clayey, buff, sticky from 19 ft	5.0	32.0
Sand and fine gravel	32.0	38.0
Gravel, fine	38.0	44.0
Cretaceous System - Upper Cretaceous Series - Colorado Group:		
Niobrara Formation:		
Shale, gray	44.0	49.0

Test Hole #124-A-39
(1-18-13bbbb)
Harlan County

Location: Northwest corner of Sec. 13, T. 1 N., R. 18 W., 70 ft. east of corner on south edge of road.
Ground elevation: 1,915.0 feet (t). (Alma 7.5 min. quadrangle)
Depth to water: 10.5 feet, (October 9, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil and fine clayey sand.....	0.0	5.0
Gravel, fine to medium, reddish.....	5.0	10.0
Sand and fine gravel.....	10.0	19.0
Gravel, fine to medium.....	19.0	30.0
Gravel, medium, drilled like some coarse gravel, not much coarse gravel in sample because mud too sandy.....	30.0	46.0
Cretaceous System - Upper Cretaceous Series - Colorado Group:		
Niobrara Formation:		
Shale, gray.....	46.0	49.0

Test Hole #118-A-39
(1-18-24daaa)
Harlan County

Location: Northeast corner SE 1/4 Sec. 24, T. 1 N., R. 18 W., 50 ft. south of bridge over Prairie Dog Creek on west side of road.
Ground elevation: 1,912.0 feet (t). (Alma 7.5 min. quadrangle)
Depth to water: 16 feet, (October 3, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Road fill, soil and sand.....	0.0	5.0
Sand, fine.....	5.0	15.0
Sand, clayey, lower foot or so blue silt (muck)...	15.0	24.0
Gravel, fine.....	24.0	30.0
Gravel, fine to medium, some water-worn shale.....	30.0	39.0
Cretaceous System - Upper Cretaceous Series - Colorado Group:		
Niobrara Formation:		
Shale, gray.....	39.0	42.0

Test Hole #119-A-39
(1-18-24dddd)
Harlan County

Location: Southeast corner of Sec. 24, T. 1 N., R. 18 W., 25 ft. west of road and 50 ft. north of section line fence.
Ground elevation: 1,922.0 feet (t). (Alma 7.5 min. quadrangle)
Depth to water: 18.4 feet, (October 9, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil and buff sand.....	0.0	5.0
Sand, clayey, brownish.....	5.0	23.0
Sand, silty, blue to gray.....	23.0	29.0
Gravel, fine, water-worn shale, a little coarser gravel.....	29.0	41.0
Cretaceous System - Upper Cretaceous Series - Colorado Group:		
Niobrara Formation:		
Shale, gray.....	41.0	45.0

Test Hole #120-A-39
(1-18-26aaaa)
Harlan County

Location: Northeast corner of Sec. 26, T. 1 N., R. 18 W., 150 ft. west of Prairie Dog Creek, on south side of road, in ditch.
Ground elevation: 1,923.0 feet (t). (Alma 7.5 min. quadrangle)
Depth to water: 15.3 feet, (October 9, 1939).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil, clayey, dark	0.0	7.0
Sand, clayey, fine, buff	7.0	16.0
Sand, fine	16.0	20.0
Gravel, fine, high percentage of water-worn shale and chalk 20 to 25 ft	20.0	30.0
Gravel, medium, some coarse	30.0	39.0
Gravel, same as above, but contains some large water-worn shale and chalk	39.0	43.0
Cretaceous System - Upper Cretaceous Series - Colorado Group:		
Niobrara Formation:		
Shale, gray	43.0	49.0

Test Hole #121-A-39
(1-18-29ddac)
Harlan County

Location: SW NE SE SE Sec. 29, T. 1 N., R. 18 W.
Ground elevation: 1,977.0 feet (t). (Alma 7.5 min. quadrangle)
Depth to water: 33.6 feet, (October 9, 1939).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil	0.0	1.0
Sand, clayey, buff	1.0	17.0
Sand, clayey, reddish brown	17.0	30.0
Sand, finer, clayey than above, sticky, soft	30.0	40.0
Clay, sandy, brownish gray	40.0	51.0
Clay, silty, blue	51.0	56.0
Gravel, medium	56.0	65.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, greenish black, a little gray	65.0	69.0

Test Hole #122-A-39
(1-18-31cbbb)
Harlan County

Location: NW NW NW SW Sec. 31, T. 1 N., R. 18 W., 0.4 mile north of southwest corner, 70 ft. south of Prairie Dog Creek, in east ditch.
Ground elevation: 1,980.0 feet (t).(Alma SW 7.5 min. quadrangle)
Depth to water: 16 feet, (October 9, 1939).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil	0.0	2.0
Sand, clayey, buff	2.0	14.0
Sand, fine (no sample)	14.0	17.0
Gravel, fine to medium	17.0	29.0
Gravel, medium, some coarse also some water-worn shale	29.0	34.0
Gravel, and much shale (drilled easy)	34.0	55.0
Cretaceous System, Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, firm, black	55.0	59.0

Test Hole #24-U-41
(1-19-10cccc)
Harlan County

Location: Southwest corner of Sec. 10, T. 1 N., R. 19 W., north edge of road, 160 ft. east of corner.
Ground elevation: 2,158.0 feet (t).(Alma SW 7.5 min. quadrangle)
Depth to water: 96 feet, (October 18, 1941).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Silt, buff	0.0	10.0
Lost water, poor sample, changed from buff to reddish buff in this interval	10.0	20.0
Silt and silty clay, reddish buff, has limy streaks and limy concretions	20.0	30.0
Silt and sandy clay, gray; concretions	30.0	35.0
Clay, soft, tan	35.0	38.0
Clay, indurated, tan, cuts in chips	38.0	52.0
Sand, brown to red, has a little clay	52.0	65.0
Clay, limy to soft limestone, fairly hard	65.0	68.0
Sand, clayey, greenish gray, limy streaks	68.0	81.0
Sand, clayey, limy, whitish gray	81.0	84.0
Sand, clayey, gray	84.0	92.0
Sand, clayey, gray, sandy concretions or layers	92.0	96.0
Clay, sandy, brown, indurated clay layers or thin seams	96.0	104.0
Clay, soft, grayish tan	104.0	111.0
Clay, tan, indurated layers	111.0	120.0
Sand and fine gravel, clayey, brownish gray	120.0	127.0
Gravel, fine to medium, light colored, clear greenish yellow, red	127.0	134.0
Sand, coarse, clayey, gray	134.0	142.0
Sand and fine gravel	142.0	147.0
Gravel, coarse, sharp, mostly red, some clear	147.0	148.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, light gray, rusty	148.0	154.0
Shale, dark blue gray to black	154.0	167.0

Test Hole #CD(A-4)
(1-19-33cbab)
Harlan County

Location: NW NE NW SW Sec. 33, T. 1 N., T. 19 W., 0.5 mile north and 0.15 mile east of southwest corner of section.
Ground elevation: 2,105.0 feet (t). (Alma SW 7.5 min. quadrangle)
Depth to water: not measured.

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Loam, silty clay	0.0	5.0
Loam, silty	5.0	25.0
Clay, lean	25.0	31.0
Loam, sandy	31.0	38.0
Clay, lean	38.0	47.0
Loam, silty clay	47.0	54.0
Clay, lean	54.0	66.0
Sand	66.0	79.0
Loam, sandy clay	79.0	85.0
Clay, lean	85.0	94.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, medium hard, waxey	94.0	137.0

Test Hole #CD(A-5)
(1-19-33ccdb)
Harlan County

Location: NW SE SW SW Sec. 33, 1 N., R. 33 W., 0.1 mile north and 0.5 mile east of SW corner of section.
Ground elevation: 2,022.0 feet (t). (Alma SW 7.5 min. quadrangle)
Depth to water: not measured.

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Loam, sandy	0.0	3.0
Loam	3.0	12.0
Clay, lean	12.0	17.0
Loam, clayey	17.0	24.0
Loam, silty	24.0	32.0
Loam, silty clay	32.0	43.0
Loam, sandy	43.0	47.0
Clay, medium	47.0	51.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, medium hard, silty, calcareous	51.0	82.0

Test Hole #123-A-39
(1-19-35cccc)
Harlan County

Location: Southwest corner of Sec. 35, T. 1 N., R. 19 W., 85 ft. east of corner on north side of road.
Ground elevation: 1,995.0 feet (t).(Alma SW 7.5 min. quadrangle)
Depth to water: 22.5 feet, (October 9, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Sand, clayey, light brown.....	0.0	14.0
Sand, clayey, brown, coarser than above.....	14.0	21.0
Sand and fine gravel, some blue silty clay at 21 ft.....	21.0	29.0
Gravel, medium.....	29.0	35.0
Gravel, medium, some coarse with water-worn shale and chalk, also some soft shale pieces.....	35.0	41.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, greenish black.....	41.0	46.0

Test Hole #33-HP-78
(1-20-33dddc)
Harlan County

Location: SW SE SE SE sec. 33, T. 1 N., R. 20 W., approximately 52 ft north and 541 ft west of southeast corner.
Ground elevation: 2,185 ft (t).(Stamford SE 7.5 min. quadrangle)
Depth to water: (not measured)

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Topsoil: silt, very clayey, very dark grayish brown.....	0.0	3.0
Silt, moderately sandy, slightly clayey, pale brown, sand is very fine.....	3.0	21.0
Silt, slightly clayey, dark brown.....	21.0	25.0
Silt, slightly clayey, slightly sandy, yellow-brown; sand is very fine.....	25.0	28.0
Tertiary System - Miocene Series - Ogallala Group:		
Sand, very fine to fine, very silty, slightly clayey, moderately calcareous; contains volcanic ash; moderately silty and some medium to very coarse sand below 37.0 ft.....	28.0	43.0
Sand, medium to very coarse, some very fine to fine sand, moderately silty, moderately calcareous; contains some volcanic ash.....	43.0	45.0
Sand, slightly gravelly, slightly silty, moderately calcareous; very fine sand to very fine gravel; contains some volcanic ash....	45.0	48.0
Silt, moderately sandy, very pale brown, moderately calcareous; sand is very fine to fine; slightly sandy from 50.0 to 52.0 ft; slightly sandy and slightly calcareous below 55.0 ft.....	48.0	65.0
Siltstone, slightly sandy, light yellowish brown, slightly calcareous; sand is very fine to fine.....	65.0	67.0
Silt, moderately sandy, light yellowish brown, slightly calcareous; sand is very fine.....	67.0	71.0
Silt, slightly sandy, slightly clayey, very pale brown, very calcareous; sand is very fine to fine; light yellowish brown and moderately calcareous below 72.0 ft.....	71.0	75.0
Silt, moderately sandy, very pale brown, slightly calcareous; sand is very fine to fine.....	75.0	79.0
Sandstone, very fine to fine grained, moderately silty, very pale brown, moderately calcareous.....	79.0	84.0
Silt, moderately sandy, very pale brown, slightly calcareous; sand is very fine to fine.....	84.0	86.0

Silt, moderately sandy, slightly clayey, very pale brown, very calcareous; sand is very fine to fine	86.0	88.0
Silt, moderately clayey, pale olive	88.0	90.0
Silt, moderately sandy, pale brown, slightly calcareous; sand is very fine to fine	90.0	95.0
Sand, very fine, very silty	95.0	103.0
Sand, very fine to coarse, moderately silty	103.0	105.0
Silt, moderately clayey, brown, slightly calcareous; pale olive below 110.0 ft	105.0	115.0
Silt, moderately sandy, moderately clayey, pale brown, slightly calcareous; sand is very fine to fine	115.0	118.0
Sand, very fine to coarse, slightly silty; some very coarse sand, trace very fine gravel	118.0	120.0
Sand, very fine to very coarse; some very fine to fine gravel	120.0	125.0
Silt, slightly clayey, light yellowish brown, slightly calcareous; yellowish brown below 149.0 ft	125.0	170.0
Siltstone, slightly clayey, yellowish brown, slightly calcareous; limy from 172.5 to 173.0 ft; pale brown below 173.0 ft; moderately sandy below 175.0 ft, sand is very fine to fine	170.0	178.0
Silt, slightly sandy, light yellowish brown; sand is very fine	178.0	185.0
Sand, moderately gravelly, slightly silty; very fine sand to fine gravel	185.0	195.0
Sand, very fine to very coarse, slightly silty	195.0	198.0
Cretaceous System - Upper Cretaceous Series - Montana Group: Pierre Formation:		
Clay, silty, light olive gray; gray below 200.0 ft; dark gray below 202.0 ft	198.0	205.0
Shale, very dark gray	205.0	213.0

Test Hole #48-B-47
(2-17-1aaaa)
Harlan County

Location: NE NE NE NE Sec. 1, T. 2 N., R. 17 W., approximately 6 feet south and 80 feet west of northeast corner.
Ground elevation: 2,129.2 feet (i). (Republican City NW 7.5 min. quadrangle)
Depth to water: 127.5 feet (September 2, 1947).

	Depth in feet From	To
Quaternary System, undifferentiated:		
Soil: silt, sandy, dark brownish-gray; contains very fine sand.....	0.0	1.0
Silt, slightly calcareous, moderately clayey, light grayish-brown.....	1.0	2.0
Silt, light buff-gray with a yellow tint, slightly calcareous from 2 to 5 ft, moderately calcareous from 5 to 8 ft; contains a few gastropods and limy rootlets.....	2.0	8.0
Silt, slightly calcareous, light buff-gray with a yellow tint.....	8.0	20.0
Silt, very slightly clayey, soil-like; contains some interbedded very fine to fine sand, medium-brown.....	20.0	24.5
Silt, slightly clayey to slightly sandy, light-brown; contains very fine to fine sand.....	24.5	28.5
Silt, moderately to very sandy, light-brown; contains very fine to fine sand with some medium and a trace of coarse sand; more sandy and very calcareous 30 to 34 ft.....	28.5	34.0
Silt, slightly sandy, slightly calcareous, light-brown; contains very fine with a trace of fine sand, moderately sandy and moderately calcareous below 36.5 ft.....	34.0	42.0
Silt, moderately to very sandy, slightly calcareous, light-brown; contains very fine to fine sand with a trace of medium to coarse sand, and a few large white limy nodules and finer but less sand 14 to 50 ft.....	42.0	58.0
Sand, silty, to silt, sandy, slightly calcareous, light-brown; contains very fine to fine with a trace of medium to coarse sand and a few limy nodules, slightly coarser below 60 ft.....	58.0	63.5

Silt, sandy, very calcareous, light brown-gray; contains very fine to medium sand with some coarse and a trace of very coarse sand, in part marly, with silty sand below 70 ft	63.5	76.0
Sand, texture grades from very fine to coarse, principally quartz	76.0	80.0
Sand and gravel; texture grades from medium sand to medium gravel with 70 percent gravel; contains much quartz with some pink feldspar	80.0	90.0
Sand and gravel; texture grades from fine sand to medium gravel, 25 percent gravel from 90 to 95 ft, grading to 45 percent gravel below 100 ft, and 60 to 70 percent gravel below 110 ft; contains much quartz with some pink feldspar, with a very sandy to slightly clayey layer of light-brown silt from 121 to 125 ft, and a thin silt layer from 133 to 133.5 ft	90.0	133.5
Sand; texture grades from very fine to coarse with a trace of very coarse; contains a trace of fine gravel, principally quartz	133.5	146.0
Sand and gravel; texture grades from coarse sand to medium gravel, 50 to 60 percent gravel, grades slightly finer with depth; contains quartz with some pink feldspar	146.0	173.0
Clay, silty to slightly sandy, brown with some iron stain in upper part	173.0	177.0
Sand and gravel; texture grades from coarse sand to medium gravel, about 60 percent gravel; contains quartz with much pink and red feldspar	177.0	199.5
Silt, moderately sandy, light-gray; contains very fine sand	199.5	201.0
Sand and gravel; texture grades from medium sand to fine gravel with some medium gravel, with 50 percent gravel 201 to 205 ft, and 65 percent gravel 205 to 209 ft; contains quartz with much pink feldspar	201.0	209.0
Silt, clayey to slightly sandy; contains very fine sand, light brownish-gray with a slight red tint at 209 ft	209.0	211.0
Sand; texture grades from fine to very coarse; contains some fine gravel	211.0	214.0
Silt, slightly sandy, light-gray with a slight brown tint; contains very fine to medium sand	214.0	220.0

Sand, slightly silty; texture grades from fine to very coarse with a trace of fine gravel; contains quartz with some feldspar	220.0	230.0
Sand, texture grades from very fine to medium with some coarse and a trace of very coarse; contains a silt layer from 232.5 to 233.5 ft, coarser below 233.5 ft	230.0	235.0
Sand and gravel; texture grades from fine sand to fine gravel, finer below 240 ft; contains quartz with some pink feldspar	235.0	250.0
Sand and gravel; texture grades from fine sand to medium gravel, 75 percent very coarse sand to medium gravel; contains quartz with much pink feldspar	250.0	256.0
Silt, sandy, light brownish-gray; contains very fine to fine sand with some coarser grains	256.0	260.0
Sand; texture grades from very fine to very coarse; contains principally quartz with some light greenish-yellow silicates, with some very silty layers and some fine gravel below 271 ft	260.0	272.5
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Clay shale, dark-gray	272.5	276.0
Clay shale, slightly silty, moderately calcareous, medium-gray	276.0	280.0
Cretaceous System - Upper Cretaceous Series - Colorado Group:		
Niobrara Formation:		
Shale, chalky and silty, very calcareous, light-gray; contains some white specks, slightly lighter below 290 ft	280.0	300.0

Test Hole #25-U-41
(2-17-3adaa)
Harlan County

Location: Northeast corner of SE NE Sec. 3, T. 2 N., R. 17 W., west edge of road, opposite gate to pasture, edge of upland; 2 miles east and 7 miles north of Republican City.
Ground elevation: 2,120.0 feet (t). (Republican City NW 7.5 min. quadrangle)
Depth to water: 110 feet, (October 18, 1941).

	Depth in feet From	To
Quaternary System, undifferentiated:		
Road fill and buff silt; cuts granular.....	0.0	15.0
Silt, sandy, soft, buff.....	15.0	18.0
Silt, dark reddish brown; old soil.....	18.0	23.0
Silt to silty sand, reddish buff.....	23.0	29.0
Sand, very fine, silty reddish buff, some limy concretions.....	29.0	38.0
Gravel, limestone pebbles, sandstone pe.....	38.0	41.0
Sand, some coarse, reddish, some silt or.....	41.0	45.0
Sand, fine, silty, reddish buff, some limy streaks.....	45.0	53.0
Sand, silty, limy, reddish gray.....	53.0	57.0
Gravel, fine to very coarse, red, good.....	57.0	84.0
Clay, sandy, reddish buff.....	84.0	85.0
Gravel, fine to coarse, red, good.....	85.0	107.0
Clay, compact, brown.....	107.0	112.0
Gravel, fine to coarse, red, finer than above, good.....	112.0	127.0
Clay, sandy, soft, gray tan.....	127.0	128.0
Gravel, fine to coarse, red, good.....	128.0	161.0
Sand, clayey, soft, tan.....	161.0	163.0
Gravel, fine to coarse, medium, red, good.....	163.0	179.0
Clay, sandy, grayish tan.....	179.0	188.0
Sand, clayey, reddish.....	188.0	191.0
Gravel, fine to medium, red.....	191.0	198.0
Clay, sandy, grayish tan.....	198.0	199.0
Gravel, fine to very coarse, red.....	199.0	211.0
Clay, sandy, reddish brown.....	211.0	214.0
Gravel, fine to medium, red, some coarse, good....	214.0	219.0
Clay, sandy, very sticky, compact, gray.....	219.0	231.0
Gravel, fine to coarse, red.....	231.0	233.0
Clay, sandy, sticky, compact, gray.....	233.0	239.0
Gravel, fine to coarse, mostly medium, compact, greenish yellow, much clear quartz.....	239.0	251.0

Cretaceous System - Upper Cretaceous Series - Montana Group:
Pierre Formation:

Shale, tough, sticky, black.....	251.0	260.0

Test Hole #22-U-41
(2-17-21cccc)
Harlan County

Location: southwest corner of Sec. 21, T. 2 N., R. 17 W., 60 ft. east of corner on north edge of road; 3 miles north of Republican City.
Ground elevation: 2,101.0 feet (t). (Alma 7.5 min. quadrangle)
Depth to water: 98 feet, (October 18, 1941).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Road fill	0.0	2.0
Silt, buff	2.0	17.0
Silt, dark reddish brown	17.0	21.0
Silt, clayey, reddish buff	21.0	30.0
Silt, clayey, soft, gray buff, some lime	30.0	43.0
Clay, hard, compact, gray buff	43.0	48.0
Sand, soft, brown, greenish at 55 ft	48.0	57.0
Gravel, fine to coarse, clean, light greenish yellow, clear and pink	57.0	65.0
Clay, sandy, limy, very tough, white	65.0	67.0
Clay, sandy, gray	67.0	71.0
Gravel, fine to coarse, clean, pink	71.0	105.0
Gravel, fine to coarse, clean, greenish yellow predominance, some red and pink, thin clay seam at 105 ft	105.0	118.0
Tertiary System - Miocene Series - Ogallala Group:		
Clay, sandy, gray, some gravel in upper part	118.0	124.0
Clay, tough, sticky, light tan, some limy streaks	124.0	130.0
Clay, sticky, tough, light tan to pinkish tan	130.0	141.0
Clay, sandy, grayish tan, some fine gravel	141.0	145.0
Gravel, fine to medium, mostly clear, some yellow, green and red	145.0	152.0
Cretaceous System - Upper Cretaceous Series - Montana Group: Pierre Formation:		
Shale, black	152.0	160.0

Test Hole #20-A-48
(2-18-8aaaa)
Harlan County

Location: NE NE NE NE Sec. 8, T. 2 N., R. 18 W., approximately 10 ft south and 78 ft west of northeast corner.
Ground elevation: 2,129.0 feet (i). (Huntley 7.5 min. quadrangle)
Depth to water : 86.3 feet, August 11, 1948).

	Depth in feet From	To
Quaternary System, undifferentiated:		
Soil and road fill: silt, dark-brown.....	0.0	0.6
Soil: silt, medium brown.....	0.6	1.5
Silt, slightly clayey, light-brown.....	1.5	2.5
Silt, medium-buff; contains a few gastropod shells from 6 to 10 ft.....	2.5	18.0
Silt, soil-like, dark reddish-brown.....	18.0	19.5
Silt, light reddish-brown.....	19.5	25.0
Silt, moderately calcareous, light-buff, mottled white and gray.....	25.0	48.5
Silt and sand, very calcareous, mottled gray and white; fine texture sand.....	48.5	67.5
Sand and gravel, gray, orange and pink; texture grades from medium sand to coarse gravel.....	67.5	84.0
Clay, silty, slightly calcareous, light-tan.....	84.0	86.5
Sand and gravel, gray to orange; textures grades from medium sand to coarse gravel.....	86.5	122.0
Sand, grayish-tan; texture grades from fine to medium.....	122.0	135.0
Tertiary System - Miocene Series - Ogallala Group:		
Silt, slightly clayey, moderately calcareous, light-tan.....	135.0	137.5
Sand, light grayish-tan; texture grades from fine to medium.....	137.5	140.0
Silt, sandy to slightly clayey, light-tan; contains coarse sand.....	140.0	144.5
Sand, light-gray; texture grades, fine to medium; contains interbedded calcareous silt.....	144.5	152.0
Sand and gravel; texture grades from coarse sand to fine gravel.....	152.0	156.5
Silt, slightly clayey, light-gray.....	156.5	161.5
Sand and gravel, light-gray to pink; texture grades from coarse sand to medium gravel.....	161.5	172.5
Clay shale, calcareous, yellowish-orange to light-gray.....	172.5	175.0

Cretaceous System - Upper Cretaceous Series - Montana Group:
Pierre Formation:

Shale, silty, moderately calcareous, light-gray to dark-gray.....	175.0	200.0

Test Hole #01-A-64
(2-18-9bccc)
Harlan County

Location: SW SW SW NW sec. 9, T. 2 N., R. 18 W., approximately 2632 ft south and 5 ft east of northwest corner.
Ground elevation: 2,117 ft (t). (Huntley 7.5 min. quadrangle)
Depth to water: 85.30 ft (12-31-65).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Topsoil: silt, slightly clayey, dark brownish gray	0.0	1.5
Silt, slightly clayey, slightly sandy, grayish brown, moderately calcareous; sand is very fine; slightly calcareous below 5.0 ft	1.5	10.0
Silt, slightly clayey, light olive brown	10.0	15.5
Silt, slightly clayey, olive brown	15.5	17.0
Silt, slightly clayey; dark grayish brown	17.0	19.0
Silt, slightly clayey, olive	19.0	20.7
Silt, slightly clayey, yellowish brown; moderately clayey below 23.0 ft	20.7	23.6
Silt, slightly to moderately clayey, very pale brown, very calcareous	23.6	25.0
Silt, slightly clayey, pale brown, slightly calcareous; very pale brown and moderately calcareous below 27.0 ft	25.0	35.0
Silt, slightly clayey, light yellow brown, slightly calcareous; very pale brown below 37.5	35.0	39.0
Silt, moderately to very clayey, light gray, very calcareous	39.0	40.0
Silt, moderately clayey, very pale brown, very calcareous	40.0	40.4
Silt, very sandy, slightly clayey, light yellow brown; slightly to moderately calcareous sand is very fine	40.4	44.6
Silt, slightly clayey, very pale brown, very calcareous	44.6	45.0
Silt, very sandy, slightly clayey, light yellow brown, moderately calcareous; sand is very fine to fine; moderately sandy below 47.7 ft	45.0	48.5
Silt, slightly to moderately clayey, slightly to moderately sandy, very pale brown, moderately to very calcareous; sand is very fine to ft	48.5	55.0
Silt, very sandy, slightly to moderately clayey, pale brown, slightly to moderately calcareous; sand is very fine to coarse; non-calcareous below 63.0 ft	55.0	63.2
Sand, very gravelly; fine sand to fine gravel	63.2	66.5

Silt, moderately clayey, pale brown.....	66.5	67.5
Sand, very gravelly; fine sand to fine gravel.....	67.5	70.0
Sand and gravel; very fine sand to fine gravel....	70.0	80.0
Sand and gravel; fine sand to fine gravel, some medium gravel, trace coarse gravel.....	80.0	95.0
Sand, moderately gravelly; fine sand to fine gravel.....	95.0	111.4
Tertiary System - Miocene Series - Ogallala Group:		
Silt, very sandy, slightly to moderately clayey, very pale brown, slightly calcareous.....	111.4	115.0
Silt, moderately clayey, very pale brown, slightly calcareous.....	115.0	120.0
Silt, moderately sandy, moderately clayey, light yellow brown, slightly calcareous; sand is very fine to fine.....	120.0	124.5
Silt, very sandy, slightly clayey, light yellow brown, slightly calcareous, sand is very fine to medium; pale gray and moderately calcareous below 130.0 ft.....	124.5	133.0
Sand, fine to very coarse.....	133.0	135.0
Sand slightly gravelly; fine sand to fine gravel.....	135.0	140.0
Sand, medium to very coarse; contains light olive gray silty clay lenses from 144.5 to 144.9 ft and from 148.3 to 148.8 ft.....	140.0	150.0
Sand, very gravelly; fine sand to fine gravel; contains light olive gray silty clay lense from 152.1 to 153.4 ft.....	150.0	155.0
Sand, moderately gravelly; very fine sand to fine gravel.....	155.0	160.0
Sand, slightly gravelly; fine sand to fine gravel.....	160.0	165.8
Cretaceous System - Upper Cretaceous Series - Montana Group: Pierre Formation:		
Shale, clay, slightly to moderately calcareous, color varies from olive yellow and light yellowish brown to light olive brown.....	165.8	180.0
Shale, clay, olive gray to dark olive gray, slightly to moderately calcareous; below 184.5 dark gray to black; contains thin bentonite from 191.3 to 192.8 ft; contains pyrite below 193.5 ft.....	180.0	194.1
Shale, clay, dark gray to black; contains traces of pyrite; contains a bentonite seam from 197.0 to 197.3 ft; silty, sandy below 201.4 ft., sand is very fine; below 205.0 ft carbonaceous odor.....	194.1	210.0

Test Hole #26-U-41
(2-18-9ddcd)
Harlan County

Location: SE SW SE SE Sec. 9, T. 2 N., R. 18 W., 0.17 mile west of southeast corner on north edge of road.
Ground elevation: 2,099.0 feet (t).(Huntley 7.5 min. quadrangle)
Depth to water: 73 feet, (October 18, 1941).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Silt, dark brownish gray and buff	0.0	19.0
Clay, silty, dark reddish buff	19.0	24.0
Silt and clay, reddish buff	24.0	28.0
Clay, silty, limy, whitish gray	28.0	33.0
Sand, silty, clayey, reddish buff	33.0	35.0
Clay, sticky, compact, whitish to gray buff	35.0	39.0
Clay, sandy, silty, gray brown to reddish	39.0	44.0
Sand, coarse, clayey, gray brown	44.0	47.0
Sand, coarse, clayey, gray, limy streaks	47.0	51.0
Gravel, fine to coarse, red	51.0	59.0
Gravel, fine to very coarse, red, some clay at 59 ft	59.0	74.0
Gravel, fine to very coarse, dark red, good	74.0	86.0
Tertiary System - Miocene Series - Ogallala Group:		
Clay, compact, reddish buff	86.0	89.0
Clay, hard, limy and limestone, white, hard, compact	89.0	93.0
Clay, sandy, greenish	93.0	96.0
Clay, tough, compact, gray brown to slightly pink, some slightly green, has limy concretions	96.0	107.0
Clay, compact, tough, sticky, tan	107.0	110.0
Sand, limy and limestone, hard, whitish gray (mudstone)	110.0	112.0
Sand, coarse, clayey, sticky, gray, cuts large pieces	112.0	122.0
Gravel, fine to medium, mostly clear quartz, has some greenish yellow and pink	122.0	132.0
Clay, sandy, soft, gray	132.0	133.0
Gravel, fine to medium, mostly clear quartz, some greenish yellow and pink	133.0	146.0
Gravel, fine, medium, coarse, mostly clear quartz, has more greenish yellow and red gravel than above	146.0	159.0
Clay or weathered shale, soft, tan	159.0	164.0

Cretaceous System - Upper Cretaceous Series - Montana Group:
Pierre Formation:

Shale, compact, sticky, ochre to rusty to light gray.....	164.0	167.0
Shale, compact, tough, plastic, black, thin hard layer at 178 ft., (Pyrite) iron concretion.....	167.0	180.0

Test Hole #19-A-48
(2-18-16cccc)
Harlan County

Location: SW SW SW SW Sec. 16, T. 2 N., R. 18 W., approximately 65 feet north and 46 feet east of southwest corner.
Ground elevation: 2,097.0 feet (i). (Huntley 7.5 min. quadrangle)
Depth to water: 89 feet (August 11, 1948).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil: silt, dark grayish-brown	0.0	1.0
Silt, medium grayish-brown to dark-brown; contains calcareous nodules and gastropod shells from 5 to 8.5 ft	1.0	17.0
Silt, soil-like, dark reddish-brown	17.0	20.5
Silt, light reddish-tan	20.5	27.5
Silt, very calcareous, light-buff; contains calcareous nodules; dark-tan below 32 ft	27.5	45.0
Sandstone, light-gray; texture grades fine; contains calcareous rootlets	45.0	51.0
Silt, medium grayish-tan with some iron stain	51.0	70.0
Silt, sandy to slightly clayey, contains very fine sand	70.0	76.5
Sand and gravel; texture grades from medium sand to medium gravel	76.5	77.5
Tertiary System - Miocene Series - Ogallala Formation:		
Silt, sandy to slightly clayey, light grayish pink; contains fine sand and a few small pebbles; reddish-tan below 80 ft	77.5	88.5
Sand, light-gray to pink; texture grades from medium to coarse; contains some thin layers of silt below 90 ft	88.5	94.0
Clay, light-gray to greenish-tan, contains many limy fragments	94.0	102.0
Sand and gravel, gray to red and yellow; texture grades from coarse sand to medium gravel	102.0	109.0
Sand, silty, light-gray; contains medium sand and many limy fragments	109.0	111.0
Silt, slightly sandy, very calcareous; contains medium sand	111.0	114.5
Sand and gravel, gray to yellow and pink; texture grades from medium sand to medium gravel	114.5	134.0
Clay, light-tan; contains some sand and calcareous fragments	134.0	141.0

Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Clay, silty, yellow; contains calcareous nodules.....	141.0	145.0
Clay shale, slightly calcareous, black.....	145.0	170.0
Cretaceous System - Upper Cretaceous Series - Colorado Group:		
Niobrara Formation:		
Shale, chalky, dark-gray.....	170.0	200.0

Test Hole #135-A-39
(2-18-31badd)
Harlan County

Location: SE SE NE NW Sec. 31, T. 2 N., R. 18 W., 60 ft. south of railroad on north edge of road.
Ground elevation: 1,950.0 feet (t). (Alma SW 7.5 min. quadrangle)
Depth to water: caved at 8 feet, October 21, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil, sandy, and fine clayey sand.....	0.0	6.0
Gravel, fine, and sand, reddish.....	6.0	10.0
Gravel, medium, green gray, some water-worn shale.....	10.0	18.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, black.....	18.0	20.0

Test Hole #141-A-39
(2-18-31cccb)
Harlan County

Location: NW corner SW SW SW Sec. 31, T. 2 N., R. 18 W., 0.1 mile north of southwest corner on east edge of road.
Ground elevation: 1,948.0 feet (t).(Alma SW 7.5 min. quadrangle)
Depth to water: 10 feet, (October 21, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil, sandy, and fine sand.....	0.0	7.0
Sand and fine gravel, reddish.....	7.0	10.0
Gravel, fine to medium and sand.....	10.0	27.0
Gravel, slightly coarser than above, gray.....	27.0	35.0
Gravel, medium, some coarse.....	35.0	46.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, black to gray.....	46.0	49.0

Test Hole #133-A-39
(2-18-32aaac)
Harlan County

Location: SW NE NE NE Sec. 32, T. 2 N., R. 18 W., north edge of golf course.
Ground elevation: 1,980 ft. (t). (Alma 7.5 min. quadrangle)
Depth to water: caved at 35 feet, (October 21, 1939).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil	0.0	4.0
Sand, clayey, buff	4.0	26.0
Sand, clayey, brown	26.0	32.0
Sand, clayey, fine	32.0	36.0
Gravel, fine to medium, seems to be some cementing material, less from 43 ft	36.0	50.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, black	50.0	53.0

Test Hole #125-A-39
(2-18-33cdcc)
Harlan County

Location: SW corner of SE SW Sec. 33, T. 2 N., R. 18 W., 50 ft. east of highway.
Ground elevation: 1,945.0 feet (t). (Alma 7.5 min. quadrangle)
Depth to water: 14 feet, (October 9, 1939).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil, sandy	0.0	2.0
Soil, sandy, black	2.0	4.0
Sand, clayey, buff	4.0	11.0
Sand, silty, gray	11.0	15.0
Sand, fine	15.0	19.0
Gravel, medium	19.0	28.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, greenish black	28.0	35.0

Test Hole #126-A-39
(2-18-33cbcc)
Harlan County

Location: SW corner NW SW Sec. 33, T. 2 N., R. 18 W., 150 ft. south of railroad and 10 ft. east of section line.
Ground elevation: 1,945.0 feet (t). (Alma 7.5 min. quadrangle)
Depth to water: 11.5 feet, (October 9, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil, sandy	0.0	4.0
Soil, black	4.0	7.0
Sand, fine, buff	7.0	14.0
Gravel, coarse	14.0	20.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, greenish black	20.0	25.0

Test Hole #20-U-41
(2-19-1cbaa)
Harlan County

Location: NE NE NW SW Sec. 1, T. 2 N., R. 19 W., 300 ft. west of corner and 50 ft. east of fence corner.
Ground elevation: 2,155.0 feet (t).(Orleans 7.5 min. quadrangle)
Depth to water: 117 feet, (October 18, 1941).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil, black	0.0	2.0
Silt, buff	2.0	18.0
Silt, dark reddish brown	18.0	24.0
Silt and silty clay, reddish buff	24.0	48.0
Clay, silty, sticky, limy, whitish buff	48.0	54.0
Silt and silty sand, soft, reddish buff	54.0	63.0
Silt, sandy, reddish buff, has hard sandy concretions	63.0	84.0
Sand, silty, limy, whitish buff, hard sandy concretions	84.0	88.0
Sand, silty, reddish buff, a few small sandy concretions	88.0	92.0
Sand, silty, reddish buff, more sandy lime concretions than above	92.0	99.0
Sand, silty, clayey, reddish buff, no concretions	99.0	108.0
Sand, clayey, reddish buff, some sandy clay	108.0	120.0
Gravel, fine to coarse, red, some clear and yellowish	120.0	130.0
Gravel, medium to coarse, red, very good, coarser toward bottom	130.0	145.0
Clay, slightly sandy, reddish buff	145.0	154.0
Clay, limy, compact, whitish buff	154.0	156.0
Clay, sandy, very compact, hard, tan, cuts small pieces like sandstone	156.0	160.0
Clay, sandy, limy, whitish, some scattered gravel	160.0	165.0
Sand, silty, reddish, some limy concretions or pebbles	165.0	173.0
Sand, fine and fine gravel (no sample)	173.0	180.0
Gravel, fine to medium, clean, light colored, red, yellow, some coarse	180.0	191.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, dark gray, slightly greenish	191.0	200.0

Test Hole #172-A-39
(2-19-6ddab)
Harlan County

Location: NW NE SE SE Sec. 6, T. 2 N., R. 19 W., 215 ft. west of creek and 125 yards southwest of tile silo.
Ground elevation: 1,995.0 feet (t).(Orleans 7.5 min. quadrangle)
Depth to water: 4.9 feet, (November 11, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil, fine, silty.....	0.0	2.0
Soil, black.....	2.0	4.0
Clay, sandy, silty, brownish gray.....	4.0	6.0
Gravel, fine and sand, red.....	6.0	10.0
Gravel, fine to medium, green.....	10.0	13.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, greenish gray.....	13.0	17.0

Test Hole #173-A-39
(2-19-6dbaa)
Harlan County

Location: Center NW SE Sec. 6, T. 2 N., R. 19 W., 50 ft. north of fence in line with house, 0.3 mile west of house.
Ground elevation: 1,995.0 feet (t).(Stamford 7.5 min. quadrangle)
Depth to water: 6.6 feet, (November 11, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil, sandy, dark brown.....	0.0	4.0
Clay, gray.....	4.0	7.0
Gravel, fine, and sand, green.....	7.0	10.0
Gravel, fine to medium, green.....	10.0	15.0
Gravel, fine to medium, green, some clay and fine sand.....	15.0	20.0
Gravel, coarse, sand.....	20.0	27.0
Cretaceous System, Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, gray to tan to green, sticky.....	27.0	29.0

Test Hole #160-A-39
(2-19-8dccb)
Harlan County

Location: NW SW SW SE Sec. 8, T. 2 N., R. 19 W., 0.12 mile north of southwest corner of quarter.
Ground elevation: 1,986.0 feet (t).(Orleans 7.5 min. quadrangle)
Depth to water: 7.3 feet, (November 1, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil and buff clayey sand.....	0.0	7.0
Gravel, fine and sand, reddish.....	7.0	12.0
Gravel, fine, greenish.....	12.0	29.0
Gravel, medium, greenish.....	29.0	40.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, black.....	40.0	47.0

Test Hole #161-A-39
(2-19-8dddb)
Harlan County

Location: NW SE SE SE Sec. 8, T. 2 N., R. 19 W.
Ground elevation: 2,004.0 feet (t).(Orleans 7.5 min. quadrangle)
Depth to water: 29 feet, (November 1, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil and brown to buff clayey sand.....	0.0	14.0
Sand, clayey, buff.....	14.0	27.0
Clay, silty, grayish brown.....	27.0	35.0
Gravel, fine to medium, reddish, some clay in sample, somewhat cemented.....	35.0	40.0
Gravel, medium to coarse, reddish.....	40.0	53.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, blue gray, some black.....	53.0	59.0

Test Hole #149-A-39
(2-19-19aaaa)
Harlan County

Location: NE NE NE NE Sec. 19, T. 2 N., R. 19 W., north side of highway, 50 yards south of railroad and 0.17 mile east of Republican River Bridge.
Ground elevation: 1,985.0 feet (t).(Orleans 7.5 min. quadrangle)
Depth to water: 8.9 feet, (October 24, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil and fine sand	0.0	5.0
Gravel, fine, and sand, reddish	5.0	10.0
Sand, gray	10.0	15.0
Gravel, medium, some coarse, also water-worn shale	15.0	22.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, greenish gray	22.0	27.0

Test Hole #151-A-39
(2-19-19abac)
Harlan County

Location: SW NE NW NE Sec. 19, T. 2 N., R. 19 W., 150 feet south of highway on west edge of road.
Ground elevation: 1,995.0 feet (t).(Stamford 7.5 min. quadrangle)
Depth to water: caved at 11 feet, (October 25, 1929).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil, sandy, and fine slightly clayey sand.....	0.0	7.0
Gravel, medium, some coarse.....	7.0	11.0
Gravel, medium and sand.....	11.0	19.0
Cretaceous System, Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, black.....	19.0	25.0

Test Hole #152-A-39
(2-19-19dcac)
Harlan County

Location: SW NE SW SE Sec. 19, T. 2 N., R. 19 W., 80 ft. north of Sappa Creek bridge, on east side of road.
Ground elevation: 1,970.0 feet (t).(Stamford 7.5 min. quadrangle)
Depth to water: 11.4 feet, (November 1, 1939).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil	0.0	3.0
Sand, clayey, buff	3.0	11.0
Gravel, medium	11.0	18.0
Clay, silty, blue, some gravel	18.0	20.0
Gravel, medium, greenish	20.0	28.0
Clay, sticky, bluish gray	28.0	33.0
Gravel, medium to coarse	33.0	45.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, black	45.0	49.0

Test Hole #168-A-39
(2-19-19bbad)
Harlan County

Location: SE NE NW NW Sec. 19, T. 2 N., R. 19 W., 0.21 mile east of northwest corner of section on south side of road.
Ground elevation: 1,985.0 feet (t).(Stamford 7.5 min. quadrangle)
Depth to water: 11.4 feet, (November 6, 1939).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil, black.....	0.0	5.0
Sand, clayey, brownish gray.....	5.0	9.0
Gravel, fine to medium, red.....	9.0	14.0
Cretaceous System - Upper Cretaceous Series - Montana Group: Pierre Formation:		
Shale, black.....	14.0	19.0

Test Hole #150-A-39
(2-19-20abaa)
Harlan County

Location: NE NE NW NE Sec. 20, T. 2 N., R. 19 W., 90 ft. south of highway and 0.28 mile west of northeast corner of section.
Ground elevation: 1,976.0 feet (t).(Orleans 7.5 min. quadrangle)
Depth to water: 5.3 feet, (October 25, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil, silty	0.0	1.0
Sand, fine	1.0	5.0
Gravel, medium, reddish, some sand	5.0	11.0
Gravel, medium, grayish green	11.0	21.0
Gravel, slightly finer	21.0	25.0
Gravel, medium to coarse, green and red, finer at 31 to 34 ft	25.0	44.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, black	44.0	49.0

Test Hole #144-A-39
(2-19-21abdd)
Harlan County

Location: Center NW NE Sec. 21, T. 2 N., R. 19 W., 0.07 mile west of house and 0.15 mile west of railroad junction.
Ground elevation: 2,000.0 feet (t).(Orleans 7.5 min. quadrangle)
Depth to water: 31.3 feet, (October 24, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil and buff clayey sand.....	0.0	8.0
Sand, slightly clayey, brown.....	8.0	15.0
Sand, clayey, buff.....	15.0	24.0
Sand, finer than above, more clay 31 to 35 ft.....	24.0	35.0
Gravel, medium, reddish.....	35.0	40.0
Gravel, medium, reddish, some coarse.....	40.0	51.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, black.....	51.0	56.0

Test Hole #137-A-39
(2-19-22cddd)
Harlan County

Location: SE SE SE SW Sec. 22, T. 2 N., R. 19 W., 95 ft. north of railroad, on west edge of road intersection.
Ground elevation: 1,980.0 feet (t).(Alma SW 7.5 min. quadrangle)
Depth to water: 11.4 feet, (October 21, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Sand, silty, brown.....	0.0	9.0
Sand, clayey, light brown.....	9.0	14.0
Gravel, medium, reddish.....	14.0	19.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, greenish black.....	19.0	22.0
Shale, gray.....	22.0	25.0

Test Hole #138-A-39
(2-19-24badd)
Harlan County

Location: Southeast corner of NE NW Sec. 24, T. 2 N., R. 19 W., 25 ft. west and 45 ft. north of Rope Creek bridge.
Ground elevation: 1,990.0 feet (t).(Orleans 7.5 min. quadrangle)
Depth to water: caved at 12.8 feet, (October 21, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil	0.0	4.0
Sand, clayey, light brown	4.0	13.0
Gravel, medium, and sand	13.0	19.0
Gravel, coarse, reddish, some fine	19.0	28.0
Cretaceous Systm - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, ochre colored and blue	28.0	32.0
Shale, sticky, dark blue gray	32.0	39.0

Test Hole #136-A-39
(2-19-25bccc)
Harlan County

Location: SW SW SW NW Sec. 25, T. 2 N., R. 19 W., 110 ft. north and 40 ft. east of the southwest corner of quarter.
Ground elevation: 1,988.0 feet (t).(Alma SW 7.5 min. quadrangle)
Depth to water: Dry at 22.7 feet, (October 21, 1939).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil	0.0	2.0
Sand, clayey, buff	2.0	16.0
Sand, clayey, brown	16.0	24.0
Gravel, coarse, reddish	24.0	36.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, black	36.0	39.0

Test Hole #139-A-39
(2-19-27abdd)
Harlan County

Location: Southeast corner of NW NE Sec. 27, T. 2 N., R. 19 W., 415 ft. south of railroad underpass, on west edge of road and 60 ft. south of old river channel.
Ground elevation: 1,960.0 feet (t).(Alma SW 7.5 min. quadrangle)
Depth to water: caved, (October 21, 1939).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil, silty, and fine sand.....	0.0	9.0
Gravel, fine.....	9.0	13.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, dark blue gray.....	13.0	19.0

Test Hole #145-A-39
(2-19-27ccbb)
Harlan County

Location: NW NW SW SW Sec. 27, T. 2 N., R. 19 W., east edge of road, 0.37 mile north of river bridge.
Ground elevation: 1,967.0 feet (t).(Alma SW 7.5 min. quadrangle)
Depth to water: 11.4 feet, (October 24, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Sand, fine	0.0	5.0
Clay, gray and silt	5.0	9.0
Gravel, medium, greenish gray	9.0	18.0
Gravel, medium to coarse, greenish-gray	18.0	38.0
Gravel, fine to medium, greenish-gray	38.0	45.0
Gravel, medium to coarse, greenish-gray	45.0	50.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, black	50.0	52.0

Test Hole #146-A-39
(2-19-28aadd)
Harlan County

Location: SE SE NE NE Sec. 28, T. 2 N., R. 19 W., 0.22 mile south of section line, 90 ft. west of road, on north edge of farm road.
Ground elevation: 1,965.0 feet (t).(Alma SW 7.5 min. quadrangle)
Depth to water: 10.2 feet, (October 24, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil, sandy.....	0.0	5.0
Sand, clayey, coarse.....	5.0	7.0
Sand and fine gravel.....	7.0	11.0
Gravel, fine to medium, greenish-gray.....	11.0	16.0
Gravel, medium to coarse, greenish-gray.....	16.0	21.0
Gravel, medium, some fine, greenish-gray.....	21.0	34.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, black.....	34.0	37.0

Test Hole #142-A-39
(2-19-34bbcc)
Harlan County

Location: SW SW NW NW Sec. 34, T. 2 N., R. 19 W., 280 ft. south and 115 ft. east of river bridge, north edge of road.
Ground elevation: 1,975.0 feet (t).(Alma SW 7.5 min. quadrangle)
Depth to water: 19 feet, (October 21, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil	0.0	3.0
Sand, fine, clayey, buff	3.0	15.0
Sand, fine, and clay; sample hard to get, losing water	15.0	19.0
Gravel, fine to medium, gray	19.0	28.0
Gravel, medium, some clay	28.0	35.0
Gravel, medium, greenish gray	35.0	46.0
Gravel, medium to coarse	46.0	59.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, black	59.0	62.0

Test Hole #143-A-39
(2-19-34cbbc)
Harlan County

Location: SW NW NW SW Sec. 34, T. 2 N., R. 19 W., east edge of road, 0.08 mile north of road along valley edge.
Ground elevation: 1,975.0 feet (t).(Alma SW 7.5 min. quadrangle)
Depth to water: 21.5 feet, (October 21, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil, sandy	0.0	4.0
Sand, fine, clayey, buff	4.0	16.0
Sand, fine, limy, lighter color	16.0	21.0
Gravel, fine, reddish	21.0	27.0
Gravel, fine to medium, greenish	27.0	35.0
Gravel, medium	35.0	43.0
Gravel, medium, reddish, coarse 51 to 54 ft., some green gravel last 3 ft	43.0	54.0
Cretaceous System - Upper Cretaceous Series - Montana Group: Pierre Formation:		
Shale, black	54.0	56.0

Test Hole #140-A-39
(2-19-36daaa)
Harlan County

Location: Northeast corner of SE1/4 Sec. 36, T. 2 N., R. 19 W., 125 ft. west of section line.
Ground elevation: 1,948.0 feet (t).(Alma SW 7.5 min. quadrangle)
Depth to water: 7.3 feet, (October 21, 1939).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil and fine sand.....	0.0	5.0
Gravel, medium and sand, light colored.....	5.0	9.0
Gravel, medium, greenish gray.....	9.0	17.0
Gravel, medium, greenish gray, some coarse.....	17.0	35.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, black.....	35.0	39.0

Test Hole #147-A-39
(2-19-36bbbb)
Harlan County

Location: Northwest corner of Sec. 36, T. 2 N., R. 19 W., 25 ft. south and 25 ft. east of corner.
Ground elevation: 1,951.0 feet (t).(Alma SW 7.5 min. quadrangle)
Depth to water: 8.5 feet, (October 24, 1939).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Sand, fine.....	0.0	5.0
Gravel, medium.....	5.0	12.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, black.....	12.0	15.0

Test Hole #148-A-39
(2-19-36acbc)
Harlan County

Location: SW NW SW NE Sec. 36, T. 2 N., R. 19 W., 45 ft. east of one half mile line.
Ground elevation: 1,948.0 feet (t).(Alma SW 7.5 min. quadrangle)
Depth to water: 7 feet, (October 24, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil, sandy and fine sand	0.0	5.0
Gravel, fine and sand, reddish	5.0	10.0
Gravel, fine to medium, gray	10.0	15.0
Gravel, medium, some coarse, gray, some water-worn shale	15.0	19.0
Silt, carbonaceous, black	19.0	24.0
Gravel, fine to medium, dirty	24.0	35.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, black	35.0	39.0

Test Hole #171-A-39
(2-20-2babd)
Harlan County

Location: SE NW NE NW Sec. 2, T. 2 N., R. 20 W., 0.33 mile east and 0.09 mile south of northwest corner, 50 feet west of river and 35 feet west of road.
Ground elevation: 2,009.0 feet (t).(Stamford 7.5 min. quadrangle)
Depth to water: 6.7 feet, (November 6, 1939)

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil and fine clayey sand.....	0.0	7.0
Gravel, fine to medium, and sand, red.....	7.0	11.0
Gravel, medium, greenish, somewhat dirty.....	11.0	19.0
Gravel, medium, green and red.....	19.0	24.0
Gravel, mostly coarse, more red, slightly finer at bottom.....	24.0	46.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, dark gray to black.....	46.0	49.0

Test Hole #169-A-39
(2-20-12bdac)
Harlan County

Location: SW NE SE NW Sec. 12, T. 2 N., R. 20 W., 50 ft. north of road and 100 yards north of house.
Ground elevation: 2,010.0 feet (t).(Stamford 7.5 min. quadrangle)
Depth to water: 16.8 feet, (November 6, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil and light brown clayey sand.....	0.0	15.0
Same as above but finer and softer.....	15.0	20.0
Silt, blue black.....	20.0	22.0
Gravel, medium, greenish.....	22.0	25.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, light blue gray, some dark.....	25.0	29.0

Test Hole #170-A-39
(2-20-12adac)
Harlan County

Location: SW NE SE NE Sec. 12, T. 2 N., R. 20 W.
Ground elevation: 1,995.0 feet (t).(Stamford 7.5 min. quadrangle)
Depth to water: 9.7 feet, (November 6, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Sand, fine; from flood	0.0	3.0
Soil	3.0	6.0
Sand, clayey, buff	6.0	8.0
Clay, gray	8.0	10.0
Gravel, medium and sand	10.0	18.0
Gravel, medium to coarse	18.0	32.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, black	32.0	37.0

Test Hole #157-A-39
(2-20-16daaa)
Harlan County

Location: Northeast corner of SE1/4 Sec. 16, T. 2 N., R. 20 W., west edge of road.
Ground elevation: 2,048.0 feet (t).(Stamford 7.5 min. quadrangle)
Depth to water: dry at 36.5 feet, (November 1, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Road fill	0.0	3.0
Sand, clayey, buff to yellow	3.0	19.0
Sand, clayey, brownish yellow	19.0	29.0
Gravel	29.0	35.0
Gravel, medium to coarse, compact, red; a little clay present	35.0	40.0
Gravel, coarse, compact	40.0	47.0
Gravel, slightly finer than above, reddish, some clay	47.0	51.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, black	51.0	54.0

Test Hole #158-A-39
(2-20-17cccc)
Harlan County

Location: SW SW SW SW Sec. 17, T. 2 N., R. 20 W., on bank east side of road and 110 ft. north of corner.
Ground elevation: 2,062.0 feet (t).(Stamford 7.5 min. quadrangle)
Depth to water: 35 feet, (November 1, 1939).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil	0.0	3.0
Sand, clayey, buff to yellow	3.0	21.0
Sand, clayey, brownish red	21.0	27.0
Gravel, medium, reddish	27.0	33.0
Gravel, medium to coarse, large pieces brown jasper	33.0	43.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, dark gray at 43 ft.; yellow rusty shale pieces and jasper	43.0	48.0

Test Hole #159-A-39
(2-20-20bccb)
Harlan County

Location: NW SW SW NW Sec. 20, T. 2 N., R. 20 W., in east ditch, 90 ft. south of Sappa Creek bridge.
Ground elevation: 2,015.0 feet (t).(Stamford 7.5 min. quadrangle)
Depth to water: 9.4 feet, (November 1, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil and clayey sand.....	0.0	7.0
Gravel, medium to coarse, reddish, large pieces water-worn shale and jasper.....	7.0	14.0
Gravel, coarse, greenish, large pieces.....	14.0	20.0
Gravel, fine to medium, gray; dirty.....	20.0	30.0
Gravel, fine, some coarser.....	30.0	38.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale (?), dark gray; few small pieces; at this point drilled like shale, but upon making pipe change, bit plugged.....	38.0	39.0

Test Hole #153-A-39
(2-20-23aaaa)
Harlan County

Location: NE NE NE NE Sec. 23, T. 2 N., R. 20 W., west edge of road, 105 ft. south of highway.
Ground elevation: 1,994.0 feet (t).(Stamford 7.5 min. quadrangle)
Depth to water: 12.6 feet, (October 26, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil and lime, slightly clayey sand.....	0.0	8.0
Sand, a little gravel.....	8.0	14.0
Gravel, fine and sand.....	14.0	19.0
Gravel, medium, well sorted, green.....	19.0	23.0
Gravel, medium, some coarse; from 23 to 25 ft., much water-worn shale and some sticky gray clay.....	23.0	29.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, black.....	29.0	32.0

Test Hole #154-A-39
(2-20-23aadd)
Harlan County

Location: SE SE NE NE Sec. 23, T. 2 N., R. 20 W., west edge of road, 0.1 mile south of Sappa Creek bridge.
Ground elevation: 1,993.0 feet (t).(Stamford 7.5 min. quadrangle)
Depth to water: 11.5 feet, (October 26, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil, dark brown and fine clayey sand.....	0.0	5.0
Sand, clayey, brownish gray.....	5.0	9.0
Gravel, medium, some fine, also large pieces.....	9.0	14.0
Gravel, fine to medium, some large gravel.....	14.0	19.0
Gravel, fine, and sand; muddy.....	19.0	26.0
Silt, blue, and clay.....	26.0	29.0
Gravel, medium to coarse; good.....	29.0	34.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, black.....	34.0	37.0

Test Hole #155-A-39
(2-20-24cbcb)
Harlan County

Location: NW SW NW SW Sec. 24, T. 2 N., R. 20 W., 0.36 mile north of section corner.
Ground elevation: 2,005.0 feet (t).(Stamford 7.5 min. quadrangle)
Depth to water: 24 feet, (October 26, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Road fill	0.0	2.0
Sand, fine, clayey, light brown	2.0	18.0
Sand, fine, clayey, sticky, reddish	18.0	28.0
Sand, silty, blue	28.0	30.0
Gravel, fine to medium, reddish	30.0	35.0
Gravel, fine to medium, greenish; some sand; drilled like coarse gravel present	35.0	63.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, black	63.0	67.0

Test Hole #156-A-39
(2-20-27aadd)
Harlan County

Location: SE SE NE NE Sec. 27, 2 N., R. 20 W., on bank, west side of road, 0.21 mile south of northeast corner.
Ground elevation: 2,039 feet (t). (Stamford SE 7.5 min. quadrangle)
Depth to water: dry at 30 feet, (November 1, 1939).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil and clay	0.0	4.0
Sand, clayey, brown to buff	4.0	20.0
Sand, clayey, slightly darker	20.0	28.0
Sand, clayey, gray, lower part rusty sand (Fossils)	28.0	36.0
Gravel, fine compact, reddish; some coarser gravel (cemented)	36.0	44.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, black	44.0	49.0

Test Hole #46-B-47
(3-17-1aaaa)
Harlan County

Location: NE NE NE NE Sec. 1, T. 3 N., R. 17 W., approximately 123 ft south and 8 ft west of northeast corner.
Ground elevation: 2,268.3 feet (i). (Wilson 7.5 min. quadrangle)
Depth to water: unknown, test hole caved at 226.5 feet, (August 29, 1947).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil: silt, dark brownish-gray.....	0.0	1.0
Silt, moderately clayey, light yellowish-brown.....	1.0	3.0
Silt, slightly clayey, slightly calcareous, light blue-gray.....	3.0	5.0
Silt, light buff-gray, moderately calcareous, contains many limy nodular rootlets.....	5.0	7.5
Silt, light buff-gray, slightly calcareous, contains a few gastropods.....	7.5	17.0
Silt, light buff-gray, moderately calcareous, slightly clayey and less calcareous from 20 to 22 ft.....	17.0	22.0
Silt, slightly clayey, slightly calcareous, light-brown.....	22.0	23.0
Silt, slightly clayey to slightly sandy, soil-like, dark-brown; contains very fine to medium sand, moderately sandy below 25 ft.....	23.0	30.0
Silt, moderately sandy, light reddish-yellow; contains very fine sand with some fine sand, with a trace of medium sand below 35 ft, and slightly clayey 40 to 43 ft.....	30.0	43.0
Silt, very sandy, yellow with a red tint; contains very fine to medium sand, less sandy with a trace of coarse sand from 45 to 50 ft, and light-brown below 50 ft.....	43.0	55.0
Sand, very silty, light-brown; texture grades from very fine to medium with a trace of coarse sand; contains a trace of siliceous rootlets below 60 ft.....	55.0	73.0
Silt, moderately to very sandy, yellow with a brown tint; contains very fine to fine sand, and slightly clayey below 77 ft.....	73.0	80.0
Silt, sandy, light brownish-yellow; contains very fine sand, with a trace of fine to medium sand below 90 ft, and moderately calcareous below 95 ft.....	80.0	100.0

Silt, sandy, moderately to very calcareous, light brownish-yellow; contains very fine to medium sand.....	100.0	106.0
Sand, very silty, light-brown; texture grades from very fine to medium with some coarse sand.....	106.0	110.0
Sand, slightly silty, light brownish-gray; texture grades from very fine to very coarse sand, less silty below 120 ft.....	110.0	127.0
Sand, slightly silty, light brownish-gray; texture grades from very fine to coarse.....	127.0	139.5
Silt, sandy, light brownish-yellow; contains very fine to fine sand with some medium sand.....	139.5	155.0
Sand, silty, light brownish-yellow; texture grades from very fine to medium with a trace of coarse and very coarse.....	155.0	170.0
Sand, slightly silty, light brownish-yellow; texture grades from very fine to medium with a trace of coarse sand, more silty below 175 ft.....	170.0	180.0
Sand, slightly silty, light brownish-gray; texture grades from very fine to medium with some coarse and a trace of very coarse, principally quartz, slightly coarser below 185 ft.....	180.0	189.0
Sand and gravel; textures grades from fine sand to medium gravel, 50 percent gravel; contains principally quartz with some pink feldspar and a few dark grains.....	189.0	200.0
Gravel; texture grades from fine to medium with a trace of coarse with some coarse to very coarse sand; contains principally quartz with much pink feldspar and a few dark grains, and some dark stain and slight cementation below 210 ft.....	200.0	218.0
Sand and gravel, light brownish-gray with a yellow tint; texture grades from fine sand to medium gravel, with 50 percent gravel, slightly finer below 250 ft; contains principally quartz with some pink feldspar.....	218.0	269.5
Silt, slightly clayey to slightly sandy, brownish-yellow; contains very fine sand with a few coarser grains.....	269.5	275.0
Sand, slightly silty, light brownish-gray; texture grades from very fine to coarse with some very coarse; contains a few rounded limy sandstone granules.....	275.0	280.0

Sandstone, slightly silty, moderately calcareous, light brownish-gray; texture grades from very fine to medium.....	280.0	284.0
Sandstone, silty, white, very calcareous, in part marly; texture grades from very fine to fine with some medium.....	284.0	288.0
Sand, light brownish-gray; texture grades from very fine to coarse with a trace of very coarse, in part cemented; contains principally quartz and a few rounded light brownish-gray clay granules.....	288.0	300.0
Sand; texture grades from fine to coarse with some very coarse and some fine gravel below 310 ft; contains principally quartz with some light-green grains.....	300.0	335.0
Sand and gravel; texture grades from medium sand to fine gravel with a trace of medium gravel; contains principally quartz with some pink feldspar and a few green and dark grains.....	335.0	344.5
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Clay, moderately calcareous, light-gray to yellowish-gray with moderate limonitic stain.....	344.5	347.5
Clay shale, moderately silty, moderately to very calcareous, dark-gray to medium-gray below 355 ft; contains a thin ironstone layer at 357 ft.....	347.5	360.0

Test Hole #23-U-41
(3-17-9cccd)
Harlan County

Location: SE SW SW SW Sec. 9, T. 3 N., R. 17 W., 470 ft east of southwest corner of section on north edge of road.
Ground elevation: 2,175.0 feet (t). (Huntley 7.5 min. quadrangle)
Depth to water: 118 feet (October 18, 1941).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Silt, sandy, buff	0.0	15.0
Sand, silty, dark reddish brown	15.0	19.0
Sand, silty, reddish buff	19.0	29.0
Sand, silty, reddish buff; some limy concretions	29.0	35.0
Sand, very fine, reddish; hard to get sample	35.0	67.0
Sand, fine, reddish; some clay, most of the material goes into the mud	67.0	101.0
Sand, fine to coarse, reddish; some gravel	101.0	105.0
Gravel, fine to very coarse, red; very good	105.0	114.0
Clay, sand, tan	114.0	116.0
Gravel, fine to coarse, red; very good	116.0	155.0
Gravel, fine to coarse; has large pebbles that are broken by the drill; very good	155.0	192.0
Clay, sandy, soft	192.0	195.0
Gravel, fine to coarse, red; has large pebbles, much of the gravel is broken by the drill; very good	195.0	225.0
Gravel, fine to coarse, red; good; very thin clay seam at about 225 ft	225.0	246.0
Clay, sandy, soft, gray	246.0	248.0
Gravel, fine to coarse, clean, red; good many broken fragments of gravel	248.0	269.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, dark gray to black	269.0	280.0

Test Hole #47-B-47
(3-17-24aaaa)
Harlan County

Location: NE NE NE NE Sec. 24, T. 3 N., R. 17 W., approximately 67 ft south and 168 ft west of northeast corner.
Ground elevation: 2,146 feet (i). (Republican City NW 7.5 min. quadrangle)
Depth to water: Unknown, test hole caved at 122 feet (August 8, 1947).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil: sand, moderately silty, yellowish-brown; texture of sand grades from very fine to medium.....	0.0	0.5
Silt, very sandy, medium grayish-brown; contains very fine to fine sand with some medium sand; slightly clayey and dark brownish-gray from 2 to 3 ft.....	0.5	3.0
Sand, slightly silty, light brownish-gray; texture grades from very fine to medium sand.....	3.0	5.0
Sand, light brownish-gray; texture grades from very fine to coarse with some very coarse; contains some large iron-cemented sand nodules from 8 to 10 ft.....	5.0	13.0
Silt, sandy, light-brown with a yellow tint; contains very fine sand, less sandy from 20 to 28 ft, and slightly clayey from 25 to 28 ft.....	13.0	28.0
Silt, sandy, light-brown with a yellow tint; contains very fine to medium sand.....	28.0	30.0
Silt, sandy, to sand, silty, light-brown; contains fine to medium sand with a trace of coarse and very coarse sand.....	30.0	35.0
Sand, very silty, light brownish-yellow; texture grades from very fine to medium with a trace of coarse sand, more silty below 40 ft.....	35.0	46.0
Clay, light-gray with a slight green tint; in part silty and slightly sandy in lower part.....	46.0	49.5
Clay, silty to sandy, light-gray with a slight green tint; contains very fine to fine sand with some medium and coarse sand.....	49.5	54.5

Sand; texture grades from very fine to medium with a trace of coarse; contains principally quartz with some white grains.....	54.5	64.0
Silt, slightly clayey to very sandy, light brownish-gray with some limonitic stain; contains very fine to fine sand with some medium sand.....	64.0	64.8
Clay, silty, in part moderately sandy, in part very calcareous, light greenish-gray; contains very fine to fine sand with some coarser grains.....	64.8	70.0
Silt, clayey to moderately sandy, light-gray with a slight brown tint; contains very fine to fine sand with some medium to coarse sand; contains a few limonite flecks.....	70.0	74.5
Sand and gravel; texture grades from fine sand to medium gravel, 50 to 70 percent gravel; principally quartz with some pink feldspar; contains a trace of gravel from 80 to 95 ft.....	74.5	140.0
Sand and gravel; texture grades from fine sand to fine gravel with a trace of medium gravel, 25 to 30 percent gravel; contains principally quartz with some pink feldspar.....	140.0	160.0
Sand and gravel; texture grades from medium sand to medium gravel, 70 percent gravel from 160 to 170 ft, 60 percent gravel from 170 to 180 ft and 50 percent gravel below 180 ft; contains principally quartz with much pink feldspar.....	160.0	198.5
Silt, clayey, light-gray with some limonitic stain.....	198.5	199.0
Sand, silty to silt, sandy, brownish-yellow; contains very fine sand, moderately calcareous below 207 ft.....	199.0	207.5
Silt, moderately clayey to slightly sandy, moderately calcareous, light brownish-gray; contains very fine sand, yellow tint below 210 ft, nonclayey and moderately sandy below 215 ft.....	207.5	221.0
Sand; texture grades from fine to very coarse with fine gravel; contains principally quartz.....	221.0	231.0
Cretaceous System - Upper Cretaceous Series - Montana Group: Pierre Formation:		
Clay, slightly calcareous, light yellowish-brown and yellowish-gray.....	231.0	236.0
Clay shale, very calcareous, dark-gray, medium-gray below 240 ft.....	236.0	250.0

Test Hole #21-U-41
(3-18-9bbba)
Harlan County

Location: NE NW NW NW Sec. 9, T. 3 N., R., 18 W., 0.1 mile east of northwest corner.
Ground elevation: 2,210.0 feet (t).(Huntley 7.5 min. quadrangle)
Depth to water: 115.2 feet (October 18, 1941).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Road fill	0.0	2.0
Silt, buff	2.0	23.0
Silt, dark reddish brown, old soil	23.0	27.0
Silt, clayey, reddish buff, has limy concretions in lower part	27.0	38.0
Sand, silty, reddish buff, some coarse sand	38.0	50.0
Sand, slightly silty or clayey, reddish buff, has hard sandy lime concretions or sandstone	50.0	67.0
Sand, clayey, compact, reddish buff	67.0	73.0
Gravel, fine to very coarse, clean, mostly red	73.0	90.0
Clay, sandy, reddish	90.0	91.0
Gravel, fine to coarse, clean, red, very good, very thin clay seam at 135 ft	91.0	144.0
Clay, sandy, reddish buff	144.0	159.0
Clay, sandy, limy, hard, whitish buff	159.0	160.0
Clay, silty, pinkish tan	160.0	168.0
Tertiary System - Miocene Series - Ogallala Group:		
Clay, sandy, limy, whitish gray to pink	168.0	177.0
Sandstone, grayish green	177.0	181.0
Clay, sandy, greenish gray, hard limy concretions or thin layers	181.0	187.0
Clay, sandy, greenish gray, cuts in large pieces	187.0	193.0
Sandstone, greenish gray	193.0	206.0
Same as above but containing gravel	206.0	208.0
Gravel, fine to medium, mostly red	208.0	213.0
Clay, sandy, greenish gray, contains some lime	213.0	226.0
Gravel, fine to medium, well sorted, mostly greenish yellow, clear, some red, a dark gravel, very thin clay seam at 280 ft	226.0	286.0
Cretaceous System - Upper Cretaceous Series - Montana Group: Pierre Formation:		
Shale, tough, plastic, light gray to black, rusty at contact	286.0	290.0

Test Hole #21-A-48
(3-18-29aaab)
Harlan County

Location: NW NE NE NE Sec. 29, T. 3 N., R. 18 W., approximately 13 ft south and 420 ft west of northeast corner.
Ground elevation: 2,175 feet (i) (Huntley 7.5 min. quadrangle)
Depth to water: 103.8 feet (August 11, 1948).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil and road fill: silt, dark-brown.....	0.0	0.6
Soil: silt, light-brown.....	0.6	1.5
Silt, slightly clayey, dark-buff.....	1.5	3.0
Silt, light-buff to medium-brown; contains a few calcareous rootlets and gastropods.....	3.0	17.0
Silt, soil-like, dark reddish-brown, granular.....	17.0	20.0
Silt, moderately calcareous, medium to light-buff; contains a few calcareous nodules.....	20.0	30.0
Silt, very calcareous, light-buff.....	30.0	48.5
Silt, sand and gravel, interbedded.....	48.5	57.5
Silt, very calcareous, light-buff to medium-buff; contains a trace of sand and gravel.....	57.5	60.0
Sand and gravel, gray and pink; texture grades from medium sand to coarse gravel.....	60.0	79.5
Silt, sand and gravel, interbedded, moderately calcareous.....	79.5	98.0
Sand and gravel, gray, orange and pink; texture grades from fine sand to coarse gravel.....	98.0	151.5
Silt, very calcareous, light-gray.....	151.5	158.0
Silt, slightly calcareous, light-brown.....	158.0	170.0
Silt, sandy to slightly clayey, slightly calcareous, light grayish-buff; contains very fine sand.....	170.0	184.5
Tertiary System - Miocene Series - Ogallala Group:		
Silt, very calcareous, light-gray.....	184.5	200.0
Silt, reddish-buff.....	200.0	212.0
Silt, very calcareous, light-gray.....	212.0	216.5
Sand and gravel, gray to yellow and pink; texture grades from medium sand to medium gravel.....	216.5	241.0
Silt, clayey, moderately calcareous, light-gray to green; medium gray and very calcareous below 244.9 ft.....	241.0	244.9

Cretaceous System - Upper Cretaceous Series - Montana Group:
Pierre Formation:

Silt, clayey, medium gray.....	244.9	260.0

Test Hole #27-U-41
(3-19-7cccc)
Harlan County

Location: Southwest corner of Sec. 7, T. 3 N., R. 19 W., 100 ft. east of corner on north edge of road.
Ground elevation: 2,155.0 feet (t).(Stamford 7.5 min. quadrangle)
Depth to water: 76 feet, (October 18, 1941).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil, clayey, dark brown	0.0	4.0
Silt, buff	4.0	22.0
Silt, buff to reddish	22.0	24.0
Silt, clayey, dark reddish brown	24.0	27.0
Silt and sandy clay, reddish buff	27.0	44.0
Silt and sandy clay, reddish buff, a few limy concretions	44.0	56.0
Sand, silty, buff to reddish, thin limy streaks	56.0	68.0
Gravel, fine to medium, red	68.0	71.0
Clay, compact, brownish buff	71.0	79.0
Clay, sandy, compact, gray	79.0	86.0
Gravel, fine to coarse, good, mostly red, some clear quartz	86.0	98.0
Tertiary System - Miocene Series - Ogallala Group:		
Clay, sandy, gray	98.0	102.0
Same but very thin limy streaks at 102 and 104 ft	102.0	104.0
Clay, sandy, tan to pinkish	104.0	110.0
Clay, sandy, gray	110.0	115.0
Clay, sandy, compact, tan to pinkish	115.0	127.0
Gravel, fine to medium, mostly clear quartz, some greenish yellow and pink	127.0	140.0
Gravel, fine to coarse, mostly clear quartz, some yellowish green, pink and red	140.0	153.0
Clay, compact, greenish gray	153.0	163.0
Gravel, and gray sandy clay, compact (red gravel)	163.0	165.0
Cretaceous System - Upper Cretaceous Series - Montana Group: Pierre Formation:		
Shale, light gray to rusty	165.0	175.0
Shale, light gray to rusty, hard rusty streak at 175 ft	175.0	181.0
Shale, plastic, dark gray to black, slight greenish cast	181.0	190.0

Test Hole #166-A-39
(3-20-15cccc)
Harlan County

Location: Southwest corner of Sec. 15, T. 3 N., R. 20W., 0.17 mile south of railroad and 12 ft. east of section line
Ground elevation: 2,033.0 feet (t).(Stamford 7.5 min. quadrangle)
Depth to water: 11 feet, (November 11, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil and brown clayey sand.....	0.0	8.0
Sand and fine gravel.....	8.0	15.0
Clay, black.....	15.0	18.0
Gravel, fine, muddy.....	18.0	23.0
Gravel, medium, reddish, some coarse, good.....	23.0	30.0
Gravel, slightly coarser than above; seems to be slightly cemented; some cemented sand.....	30.0	38.0
Flint boulder, green; at 38 feet; rusty yellow shale below flint.....	38.0	43.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, black.....	43.0	47.0

Test Hole #167-A-39
(3-20-16acca)
Harlan County

Location: SE SW SW NE Sec. 16, T. 3 N., R. 20 W., 0.4 mile west of east section where cut by highway and 0.05 mile north of highway in southwest corner of hay flat.
Ground elevation: 2,038.0 feet (t).(Stamford 7.5 min. quadrangle)
Depth to water: 8.8 feet, (November 1, 1939)

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil	0.0	4.0
Sand, clayey, brownish gray	4.0	7.0
Clay, silty, black to gray	7.0	15.0
Gravel, fine, and sand	15.0	20.0
Gravel, medium, loose, reddish, some sand	20.0	31.0
Gravel, medium, some coarse and compact sand, reddish	31.0	46.0
Gravel, flint, some limy shale	46.0	53.0
Cretaceous System - Upper Cretaceous Series - Colorado Group:		
Niobrara Formation:		
Shale, limy, very light gray to white	53.0	60.0
Shale, sticky, gray	60.0	64.0

Test Hole #174-A-39
(3-20-18cdda)
Harlan County

Location: NE SE SE SW Sec. 18, T. 3 N., R. 20 W., 1/8 mile north and 260 feet west of southeast corner.
Ground elevation: 2,048.0 feet (t).(Stamford 7.5 min. quadrangle)
Depth to water: 13.7 feet (November 6, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil and buff clayey sand.....	0.0	12.0
Sand and fine gravel.....	12.0	20.0
Gravel, medium to coarse, greenish-gray, some clay at 25 ft.....	20.0	30.0
Gravel, coarse, green and red.....	30.0	35.0
Gravel, medium, more red than above.....	35.0	40.0
Gravel, medium to coarse, very compact, red, some sand.....	40.0	52.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, ochre to greenish gray.....	52.0	57.0

Test Hole #165-A-39
(3-20-23cbcb)
Harlan County

Location: NW SW NW SW Sec. 23, T. 3 N., R. 20 W., 115 ft. south of railroad and 20 ft. east of section fence.
Ground elevation: 2,044.0 feet (t).(Stamford 7.5 min. quadrangle)
Depth to water: 29.2 feet, (November 1, 1939).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil	0.0	4.0
Sand, clayey, buff	4.0	27.0
More sand than above, darker brownish gray	27.0	34.0
Gravel, medium, compact, reddish, cemented	34.0	39.0
Gravel, medium, some coarse, reddish	39.0	48.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, black	48.0	57.0

Test Hole #164-A-39
(3-20-26cdcc)
Harlan County

Location: Southwest corner of SE SW Sec. 26, T. 3 N., R. 20 W., 0.24 mile west of Carter bridge.
Ground elevation: 2,015.0 feet (t).(Stamford 7.5 min. quadrangle)
Depth to water: 8.8 feet, (November 1, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil, sandy, and brown slightly clayey sand.....	0.0	7.0
Gravel, fine, and muddy sand.....	7.0	21.0
Gravel, fine to medium, some coarse gravel, coarser lower part.....	21.0	40.0
Cretaceous System - Upper Cretaceous Series - Montana Group: Pierre Formation:		
Shale, greenish black.....	40.0	49.0

Test Hole #175-A-39
(3-20-28bbbc)
Harlan County

Location: SW NW NW NW Sec. 28, T. 3 N., R. 20 W., 425 ft. south of northwest corner, east edge of road.
Ground elevation: 2,035.0 feet (t).(Stamford 7.5 min. quadrangle)
Depth to water: 9.6 feet, (November 6, 1939).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Road fill	0.0	3.0
Sand, dark brown	3.0	5.0
Sand, clayey, buff to brown	5.0	12.0
Gravel, fine, and sand, red; coarser from 18 ft	12.0	24.0
Gravel, medium to coarse, red	24.0	29.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, dark gray to greenish gray	29.0	34.0

Test Hole #163-A-39
(3-20-35aaab)
Harlan County

Location: NW NE NE NE Sec. 35, T. 3 N., R. 20 W., 0.12 mile west of northeast corner in south ditch.
Ground elevation: 2,014.0 ft (t). (Stamford 7.5 min. quadrangle)
Depth to water: 8 feet, (October 30, 1939).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil and clayey sand.....	0.0	5.0
Clay, silty, black.....	5.0	7.0
Gravel and sand.....	7.0	13.0
Clay, blue.....	13.0	17.0
Gravel, coarse, reddish.....	17.0	26.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Shale, dark gray, some brownish gray; very hard to get sample, seemed to mix with mud.....	26.0	39.0

Test Hole 162-A-39
(3-20-36dadd)
Harlan County

Location: SE SE NE SE Sec. 36, T. 3 N., R. 20 W., 100 yards north of house and 0.15 mile south of railroad.
Ground elevation: 2,015.0 feet (t).(Stamford 7.5 min. quadrangle)
Depth to water: 13.1 feet, (November 1, 1939).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Soil and brown clayey sand.....	0.0	9.0
Sand, clayey, buff.....	9.0	14.0
Clay, silty, sandy, gray.....	14.0	21.0
Gravel, medium, reddish.....	21.0	31.0
Sand, clayey, yellow, cemented.....	31.0	33.0
Gravel, medium, light.....	33.0	37.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, dark gray to black.....	37.0	41.0

Test Hole #44-B-47
(4-17-1aaaa)
Harlan County

Location: NE NE NE NE Sec. 1, t. 4 N., R. 17 W., approximately 119 ft south and 8 ft west of northeast corner.
Ground elevation: 2,263.1 feet (i). (Wilcox 7.5 min. quadrangle)
Depth to water: 144.4 feet (August 27, 1947)

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Road fill and soil: silt, dark brownish-gray	0.0	1.5
Silt, moderately clayey, light brownish-gray	1.5	3.5
Silt, slightly to moderately clayey, slightly calcareous, buff to light brownish-gray	3.5	6.0
Silt, moderately clayey, soil-like, medium brownish-gray, slightly calcareous	6.0	7.5
Silt, moderately clayey, slightly calcareous, light brownish-gray, light buff-gray with a yellow tint from 8 to 10 ft; contains a few limy nodules	7.5	10.0
Silt, slightly clayey, light buff-gray with a yellow tint	10.0	31.5
Silt, moderately clayey to slightly sandy, soil-like, light brownish-gray; contains a very fine to medium sand	31.5	34.5
Sand, slightly silty, brownish-gray; texture grades from very fine to medium with a trace of coarse; contains more coarse below 40 ft	34.5	45.0
Sand, slightly silty, light-gray with a brown tint; texture grades from very fine to fine with some medium sand	45.0	50.0
Silt, sandy, light-brown; contains very fine to fine sand	50.0	55.0
Silt, moderately sandy, light-brown; contains very fine sand	55.0	60.0
Silt, slightly clayey to moderately sandy, light-brown with a pink tint; contains very fine sand with a trace of fine to medium sand and a few limy nodules, while slightly sandy with many limy nodules below 66 ft	60.0	76.5
Sand, slightly silty, light brownish-gray; texture grades from very fine to coarse	76.5	84.5

Silt, slightly clayey to moderately sandy, light-brown; contains very fine to fine sand, very sandy and light grayish-brown below 87 ft.....	84.5	88.0
Sand, slightly silty, light brownish-gray; texture grades from very fine to coarse, finer below 90 ft.....	88.0	94.5
Silt, sandy, light-gray; texture grades from very fine to fine; contains limonite flecks, and is slightly clayey, light yellowish-gray and contains some medium sand below 97 ft.....	94.5	102.0
Sand, moderately silty, light brownish-gray; texture grades from very fine to medium.....	102.0	106.0
Silt, clayey to slightly sandy, light-gray with some limonitic stain; contains very fine to fine sand with some medium sand.....	106.0	108.0
Sand, slightly silty, light brownish-gray; texture grades from very fine to medium sand; contains some coarse sand below 110 ft, and a trace of very coarse sand below 115 ft.....	108.0	117.0
Silt, slightly clayey to very sandy, light brownish-gray with much iron stain; contains very fine to medium sand with some coarse sand.....	117.0	118.5
Silt, clayey to sandy, light-brown with some iron stain; contains very fine sand.....	118.5	120.0
Silt, moderately clayey, light-brown with a yellow tint; contains a trace of very fine to fine sand below 125 ft.....	120.0	129.5
Silt, sandy, brownish-yellow; texture grades from very fine to fine sand with a trace of medium to coarse sand; contains sandy silt to silty sand and traces of very coarse sand and fine gravel below 135 ft.....	129.5	140.0
Sand, slightly silty, light brownish-gray; texture grades from very fine to coarse with a trace of very coarse sand and gravel; contains some very coarse sand and a trace of fine gravel below 145 ft, a few rounded and flattened brownish-yellow clay granules below 150 ft, and much very coarse sand and fine gravel below 155 ft.....	140.0	162.0
Sand and gravel, brownish-gray with some pink feldspar; texture grades from medium sand to medium gravel, 50 percent gravel, slightly iron-stained; contains 30 percent gravel from 170 to 175 ft; 75 percent gravel below 190 ft.....	162.0	201.0

Tertiary System - Miocene Series - Ogallala Group:		
Clay, silty, yellowish-brown with iron stain	201.0	202.0
Clay, silty, brown; contains thin hard limy layers at 205.5 and 211.5 ft	202.0	217.5
Silt, greenish-gray; contains some hard limy layers from 220 to 222 ft	217.5	222.0
Sand, light brownish-gray; texture grades from fine to very coarse with some fine gravel	222.0	238.0
Sandstone and siltstone, very calcareous, light-gray with some greenish-gray; contains thin hard limy layers at 238 and 240 ft	238.0	249.5
Marl, light yellowish-gray	249.5	252.0
Silt, light-gray, very calcareous	252.0	260.0
Silt, slightly clayey to sandy, light greenish-gray; contains several hard limy layers and very fine sand	260.0	281.0
Clay, silty to sandy, light-gray; contains thin limy layers at 282 and 238.5 ft and very fine sand	281.0	295.0
Sand, moderately calcareous; texture grades from fine to coarse	295.0	297.0
Marl, sandy to silty, very light-brown	297.0	302.0
Clay, silty to sandy, light-brown; contains some interbedded limy layers	302.0	310.0
Clay, silty, light brownish-gray	310.0	326.5
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Clay, moderately calcareous, light-gray with some limonitic-stain, medium-gray below 330 ft	326.5	347.0
Clay shale, slightly calcareous, dark-gray	347.0	360.0

Test Hole #45-B-47
(4-17-24aaaa)
Harlan County

Location: NE NE NE NE Sec. 24, T. 4 N., R. 17 W., approximately 121 ft south and 6 ft west of northeast corner.
Ground elevation: 2,245.0 feet (i). (Wilcox 7.5 min. quadrangle)
Depth to water: 179.7 feet, (August 28, 1947).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil with some road fill: silt, slightly clayey, dark brownish-gray.....	0.0	2.5
Silt, moderately clayey, medium brownish-gray.....	2.5	3.0
Silt, slightly clayey, slightly calcareous, light buff-gray with a yellow tint.....	3.0	4.0
Silt, moderately calcareous, light yellowish-gray; contains a few gastropods and a few limonite flecks below 7 ft, less calcareous below 9 ft.....	4.0	15.0
Silt, light yellowish-gray with light-brown tint; contains a trace of very fine to fine sand.....	15.0	18.5
Silt, slightly sandy, light-brown; contains very fine to fine sand.....	18.5	20.0
Silt, soil-like, slightly clayey to very sandy, brown; contains very fine to fine sand with some medium with a trace of coarse sand.....	20.0	23.0
Sand, light brownish-gray; texture grades from very fine to coarse.....	23.0	27.5
Silt, sandy, light-brown; contains very fine to fine sand, and slightly clayey with some medium and a trace of coarse sand below 30 ft.....	27.5	37.0
Silt, slightly clayey to moderately sandy; moderately to very calcareous, pinkish-yellow with a gray tint; contains very fine to fine sand with a trace of medium sand.....	37.0	40.0
Silt, sandy, to sand, silty, moderately calcareous, very light brownish-yellow; contains very fine to fine with a trace of medium sand.....	40.0	43.0
Sand, moderately silty, light brownish-gray; texture grades from very fine to medium with some coarse, light brownish-yellow and more silty below 50 ft.....	43.0	55.0

Sand, light brownish-gray with a yellow tint; texture grades from very fine to medium with some coarse, slightly silty from 55 to 60 ft, light yellowish-gray below 60 ft; slightly coarser below 80 ft.....	55.0	70.0
Silt, moderately sandy, light-brown with a yellow tint; contains very fine sand, and a trace of medium to coarse sand below 80 ft.....	70.0	87.0
Sand, slightly silty, light brownish-gray; texture grades from very fine to coarse with some very coarse.....	87.0	92.5
Silt, slightly clayey to moderately sandy, light-brown; contains very fine to fine sand with a trace of medium; contains a few limonite flecks.....	92.5	98.0
Clay, silty, to silt, clayey to moderately sandy, light-gray with slight green tint.....	98.0	100.0
Silt, clayey, to sandy, light-gray with a slight brown tint; contains very fine to fine sand with some medium; very sandy with a trace of coarse sand below 106.5 ft.....	100.0	111.0
Silt, sandy, light-gray with much limonitic stain; contains very fine to fine sand with some medium; light brownish-yellow with a few limonite flecks below 115 ft.....	111.0	120.0
Sand, silty, to silt, sandy, light brownish-yellow; texture grades from very fine to fine sand with some medium.....	120.0	130.0
Sand, light brownish-gray; texture grades from very fine to coarse, slightly silty with some very coarse sand and fine gravel below 135 ft; contains principally quartz with a few flattened and rounded brownish-yellow clay granules below 140 ft.....	130.0	150.0
Sand and gravel, light brownish gray with some pink feldspar; texture grades from fine sand to fine gravel with some medium gravel, with 30 to 40 percent gravel from 150 to 165 ft, 20 percent gravel from 165 to 175 ft, and 30 to 40 percent gravel and some iron-stain below 175 ft.....	150.0	194.0
Sand; texture grades from fine to coarse; contains principally quartz.....	194.0	198.0
Tertiary System - Miocene Series - Ogallala Group:		
Silt, sandy, light greenish-gray; contains very fine to fine sand, and a hard calcareous layer from 198 to 198.5 ft.....	198.0	200.0

Silt, sandy, very calcareous, light greenish-gray; contains very fine to fine sand, with some consolidation	200.0	203.0
Silt, sandy, to sand, silty, light greenish-gray; contains very fine to fine sand, with some thin hard limy layers	203.0	210.0
Silt, sandy, light greenish-gray; light brownish-gray below 215 ft, very sandy below 220 ft	210.0	226.0
Sand; texture grades from fine to very coarse with some fine gravel; contains principally quartz with a few green grains	226.0	231.0
Clay, red-tan; contains thin hard limy layers from 231 to 231.2 ft and at 236.5 ft, while sandy below 237 ft	231.0	241.0
Sandstone, moderately calcareous, light brownish-gray; fine-texture, consolidated and very calcareous from 243 to 247 ft	241.0	251.0
Silt, clayey to sandy, light greenish-gray; contains very fine to fine sand	251.0	255.0
Sandstone, silty, light-brown; fine-texture, slightly consolidated	255.0	258.0
Silt, sandy, light greenish-gray; contains fine sand, less sandy below 263 ft, with some calcareous layers below 267 ft	258.0	270.0
Sand, silty, light greenish-gray; texture grades from very fine to fine with some medium	270.0	280.0
Silt, slightly clayey to slightly sandy, light greenish-gray	280.0	286.0
Sand, slightly silty, light brownish-gray, in part light-green; texture grades from very fine to medium with a trace of coarse to very coarse	286.0	291.0
Silt, slightly clayey to sandy, light brownish-gray with a green tin; contains very fine sand	291.0	293.0
Sand, slightly silty, light brownish-gray; texture grades from very fine to medium	293.0	302.0
Silt, slightly clayey to sandy, light greenish-gray; contains very fine sand	302.0	306.0
Sand, light brownish-gray with some pink grains; texture grades from fine to very coarse with some fine gravel; contains some silty layers	306.0	310.0
Clay, silty to sandy, light greenish-gray; contains very fine sand	310.0	320.0

Sand and gravel, light brownish-gray with some pink and light-green grains; texture grades from fine sand to fine gravel with a trace of medium gravel.....	320.0	323.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Clay, very calcareous, light-gray with a slight limonitic-stain.....	323.0	326.0
Clay shale, very calcareous, medium-gray.....	326.0	335.0
Clay shale, moderately calcareous, dark-gray.....	335.0	340.0

Test Hole #24-A-48
(4-18-4babb)
Harlan County

Location: NW NW NE NW Sec. 4, T. 4 N., R. 18 W., approximately 9 ft south and 1,400 ft east of northwest corner.
Ground elevation: 2,339.81 feet (i). (Ragan 7.5 min. quadrangle)
Depth to water: 198.7 feet, (August 19, 1948).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil and road fill: silt, dark-brown.....	0.0	1.0
Soil: silt, medium-brown.....	1.0	3.0
Silt, dark brownish-buff to medium-buff; contains a few calcareous rootlets, gastropod shells and limonite nodules.....	3.0	30.5
Silt, soil-like, dark reddish-brown.....	30.5	33.0
Silt, dark reddish-buff to medium-buff.....	33.0	93.0
Silt, sandy, to sand, grayish-buff; contains very fine to fine sand.....	93.0	100.0
Silt, sandy, medium-buff with red tint; contains very fine sand.....	100.0	137.0
Silt, slightly clayey, light-gray.....	137.0	143.0
Silt, sandy, light-gray; contains some fine gravel.....	143.0	147.0
Silt, slightly clayey, medium-gray.....	147.0	156.0
Silt, sandy, medium brownish-buff to grayish-tan; contains some medium gravel below 167 ft.....	156.0	175.0
Sand and gravel, orange, gray, pink and yellow; texture grades from coarse sand to medium gravel.....	175.0	254.0
Tertiary System - Miocene Series - Ogallala Group:		
Silt, sandy; contains fine sand and some interbedded layers of very calcareous silt.....	254.0	258.0
Sandstone, very calcareous; contains some calcareous silt below 270 ft.....	258.0	286.0
Silt, sandy, light-gray; contains very fine sand.....	286.0	296.0
Sand, grayish-tan; texture grades from fine to medium.....	296.0	300.0
Silt, sandy, slightly calcareous, medium-gray.....	300.0	307.0
Sandstone, fine-grained, moderately calcareous, light-gray with pink tint; contains some silt from 307 to 310 ft.....	307.0	320.0
Marl, light-blue to light-gray.....	320.0	330.0

Siltstone, very calcareous, light-gray with tan tint	330.0	343.0
Marl, white	343.0	343.2
Siltstone, greenish-gray	343.2	350.0
Sand, silty, light-gray with green tint, yellow to tan tint below 370 ft	350.0	371.0
Sand and gravel, light yellowish-gray; texture grades medium sand to fine gravel	371.0	383.0
Silt, sandy, light yellowish-gray; contains very fine sand	383.0	411.0
Sand, light grayish-tan; texture grades from fine to coarse	411.0	427.0
Silt, sandy, moderately calcareous, light-gray; contains fine sand	427.0	436.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Quartzite, red	436.0	437.0

Test Hole #23-A-48
(4-18-17addd)
Harlan County

Location: SE SE SE NE Sec. 17, T. 4 N., R. 18 W., approximately 2,607 ft south and 21 ft west of northeast corner.
Ground elevation: 2,297.0 feet (i). (Ragan 7.5 min. quadrangle)
Depth to water: 168.6 feet (August 13, 1948).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil and road fill: silt, medium-brown.....	0.0	0.6
Soil: silt, light-brown.....	0.6	1.0
Silt, light-buff to dark-buff.....	1.0	10.0
Silt, soil-like, dark reddish-brown.....	10.0	13.5
Silt, reddish-brown to dark buff.....	13.5	30.0
Silt, sandy, light-gray to brownish-gray; contains very fine to coarse sand.....	30.0	55.0
Sand, brownish-gray to pink; texture grades from fine to coarse.....	55.0	62.0
Silt, moderately calcareous, medium reddish-buff; contains a few calcareous nodules, medium-buff from 90 to 105.5 ft, light-gray below 105.5 ft.....	62.0	110.0
Silt, sandy, light grayish-tan; contains very fine sand.....	110.0	114.0
Sand, light grayish-tan; texture grades from fine to medium.....	114.0	142.0
Sand and gravel, gray and pink with some orange; texture grades from coarse sand to coarse gravel.....	142.0	239.0
Sand, grayish-tan; texture grades from fine to medium.....	239.0	242.5
Sand, silty, grayish-tan.....	242.5	244.0
Sand and gravel, gray to orange and pink; texture grades from coarse sand to medium gravel.....	244.0	268.5
Sand, grayish-tan; texture grades from fine to medium.....	268.5	270.0
Silt, sandy, grayish-tan; contains fine sand.....	270.0	273.0
Sand and gravel, gray to orange; texture grades from coarse sand to fine gravel.....	273.0	277.0
Silt, sandy to slightly clayey, light-gray; contains fine sand.....	277.0	289.0
Sand and gravel, gray to orange and pink; texture grades from coarse sand to coarse gravel.....	289.0	307.0

Tertiary System - Miocene Series - Ogallala Group:		
Silt, moderately calcareous, light-gray with green tint, very calcareous below 310 ft.....	307.0	315.0
Silt, sandy to slightly clayey, slightly calcareous, light-gray, tan tint below 320 ft.....	315.0	330.0
Sand and gravel, grayish-tan; texture grades from medium sand to fine gravel.....	330.0	355.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Shale, light-gray to medium gray with some limonitic-stain.....	355.0	370.0

Test Hole #22-A-48
(4-18-33bbbb)
Harlan County

Location: NW NW NW NW Sec. 33, T. 4 N., R. 18 W., approximately 39 ft south and 81 ft east of northwest corner.
Ground elevation: 2,203.0 feet (i). (Ragan 7.5 min. quadrangle)
Depth to water: 92.3 feet (August 13, 1948).

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Silt, light-tan	0.0	0.6
Soil: silt, medium-brown to dark-brown	0.6	6.0
Silt, medium-buff to dark-buff	6.0	30.0
Silt, slightly clayey, light-gray with some iron-stain	30.0	40.0
Sand, to silt, sandy, grayish-tan; texture grades from fine to medium	40.0	52.5
Sand and gravel, grayish-tan to orange and pink; texture grades from medium sand to coarse gravel	52.5	143.5
Silt, sandy	143.5	147.5
Sand and gravel, grayish-tan to orange and pink; texture grades from sand to coarse gravel	147.5	154.5
Tertiary System - Miocene Series - Ogallala Group:		
Silt, slightly sandy, tan	154.5	162.5
Silt, very calcareous, white	162.5	164.5
Sandstone, moderately to very calcareous, grayish-white; contains a few calcareous rootlets	164.5	195.0
Silt, very calcareous, grayish-white; contains a few sand grains, and slightly calcareous below 205 ft	195.0	229.0
Silt and gravel, interbedded	229.0	234.0
Sand and gravel, brownish-gray to pink; texture grades from coarse sand to medium gravel	234.0	250.0
Cretaceous System - Upper Cretaceous Series - Montana Group: Pierre Formation:		
Shale, silty, moderately calcareous, light-gray to dark-gray	250.0	270.0

Test Hole #27-B-48
(4-20-1daad)
Harlan County

Location: SE NE NE SE Sec. 1, T. 4 N., R. 20 W., approximately 2,192 ft north and 12 ft west of southeast corner.
Ground elevation: 2,294.0 feet (i). (Mascot 7.5 min. quadrangle)
Depth to water: 127 feet (August 12, 1948).

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Soil and road fill: silt, medium brownish-gray	0.0	0.5
Soil: silt, dark brownish-gray	0.5	3.0
Silt, brownish-buff with slight gray tint	3.0	3.5
Silt, slightly clayey, buff-gray with slight brown tint	3.5	4.0
Silt, moderately calcareous, buff-gray, contains a few gastropod shells below 9 ft	4.0	28.5
Silt, soil-like, reddish-brown	28.5	32.5
Silt, tan	32.5	35.0
Silt, slightly clayey, moderately to very calcareous, grayish-tan; contains a few calcareous nodules below 38 ft	35.0	40.0
Sand, silty to silt, sandy, in part very calcareous, brown; contains very fine to medium sand with some coarse sand	40.0	56.0
Silt, very calcareous, white with brown tint	56.0	60.0
Silt, in part sandy, moderately to very calcareous, brownish-gray to buff; contains very fine to medium sand, coarser below 80 ft	60.0	90.5
Sand, silty, light-brown; fine texture sand	90.5	94.5
Silt, slightly sandy, very calcareous, light-gray	94.5	95.0
Sand and gravel, brownish-gray to pink; texture grades from fine sand to coarse gravel, in part iron-stained	95.0	178.0
Tertiary System - Miocene Series - Ogallala Group:		
Silt, slightly clayey, brownish-buff	178.0	181.5
Silt, sandy, brown-gray to light-gray, very calcareous from 181.5 to 184 ft	181.5	191.0
Silt, in part sandy, very calcareous, white	191.0	194.0
Sandstone, very calcareous, light-green to white; texture grades from very fine to fine	194.0	205.0

Sand, silty, very calcareous, light-gray; texture grades from very fine to medium.....	205.0	207.0
Sandstone, moderately to very calcareous, light greenish-gray; texture grades from very fine to medium; contains a few sandy silt layers.....	207.0	233.0
Silt to claystone, moderately to very calcareous, light-gray.....	233.0	235.0
Silt, sandy to slightly clayey, light greenish-gray; contains very fine sand, and a hard calcareous layer from 238 to 238.5 ft.....	235.0	240.0
Clay, silty, to silt, clayey, light greenish-gray, brown and slightly calcareous below 244.5 ft.....	240.0	255.0
Silt, clayey, moderately calcareous, light-gray; contains gravel below 259.5 ft, which consists of reworked limestone and limonite fragments.....	255.0	260.0
Cretaceous System - Upper Cretaceous Series - Montana Group:		
Pierre Formation:		
Clay, moderately calcareous, light-gray to yellowish gray; light-gray with yellowish tint below 284.5 ft; limonitic-stained contains a few aragonite fragments.....	260.0	305.0
Clay shale, moderately calcareous, medium-gray; dark-gray below 315 ft.....	305.0	320.0

Test Hole #19-U-41
(4N-20W-25aaaa)
Harlan County

Location: Northeast corner of Sec. 25, T. 4 N., R. 20 W., 75 ft. west of corner on south side of road.
Ground elevation: 2,280 ft. (t). (Mascot 7.5 min. quadrangle)
Depth to water: caved at 149.6 ft., (October 18, 1941)

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Silt, buff	0.0	27.0
Silt, dark brown to reddish (old soil)	27.0	30.0
Silt and silty sand, reddish buff	30.0	67.0
Silt and silty clay, reddish buff, limy streaks	67.0	72.0
Clay, silty, limy, reddish buff to white	72.0	78.0
Silt, reddish buff, some limy concretions	78.0	84.0
Sand, silty, clayey, reddish buff, some red gravel	84.0	96.0
Gravel, medium to coarse, red, good	96.0	123.0
Clay, silty, sandy, gray	123.0	127.0
Sand, silty, clayey, tan	127.0	132.0
Sand, coarse, clayey, cuts in large pieces	132.0	138.0
Gravel, fine to coarse, red	138.0	155.0
Gravel, fine to coarse, red, some black gravel	155.0	170.0
Gravel, medium to coarse, more coarse black gravel	170.0	178.0
Gravel, fine to coarse, pinkish to red, no black	178.0	188.0
Clay, sandy, soft, tan	188.0	198.0
Clay, limy, soft, whitish	198.0	202.0
Clay, sandy, tan	202.0	206.0
Gravel, fine to medium, dirty	206.0	212.0
Clay, sandy, reddish buff	212.0	215.0
Gravel, fine to medium, reddish, some tan sandy clay in upper part, poor	215.0	221.0
Tertiary System - Miocene Series - Ogallala Group:		
Sand, clayey, greenish gray	221.0	224.0
Clay, sandy, hard, compact, limy, white	224.0	227.0
Clay, sandy, greenish gray, some fine red gravel	227.0	235.0
Clay, sandy, soft, greenish gray	235.0	246.0
Gravel, fine, red, some greenish gray sandy clay	246.0	260.0
Gravel, fine to medium, loose, red, clear	260.0	267.0
Clay, gray, small amount of sand	267.0	271.0
Gravel, fine to coarse, red, good	271.0	286.0

Gravel, fine to coarse, red, about 1 foot of silty clay at 286 ft.....	286.0	290.0
Sand, clayey, soft, gray.....	290.0	294.0
Gravel, fine to coarse, loose, red, clear.....	294.0	319.0
Cretaceous System - Upper Cretaceous Series - Montana Group: Pierre Formation:		
Shale, yellow, rusty to light steel gray.....	319.0	