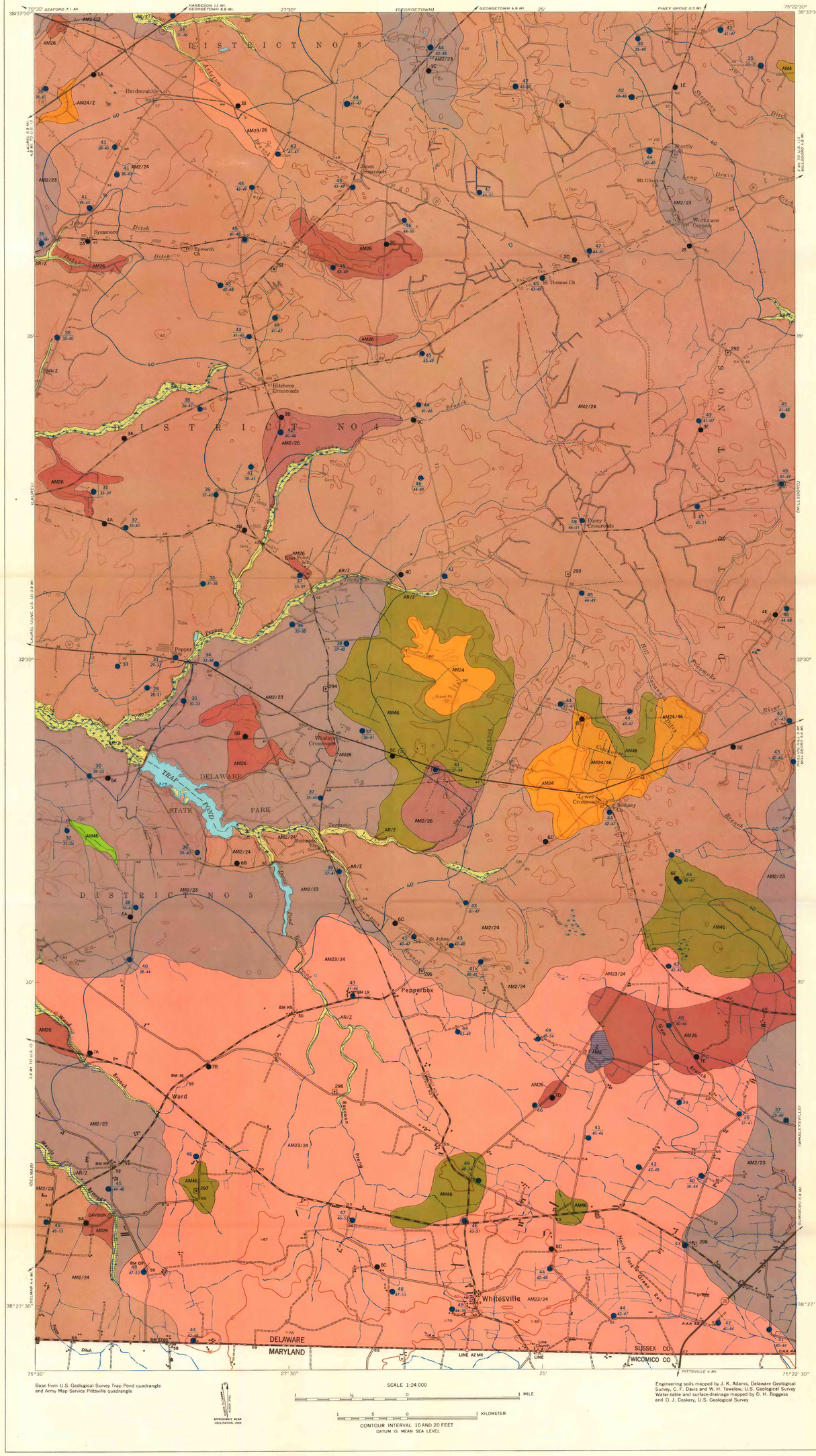
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH
THE DELAWARE GEOLOGICAL SURVEY
AND THE DELAWARE STATE HIGHWAY DEPARTMENT

HYDROLOGIC INVESTIGATIONS
ATLAS HA-120




## EXPLANATION

**AM24** — Nonplastic to slightly plastic sandy and silty soil derived from fluvial deposits of Pleistocene age

**AM26** — Nonplastic to highly plastic sandy and clayey soil derived from fluvial deposits of Pleistocene age

**AM4** — Slightly plastic silty and clayey soil derived from fluvial deposits of Pleistocene age

**AM46** — Slightly plastic to highly plastic silty and clayey soil derived from fluvial deposits of Pleistocene age

**AR/Z** — Flood-plain deposits associated with swamp deposits

**AM2/23** — Nonplastic to slightly plastic sandy soil associated with nonplastic sandy soil derived from fluvial deposits of Pleistocene age

**AM2/24** — Nonplastic to slightly plastic sandy soil derived from fluvial deposits of Pleistocene age associated with AM24 soil

**AM2/26** — Nonplastic to slightly plastic sandy soil derived from fluvial deposits of Pleistocene age associated with AM26 soil

**AM23/24** — Nonplastic sandy soil derived from fluvial deposits of Pleistocene age associated with AM24 soil

**AM23/26** — Nonplastic sandy soil derived from fluvial deposits of Pleistocene age associated with AM26 soil

**AM24/46** — AM24 soil associated with AM46 soil

**AM24/Z** — AM24 soil associated with swamp deposits

**AM2** — Swamp deposits underlain by nonplastic to slightly plastic sandy soil derived from fluvial deposits of Pleistocene age

**294** — Soil sample pit
*Location and number of pit from which soil samples were obtained for laboratory analyses (See table 3). General characteristics are summarized in table 4*

**5B** — Soil sample site
*Location and number of secondary soil sample sites. Samples were collected with a one-inch-diameter long-core soil sampler. For results of laboratory analyses see table 3; for general characteristics see table 4*

**41 / 37-44** — Secondary observation well
*Numerator is altitude of water table in October 1960. Denominator shows estimated range in altitude of water table during 1950-62 based on measurements from 1959 to 1962 and comparison with primary observation-well records*

**43 / 41-47** — Domestic or farm well
*Numerator is altitude of water table in October 1960. Denominator, where given, shows estimated range in altitude of water table during 1950-62, based on 2 or 3 measurements and comparison with primary and secondary observation-well records*

**40** — Water-table contour
*Number shows altitude of water table in feet above mean sea level in October 1960. Contour interval 10 feet. Relative position of water table in October 1960 is shown in hydrograph, figure 2*

Perennial stream
*Bottom of stream channel almost always below water table*

Intermittent stream
*Bottom of stream channel above water table part of the time and below water table part of the time*

FIGURE 1.—*Index map of Delaware showing location of the Trap Pond Area*

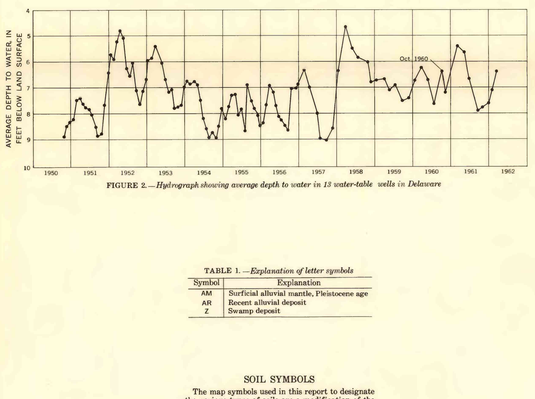



FIGURE 2.—*Hydrograph showing average depth to water in 13 water-table wells in Delaware*

TABLE 1.—*Explanation of letter symbols*

| Symbol | Explanation |
|---|---|
| AM | Surficial alluvial mantle, Pleistocene age |
| AR | Recent alluvial deposit |
| Z | Swamp deposit |

## SOIL SYMBOLS

The map symbols used in this report to designate the various types of soils are a modification of the system used in the engineering soil survey of New Jersey (Rogers, 1955). The first part of the symbol is a letter, or group of letters, which identifies the parent material according to the classification developed by Lueder (1950) (see table 1). The second part of the symbol is a number which identifies the soil group according to the classification system adopted by the Highway Research Board (Allen and others, 1945) and used with some modifications by the Delaware State Highway Department (see table 2). A two-digit number indicates that two soil types are present within the same profile; for example, the symbol AM23 implies that both A-2 and A-3 soils are present in the same soil profile, but usually in different horizons.

Two different soil symbols may be combined by either a horizontal bar or a diagonal bar. A horizontal bar, $\frac{AM2}{AM24}$, indicates that the soil designated by the denominator underlies the soil designated by the numerator within a depth of 20 to 72 inches. If a letter symbol is used only in the numerator, it also applies to the denominator. A diagonal bar (AM2/24) indicates that two soil types (AM2 and AM24) are present within the same area, but not necessarily in the same profile. The two soils are so finely interspersed that they cannot be mapped separately.

## REFERENCES


Allen, Harold, and others, 1945, Report of committee on classification of materials for subgrades and granular type roads: Highway Research Broad, 25th Ann. Mtg., Oklahoma City, 1946, Highway Research Board Proc., v. 25, p. 375-388, Washington.

Lueder, D. R., 1950, A system for designating map-units on engineering soil-maps in soil exploration and mapping: Highway Research Board Bull. 28, p. 17-35, Washington.

Rogers, F. C., 1955, Engineering soil survey of New Jersey, Report No. 1: Rutgers Univ. Eng. Research Bull. 15, 114 p. New Brunswick, N. J.


TABLE 2.—*Soils classification*

| General classification | Granular materials (35 percent or less passing a No. 200 sieve) | | | | | | | Silt-clay materials (more than 35 percent passing a No. 200 sieve) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group classification | A-1 | | A-3 | A-2 | | | | A-4 | A-5 | A-6 | A-7 | | A-8 |
| | a | b | | 4 | 5 | 6 | 7 | | | | 5[1] | 6[2] | |
| Sieve analysis Percent passing No. 10 sieve | 50 max. | | | | | | | | | | | | |
| No. 40 sieve | 30 max. | 50 max. | 51 min. | | | | | | | | | | |
| No. 200 sieve | 15 max. | 25 max. | 10 max. | 35 max. | 35 max. | 35 max. | 35 max. | 36 min. | 36 min. | 36 min. | 36 min. | 36 min. | |
| Characteristics of fraction passing No. 40 sieve Liquid limit | | | | | | | | | | | | | |
| Plasticity index | 6 max. | 6 max. | Nonplastic | 40 max. 10 max. | 41 min. 10 max. | 40 max. 11 min. | 41 min. 11 min. | 40 max. 10 max. | 41 min. 10 max. | 40 max. 11 min. | 41 min. 11 min. | 40 min. 11 min. | 42–400 0–60 |
| Group index[3] | 0 | | 0 | 0 | | 4 max. | | 8 max. | 12 max. | 16 max. | 20 max. | | |
| General subgrade rating | Excellent | | Good | Good | | Fair | | Poor | Poor | Poor | Very poor | | Unsatisfactory |
| Material | Well-graded gravel and sand | | Clean sand and gravelly sand | Poorly graded, silty or clayey sand and gravel | | | | Silty soil | Plastic silt | Plastic clay | Expansive plastic clay | | Muck-peat |

[1] Plasticity index of A-7-5 subgroup is equal to or less than the liquid limit minus 30.
[2] Plasticity index of A-7-6 subgroup is greater than the liquid limit minus 30.
[3] The group index is calculated according to the following formula: Group index = 0.2a + 0.005 ac + 0.01 bd
in which: a = That portion of the percentage passing No. 200 sieve greater than 35 percent and not exceeding 75 percent, expressed as a positive whole number (1 to 40).
b = That portion of the percentage passing No. 200 sieve greater than 15 percent and not exceeding 55 percent, expressed as a positive whole number (1 to 40).
c = That portion of the numerical liquid limit greater than 40 and not exceeding 60, expressed as a positive whole number (1 to 20).
d = That portion of the numerical plasticity index greater than 10 and not exceeding 30, expressed as a positive whole number (1 to 20).

TABLE 3.—*Results of laboratory analyses of soil samples*

Liquid limit: NL, nonliquid. Plasticity index: NP, nonplastic.

| Sample pit and site number | Depth of interval sampled (inches) | Mechanical analyses: Cumulative percent by weight passing sieve— 3/4 in. | No. 4 (4.7 mm.) | No. 10 (2.0 mm.) | No. 40 (0.42 mm.) | No. 200 (0.074 mm.) | Percent by weight: Silt (0.052 to .0039mm.) | Clay (<0.0039mm.) | Liquid limit[1] | Plasticity index[2] | Moisture-density[3]: Maximum density (lbs. per cu. ft.) | Optimum moisture (percent by weight) | Classification: HRB[4] | Map symbol[5] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 291 | 0–6 | 100 | 100 | 99.8 | 81.3 | 28.5 | | | NL | NP | | | A-2-4 (0) | AM2 |
| | 6–22 | 100 | 99.8 | 99.5 | 80.6 | 26.7 | | | NL | NP | 129 | 6 | A-2-4 (0) | |
| | 22–36 | 100 | 99.8 | 91.0 | 78.3 | 31.9 | 15 | 16 | 16 | 3 | 132 | 8 | A-2-4 (0) | |
| 292 | 0–6 | 100 | 99.7 | 99.1 | 91.0 | 16.5 | | | NL | NP | | | A-2-4 (0) | AM2 |
| | 6–34 | 100 | 97.4 | 93.4 | 66.0 | 16.4 | | | NL | NP | | | A-2-4 (0) | |
| | 34–48 | 100 | 99.3 | 97.4 | 58.1 | 14.9 | | | NL | NP | | | A-2-4 (0) | |
| 293 | 0–4 | 100 | 100 | 99.7 | 81.8 | 23.9 | | | NL | NP | | | A-2-4 (0) | AM24 |
| | 24–45 | 100 | 99.4 | 98.4 | 85.6 | 45.0 | 16 | 28 | 26 | 6 | 125 | 11 | A-4 (2) | |
| 294 | 0–6 | 100 | 100 | 99.9 | 76.2 | 14.1 | | | NL | NP | | | A-2-4 (0) | AM2 |
| | 6–36 | 100 | 99.9 | 99.6 | 75.2 | 16.8 | | | NL | NP | 123 | 7 | A-2-4 (0) | |
| | 36–54 | 100 | 100 | 99.9 | 83.1 | 18.2 | | | NL | NP | 116 | 8 | A-2-4 (0) | |
| 295 | 0–9 | 100 | 100 | 99.7 | 89.7 | 14.2 | | | NL | NP | | | A-2-4 (0) | AM2 |
| | 9–21 | 100 | 99.8 | 99.4 | 85.6 | 16.2 | | | NL | NP | | | A-2-4 (0) | |
| | 21–45 | 100 | 99.8 | 98.9 | 88.1 | 15.8 | | | NL | NP | | | A-2-4 (0) | |
| 296 | 0–12 | 100 | 100 | 100 | 90.8 | 8.4 | | | NL | NP | | | A-3 (0) | AM23 |
| | 12–34 | 100 | 100 | 99.9 | 80.4 | 11.1 | | | NL | NP | 123 | 8 | A-2-4 (0) | |
| | 34–48 | 100 | 99.9 | 99.8 | 78.3 | 14.9 | | | NL | NP | 125 | 8 | A-2-4 (0) | |
| 297 | 0–9 | 100 | 100 | 99.9 | 88.5 | 46.7 | | | NL | NP | | | A-4 (2) | AM46 |
| | 9–15 | 100 | 100 | 99.9 | 89.8 | 48.8 | 26 | 21 | 25 | 10 | 124 | 11 | A-4 (3) | |
| | 15–48 | 100 | 100 | 99.9 | 96.7 | 64.8 | 27 | 36 | 27 | 12 | 119 | 12 | A-6 (7) | |
| 298 | 0–4 | 100 | 100 | 100 | 91.3 | 8.7 | | | NL | NP | | | A-3 (0) | AM3 |
| | 4–18 | 100 | 100 | 100 | 78.7 | 4.6 | | | NL | NP | | | A-3 (0) | |
| | 18–54 | 100 | 100 | 100 | 81.7 | 7.3 | | | NL | NP | | | A-3 (0) | |
| 1A | 0–6 | | | 99.2 | 85.1 | 35.6 | | | < 40 | < 10 | | | A-4 (0) | AM24 |
| | 6–26 | | | 99.4 | 87.7 | 37.8 | | | NL | NP | | | A-4 (1) | |
| | 26–72 | | | 97.8 | 86.0 | 46.0 | | | < 40 | < 10 | | | A-2-4 (0) | |
| 1B | 0–12 | | | 100 | 83.3 | 15.3 | | | < 40 | < 10 | | | A-2-4 (0) | AM23 |
| | 12–38 | | | 99.7 | 84.5 | 15.1 | | | < 40 | < 10 | | | A-2-4 (0) | |
| | 38–72 | | | 97.8 | 75.5 | 4.4 | | | < 40 | NP | | | A-3 (0) | |
| 1C | 0–8 | | | 100 | 52.7 | 23.5 | | | < 40 | < 10 | | | A-2-4 (0) | AM2 |
| | 8–24 | | | 99.8 | 81.6 | 25.2 | | | < 40 | < 10 | | | A-2-4 (0) | |
| | 24–72 | | | 98.9 | 76.0 | 20.4 | | | < 40 | < 10 | | | A-2-4 (0) | |
| 1D | 0–12 | | | 99.5 | 88.2 | 29.6 | | | < 40 | < 10 | | | A-2-4 (0) | AM24 |
| | 12–38 | | | 99.9 | 97.0 | 45.0 | | | 25 | NP | | | A-4 (2) | |
| | 38–72 | | | 100 | 99.5 | 25.6 | | | < 40 | < 10 | | | A-2-4 (0) | |
| 1E | 0–12 | | | 99.9 | 78.2 | 23.3 | | | < 40 | < 10 | | | A-2-4 (0) | AM2 |
| | 12–48 | | | 99.5 | 71.0 | 18.1 | | | < 40 | < 10 | | | A-2-4 (0) | |
| | 48–72 | | | 97.4 | 76.6 | 15.2 | | | < 40 | < 10 | | | A-2-4 (0) | |
| 2A | 0–10 | | | 99.8 | 83.8 | 21.3 | | | < 40 | < 10 | | | A-2-4 (0) | AM2 |
| | 10–48 | | | 99.7 | 88.3 | 20.2 | | | NL | NP | | | A-2-4 (0) | |
| | 48–72 | | | 99.5 | 89.7 | 20.9 | | | < 40 | < 10 | | | A-2-4 (0) | |
| 2C | 0–11 | | | 99.9 | 69.8 | 22.1 | | | < 40 | < 10 | | | A-2-4 (0) | AM26 |
| | 11–42 | | | 99.9 | 79.0 | 19.0 | | | < 40 | < 10 | | | A-2-4 (0) | |
| | 42–70 | | | 99.9 | 95.2 | 82.1 | | | 36 | 19 | | | A-6 (12) | |
| 2D | 0–12 | | | 99.9 | 86.6 | 29.3 | | | < 40 | < 10 | | | A-2-4 (0) | AM2 |
| | 12–36 | | | 99.2 | 87.6 | 31.3 | | | < 40 | < 10 | | | A-2-4 (0) | |
| | 36–72 | | | 99.5 | 83.1 | 17.6 | | | < 40 | < 10 | | | A-2-4 (0) | |
| 2E | 0–12 | | | 99.9 | 83.9 | 26.3 | | | < 40 | < 10 | | | A-2-4 (0) | AM24 |
| | 12–28 | | | 99.8 | 83.4 | 27.1 | | | < 40 | < 10 | | | A-2-4 (0) | |
| | 28–46 | | | 100 | 94.1 | 52.8 | | | 28 | 9 | | | A-4 (4) | |
| | 46–72 | | | 92.4 | 62.6 | 16.7 | | | < 40 | < 10 | | | A-2-4 (0) | |
| 3A | 0–12 | | | 99.7 | 83.1 | 15.2 | | | < 40 | < 10 | | | A-2-4 (0) | AM2 |
| | 12–48 | | | 97.6 | 74.8 | 15.0 | | | < 40 | < 10 | | | A-2-4 (0) | |
| | 48–72 | | | 99.8 | 83.3 | 17.5 | | | < 40 | < 10 | | | A-2-4 (0) | |
| 3B | 0–18 | | | 99.1 | 90.1 | 32.1 | | | < 40 | < 10 | | | A-2-4 (0) | AM26 |
| | 18–60 | | | 100 | 98.4 | 37.9 | | | 28 | 15 | | | A-6 (2) | |
| 3C | 0–8 | | | 99.2 | 83.3 | 25.2 | | | < 40 | < 10 | | | A-2-4 (0) | AM2 |
| | 8–16 | | | 99.6 | 74.8 | 23.6 | | | < 40 | < 10 | | | A-2-4 (0) | |
| | 16–72 | | | 99.0 | 73.4 | 19.8 | | | < 40 | < 10 | | | A-2-4 (0) | |
| 3E | 0–6 | | | 99.8 | 91.8 | 37.0 | | | < 40 | < 10 | | | A-2-4 (0) | AM24 |
| | 6–36 | | | 99.7 | 90.2 | 41.0 | | | 19 | 6 | | | A-4 (1) | |
| | 36–72 | | | 100 | 98.2 | 44.4 | | | 17 | 7 | | | A-4 (2) | |
| 4A | 0–9 | | | 99.0 | 82.5 | 26.2 | | | < 40 | < 10 | | | A-2-4 (0) | AM24 |
| | 9–30 | | | 96.6 | 81.7 | 36.2 | | | < 40 | < 10 | | | A-4 (0) | |
| | 30–60 | | | 99.8 | 86.7 | 22.8 | | | NL | NP | | | A-2-4 (0) | |
| | 60–72 | | | 99.9 | 98.0 | 19.5 | | | < 40 | < 10 | | | A-2-4 (0) | |
| 4B | 2–12 | | | 99.3 | 84.6 | 35.2 | | | < 40 | < 10 | | | A-2-4 (0) | AM2 |
| | 12–60 | | | 99.8 | 87.0 | 27.4 | | | 20 | 4 | | | A-2-4 (0) | |
| 4C | 0–12 | | | 99.4 | 82.7 | 21.2 | | | < 40 | < 10 | | | A-2-4 (0) | AM24 |
| | 12–36 | | | 99.4 | 82.9 | 21.5 | | | < 40 | < 10 | | | A-2-4 (0) | |
| | 36–46 | | | 99.8 | 96.1 | 68.1 | | | 23 | 4 | | | A-4 (7) | |
| | 46–72 | | | 99.5 | 95.0 | 34.8 | | | < 40 | < 10 | | | A-2-4 (0) | |
| 4E | 0–12 | | | 100 | 82.3 | 18.4 | | | < 40 | < 10 | | | A-2-4 (0) | AM2 |
| | 12–28 | | | 98.9 | 81.5 | 15.8 | | | < 40 | < 10 | | | A-2-4 (0) | |
| | 28–72 | | | 99.9 | 87.1 | 11.6 | | | < 40 | < 10 | | | A-2-4 (0) | |
| 5A | 0–22 | | | 100 | 92.6 | 10.7 | | | < 40 | < 10 | | | A-2-4 (0) | AM2 |
| | 22–68 | | | 99.8 | 96.2 | 11.5 | | | < 40 | < 10 | | | A-2-4 (0) | |
| 5B | 0–4 | | | 100 | 77.8 | 23.1 | | | < 40 | < 10 | | | A-2-4 (0) | AM26 |
| | 4–42 | | | 99.5 | 76.5 | 17.6 | | | < 40 | < 10 | | | A-2-4 (0) | |
| | 42–72 | | | 96.0 | 75.3 | 42.1 | | | 26 | 12 | | | A-6 (2) | |
| 5C | 0–8 | | | 100 | 88.2 | 73.0 | | | < 40 | < 10 | | | A-4 (6) | AM4 |
| | 8–72 | | | 99.6 | 99.1 | 97.8 | | | 35 | 4 | | | A-4 (8) | |
| 5D | 0–4 | | | 97.8 | 82.4 | 25.3 | | | < 40 | < 10 | | | A-2-4 (0) | AM24 |
| | 4–32 | | | 99.0 | 92.5 | 37.1 | | | < 40 | < 10 | | | A-4 (0) | |
| | 32–52 | | | 97.9 | 80.6 | 22.5 | | | < 40 | < 10 | | | A-2-4 (0) | |
| | 52–72 | | | 98.2 | 89.0 | 16.2 | | | < 40 | < 10 | | | A-2-4 (0) | |
| 5E | 0–14 | | | 99.7 | 91.6 | 34.6 | | | < 40 | < 10 | | | A-2-4 (0) | AM2 |
| | 14–72 | | | 99.9 | 96.6 | 33.2 | | | < 40 | < 10 | | | A-2-4 (0) | |
| 6A | 0–4 | | | 99.9 | 96.0 | 22.0 | | | < 40 | < 10 | | | A-2-4 (0) | AM2 |
| | 4–28 | | | 99.9 | 94.6 | 18.4 | | | < 40 | < 10 | | | A-2-4 (0) | |
| | 28–72 | | | 99.5 | 81.1 | 14.1 | | | < 40 | < 10 | | | A-2-4 (0) | |
| 6B | 0–11 | | | 99.4 | 87.9 | 64.7 | | | < 40 | < 10 | | | A-4 (6) | AM24 |
| | 11–28 | | | 100 | 89.0 | 15.3 | | | < 40 | < 10 | | | A-2-4 (0) | |
| | 28–72 | | | 99.0 | 88.1 | 13.6 | | | < 40 | < 10 | | | A-2-4 (0) | |
| 6C | 0–54 | | | 100 | 82.0 | 11.2 | | | < 40 | < 10 | | | A-2-4 (0) | AM2 |
| | 54–72 | | | 99.9 | 93.8 | 33.2 | | | < 40 | < 10 | | | A-2-4 (0) | |
| 6D | 0–5 | | | 99.9 | 89.1 | 24.8 | | | < 40 | < 10 | | | A-2-4 (0) | AM2 |
| | 5–22 | | | 99.9 | 90.9 | 26.3 | | | < 40 | < 10 | | | A-2-4 (0) | |
| | 22–67 | | | 99.4 | 88.4 | 20.7 | | | < 40 | < 10 | | | A-2-4 (0) | |
| | 67–72 | | | 100 | 99.4 | 91.3 | | | | | | | | |
| 6E | 0–12 | | | 99.2 | 91.4 | 65.2 | | | | | | | | |
| | 12–26 | | | 99.2 | 91.0 | 68.4 | | | 29 | 5 | | | A-4 (7) | AM46 |
| | 26–72 | | | 99.9 | 99.4 | 95.5 | | | 22 | 16 | | | A-6 (10) | |
| 7A | 0–18 | | | 98.3 | 83.3 | 43.0 | | | < 40 | < 10 | | | A-4 (2) | AM4 |
| | 18–72 | | | 100 | 99.3 | 78.9 | | | 31 | 8 | | | A-4 (8) | |
| 7B | 0–17 | | | 100 | 78.4 | 10.6 | | | < 40 | < 10 | | | A-2-4 (0) | AM24 |
| | 17–39, 50–62 | | | 100 | 79.0 | 11.0 | | | < 40 | < 10 | | | A-2-4 (0) | |
| | 39–50, 62–72 | | | 100 | 94.6 | 52.0 | | | 22 | 8 | | | A-4 (3) | |
| 7D | 0–6 | | | 100 | 83.1 | 18.5 | | | < 40 | < 10 | | | A-2-4 (0) | AM26 |
| | 6–19 | | | 100 | 83.2 | 20.1 | | | < 40 | < 10 | | | A-2-4 (0) | |
| | 19–59 | | | 100 | 86.6 | 30.5 | | | 23 | 7 | | | A-2-4 (0) | |
| | 59–72 | | | 100 | 89.0 | 64.4 | | | 32 | 13 | | | A-6 (7) | |
| 7E | 0–8 | | | 100 | 81.8 | 22.6 | | | < 40 | < 10 | | | A-2-4 (0) | AM26 |
| | 8–24 | | | 100 | 83.6 | 29.6 | | | < 40 | < 10 | | | A-2-4 (0) | |
| | 24–61 | | | 100 | 97.3 | 88.1 | | | 40 | 19 | | | A-6 (12) | |
| | 61–72 | | | 99.0 | 85.6 | 26.0 | | | < 40 | < 10 | | | A-2-4 (0) | |
| 8A | 0–5 | | | 100 | 75.0 | 14.0 | | | < 40 | < 10 | | | A-2-4 (0) | AM24 |
| | 5–20 | | | 99.6 | 74.8 | 16.2 | | | < 40 | < 10 | | | A-2-4 (0) | |
| | 20–72 | | | 100 | 95.9 | 51.3 | | | 30 | 10 | | | A-4 (3) | |
| 8C | 0–3 | | | 100 | 74.5 | 14.6 | | | < 40 | < 10 | | | A-2-4 (0) | AM34 |
| | 3–37 | | | 99.9 | 71.6 | 6.8 | | | < 40 | NP | | | A-3 (0) | |
| | 37–72 | | | 100 | 96.2 | 72.2 | | | 21 | 8 | | | A-4 (7) | |
| 8D | 0–3 | | | 100 | 79.0 | 9.4 | | | < 40 | NP | | | A-3 (0) | AM34 |
| | 3–29 | | | 100 | 77.1 | 8.8 | | | < 40 | NP | | | A-3 (0) | |
| | 29–39 | | | 100 | 84.9 | 19.3 | | | < 40 | < 10 | | | A-2-4 (0) | |
| | 39–72 | | | 100 | 96.9 | 81.7 | | | 24 | 7 | | | A-4 (8) | |

[1] Based on AASHO (American Association of State Highway Officials) Designation: T89-49.
[2] Based on AASHO Designation: T91-49.
[3] Based on AASHO Designation: T180-57.
[4] Highway Research Board system (see table 2); group index given in parentheses.
[5] Map symbol was determined from laboratory data and does not alway agree with unit shown on map. Detailed field reconnaissance has shown that some sampling sites were not representative of the predominant soil in the area.

TABLE 4.—*Characteristics of the engineering soil types in the Trap Pond Area*

| Soil type[1] | Description | Origin | Engineering properties: In place — Suitability as a subgrade[2] | In place — Suitability as a wearing surface[3,4] | Disturbed[2] — Suitability as embankment material | Disturbed[2] — Compaction characteristics | Suitable compaction equipment |
|---|---|---|---|---|---|---|---|
| AM2 | Nonplastic to slightly plastic sandy soil. | Fluvial deposits of Pleistocene age. | Good | Excellent to good depending on binding present. | Good | Good | Rubber-tired equipment. |
| AM23 | Nonplastic, generally poorly graded sandy soil. | Fluvial deposits of Pleistocene age. | Good to fair. | Excellent to good depending on binder present if surface is A-2. Fair if surface is A-3. | Good if predominant material is A-2. Fair if predominant material is A-3. | Good if predominant material is A-2. Poor if predominant material is A-3. | Rubber-tired equipment for soil which is predominantly A-2. Vibratory equipment for soil which is predominantly A-3. |
| AM24 | Nonplastic to slightly plastic, sandy and silty soil. | Fluvial deposits of Pleistocene age. | Good if material left after grading is predominantly A-2. Fair if material left after grading is predominantly A-4. | Excellent to good depending on binder present if surface is A-2, Fair to poor if surface is A-4. | Good if predominant material is A-2. Fair if predominant material is A-4. | Good if predominant material is A-2. Fair if predominant material is A-4. | Rubber-tired equipment. |
| AM26 | Nonplastic to highly plastic, sandy and clayey soil. | Fluvial deposits of Pleistocene age. | Good if material left after grading is predominantly A-2. Poor if material left after grading is predominantly A-6 or poorly drained A-2. | Good if surface is A-2, Poor if surface is poorly drained A-2, Very poor if surface is A-6. | Fair if predominant material is A-6. | Fair if predominant material is A-6. | Rubber-tired equipment for soil which is predominantly A-2, Sheep's-foot rollers for soil which is predominantly A-6. |
| AM4 | Slightly plastic, silty and clayey soil. | Fluvial and possibly eolian deposits of Pleistocene age. | Fair to poor. | Fair to poor. | Fair to poor. | Fair to poor. | Rubber-tired equipment. |
| AM46 | Slightly plastic to highly plastic, silty and clayey soil. | Fluvial, paludal, and lacustrine deposits of Pleistocene age. | Poor if material left after grading is predominantly A-4. Very poor if material left after grading is predominantly A-6. | Poor if surface is A-4. Very poor if surface is A-6. | Poor if predominant material is A-4. Very poor if predominant material is A-6. | Poor | Sheep's-foot rollers. |
| AR | Alluvial gravel, sand, silt and clay. | Alluvium of Recent age. | Variable | Variable | Variable | Variable | Variable |
| Z | Soil rich in organic material and frequently poorly drained. May be underlain at shallow depths by gravel, sand or clay. | Swamp deposits of Recent age. | Variable | Variable | Variable | Variable | Variable |

[1] Two different soil types may be combined into a single map symbol (AM2/24), but the engineering characteristics of the individual soil types are described separately.
[2] For soil types designated by two-digit numbers, these columns refer to the composite soil.
[3] When not subject to frost action. Frost will affect soils that contain appreciable silt and clay and have a high moisture content.
[4] Untreated. Additives may aid in stabilization of the sandy soils and minimize dusty conditions.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# WATER-TABLE, SURFACE-DRAINAGE, AND ENGINEERING SOILS MAP OF THE TRAP POND AREA, DELAWARE


By
John K. Adams and Durward H. Boggess


1964


HYDROLOGIC INVESTIGATIONS
ATLAS HA-120

For sale by U.S. Geological Survey, price 75 cents