ES1

November 30, 2022

1 CE 4363/5363 Groundwater Hydrology Spring 2023 Exercise Set 1

LAST NAME, FIRST NAME

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1.0.1 Purpose :

Reinforce definitions of aquifer properties; apply propertities to quantitative cases

1.0.2 Assessment Criteria :

Completion, results plausible, format correct, example calculations shown.
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2 Exercise 1-1 (*Problem 3.7 pp. 110*)

A constant-head permeameter has a cross-sectional area of 78.5 cm^2. A sample is 23 cm long. At an applied head differential of 3.4 cm, the permeameter discharges 50 cm^3 in 38 seconds.

Determine: 1. The hydraulic conductivity in centimeters per second. 2. The hydraulic conductivity in feet per day. 3. The intrinsic permeability if the measurement is conducted at 15^oC. 4. What type of soil is suggested by the hydraulic conductivity value.

3 Exercise 1-2 (*Problem 3.10 pp. 111*)

An aquifer has S_y of 0.24. During a drought period, the following average water table declines were recorded:

Area	Size(mi^2)	Decline(ft)
A	12.5	1.33
B	19.8	0.88
C	23.8	3.98
D	9.56	2.34
E	12.3	4.44
F	7.22	0.34

Determine: 1. The total volume of water represented by the decline in the water table.

4 Exercise 1-3 (*Problem 3.13 pp. 111*)

A confined aquifer has a specific storage of $4.033 \times 10^{-3} m^{-1}$ and a porosity of 0.274. The compressibility of water is $4.6 \times 10^{-10} m^2/N$.

Determine: 1. The compressibility of the aquifer skeleton.

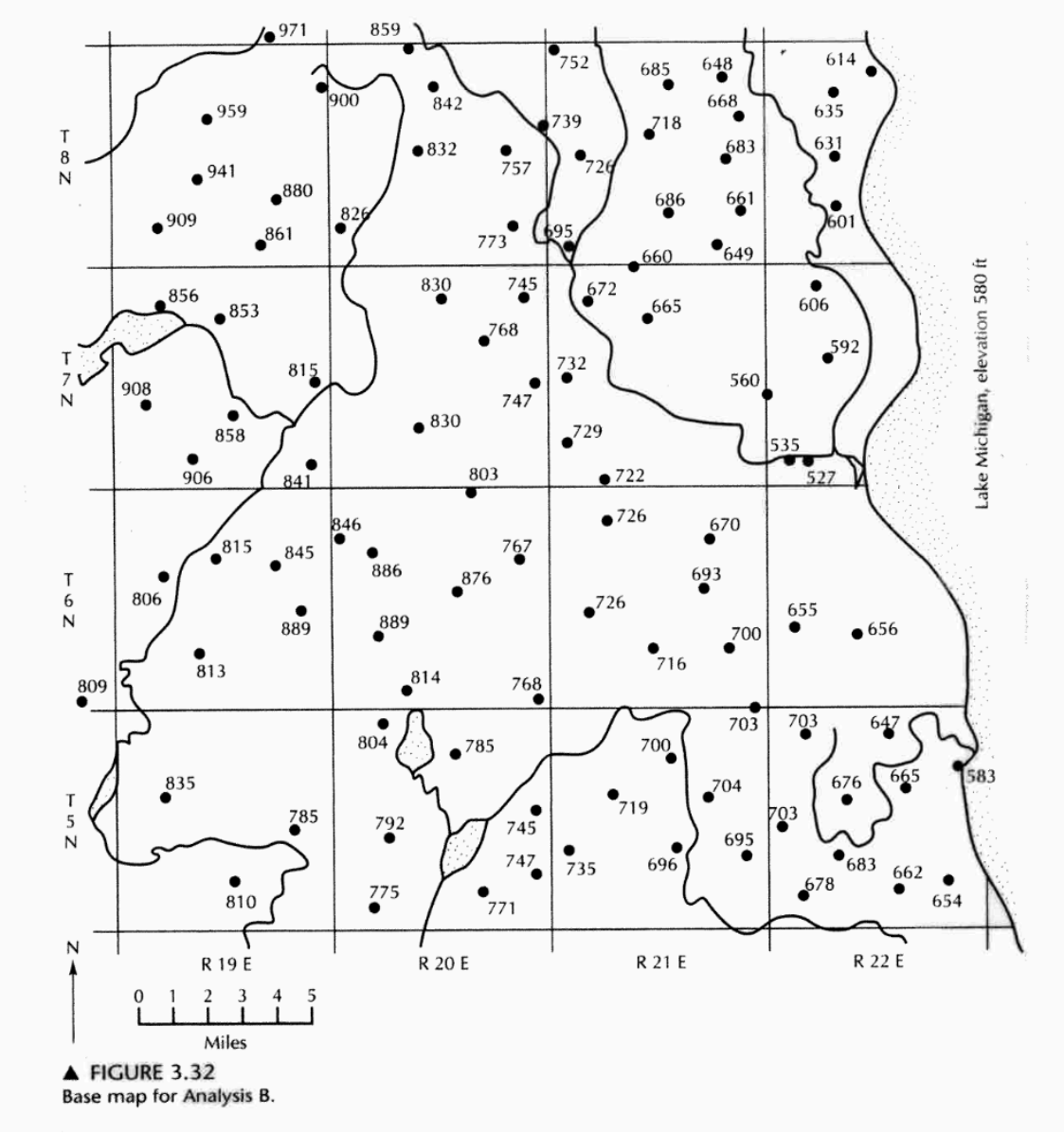
5 Exercise 1-4 (*Problem 3.16 pp. 111*)

An aquifer has three different formations. The uppermost formation A has a thickness of 8.4 m and a hydraulic conductivity of 22.3 m/day. The middle formation B has a thickness of 2.8 m and a hydraulic conductivity of 144 m/day. The lower formation C has a thickness of 33 m and a hydraulic conductivity of 35 m/day. Each formation is homogeneous and isotropic.

Determine: 1. The overall horizontal hydraulic conductivity. 2. The overall horizontal vertical conductivity.

6 Exercise 1-5 (*Analysis B pp. 109*)

The figure below (*Fig. 3.32 pp. 110*) is a map showing the ground-water elevations in wells screened in an unconfined aquifer in Milwaukee, Wisconsin. The aquifer is hydraulically connected to Lake Michigan, which has a surface elevation of 580 ft above MSL. Lakes and streams are also depicted on the map.



▲ FIGURE 3.32
Base map for Analysis B.

Determine: 1. Make a water-table contour map with a contour interval of 50 ft starting at 550 ft. 2. How groundwater levels are below the Lake Michigan surface elevation in part of the area.

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