

Physical Geology Subsidence

Adapted from AGI/NAGT Lab Manual

Name _____

Period _____

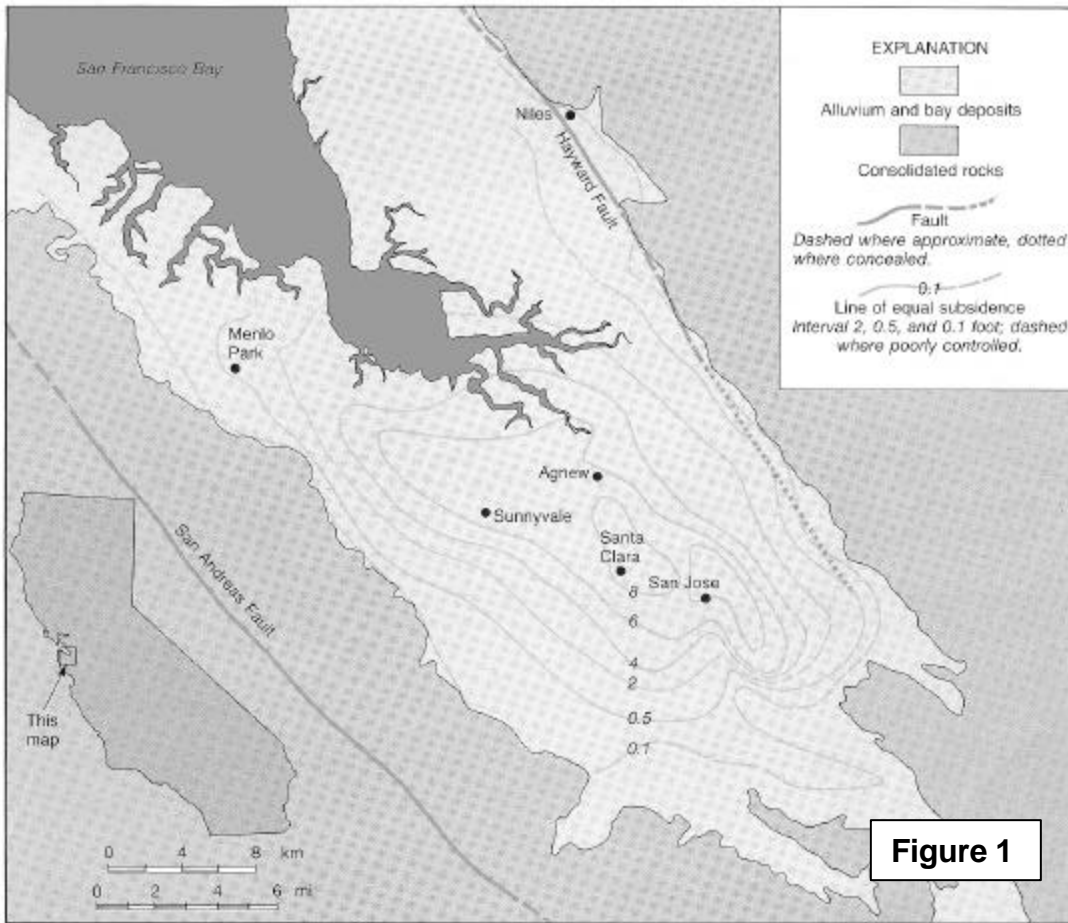


Figure 1

1. Where are the areas of greatest subsidence in the Santa Clara Valley?

2. What was the total subsidence at San Jose from 1934 to 1967? (see Figure 2)

3. What was the annual rate of subsidence for this period in ft / yr?

Work:

Ans. _____

4. Where in the Santa Clara Valley would the subsidence be most noticeable because of the problems it caused?

Explain: _____

5. Would you expect much subsidence to occur in the darker shaded areas of Figure 1? Explain. _____

6. By 1960, the total subsidence at San Jose had reached 9.0 feet (Figure 2). What was the average annual rate of subsidence (in ft / yr) for the seven-year period from 1960 through 1967?

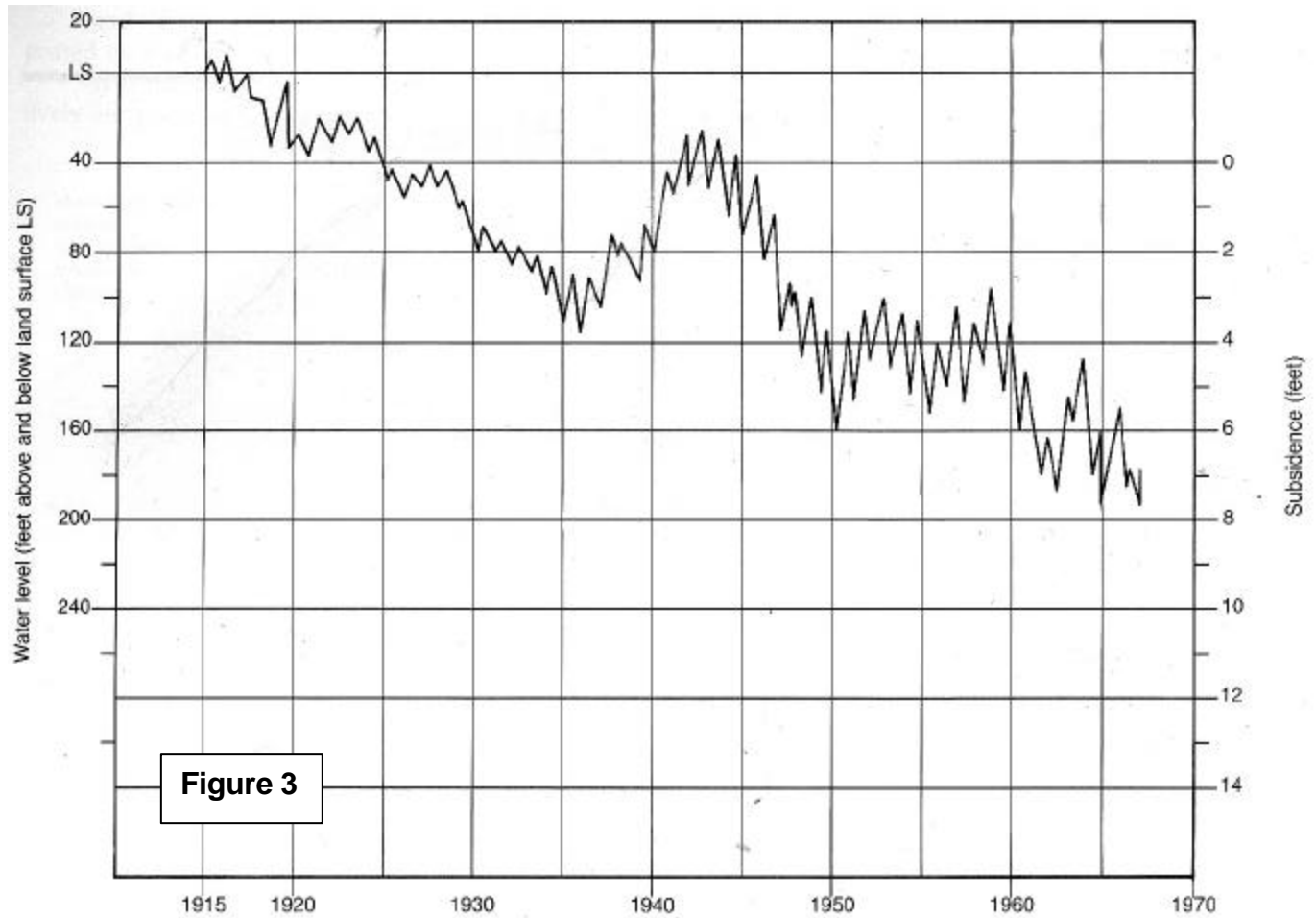
Work:

Year	Subsidence (feet)
1912	0.0
1920	0.3
1934	4.6
1935	5.0
1936	5.0
1937	5.2
1940	5.5
1948	5.8
1955	8.0
1960	9.0
1963	11.1
1967	12.7

Figure 2 - Subsidence at Station P7, San Jose, CA

Answer _____

7. Refer to Figure 3 (the hydrograph of a well in the San Jose Valley). What was the level of the water in the San Jose well in:
- a. 1915? _____ b. 1967? _____
8. During what period would this well have been a flowing artesian well? _____
9. Notice the minor fluctuations in the hydrograph. Count the crests and troughs that occur in a 5 or 10 year period and suggest the cause of those fluctuations.



10. Use the data in Figure 2 to plot the subsidence of the land surface on Figure 3. (use the scale on the RIGHT side of Figure 3.)
11. The slope of the line you just drew gives the rate of subsidence during the years 1915 –1967. What was the average rate of subsidence for the entire time represented in the hydrograph? (Answer in ft / yr)

Work:

Answer _____

12. From 1938 – 1943 the water table rose and the subsidence nearly stopped. Explain why the subsidence stopped, and why the land surface did not rebound.

13. Examine the amplitude of the annual water table fluctuations. Describe any pattern in the magnitude of amplitude that you observe.

14. What is one climatological explanation for the increased amplitude in more recent years? _____

15. Think of how the porosity in the aquifer changes as subsidence occurs, and explain how changes in porosity could cause more dramatic changes in the water table level even if rainfall amounts remained unchanged.

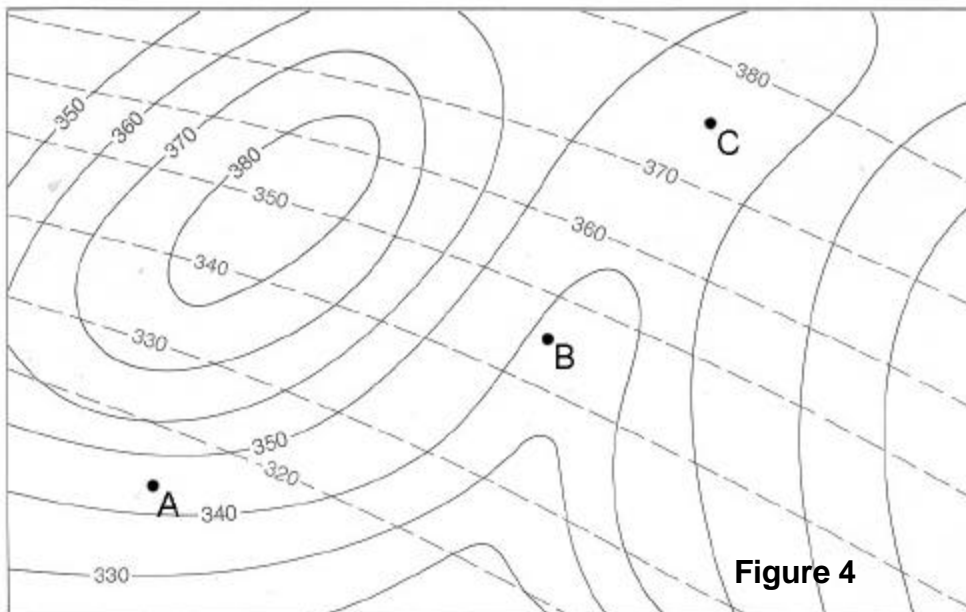


Figure 4 is a map of an area underlain by a confined (artesian) aquifer. The solid lines are contours of land surface elevation, the dashed lines are contours of the potentiometric (water pressure) surface.

16. On the map, make a small mark where the potentiometric and elevation contours of the same value intersect. To what level would water rise in a well drilled at any of those intersections?

17. Imagine wells drilled at points A, B, and C. In which well(s) would water flow freely at the surface?

18. On the map, lightly shade the entire area (s) where drilled wells would flow at the surface

19. Each foot of hydraulic pressure head produces a pressure of about 0.45 psi. What would be the wellhead pressure at the well(s) that flow at the surface? Show and explain your calculation.