

Geophysics – fall 2001, problem set #2.

1. Here are some first arrival data from a simple ground water mapping exercise; assume the reverse refraction data are symmetrical. What are the velocities of the first and second layers? How deep is the groundwater?

x(feet)	T(seconds)
0	0.0000
15	0.0052
30	0.0103
45	0.0155
60	0.0200
75	0.0228
90	0.0256
105	0.0285
120	0.0313

2. This requires you to model the refraction equations and come up with a rule of thumb for refraction experiments. Use a couple reasonable velocities for alluvium above the water table: perhaps 1,000 m/s – 1300 m/s and some equally common values for water saturated material: something like 1,600 m/s - 1,700 m/s. Suppose you have water depths of 10 to 25 meters. Graph several of these cases and determine a general rule of thumb for how far out you have to place geophones to get enough information from the groundwater surface to make a reliable interpretation ($4 * \text{depth?}$ $1.2 * \text{depth?}$). Explain your procedure and turn in two representative graphs. A really efficient way to do this would be to set up a spreadsheet where you only have to vary velocities and/or depths to see how the response changes on a graph.