67. (a) In regions where the speed is constant, it is equal to distance divided by time. Thus, we conclude that the time difference is

$$\Delta t = \left(\frac{L-d}{V} + \frac{d}{V-\Delta V} \right) - \frac{L}{V}$$

where the first term is the travel time through bone and rock and the last term is the expected travel time purely through rock. Solving for d and simplifying, we obtain

$$d = \Delta t \, \frac{V(V-\Delta V)}{\Delta V} \approx \Delta t \, \frac{V^2}{\Delta V} \ .$$

(b) If we estimate $d \approx 10$ cm (as the lower limit of a range that goes up to a diameter of 20 cm), then the above expression (with the numerical values given in the problem) leads to $\Delta t = 0.8\,\mu$s (as the lower limit of a range that goes up to a time difference of $1.6\,\mu$s).