CIEG 680 Homework #5 Due TUESDAY, April 15
Looks long, but some of these are real easy questions.

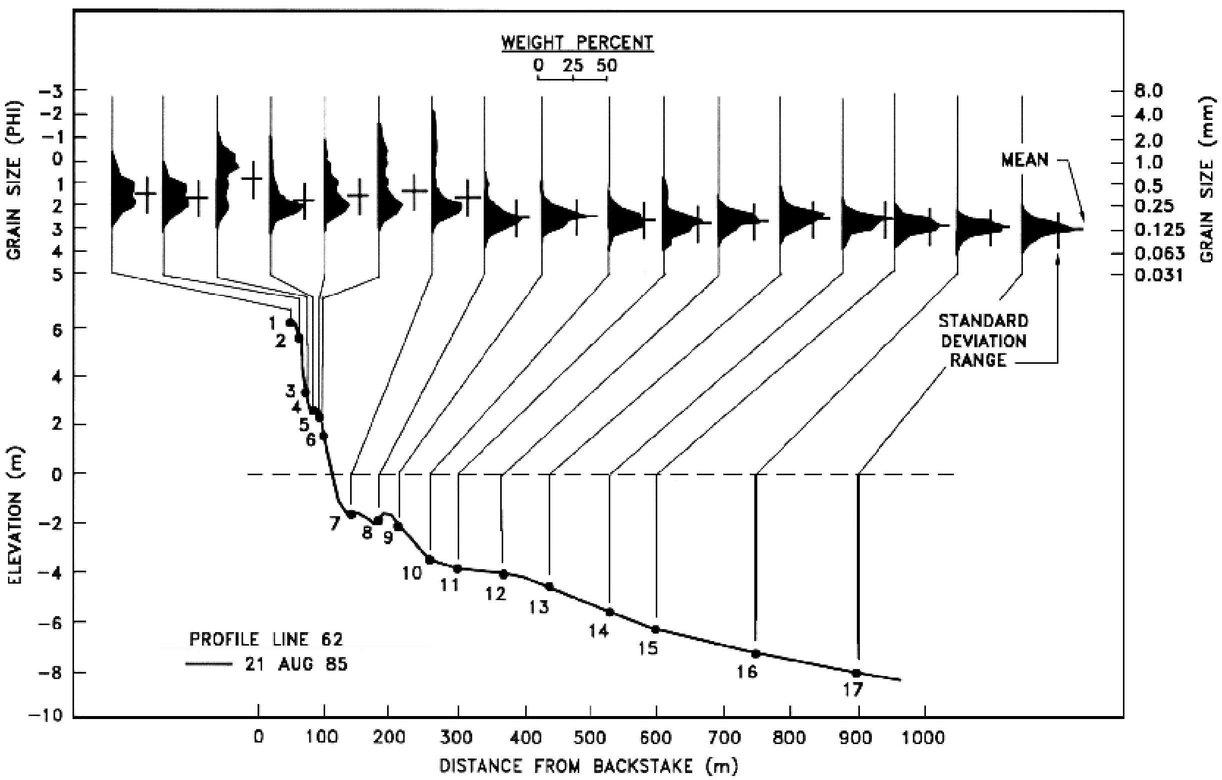
1. DD 7.2

2. DD 7.13

3. DD 7.16

4. DD 7.20

5. Using the picture below from Stauble (1992), extract mean sediment grain sizes at the locations shown. Then go to www.frf.usace.army.mil and find the CRAB data for this profile. Calculate and plot the underwater portion of the profile using EBP theory based on equations 7.31 and 7.33. You will need Table 7.2 to determine you're A values.



From Stauble, 1992

6. DD 7.4 (should be familiar)

7. Nielsen (1992) on page one states that " .. in general terms the boundary layer thickness obeys the formula

$$\delta = \sqrt{\nu_t T} \text{ where T is the flow period.}$$

PROVE IT! Starting from the equation given below for unidirectional flow over a boundary, non-dimensionalize the equation and show that the constants in front of the pressure and x-diffusion term become very common non-dimensional numbers used in fluid mechanics. Based on the order of magnitude of these non-dimensional numbers you should be able to perform a scaling between two of the terms to determine the boundary layer thickness. Clearly the vertical-diffusion term must come into play since it is the only term that contains δ.

$$\frac{\partial u}{\partial t} = -\frac{1}{\rho}\frac{\partial P}{\partial x} + \nu_t \frac{\partial^2 u}{\partial x^2} + \nu_t \frac{\partial^2 u}{\partial z^2}, \quad \text{assuming a constant eddy viscosity}$$

From the result, how much thicker would the boundary layer for a tidal flow be as compared to a typical wave?