

## Hydrology/Hydrogeology (EaES 475) Lab # 1

**Do all calculations on a spreadsheet and supply a well organized and labeled printout of results**

Due Monday Jan. 25.

1. Answer the following questions in Fetter at the end of Chapter 1: 2, 4, 6,10
2. Assume a terrorist has a number of nuclear bombs and wants to wreak as much havoc as possible. He/she decides to try to melt the ice caps using the bombs. Unfortunately there are only 100 Nagasaki-sized bombs available. a) what percentage of the water in the Antarctic ice caps could be melted with the available bombs?, b) what sea level change would this create? c) how many bombs would it take to melt all the ice? d) how far apart would the bombs be in order to accomplish this task (i.e. if the sites are layed out on a grid, what would the grid spacing be)? e) what would be the sea level rise associated with question c? f) what percent reduction in land surface would this create? g) discuss the implications for bad movies such as Waterworld where global warming has made all land essentially disappear.  
Needed:- Antarctic ice volume is  $2.3 \times 10^7 \text{ km}^3$  with a density of 0.917  
- energy released by 1 ton of TNT =  $4.18 \times 10^9$  Joules  
- TNT equivalent of the Nagasaki nuclear bomb was 23 kilotons  
- assume all energy released from the bomb goes into melting ice (in reality a lot of it would melt as well as atomize  
- Antarctica contains 90% of the worlds ice (assume this applies to volume and surface area)  
- attached hypsographic curve of the globe  
- the earth's surface area is  $5.1 \times 10^8 \text{ km}^2$   
- Antarctica surface area is  $1.4 \times 10^7 \text{ Km}^2$
3. For the lake shown on the attached bathymetric map, how much energy is stored in it? A temperature profile is on the course website as an excel file. Plot the temperature profile, and use it with the bathymetric map to answer this question. Assume an ice density of 0.9., and the ice thickness is 0.75 m.



