EPSc 413 SP17 Homework #2 ANSWER KEY

1. Soil texture.

a.

Soil Type	Texture class
1	Silty Clay
2	Loam
3	Silt Loam
4	Sandy Loam
5	Clay

b. The Sandy Loam (#4) would be the best choice because it has the highest sand fraction and is low in clay. A sandy texture has the highest drainage rate, whereas silt and clay lead to much lower drainage rates.

c. The site with soil type 2 has the greatest potential for contaminants to be released into the environment. Soil type 5 has a high clay content that produces a low contaminant leaching potential. The loam texture of soil type 2 would not be as effective at preventing the spread of contaminants.

2. Soil density properties.

a. Calculate core volume, then density:

Volume = $\pi r^2 L = \pi*(5/2)^2*7.5 = 147.26\ cm^3$

$D_b(A) = 1.27\ g/cm^3$
$D_b(B) = 1.73\ g/cm^3$
$D_b(C) = 0.42\ g/cm^3$

b. %porosity = $100 – (D_b/D_p * 100)$

%porosity(A) = 100 – (1.27/2.65 *100) = 52.1%
%porosity(B) = 100 – (1.73/2.65 *100) = 34.7%
%porosity(C) = 100 – (0.42/2.65 *100) = 84.2%

c. Soil B is likely from the footpath of the lawn. It has the bulk density of a mineral soil and shows clear evidence of compaction by its high bulk density. This compaction effect is why footpaths cause plant loss (e.g., dead grass) and eventually encourage erosion.

d. Soil C is likely a Histosol because it has the lowest bulk density. The bulk density is in a range well below that expected for a mineral soil. Using the lower particle density value:

%porosity(C) = 100 – (0.42/0.96 *100) = 56.2%

This is more in line with the expected %porosity of a soil, which is approximately 50%. Also, a soil having 84% porosity would likely have a difficult time maintaining its physical form and would like collapse under its own weight.

3. Soil water retention curves.

a. Approximate values

	Soil A	Soil B
maximum retentive capacity	0.46	0.22
field capacity	0.35	0.09
wilting coefficient	0.11	0.011
hygroscopic coefficient	0.09	0.009

b. Soil B likely has a sandy texture because it overall has a lower water retention capacity and substantially drains at a lower water potential than Soil A.

c. AWHC = $(\theta_{v,FC} - \theta_{v,WC})$ * thickness

Soil A: AWHC = (0.35-0.11)*15 = 3.6 cm

Soil B: AWHC = (0.09-0.011)*15 = 1.2 cm

4. Soil water budgets.

a. Evapotranspiration is the volatization of water to the atmosphere from the soil surface and the pores of plant leave. This is what actually occurs. Potential evapotranspiration is for the idealized case where a soil is fully vegetated and always at field capacity. Potential evapotranspiration is always equal to or greater than actual evapotranspiration.

b. If PET > P, then more water should leave a soil through evapotranspiration than is added by rainfall. Under these conditions, the extra water that leaves a soil comes from stored soil moisture. Because soil storage is being reduced the volumetric water content will decrease.