HOMEWORK EXERCISE # 1
ON-THE-FLY REMEDIATION ANALYSIS

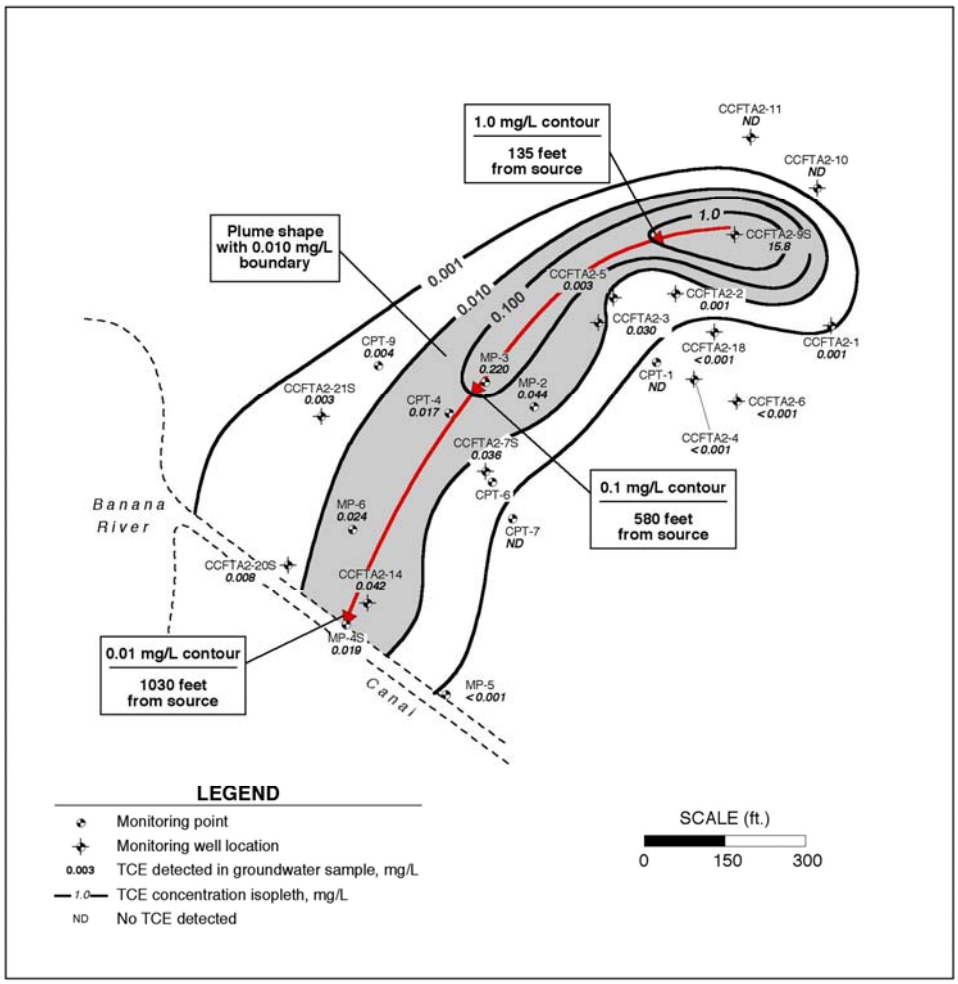
PROBLEM

You are going into an important meeting and need to figure out what long-term impact a *source zone* remediation project will have on the size of a plume currently discharging into a canal.

Since you coached 6 soccer games last week, you have not had time to work on this before now.

KEY INPUT DATA

The edge of the plume is defined here as the 0.01 mg/L contour (10 ug/L, 10 parts per billion).



KEY RELATIONSHIP

All you need to know:

At steady state-conditions, the change in concentration at any point in the plume ("C") is directly related to the source concentration ("C_o"). ("Steady state" means we don't worry about how long it takes for changes in the source to affect the downgradient plume).

If you want to know more, with some math: as an example, here is a mathematical formula for a one-dimensional column filled with sand in a laboratory:

$$\frac{C}{C_o} = \frac{1}{2} erfc\left(\frac{x - \bar{v}t}{2\sqrt{\alpha_x \bar{v}t}}\right)$$

The equation used in REMChlor is more complicated, but has the same basic idea: the change in concentration at any point in the plume ("C") is directly related to the source concentration ("C_o"). REMChlor accounts for travel time, and more!

KEY ASSUMPTION

After reading a good summary about the performance of chlorinated solvent remediation projects, you assume:

For this site and hydrogeology, you know that a source remediation project (chemox, thermal, or biodeg) will probably reduce source concentrations by **90**%. This means:

- **Source concentration now: 15.5 mg/L**
- **Source concentration after: 1.55 mg/L**

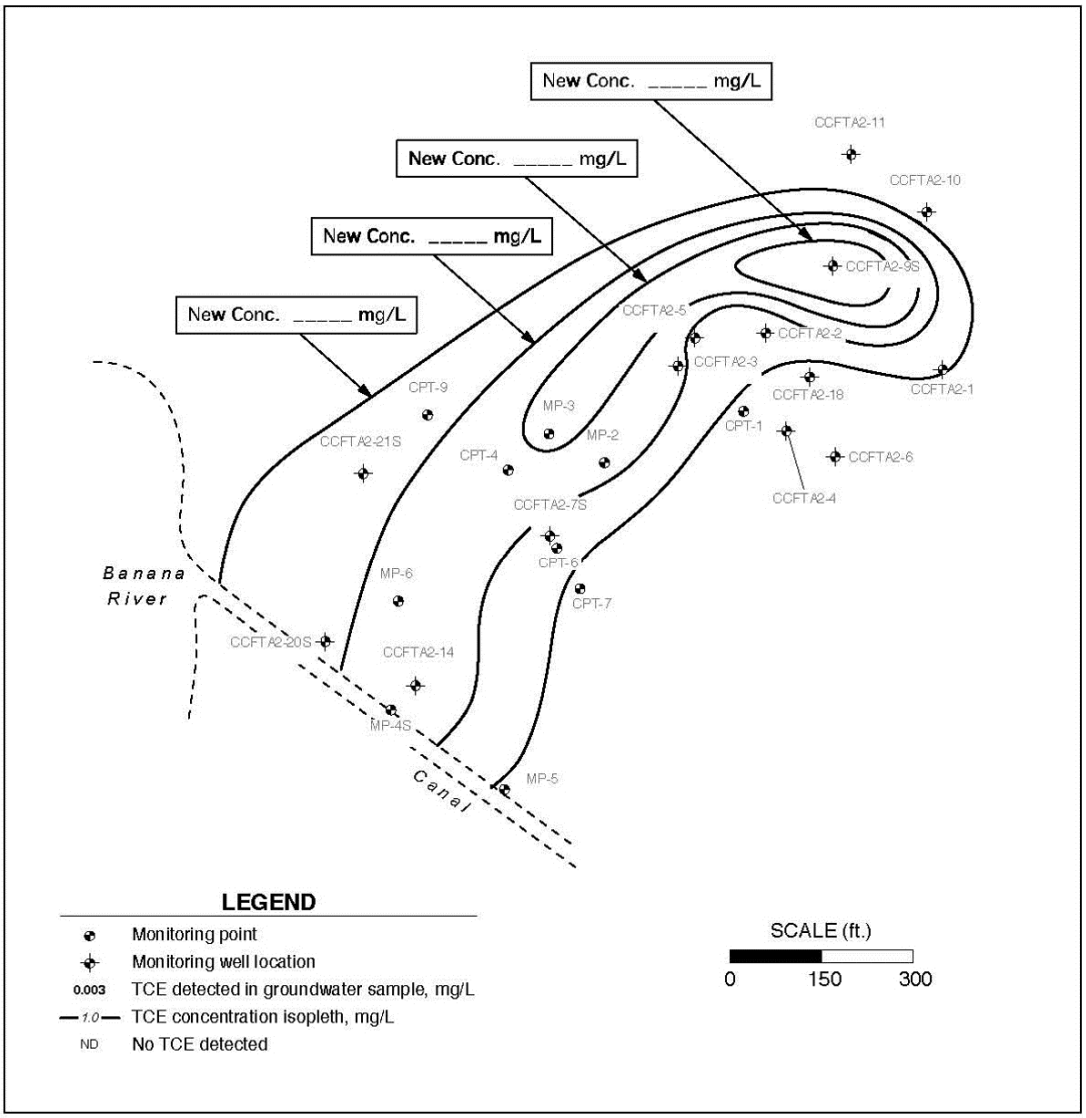
EXAMPLE

Before remediation, monitoring point MP-3 has concentration of 0.22 mg/L.

After remediation, and after the plume reaches the new condition, the concentration would be 0.022 mg/L.

YOUR ASSIGNMENT….

Shade the extent of the plume after source remediation and after the plume reaches steady state.



ANALYSIS

Does reducing the source concentration 90% reduce the steady state plume length by 90%?

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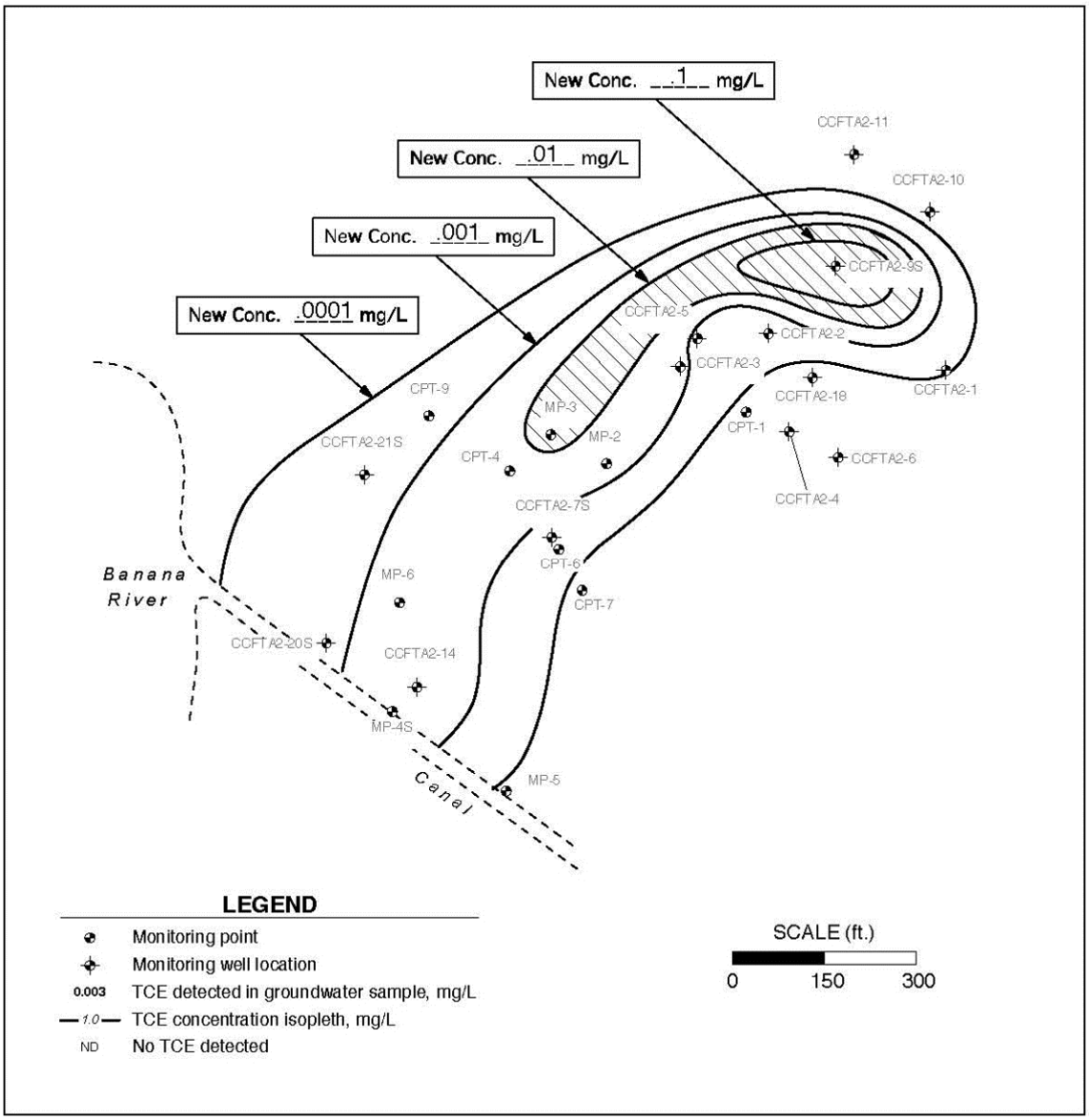
ANSWERS

Shade the extent of the plume after source remediation and after the plume reaches steady state



ANALYSIS

Reducing the source concentration 90% **does not** reduce the steady state plume length 90%. But in this case remediation was enough to stop the plume from discharging into the canal. Time to go to soccer practice!