

HYDRAULIC CONDUCTIVITY VARIES WIDELY WITHIN A SITE

$$95\% \text{ C.I.} = \text{Avg. K} - (50\% * \text{Avg. K})$$

to

$$\text{Avg. K} + (50\% * \text{Avg. K})$$

Example:

If Avg. K at a site was measured as 1 m/day,
We expect the true value of any particular location at
that site to range from 0.5 m/day to 1.5 m/day

OR

We aren't surprised if groundwater plume movement
varies by a factor of 3.

.....

LAYERED MEDIA AND GROUNDWATER FLOW PATHS

Buried layers of high K will alter flow paths

- High permeability layers
 1. can generate horizontal flow
 2. can control flow paths

- Lower permeability layers
 1. tend to generate more vertical flow toward higher K layers

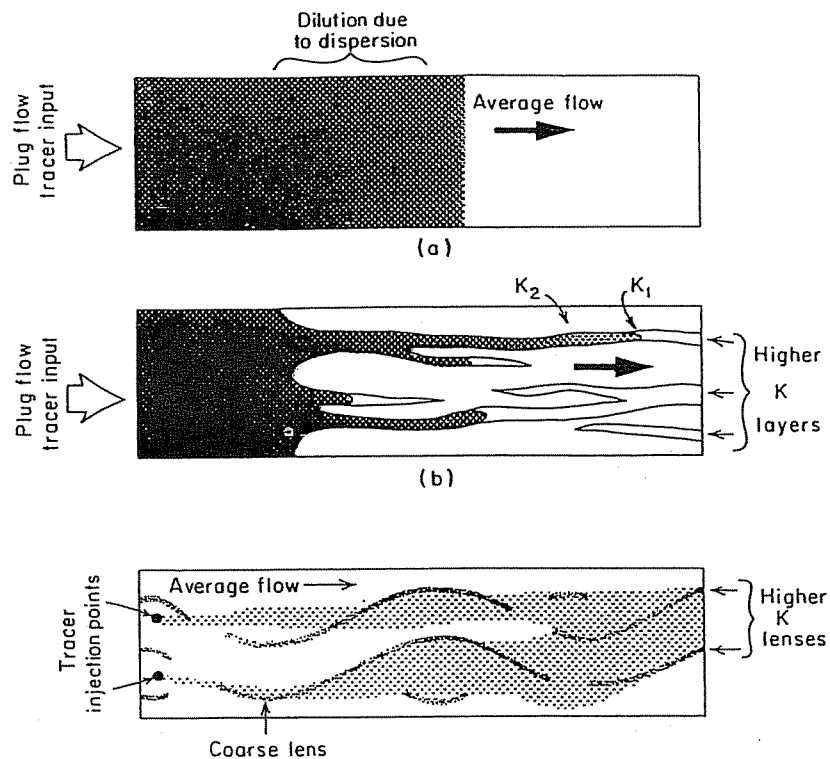


Figure 9.9 Comparison of advance of contaminant zones influenced by hydrodynamic dispersion. (a) Homogeneous granular medium; (b) fingering caused by layered beds and lenses; (c) spreading caused by irregular lenses.

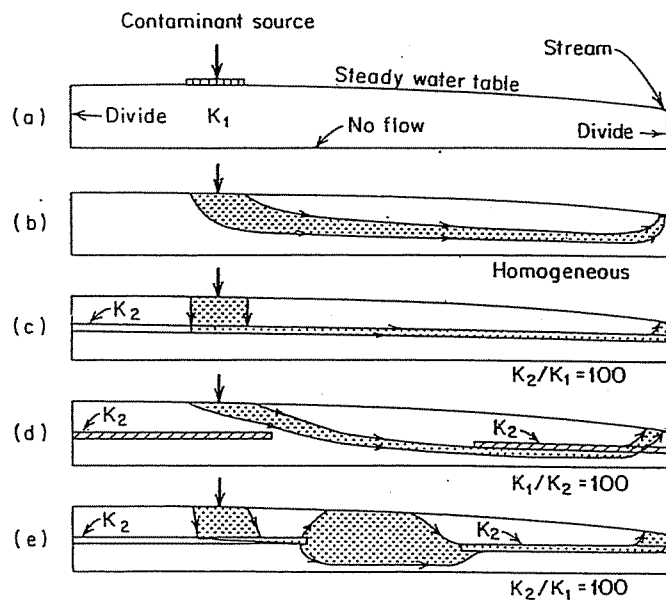


Figure 9.8 Effect of layers and lenses on flow paths in shallow steady-state groundwater flow systems. (a) Boundary conditions; (b) homogeneous case; (c) single higher-conductivity layer; (d) two lower-conductivity lenses; (e) two higher-conductivity lenses.

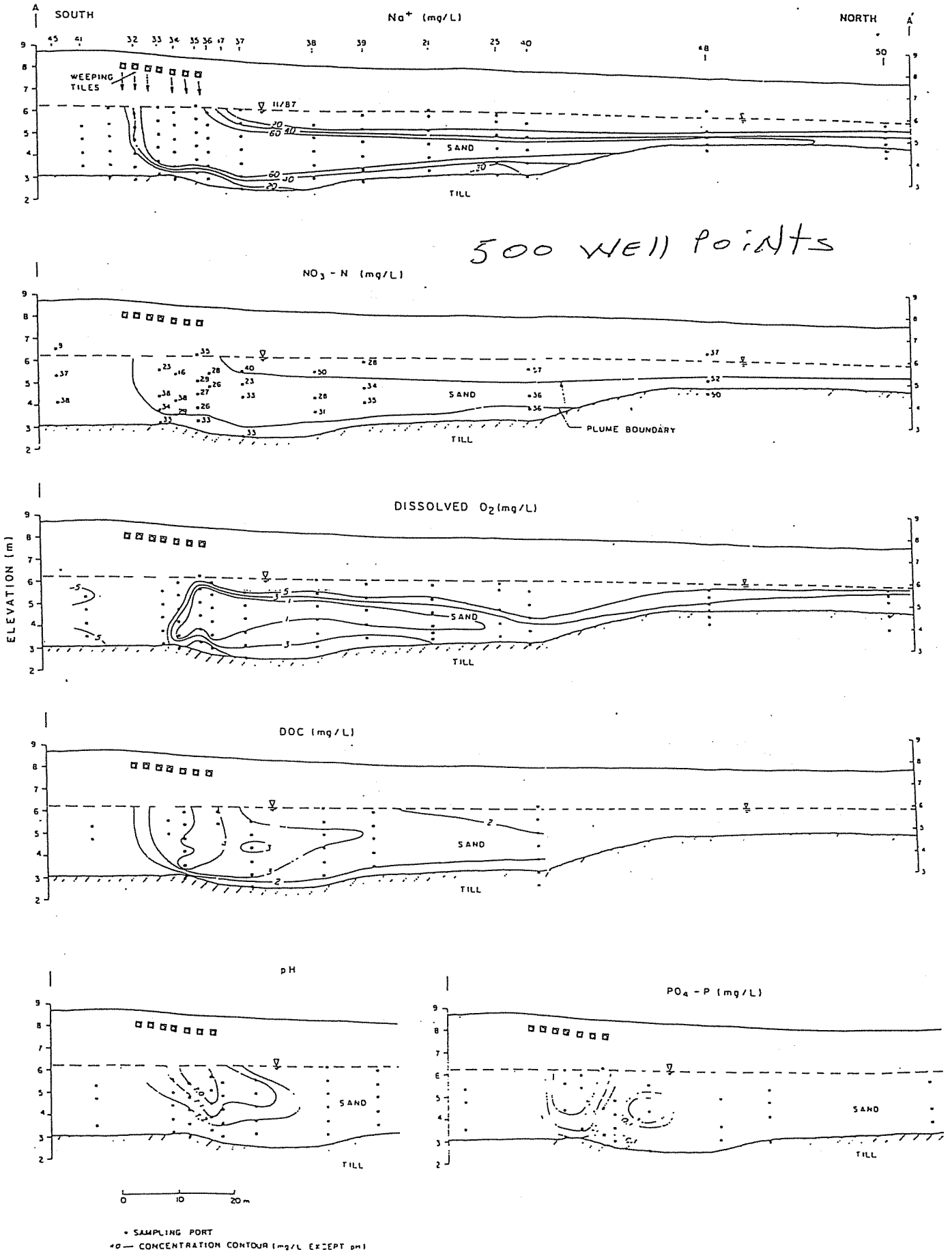


Fig. 3. Major-ion geochemistry along the plume centerline at the Cambridge site, 1987-88.

Small-scale geologic features in beds of surface-water bodies affect seepage patterns at scales too small to be shown in Figure 3. For example, the size, shape, and orientation of the sediment grains in surface-water beds affect seepage patterns. If a surface-water bed consists of one sediment type, such as sand, inflow seepage is greatest at the shoreline, and it decreases in a nonlinear pattern away from the shoreline (Figure 4). Geologic units having different permeabilities also affect seepage distribution in surface-water beds. For example, a highly permeable sand layer within a surface-water bed consisting largely of silt will transmit water preferentially into the surface water as a spring (Figure 5).



Subaqueous spring in Nebraska. (Photograph by Charles Flowerday.)

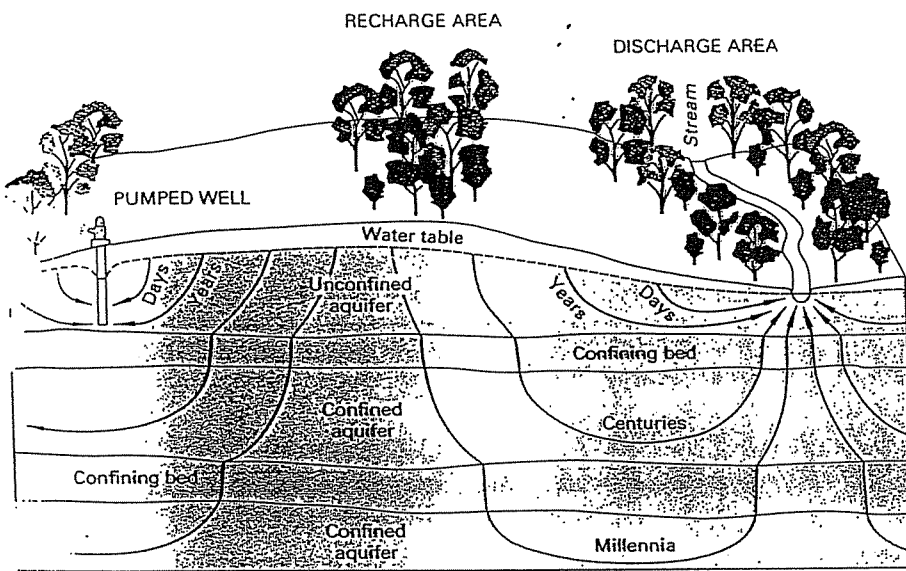


Figure 3. Ground-water flow paths vary greatly in length, depth, and traveltime from points of recharge to points of discharge in the ground-water system.

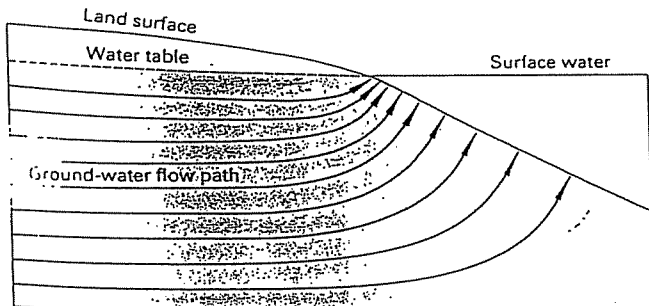


Figure 4. Ground-water seepage into surface water usually is greatest near shore. In flow diagrams such as that shown here, the quantity of discharge is equal between any two flow lines; therefore, the closer flow lines indicate greater discharge per unit of bottom area.

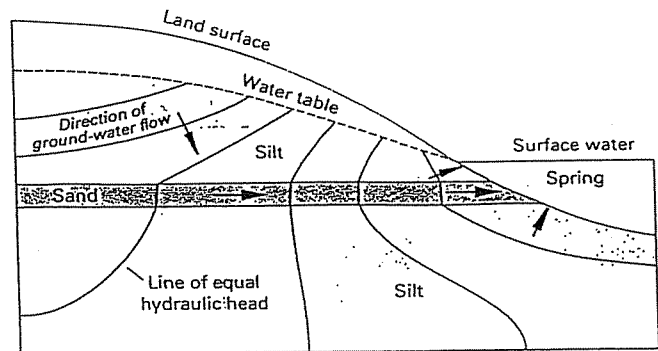


Figure 5. Subaqueous springs can result from preferred paths of ground-water flow through highly permeable sediments.