

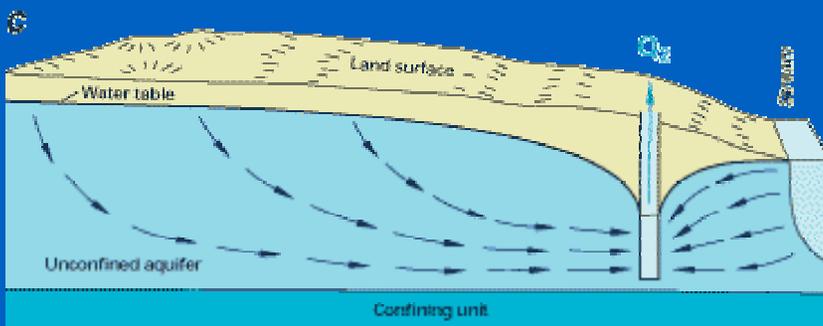
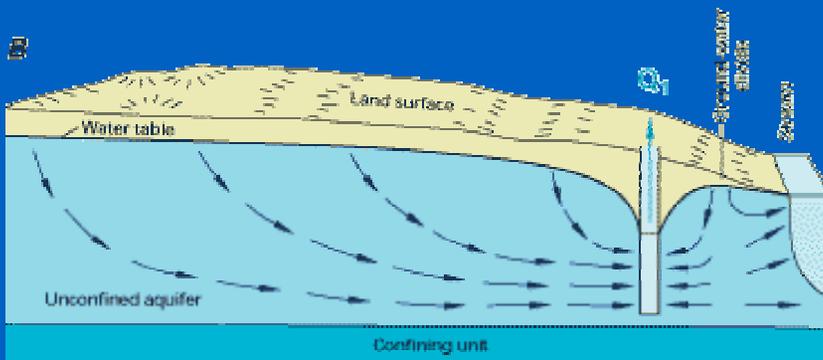
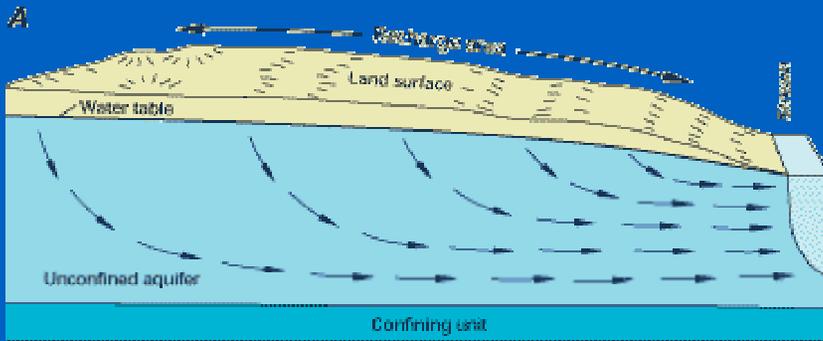


Tools for Riverbank Infiltration Studies

U.S. Geological Survey
Department of the Interior

Or - -

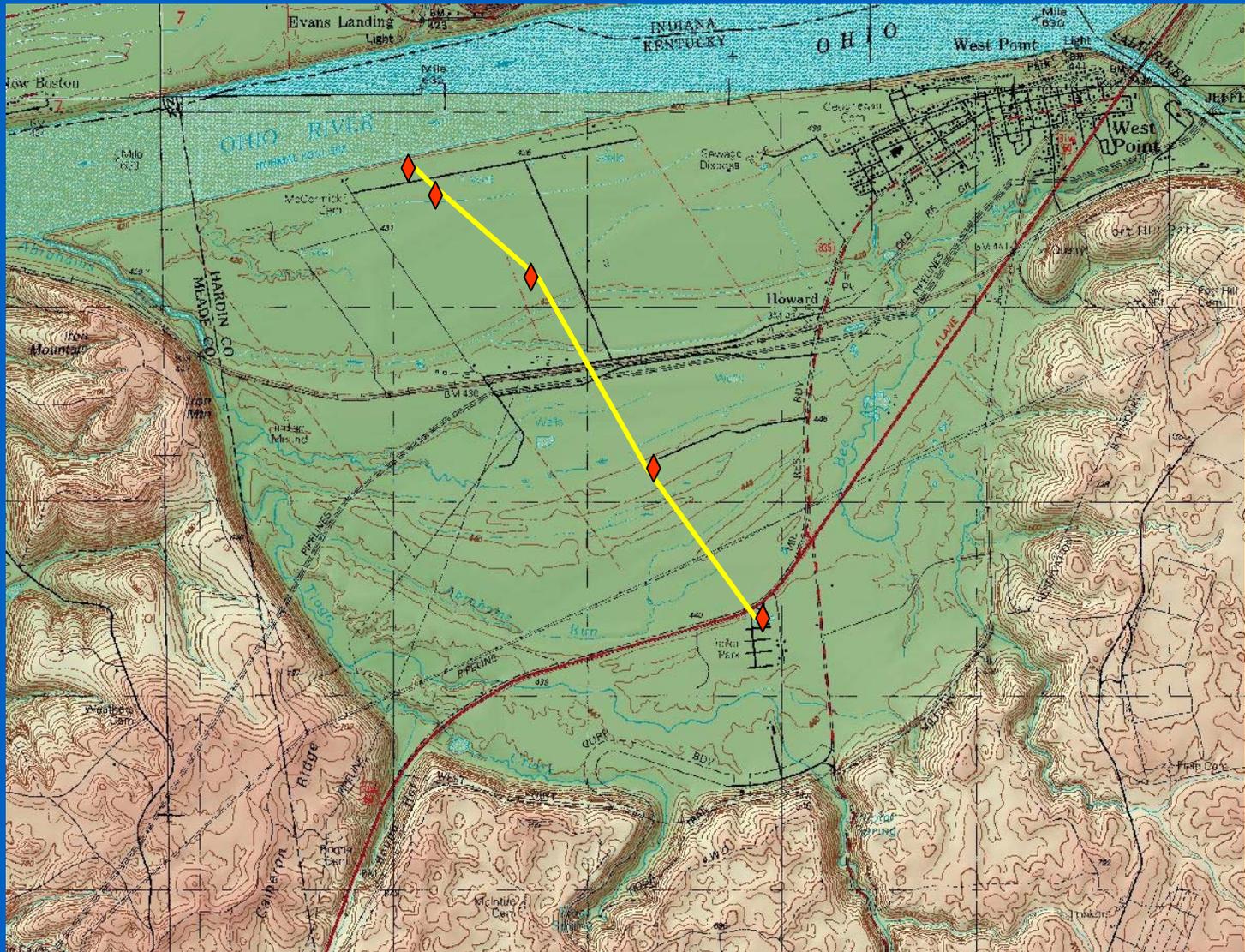
“Why we were drilling for water in the middle of the Ohio River”



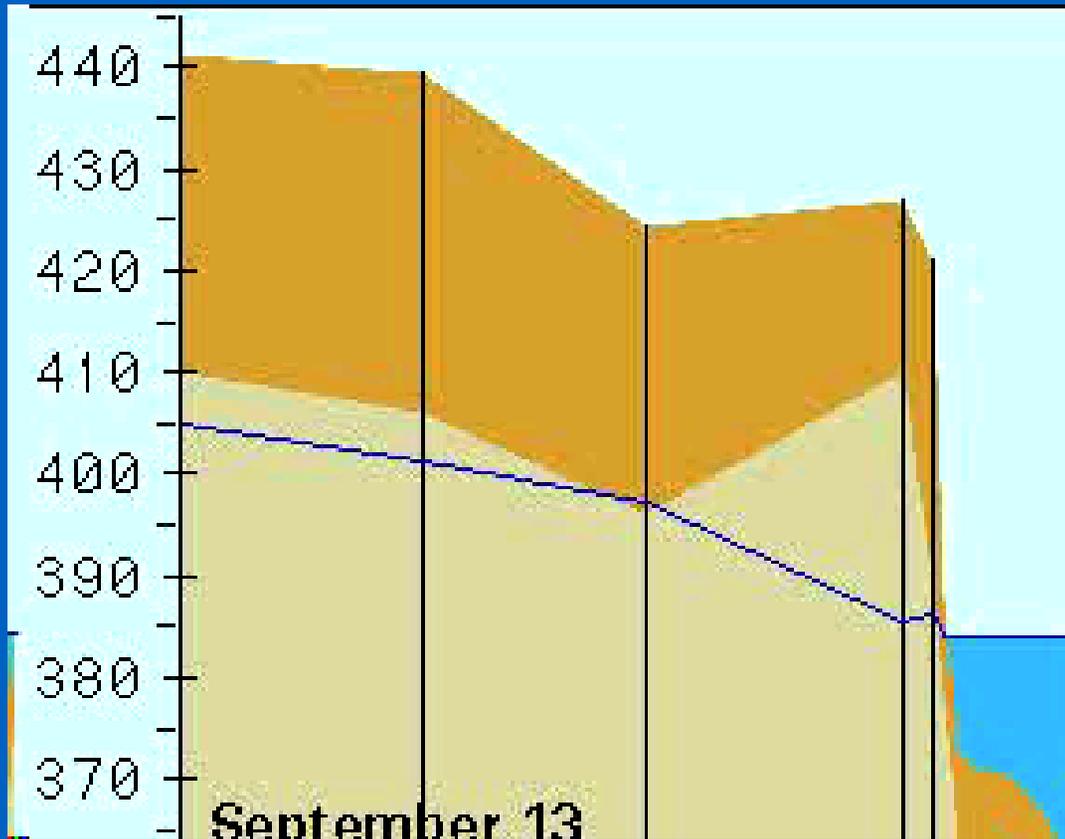
The Concept

Ground-water wells located adjacent to a body of surface water (river, lake) may, over time, withdraw enough water from the flow system to reverse flow gradients and induce water from the surface source. Wells are commonly placed in close proximity to riverbanks and lakes to take advantage of this induced infiltration thereby maximizing the water-supply potential of the area.

There are many advantages besides a greater supply volume: possible improved water quality over a surface source, gained filtration from the alluvial deposits, and a tighter temperature range for the raw water.



Fort Knox – The Movie



By arranging a series of pressure transducers, changes in the water-table surface over time can be visualized in profile. The aquifer's response to ground-water withdrawals and changes in river stage are evident.

The Louisville Water Company's “Hideous Structure”

In the summer of 1999, the Louisville Water Company began using ground water in a big way – the pumps started in the newly constructed horizontal collector well.

The collector well is designed to withdraw 20 Mgd and averages 15 to 17 Mgd. It produces a mix of surface water and ground water but is definitely meant to capitalize on the potential for induced infiltration from the Ohio River.



Ground Water in Northeastern Louisville, Kentucky

With Reference to Induced Infiltration

M.I. Rorabaugh, 1956



Basic factors affecting the design of withdrawal systems:

- Permeability of the aquifer
- Hydraulic gradient from the source to the installation
- Vertical permeability of the river bed

Determining the hydraulic gradient on the river side of the well

In the summer of 2000, the USGS, in cooperation with the Louisville Water Company, devised a procedure to install temporary piezometers in the river for the purpose of determining the extent and magnitude of the drawdown beneath the river.

Thus was born the Kentucky District's Ground-Water Flotilla.







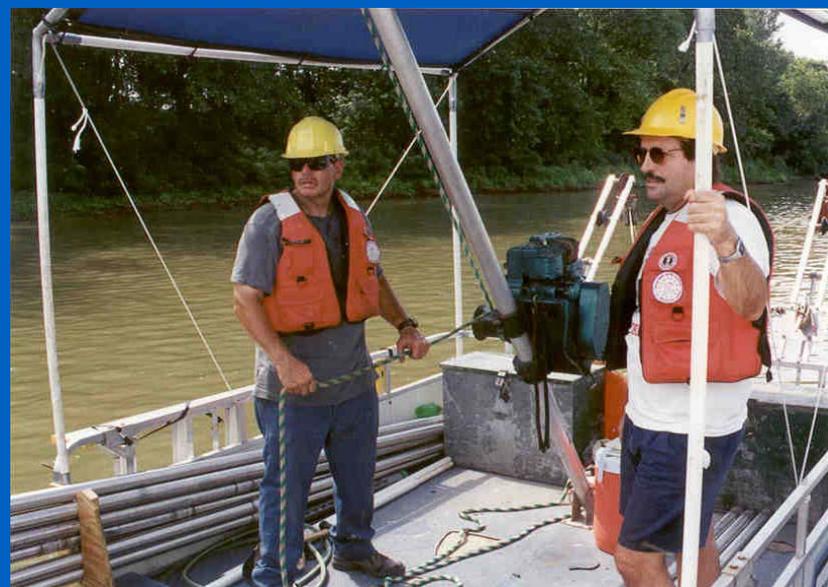


Piezometer installation

Temporary piezometers, constructed of 2-inch galvanized pipe with a drive-point well screen, are driven into the river bed using a 75-lb drop weight. A gas-powered cathead provides the lift for the weight.

Removal

After a series of field parameters are measured, the driving process is reversed and the piezometers are “bumped” out.

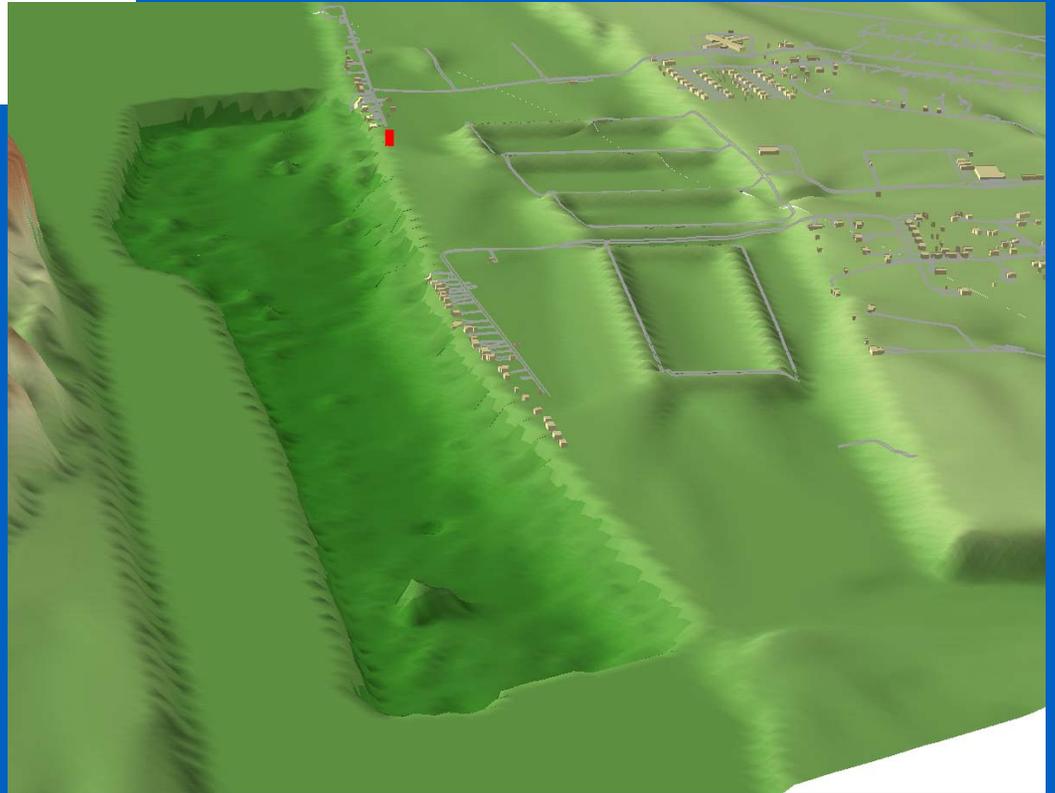
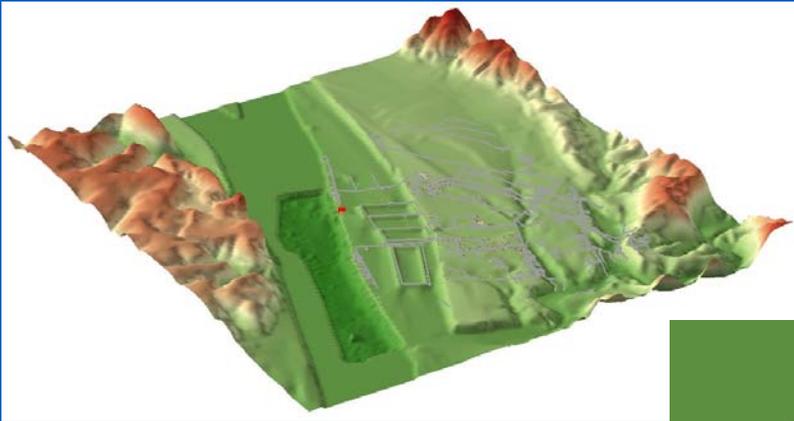


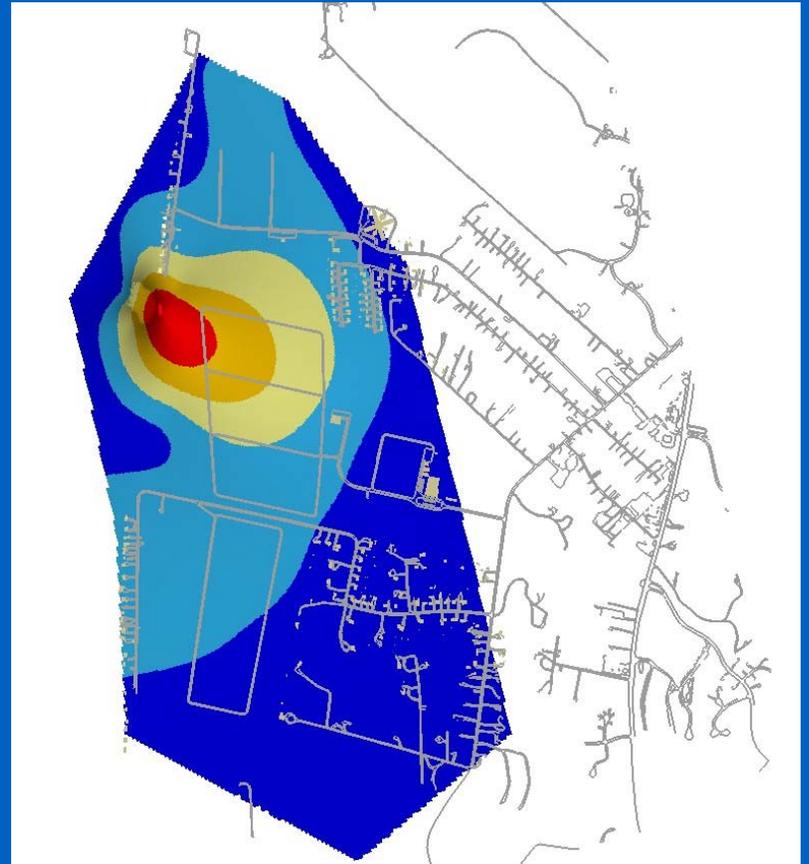
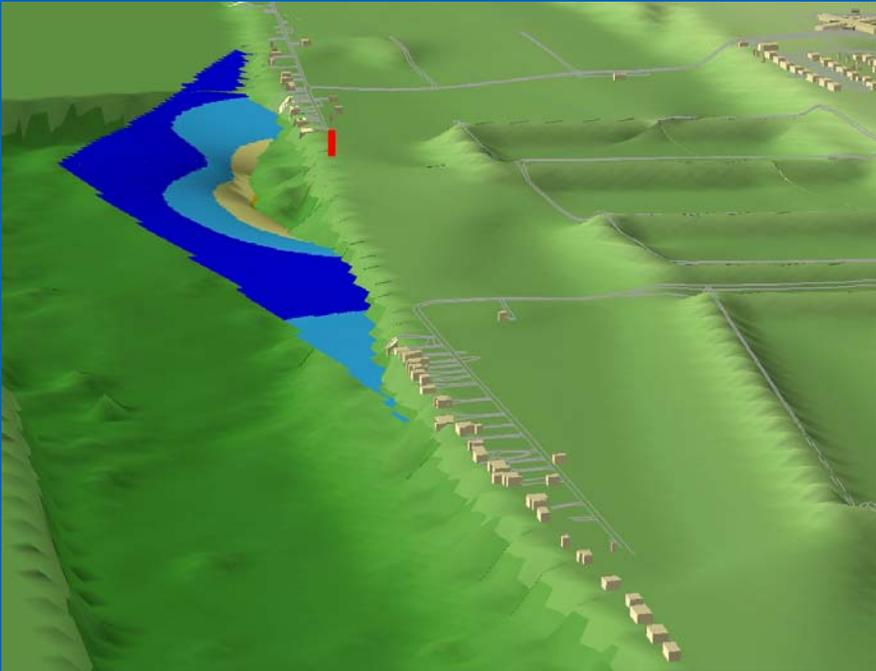
Collection of field parameters

Once the piezometer is driven to the desired depth, three volumes of water are purged and the water level is checked to insure a tight seal with the river bed.



Field parameters including depth to water, water temperature, and specific conductance are recorded.





Ground Water in Northeastern Louisville, Kentucky

With Reference to Induced Infiltration

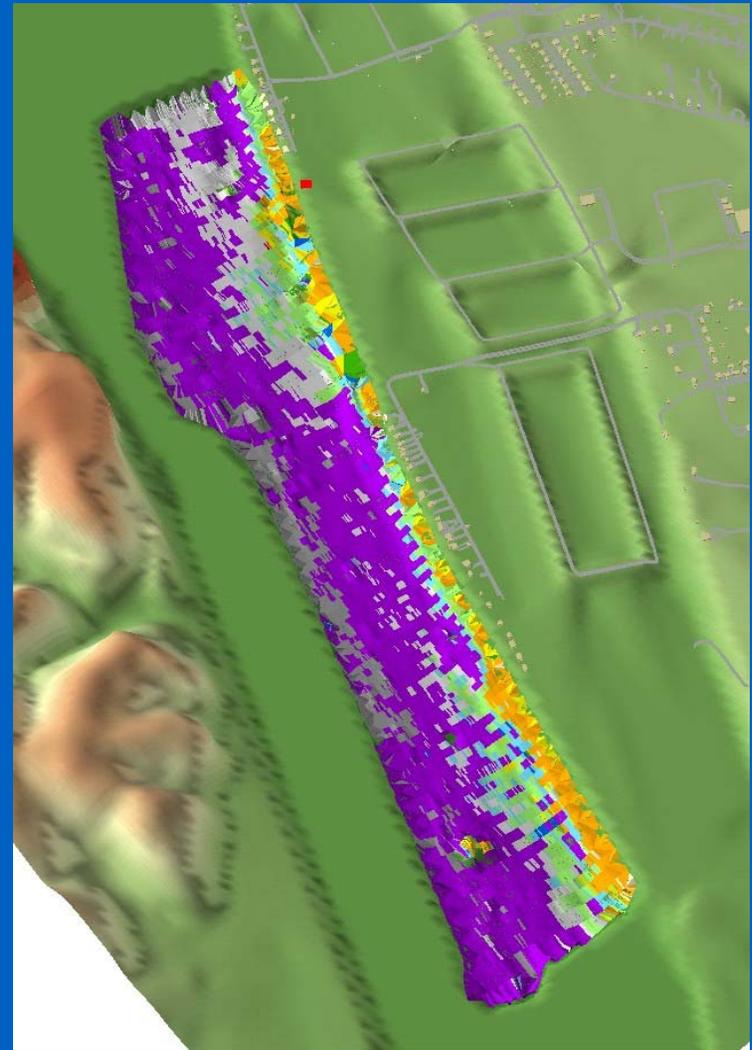
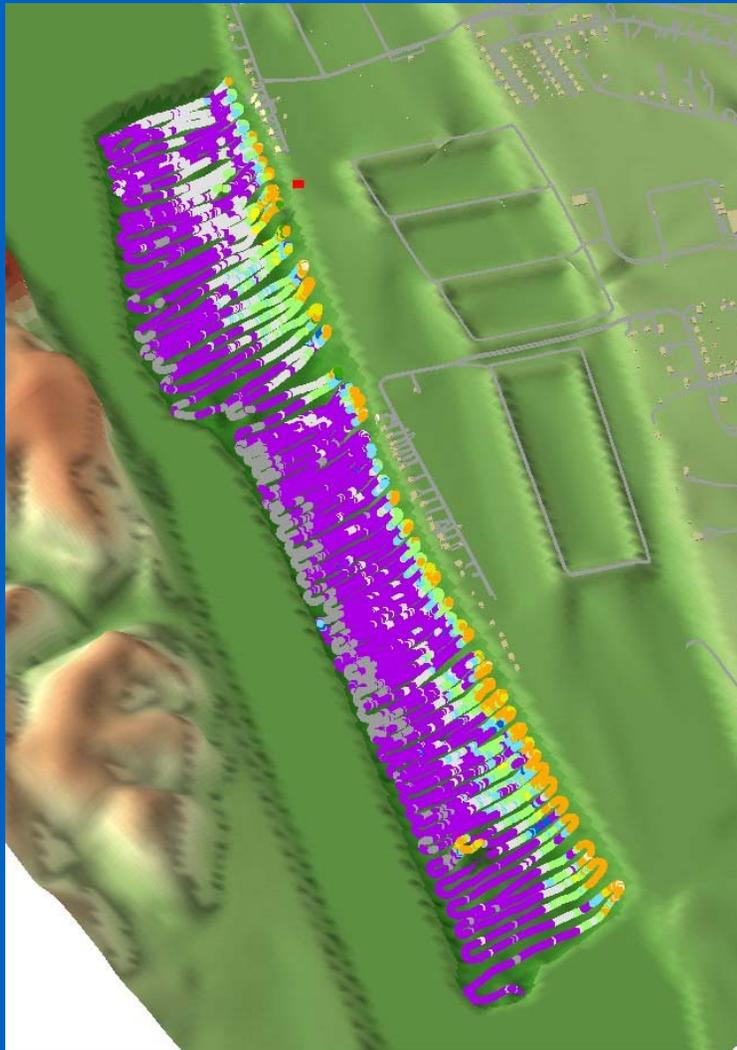
M.I. Rorabaugh, 1956

Limiting infiltration rate of the river bed:

- Vertical permeability of the river bed may be so low that dewatering would occur under part of the river causing the line source to move farther away from the unit.
- Silt, deposited over a period of time, might reduce the infiltration rate. No long-term studies have been made.
- It is thought that high velocities every spring would scour the river bed and limit clogging effects, if present, to short periods of low-velocity flow.

For 280 Mgd, average infiltration rate would be 4 gpd/ft² and as high as 16.5 gpd/ft²

RoxAnn Streambed Classification System



The “Can”









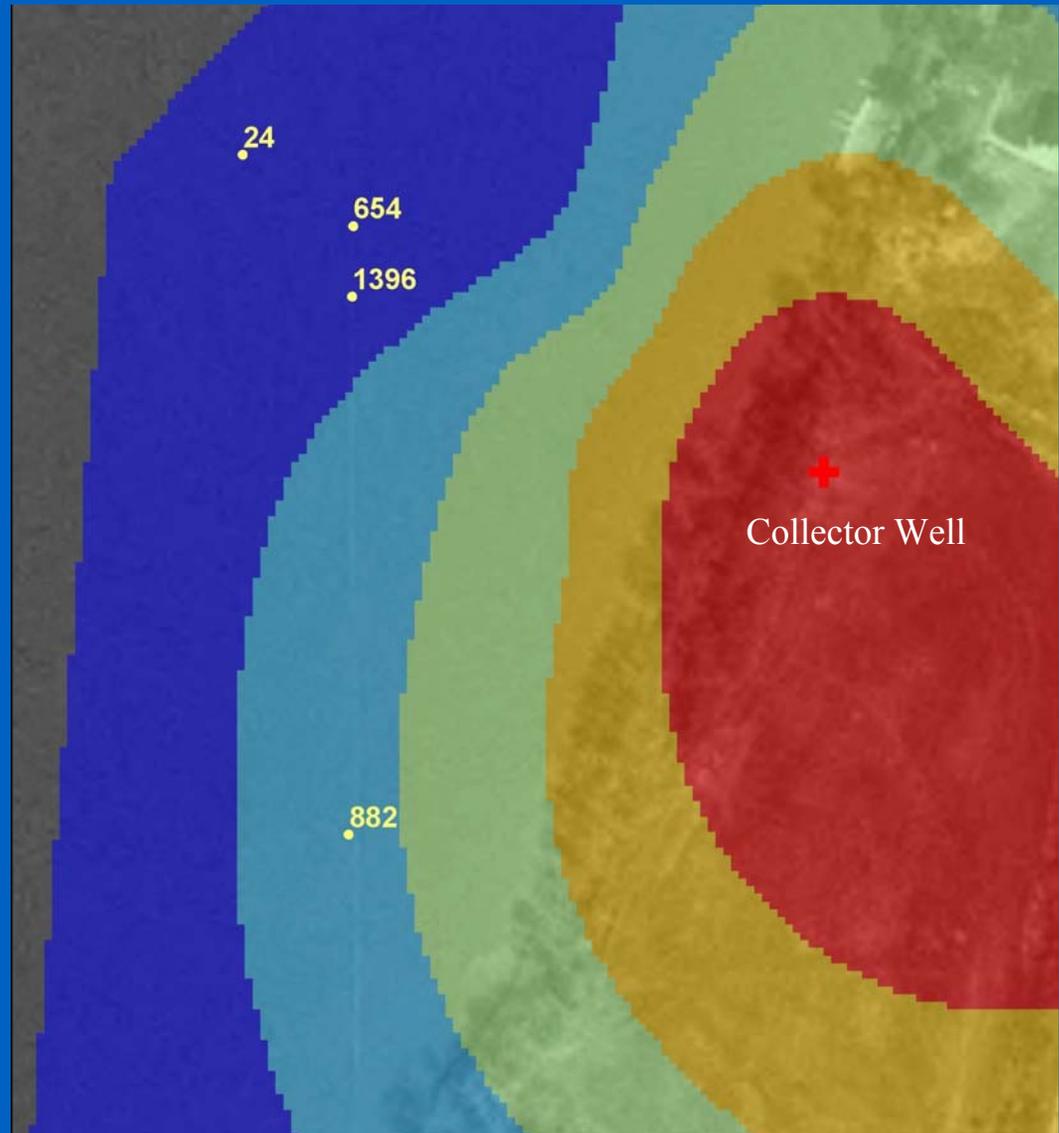


Infiltration Rates

As measured in the field,
August 2003

Values reported in milliliters
per minute per square foot of
river bed

Rorabaugh's estimates of 4 to
16.5 gpd/ft² convert to 10.5 to
43.4 ml/min/ft²





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