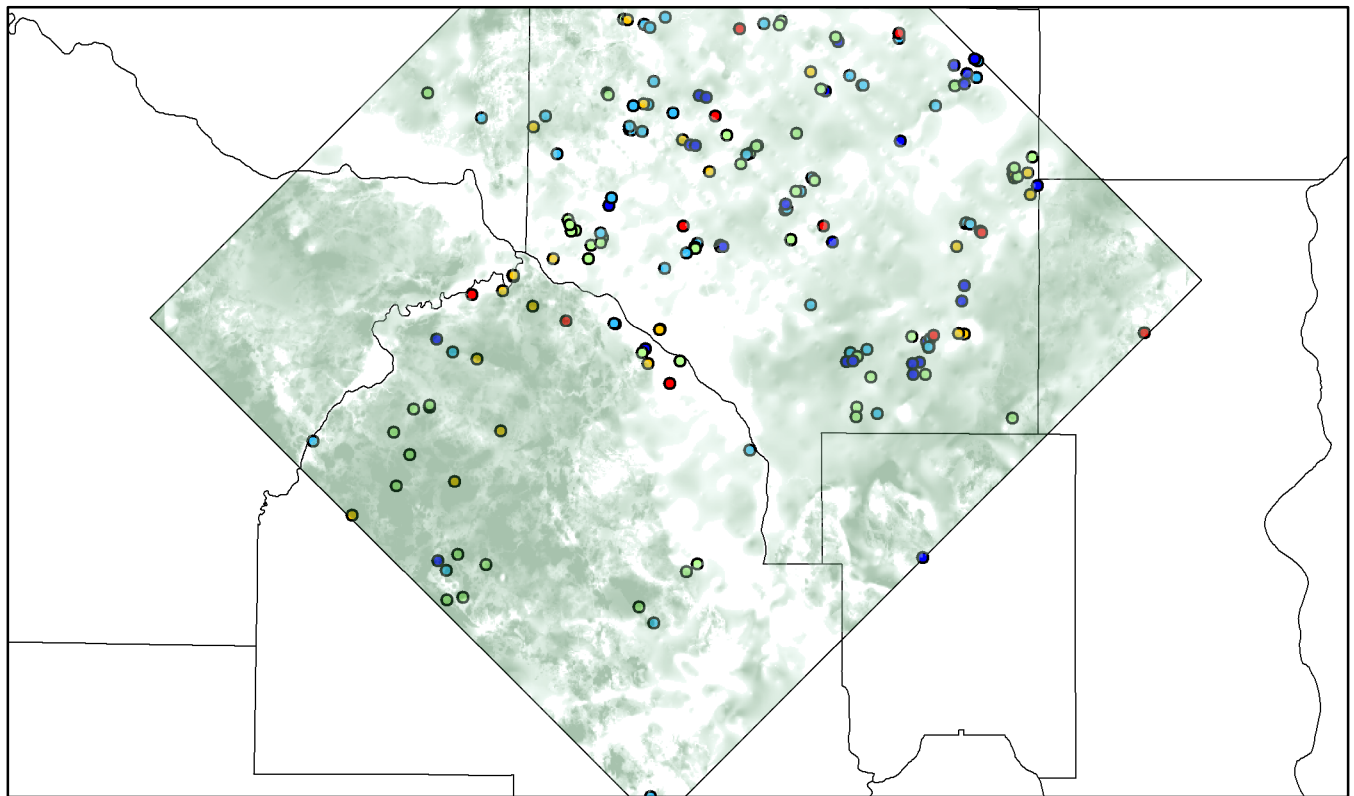
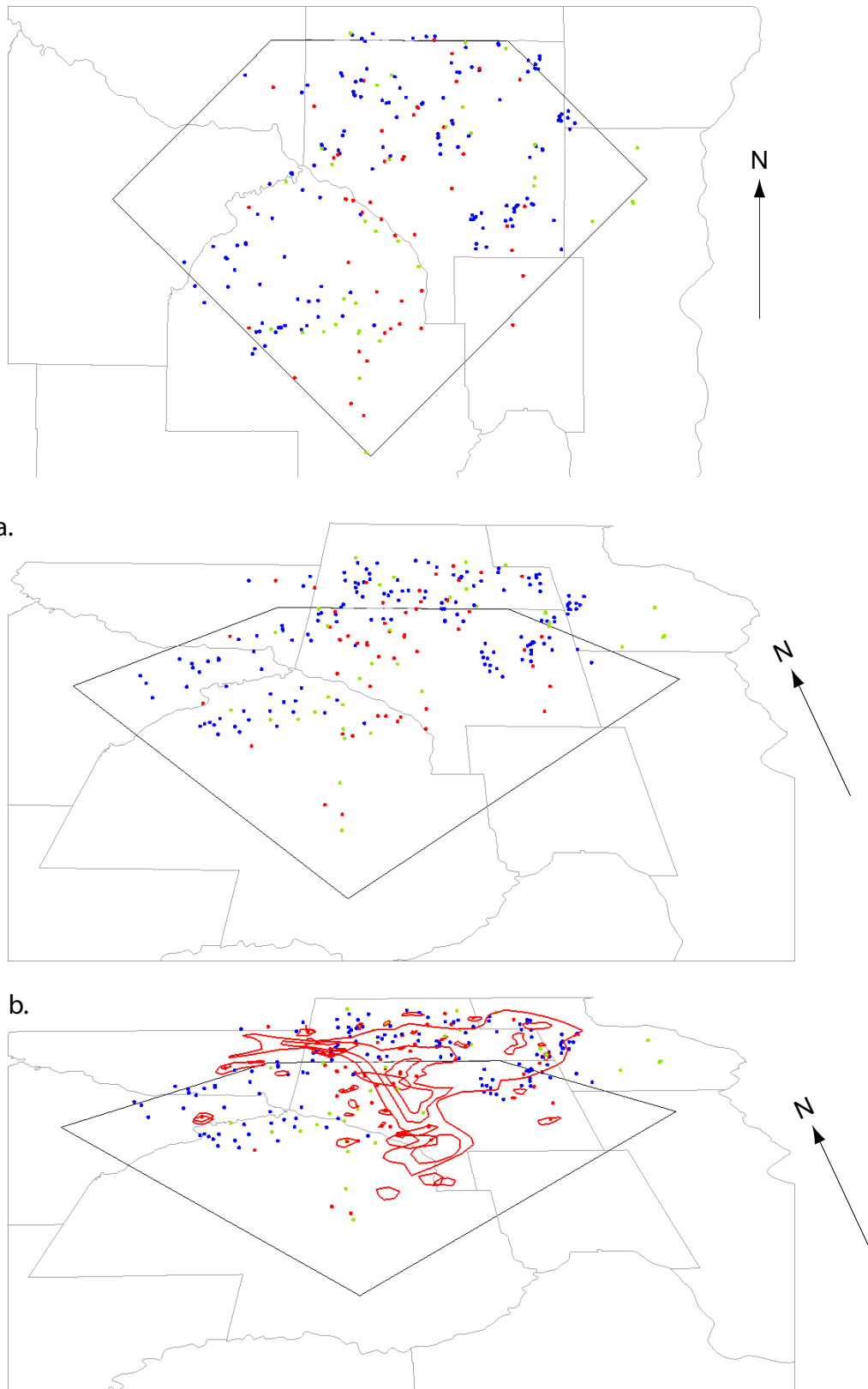


a.



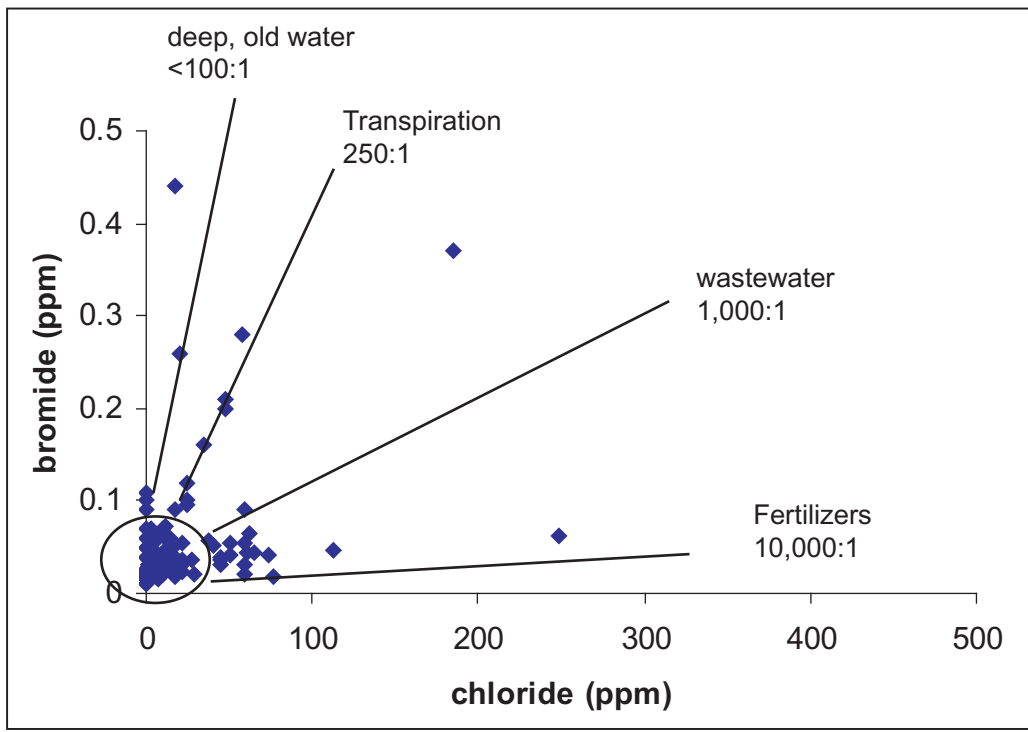
b.

**Figure 7 a.** Map view of ground-water strontium-barium ratios within the study area. **b.** strontium barium ratios with overlay of unit n1 – New Ulm till thickness, with elevation set to top of the unit. Lighter shades indicate decrease in thickness. Maximum mapped thickness of unit n1 within the study area is 254 feet. Comparison of **a.** with **b.** shows higher ratios associated with unit n1 are located below thick portions of the unit in northwest Hennepin County, where as more variable ratios are found in Anoka County, where unit n1 is largely thin or absent

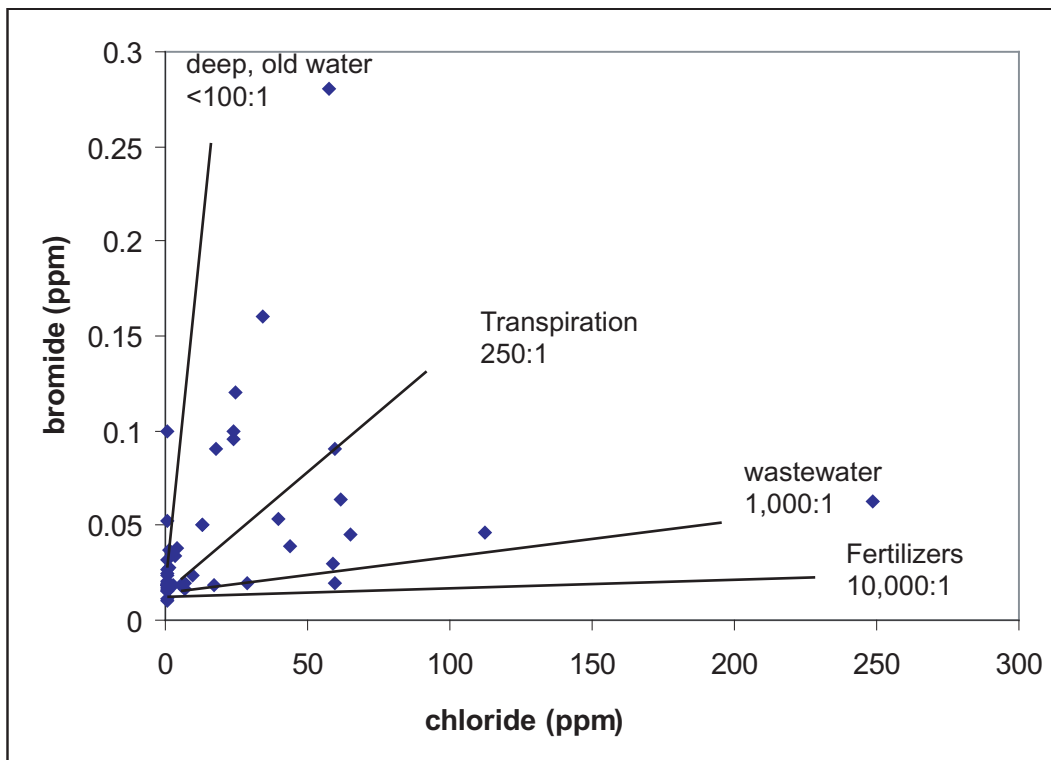


c.

**Figure 8** a. Map showing chloride values within study area. Wells are color-coded according to interpreted age designation: red indicates predominantly “recent” water, with chloride concentrations greater than 8 ppm, blue indicates predominantly “vintage” water with chloride concentrations less than 3 ppm, and green indicates an intermediate “mixed” water with chloride values between 3 and 8 ppm. **b-c.** Perspective views of chloride values. Tritium contours of recent water elevations have been added in **c.** to illustrate the spatial similarity of elevated chloride and tritium values (vertical exaggeration 10x).

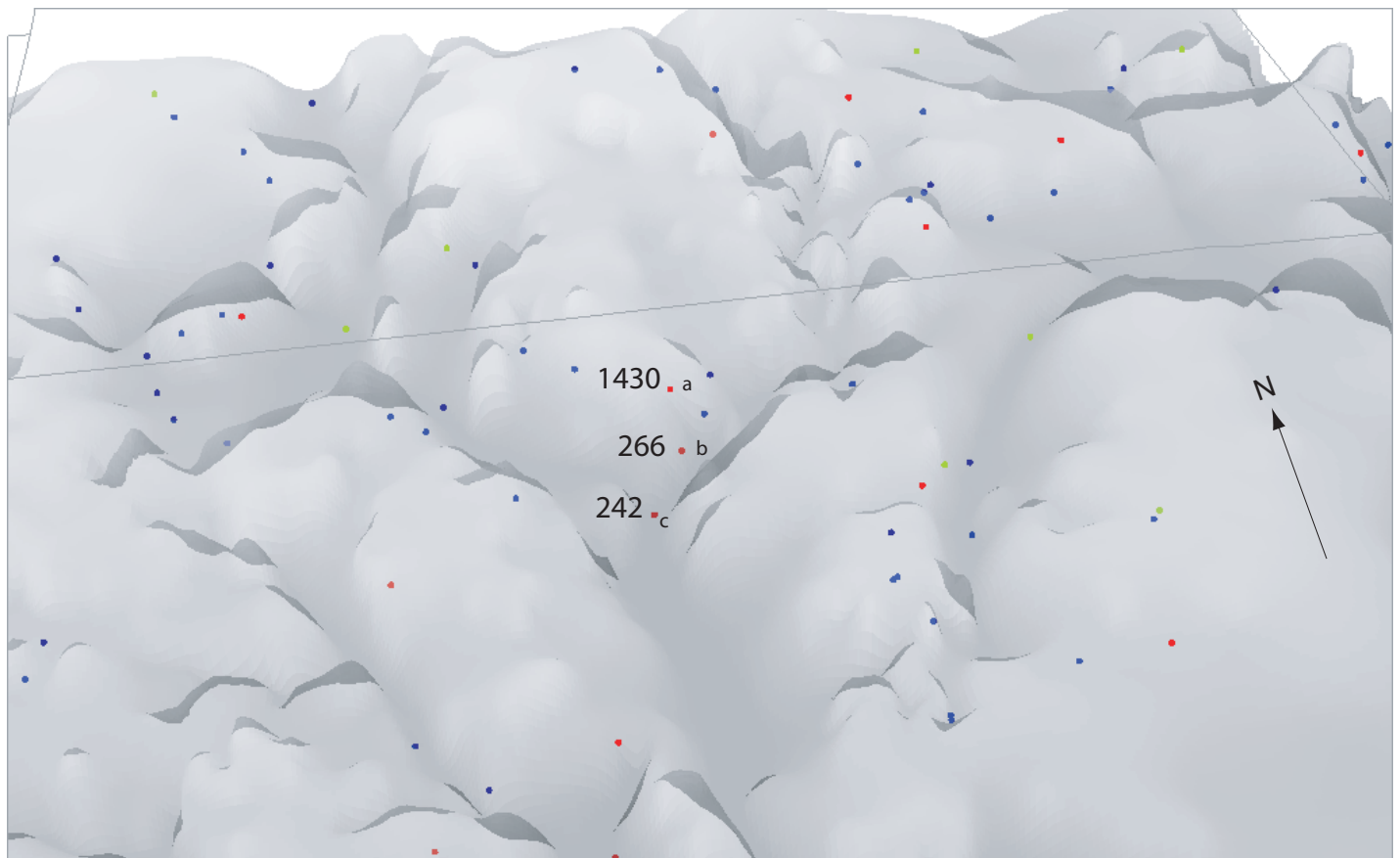


a.

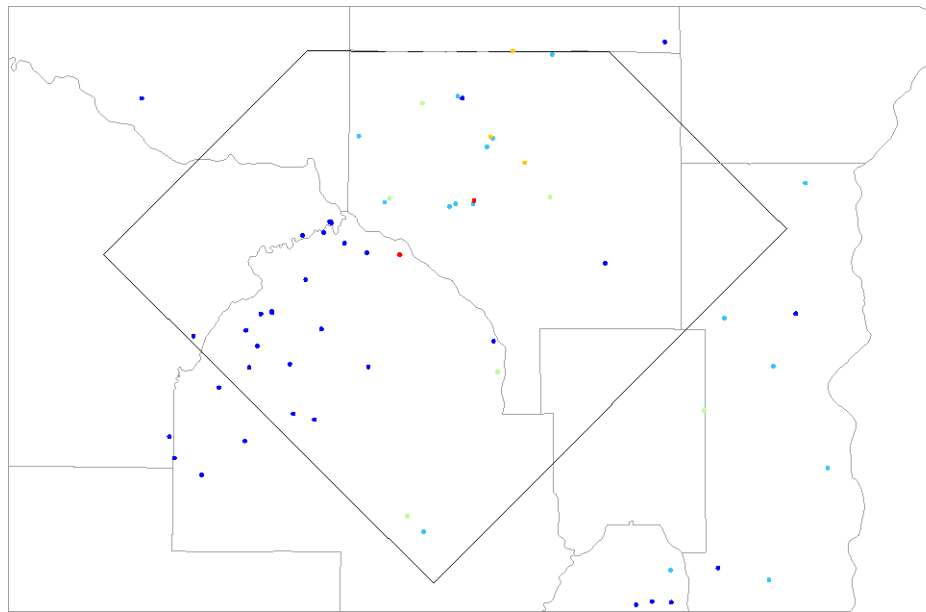


b.

**Figure 9** a. Scatter plot of chloride/bromide ratios from the greater metropolitan area. b. Scatter plot of chloride/bromide ratios within the study area. Interpreted ratios from Alexander, 2005.



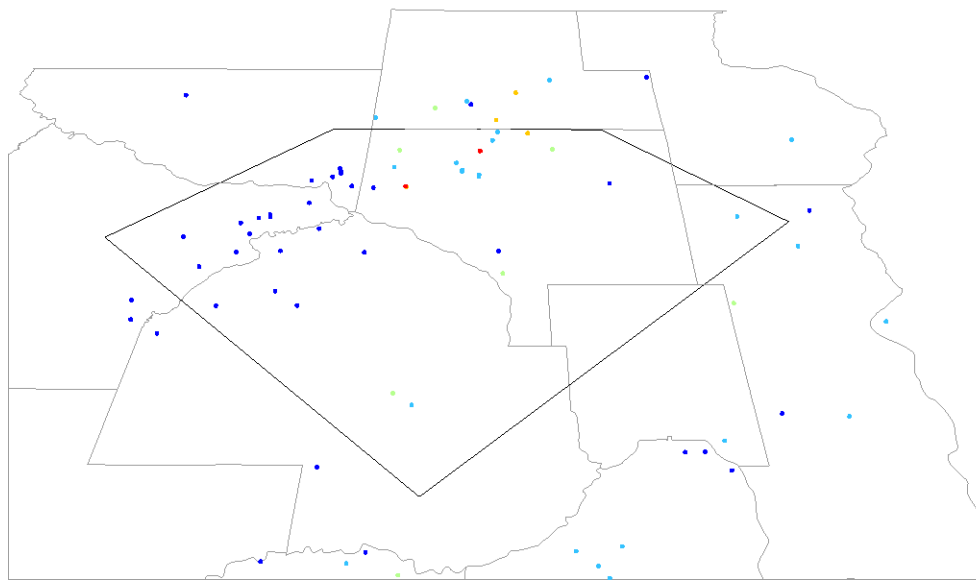
**Figure 10** Perspective view showing chloride/bromide ratios for three wells interpreted as recent waters based on their chloride concentrations. Wells with greater than 8 ppm chloride area shown in red. Bedrock surface has been drawn semi-transparent so bedrock wells area visible. Well “a” is 90 feet deep and completed in glacial sand. Wells “b” and “c” are over 250 feet deep and completed in bedrock. Based on trend lines shown in Fig. 9, wells b and c show a transpiration signature, whereas well a shows a wastewater signature (vertical exaggeration 10x)



a.

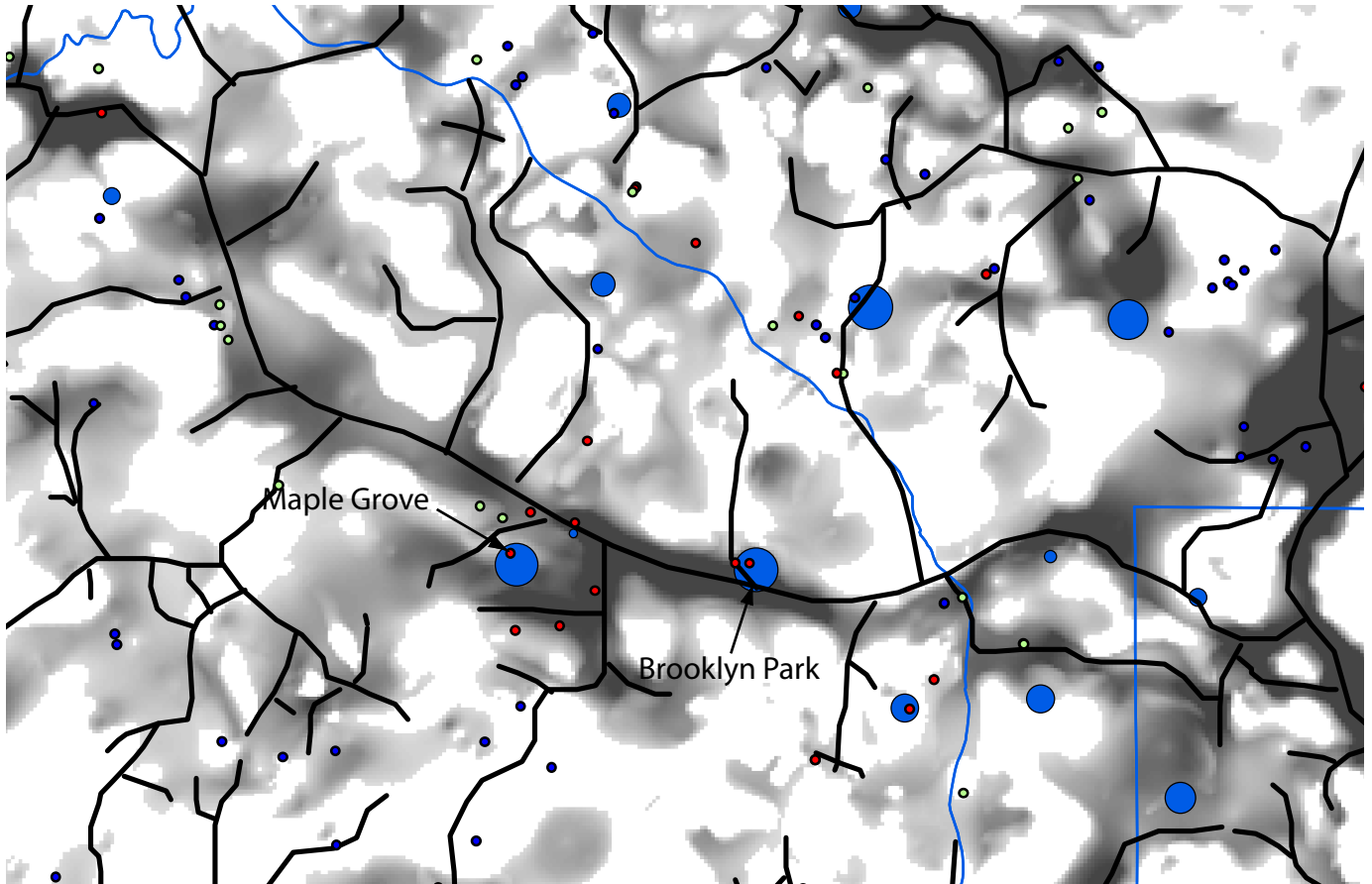
cl/br ratio

- 2400 - 4000
- 1200 - 2400
- 500 - 1200
- 150 - 500
- 3 - 150

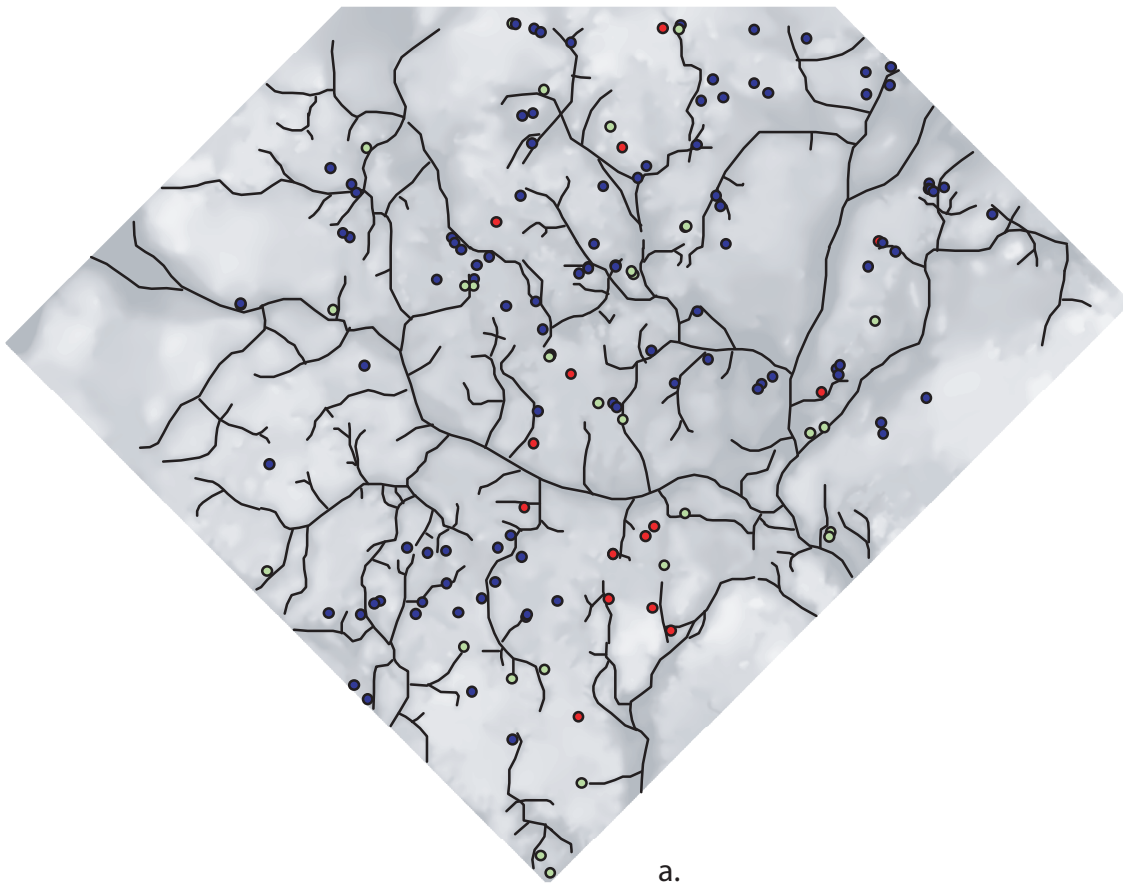


b.

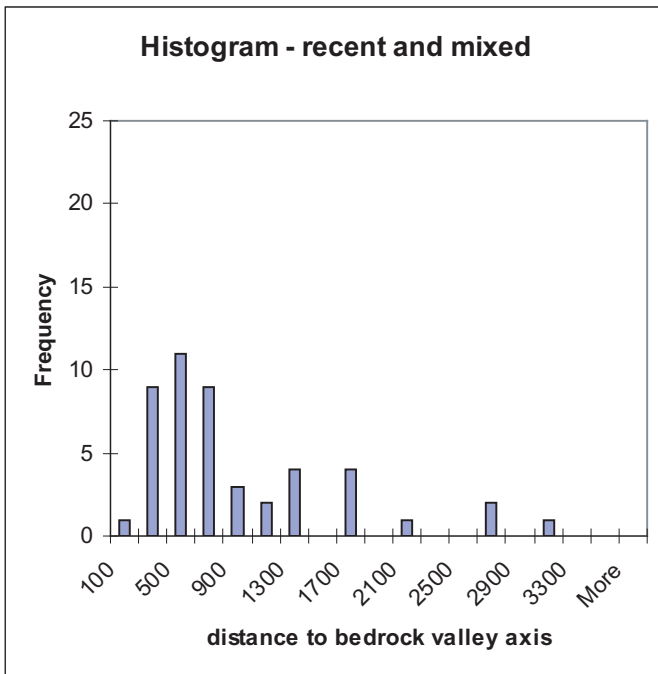
**Figure 11** Map and perspective views of chloride/bromide ratios supporting a conceptual model of older water in bedrock aquifers below thick Des Moines Lobe sediments in northwestern Hennepin County, where chloride/bromide ratios are consistently low. In contrast, values in Anoka County are more heterogeneous, both horizontally and with depth (vertical exaggeration 10x).



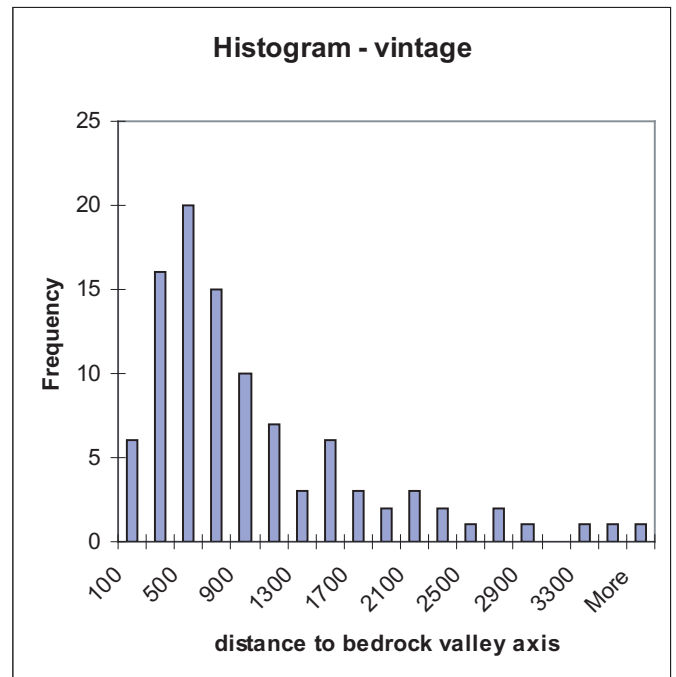
**Figure 12** Map showing distribution of sand thickness along a major bedrock valley in northern Hennepin County. Black lines mark the axes of bedrock valleys in the area. Grey-scale tones are scaled according to sand thickness, with darker shades in excess of 150 feet (unit co, geologic framework model). Tritium results are color coded with red representing recent water, green mixed water, and blue vintage water.



a.



b.



c.

**Figure 13** a. Map view of bedrock topography and tritium age interpretation for wells that reach bedrock. Axes of the bedrock valleys have been digitized in order to calculate the horizontal distance from the sampled well to a bedrock valley axis. b. Histogram of distance to bedrock valley axis for wells interpreted as vintage age based on tritium concentration. c. Histogram of distance to bedrock valley axis for wells interpreted as recent or mixed age based on tritium concentration. No discernable difference between the two histograms. See text for discussion.