Supporting Information

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SI Text

This supporting information provides further details on the numerical modeling analysis and results concerning sustainability of deep water as a source of arsenic-safe water in the Bengal Basin. Fig. S1 supports the designation of the "high-arsenic region" central to the analysis. Fig. S2 illustrates the design and results of simulations with individual wells rather than distributed areal pumping in a local area.

1. British Geological survey and Department of Public Health Engineering (2001) *Arsenic Contamination of Groundwater in Bangladesh*, eds Kinniburgh DG, Smedley PL (British Geological Survey, Keyworth, UK), Vols 1–4, British Geological Survey Report WC/00/19.
2. Harvey CF, *et al.* (2006) Groundwater dynamics and arsenic contamination in Bangladesh. *Chem Geol* 228:112–136.

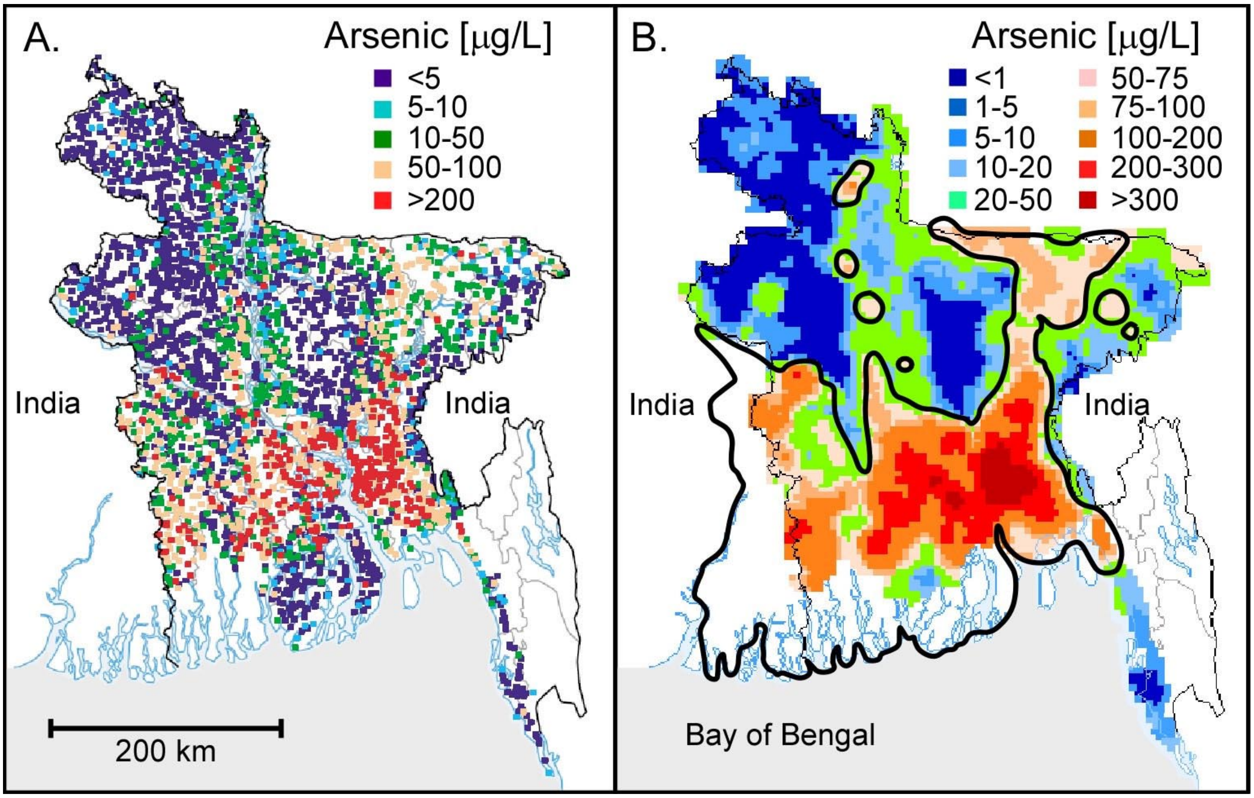

Fig. S1. Maps of dissolved arsenic concentrations measured in wells in Bangladesh by the British Geological Survey and Bangladesh Department of Public Health Engineering, adapted from ref. 1. (*A*) Colored squares represent measured well arsenic concentrations; black line is the border of Bangladesh. The World Health Organization standard for arsenic in drinking water is 10 μg/liter, and the Bangladesh standard is 50 μg/liter. (*B*) Colors represent smoothed arsenic concentrations. Black contour approximately encloses area where arsenic concentrations exceed the Bangladesh arsenic standard, extended to the Hooghly River in West Bengal as suggested by measurements collected by Jadavpur University in West Bengal, India (School of Environmental Studies, Jadavpur University, 2006, http://www.soesju.org/arsenic/wb.htm). The contour is extended south to the Bay of Bengal because, although there is a lack of evidence of high levels of arsenic, shallow groundwater is widely saline and therefore an undesirable source of drinking water.

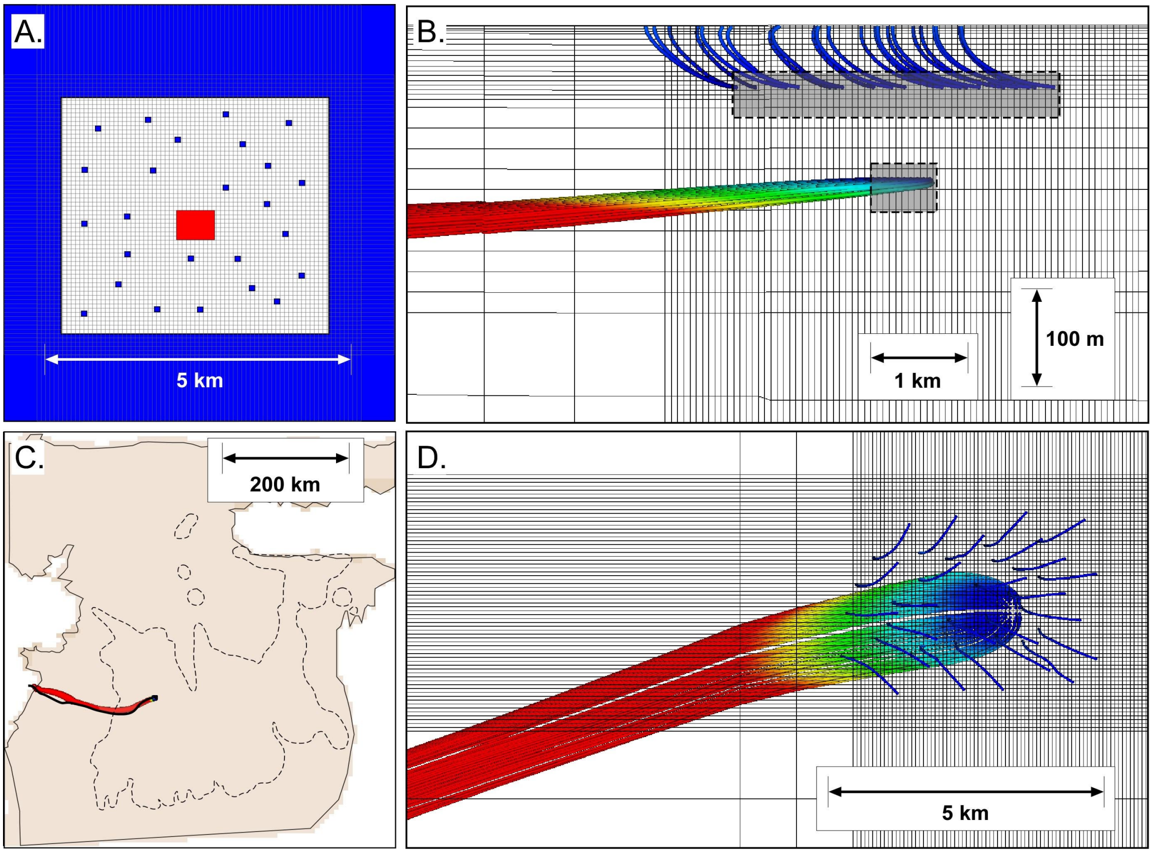

Fig. S2. Illustration of well configuration and flow path results for simulation of individual pumping wells in a local area within the high-arsenic region with base-case parameters. (*A*) Pump locations for a simulated village. The entire 5-km area is the small black square in *C*. Solid blue indicates areal pumping as in base-case simulations. Village size (i.e., the zone where distributed wells are replaced by individual irrigation wells and a small domestic pumping region) is ≈20 km^2. Small blue squares are individual irrigation well locations. The number of wells is based on the total irrigation pumping (7.0×10^{-2} m^3/s) estimated for the 20-km^2 area divided by the median irrigation well pumping rate, as reported by Harvey *et al.* (2), of 24.1 m^3/s, assuming 10 h/day of pumping, over a 100-day pumping season. This results in a low number of irrigation wells (a pessimistic case because the fewer the number of individual wells pumping the same total amount of water, the more likely the hydraulic barrier will not be continuous), 25 within 20 km^2, fewer than the 32 irrigation wells per 7 km^2 reported by Harvey *et al.* (3) for their field site in Bangladesh. Red square is domestic pumping region, pumping rate (1.6×10^{-2} m^3/s) concentrated pessimistically as if domestic pumping occurs only in the village center. (*B*) Cross-sectional view of flow paths to irrigation and domestic wells. Gray boxes indicate depth interval of pumping. Path-line colors indicate backward travel time, blue = 0 year, red = 1000+ years. (*C*) Top view of flow paths. Colored lines are results of the simulation with individual wells; black line is the result of the base-case simulation (which has only areal wells). The difference in paths is small and could be a result of increased discretization in the vicinity of the individual wells (75 m vs. 5,000 m in the base case) and decreased discretization outside of the vicinity (7,000 m cell width vs. 5,000 m in the base case). Dashed contour is high-arsenic region. The simulation result with individual wells is very similar to the base-case simulation result, indicating that the assumption of areally distributed pumping does not significantly impact model results. (*D*) Top view of individual well flow paths in the vicinity of the simulated village.