Summary and Conclusions

The goal of this project was to summarize groundwater quality from wells and springs in basin management unit 5 (watersheds of the Big Sandy River, Little Sandy River, and Tygarts Creek in eastern Kentucky) and evaluate analyte concentrations with respect to criteria provided by the Division of Water. Thirty sites that had not been sampled previously were selected and sampled quarterly from fall 2002 through summer 2003. Results of those analyses were combined with data obtained from the Kentucky Groundwater Data Repository, which is the largest and most inclusive collection of information about groundwater in Kentucky. The water-quality data were compared to criteria provided by the Kentucky Division of Water, including maximum contaminant levels, secondary maximum contaminant levels, health advisory limits set by the U.S. Environmental Protection Agency, and other criteria established by the Division of Water.

The results show that the overall quality of Kentucky groundwater is generally good in the project area. This may be in part because of no extensive urban, industrial, or agricultural factors that could contribute nonpoint-source contamination. Coal mining, timber cutting, and oil and gas production occur in the area, and historically there has been a lack of adequate waste-disposal systems. Table 35 summarizes the findings.

Water properties (pH, total dissolved solids, total suspended solids, electrical conductance, and hardness), inorganic ions (chloride, sulfate, fluoride), and most metals (arsenic, barium, mercury, iron, and manganese) have natural sources and are largely controlled by bedrock lithology. Some exceptionally high values of conductance, chloride, and sulfate may be the effects of deep saline water associated with coal fields, oil and gas production, or leaking on-site waste-disposal systems, and some exceptionally low pH values may show the input of mine drainage. Some anomalously high metal concentrations may be natural or may be the result of human contamination; however, widespread nonpoint-source contamination is not suggested by these data.

Nutrient concentrations show the effects of both natural sources and nonpoint-source inputs. Nitrate-nitrogen concentrations that far exceeded natural contributions were common and probably caused by fertilizer applications. Ammonia-nitrogen concentrations were also commonly above recommended limits; however, this may have been caused by nitrogen from coal beds or leaf litter.

Pesticides and volatile organic chemicals are synthetic organic compounds that do not occur naturally. Although pesticides or volatile organic chemicals exceeded analytical detection limits at relatively few sites, the presence of any amounts of synthetic organic chemicals in groundwater indicates some contamination is occurring.

Throughout the project area, springs and shallow wells were more likely to have harmful levels of metals, nutrients, pesticides, and volatile organic chemicals than deeper wells. The potential contamination of the shallow groundwater system (springs and shallow wells) is cause for concern.

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Table 35. Summary of nonpoint-source effects on groundwater quality in basin management unit 5.

	Parameter	No Strong Evidence for Nonpoint-Source Impact on Groundwater Quality	Some Evidence for Nonpoint-Source Impact on Groundwater Quality	Clear Evidence for Nonpoint-Source Impact on Groundwater Quality
Water Properties	Conductance	X		
	Hardness	X		
	pH	X		
	Total dissolved solids	X		
	Total suspended solids	X		
Inorganic Ions	Chloride	X		
	Sulfate	X		
	Fluoride	X		
Metals	Arsenic	X		
	Barium	X		
	Iron	X		
	Manganese	X		
	Mercury	X		
Nutrients	Ammonia-nitrogen		X	
	Nitrate-nitrogen			X
	Nitrite-nitrogen	X		
	Orthophosphate	X		
	Total phosphorus	X		
Water Properties	2,4-D		X	
	Alachlor		X	
	Atrazine		X	
	Cyanazine	X		
	Metolachlor		X	
	Simazine		X	
Volatile Organic Compounds	Benzene		X	
	Ethylbenzene		X	
	Toluene		X	
	Xylenes		X	
	MTBE		X	

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